

## ENVIRONMENTAL PROTECTION AGENCY

## DRAFT

40 CFR Parts 86, 87, 89, 90,  
94, 98, 600, 1033, 1039, 1042, 1045,  
1048, 1051, 1054, 1065

[EPA-HQ-OAR-2008-0508; FRL- ]

RIN 2060-A079

**Mandatory Reporting of Greenhouse Gases**

**AGENCY:** Environmental Protection Agency (EPA).

**ACTION:** Proposed Rule.

**SUMMARY:** EPA is proposing a regulation to require reporting of greenhouse gas emissions from all sectors of the economy. The rule would apply to fossil fuel suppliers and industrial gas suppliers, as well as to direct greenhouse gas emitters. The proposed rule does not require control of greenhouse gases, rather it requires only that sources above certain threshold levels monitor and report emissions.

**DATES:** Comments must be received on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. There will be two public hearings. One hearing will be held on April 6 and 7, 2009 in the Washington, DC area (One Potomac Yard, 2777 S. Crystal Drive, Arlington, VA 22202). One hearing will be on April 16, 2009 in

Sacramento, CA (Sacramento Convention Center, 1400 J Street, Sacramento, CA 95814). Both hearings will begin at 9:00 am local time. To obtain information about the public hearings or to register to speak at the hearings, please go to

[www.epa.gov/climatechange/emissions/ghgreportingrule.html](http://www.epa.gov/climatechange/emissions/ghgreportingrule.html).

Alternatively, contact Carole Cook at 202-343-9263.

**ADDRESSES:** Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0508, by one of the following methods:

- X Federal eRulemaking Portal:  
<http://www.regulations.gov>. Follow the online instructions for submitting comments.
- X E-mail: [a-and-r-Docket@epa.gov](mailto:a-and-r-Docket@epa.gov).
- X Fax: (202) 566-1741.
- X Mail: Environmental Protection Agency, EPA Docket Center (EPA/DC), Mailcode 6102T, Attention Docket ID No. EPA-HQ-OAR-2008-0508, 1200 Pennsylvania Avenue, NW, Washington, DC 20460.
- X Hand Delivery: EPA Docket Center, Public Reading Room, EPA West Building, Room 3334, 1301 Constitution Avenue, NW, Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0508. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at <http://www.regulations.gov>, including any personal

information provided, unless the comment includes information claimed to be CBI or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through <http://www.regulations.gov> or e-mail. The <http://www.regulations.gov> Web site is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through <http://www.regulations.gov> your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses.

Docket: All documents in the docket are listed in the <http://www.regulations.gov> index. Although listed in the index, some information is not publicly available, e.g.,

CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in <http://www.regulations.gov> or in hard copy at the Air Docket, EPA/DC, EPA West, Room B102, 1301 Constitution Ave., NW., Washington, DC. This Docket Facility is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air Docket is (202) 566-1742.

**FOR FURTHER GENERAL INFORMATION CONTACT:** Carole Cook, Climate Change Division, Office of Atmospheric Programs (MC-6207J), Environmental Protection Agency, 1200 Pennsylvania Ave., NW, Washington, DC 20460; telephone number: (202) 343-9263; fax number: (202) 343-2342; e-mail address: [GHGReportingRule@epa.gov](mailto:GHGReportingRule@epa.gov). For technical information, contact the Greenhouse Gas Reporting Rule Hotline at telephone number: (877)444-1188; or e-mail: [ghgmrr@epa.gov](mailto:ghgmrr@epa.gov).

**SUPPLEMENTARY INFORMATION:**

**Additional Information on Submitting Comments:** To expedite review of your comments by Agency staff, you are encouraged to send a separate copy of your comments, in

addition to the copy you submit to the official docket, to Carole Cook, U.S. EPA, Office of Atmospheric Programs, Climate Change Division, Mail Code 6207-J, Washington, DC, 20460, telephone (202)343-9263, e-mail GHGReportingRule@epa.gov.

**Regulated Entities.** The Administrator determines that this action is subject to the provisions of CAA section 307(d). See CAA section 307(d)(1)(V) (the provisions of section 307(d) apply to "such other actions as the Administrator may determine."). This is a proposed regulation. If finalized, these regulations would affect owners and operators of fuel and chemicals suppliers, direct emitters of GHGs and manufacturers of mobile sources and engines. Regulated categories and entities would include those listed in Table 1 of this preamble:

**Table 1. Examples of Affected Entities by Category**

Category	NAICS	Examples of affected facilities
General Stationary Fuel Combustion Sources		Facilities operating boilers, process heaters, incinerators, turbines, and internal combustion engines:
	211	Extractors of crude petroleum and natural gas.
	321	Manufacturers of lumber and wood products.
	322	Pulp and paper mills.
	325	Chemical manufacturers.
	324	Petroleum refineries, and manufacturers of coal products.
	316, 326, 339	Manufacturers of rubber and miscellaneous plastic products.
	331	Steel works, blast furnaces.

<b>Category</b>	<b>NAICS</b>	<b>Examples of affected facilities</b>
	332	Electroplating, plating, polishing, anodizing, and coloring.
	336	Manufacturers of motor vehicle parts and accessories.
	221	Electric, gas, and sanitary services.
	622	Health services.
	611	Educational services.
Electricity Generation	221112	Fossil-fuel fired electric generating units, including units owned by Federal and municipal governments and units located in Indian Country.
Adipic Acid Production	325199	Adipic acid manufacturing facilities.
Aluminum Production	331312	Primary Aluminum production facilities.
Ammonia Manufacturing	325311	Anhydrous and aqueous ammonia manufacturing facilities.
Cement Production	327310	Owners and operators of Portland Cement manufacturing plants.
Electronics Manufacturing	334111	Microcomputers manufacturing facilities.
	334413	Semiconductor, photovoltaic (solid-state) device manufacturing facilities.
	334419	LCD unit screens manufacturing facilities. MEMS manufacturing facilities.
Ethanol Production	325193	Ethyl alcohol manufacturing facilities.
Ferroalloy Production	331112	Ferroalloys manufacturing facilities.
Fluorinated GHG Production	325120	Industrial gases manufacturing facilities.
Food Processing	311611	Meat processing facilities.
	311411	Frozen fruit, juice, and vegetable manufacturing facilities.
	311421	Fruit and vegetable canning facilities.

<b>Category</b>	<b>NAICS</b>	<b>Examples of affected facilities</b>
Glass Production	327211	Flat glass manufacturing facilities.
	327213	Glass container manufacturing facilities.
	327212	Other pressed and blown glass and glassware manufacturing facilities.
HCFC-22 Production and HFC-23 Destruction	325120	Chlorodifluoromethane manufacturing facilities.
Hydrogen Production	325120	Hydrogen manufacturing facilities.
Iron and Steel Production	331111	Integrated iron and steel mills, steel companies, sinter plants, blast furnaces, basic oxygen process furnace shops.
Lead Production	331419	Primary lead smelting and refining facilities.
	331492	Secondary lead smelting and refining facilities.
Lime Production	327410	Calcium oxide, calcium hydroxide, dolomitic hydrates manufacturing facilities.
Magnesium Production	331419	Primary refiners of nonferrous metals by electrolytic methods.
	331492	Secondary magnesium processing plants.
Nitric Acid Production	325311	Nitric acid manufacturing facilities.
Oil and Natural Gas Systems	486210	Pipeline transportation of natural gas.
	221210	Natural gas distribution facilities.
	325212	Synthetic rubber manufacturing facilities.
Petrochemical Production	32511	Ethylene dichloride manufacturing facilities.
	325199	Acrylonitrile, ethylene oxide, methanol manufacturing facilities.
	325110	Ethylene manufacturing facilities.
	325182	Carbon black manufacturing facilities.
Petroleum Refineries	324110	Petroleum refineries.
Phosphoric Acid Production	325312	Phosphoric acid manufacturing facilities.
Pulp and Paper Manufacturing	322110	Pulp mills.
	322121	Paper mills.
	322130	Paperboard mills.

<b>Category</b>	<b>NAICS</b>	<b>Examples of affected facilities</b>
Silicon Carbide Production	327910	Silicon carbide abrasives manufacturing facilities.
Soda Ash Manufacturing	325181	Alkalies and chlorine manufacturing facilities.
Sulfur Hexafluoride (SF <sub>6</sub> ) from Electrical Equipment	221121	Electric bulk power transmission and control facilities.
Titanium Dioxide Production	325188	Titanium dioxide manufacturing facilities.
Underground Coal Mines	212113	Underground anthracite coal mining operations.
	212112	Underground bituminous coal mining operations.
Zinc Production	331419	Primary zinc refining facilities.
	331492	Zinc dust reclaiming facilities, recovering from scrap and/or alloying purchased metals.
Landfills	562212	Solid waste landfills.
	221320	Sewage treatment facilities.
	322110	Pulp mills.
	322121	Paper mills.
	322122	Newsprint mills.
	322130	Paperboard mills.
	311611	Meat processing facilities.
	311411	Frozen fruit, juice, and vegetable manufacturing facilities.
Wastewater Treatment	311421	Fruit and vegetable canning facilities.
	322110	Pulp mills.
	322121	Paper mills.
	322122	Newsprint mills.
	322130	Paperboard mills.
	311611	Meat processing facilities.
	311411	Frozen fruit, juice, and vegetable manufacturing facilities.
	311421	Fruit and vegetable canning facilities.
Manure Management	325193	Ethanol manufacturing facilities.
	324110	Petroleum refineries.
	112111	Beef cattle feedlots.
	112120	Dairy cattle and milk production facilities.
	112210	Hog and pig farms.
	112310	Chicken egg production facilities.
	112330	Turkey Production



<b>Category</b>	<b>NAICS</b>	<b>Examples of affected facilities</b>
	112320	Broilers and Other Meat type Chicken Production.
Suppliers of Coal and Coal-based Products	212111	Bituminous, and lignite coal surface mining facilities.
	212113	Anthracite coal mining facilities.
	212112	Underground bituminous coal mining facilities.
Suppliers of Coal Based Liquids Fuels	211111	Coal liquefaction at mine sites.
Suppliers of Petroleum Products	324110	Petroleum refineries.
Suppliers of Natural Gas and NGLs	221210	Natural gas distribution facilities.
	211112	Natural gas liquid extraction facilities.
Suppliers of Industrial GHGs	325120	Industrial gas manufacturing facilities.
Suppliers of Carbon Dioxide (CO <sub>2</sub> )	325120	Industrial gas manufacturing facilities.
Mobile Sources	336112	Light-duty vehicles and trucks manufacturing facilities.
	333618	Heavy-duty, non-road, aircraft, locomotive, and marine diesel engine manufacturing.
	336120	Heavy-duty vehicle manufacturing facilities.
	336312	Small non-road, and marine spark-ignition engine manufacturing facilities.
	336999	Personal watercraft manufacturing facilities.
	336991	Motorcycle manufacturing facilities.

Table 1 of this preamble is not intended to be exhaustive, but rather provides a guide for readers regarding facilities likely to be regulated by this action. Table 1 of this preamble lists the types of facilities that EPA is now aware could be potentially affected by this action. Other types of facilities not listed in the table

could also be subject to reporting requirements. To determine whether your facility is affected by this action, you should carefully examine the applicability criteria found in proposed 40 CFR part 98, subpart A. If you have questions regarding the applicability of this action to a particular facility, consult the person listed in the preceding **"FOR FURTHER INFORMATION CONTACT"** section.

Many facilities that would be affected by the proposed rule have GHG emissions from multiple source categories listed in Table 1 of this preamble. Table 2 of this preamble has been developed as a guide to help potential reporters subject to the mandatory reporting rule identify the source categories (by subpart) that they may need to (1) consider in their facility applicability determination, and (2) include in their reporting. For each source category, activity, or facility type (e.g., electricity generation, aluminum production), Table 2 of this preamble identifies the subparts that are likely to be relevant. The table should only be seen as a guide. Additional subparts may be relevant for a given reporter. Similarly, not all listed subparts would be relevant for all reporters.

**Table 2. Source Categories and Relevant Subparts**

<b>Source category (and main applicable subpart)</b>	<b>Subparts recommended for review to determine applicability</b>
General Stationary Fuel Combustion Sources	General Stationary Fuel Combustion
Electricity Generation	General Stationary Fuel Combustion, Electricity Generation, Suppliers of CO <sub>2</sub> , Electric Power Systems
Adipic Acid Production	Adipic Acid Production, General Stationary Fuel Combustion
Aluminum Production	General Stationary Fuel Combustion
Ammonia Manufacturing	General Stationary Fuel Combustion, Hydrogen, Nitric Acid, Petroleum Refineries, Suppliers of CO <sub>2</sub>
Cement Production	General Stationary Fuel Combustion, Suppliers of CO <sub>2</sub>
Electronics Manufacturing	General Stationary Fuel Combustion
Ethanol Production	General Stationary Fuel Combustion, Landfills, Wastewater Treatment
Ferroalloy Production	General Stationary Fuel Combustion
Fluorinated GHG Production	General Stationary Fuel Combustion
Food Processing	General Stationary Fuel Combustion, Landfills, Wastewater Treatment
Glass Production	General Stationary Fuel Combustion
HCFC-22 Production and HFC-23 Destruction	General Stationary Fuel Combustion
Hydrogen Production	General Stationary Fuel Combustion, Petrochemicals, Petroleum Refineries, Suppliers of Industrial GHGs, Suppliers of CO <sub>2</sub>
Iron and Steel Production	General Stationary Fuel Combustion, Suppliers of CO <sub>2</sub>
Lead Production	General Stationary Fuel Combustion
Lime Manufacturing	General Stationary Fuel Combustion
Magnesium Production	General Stationary Fuel Combustion
Nitric Acid Production	General Stationary Fuel Combustion, Adipic Acid
Oil and Natural Gas Systems	General Stationary Fuel Combustion, Petroleum Refineries, Suppliers of Petroleum Products, Suppliers of Natural Gas and NGL, Suppliers of CO <sub>2</sub>
Petrochemical Production	General Stationary Fuel Combustion, Ammonia, Petroleum Refineries
Petroleum Refineries	General Stationary Fuel Combustion, Hydrogen, Landfills, Wastewater Treatment, Suppliers of Petroleum Products

<b>Source category (and main applicable subpart)</b>	<b>Subparts recommended for review to determine applicability</b>
Phosphoric Acid Production	General Stationary Fuel Combustion
Pulp and Paper Manufacturing	General Stationary Fuel Combustion, Landfills, Wastewater Treatment
Silicon Carbide Production	General Stationary Fuel Combustion
Soda Ash Manufacturing	General Stationary Fuel Combustion
Sulfur Hexafluoride (SF <sub>6</sub> ) from Electrical Equipment	General Stationary Fuel Combustion
Titanium Dioxide Production	General Stationary Fuel Combustion
Underground Coal Mines	General Stationary Fuel Combustion, Suppliers of Coal
Zinc Production	General Stationary Fuel Combustion
Landfills	General Stationary Fuel Combustion, Ethanol, Food Processing, Petroleum Refineries, Pulp and Paper
Wastewater Treatment	General Stationary Fuel Combustion, Ethanol, Food Processing, Petroleum Refineries, Pulp and Paper
Manure Management	General Stationary Fuel Combustion
Suppliers of Coal	General Stationary Fuel Combustion, Underground Coal Mines
Suppliers of Coal-based Liquid Fuels	Suppliers of Coal, Suppliers of Petroleum Products
Suppliers of Petroleum Products	General Stationary Fuel Combustion, Oil and Natural Gas Systems
Suppliers of Natural Gas and NGLs	General Stationary Fuel Combustion, Oil and Natural Gas Systems, Suppliers of CO <sub>2</sub>
Suppliers of Industrial GHGs	General Stationary Fuel Combustion, Hydrogen Production, Suppliers of CO <sub>2</sub>
Suppliers of Carbon Dioxide (CO <sub>2</sub> )	General Stationary Fuel Combustion, Electricity Generation, Ammonia, Cement, Hydrogen, Iron and Steel, Suppliers of Industrial GHGs
Mobile Sources	General Stationary Fuel Combustion

**Acronyms and Abbreviations.** The following acronyms and abbreviations are used in this document.

A/C            air conditioning  
 AERR        Air Emissions Reporting Rule  
 ANPR        advance notice of proposed rulemaking

ARP	Acid Rain Program
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BLS	Bureau of Labor Statistics
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CARB	California Air Resources Board
CBI	confidential business information
CCAR	California Climate Action Registry
CDX	central data exchange
CEMS	continuous emission monitoring system(s)
CERR	Consolidated Emissions Reporting Rule
cf	cubic feet
CFCs	chlorofluorocarbons
CFR	Code of Federal Regulations
CH <sub>4</sub>	methane
CHP	combined heat and power
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	CO <sub>2</sub> -equivalent
COD	chemical oxygen demand
DE	destruction efficiency
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DE	destruction efficiency
DRE	destruction or removal efficiency
ECOS	Environmental Council of the States
EGUs	electrical generating units
EIA	Energy Information Administration
EISA	Energy Independence and Security Act of 2007
EO	Executive Order
EOR	enhanced oil recovery
EPA	U.S. Environmental Protection Agency
EU	European Union
FTP	Federal Test Procedure

FY2008	fiscal year 2008
GHG	greenhouse gas
GWP	global warming potential
HCFC-22	chlorodifluoromethane (or $\text{CHClF}_2$ )
HCFCs	hydrochlorofluorocarbons
HCl	hydrogen chloride
HFC-23	trifluoromethane (or $\text{CHF}_3$ )
HFCs	hydrofluorocarbons
HFES	hydrofluorinated ethers
HHV	higher heating value
ICR	information collection request
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
kg	kilograms
LandGEM	Landfill Gas Emissions Model
LCD	liquid crystal display
LDCs	local natural gas distribution companies
LEDs	light emitting diodes
LNG	liquefied natural gas
LPG	liquified petroleum gas
MEMS	microelectricomechanical system
mmBtu/hr	millions British thermal units per hour
MMTCO <sub>2</sub> e	million metric tons carbon dioxide equivalent
MSHA	Mine Safety and Health Administration
MSW	municipal solid waste
MW	megawatts
N <sub>2</sub> O	nitrous oxide
NAAQS	national ambient air quality standard
NACAA	National Association of Clean Air Agencies
NAICS	North American Industry Classification System
NEI	National Emissions Inventory
NESHAP	national emission standards for hazardous air pollutants
NF <sub>3</sub>	nitrogen trifluoride
NGLs	natural gas liquids

NIOSH	National Institute for Occupational Safety and Health
NSPS	new source performance standards
NSR	New Source Review
NTTAA	National Technology Transfer and Advancement Act of 1995
O <sub>3</sub>	ozone
ODS	ozone-depleting substance(s)
OMB	Office of Management and Budget
ORIS	Office of Regulatory Information Systems
PFCs	perfluorocarbons
PIN	personal identification number
POTWs	publicly owned treatment works
PSD	Prevention of Significant Deterioration
PV	photovoltaic
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	quality assurance performance plan
RFA	Regulatory Flexibility Act
RFS	Renewable Fuel Standard
RGGI	Regional Greenhouse Gas Initiative
RIA	regulatory impact analysis
SAE	Society of Automotive Engineers
SAR	IPCC Second Assessment Report
SBREFA	Small Business Regulatory Enforcement Fairness Act
SF <sub>6</sub>	sulfur hexafluoride
SFTP	Supplemental Federal Test Procedure
SI	international system of units
SIP	State Implementation Plan
SSM	startup, shutdown, and malfunction
TCR	The Climate Registry
TOC	total organic carbon
TRI	Toxic Release Inventory
TSCA	Toxics Substances Control Act
TSD	technical support document

U.S.	United States
UIC	underground injection control
UMRA	Unfunded Mandates Reform Act of 1995
UNFCCC	United Nations Framework Convention on Climate Change
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VMT	vehicle miles traveled
VOC	volatile organic compound(s)
WBCSD	World Business Council for Sustainable Development
WCI	Western Climate Initiative
WRI	World Resources Institute
XML	eXtensible Markup Language

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## **I. Background**

The proposed rule would require reporting of annual emissions of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), sulfur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFCs), perfluorochemicals (PFCs), and other fluorinated

gases (e.g., nitrogen trifluoride and hydrofluorinated ethers (HFEs)). The proposed rule would apply to certain downstream facilities that emit GHGs (primarily large facilities emitting 25,000 tpy of CO<sub>2</sub> equivalent GHG emissions or more) and to upstream suppliers of fossil fuels and industrial GHGs, as well as to manufacturers of vehicles and engines. Reporting would be at the facility level, except certain suppliers and vehicle and engine manufacturers would report at the corporate level.

This preamble is broken into several large sections, as detailed above in the Table of Contents. Throughout the preamble we explicitly request comment on a variety of issues. The paragraph below describes the layout of the preamble and provides a brief summary of each section. We also highlight particular issues on which, as indicated later in the preamble, we would specifically be interested in receiving comments.

The first section of this preamble contains the basic background information about greenhouse gases and climate change. It also describes the origin of this proposal, our legal authority and how this proposal relates to other efforts to address emissions of greenhouse gases. In this section we would be particularly interested in receiving

comment on the relationship between this proposal and other government efforts.

The second section of this preamble describes existing Federal, State, Regional mandatory and voluntary GHG reporting programs and how they are similar and different to this proposal. Again, similar to the previous section, we would like comments on the interrelationship of this proposal and existing GHG reporting programs.

The third section of this preamble provides an overview of the proposal itself, while the fourth section provides the rationale for each decision the Agency made in developing the proposal, including key design elements such as: (i) source categories included, (ii) the level of reporting, (iii) applicability thresholds, (iv) reporting and monitoring methods, (v) verification, (vi) frequency and (vii) duration of reporting. Furthermore, in this section, EPA explains the distinction between upstream and downstream reporters, describes why it is necessary to collect data at multiple points, and provides information on how different data would be useful to inform different policies. As stated in the fourth section, we solicit comment on each design element of the proposal generally.

The fifth section of this preamble looks at the same key design elements for each of the source categories

covered by the proposal. Thus, for example, there is a specific discussion regarding appropriate applicability thresholds, reporting and monitoring methodologies and reporting and recordkeeping requirements for each source category. Each source category describes the proposed options for each design element, as well as the other options considered. In addition to the general solicitation for comment on each design element generally and for each source category, throughout the fifth section there are specific issues highlighted on which we solicit comment. Please refer to the specific source category of interest for more details.

The sixth section of this preamble explains how EPA would collect, manage and disseminate the data, while the seventh section describes the approach to compliance and enforcement. In both sections the role of the States is discussed, as are requests for comment on that role.

Finally, the eighth section provides the summary of the impacts and costs from the Regulatory Impact Analysis and the last section walks through the various statutory and executive order requirements applicable to rulemakings.

#### A. What are GHGs?

The proposed rule would cover the major GHGs that are directly emitted by human activities. These include CO<sub>2</sub>,

CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>, and other specified fluorinated compounds (e.g., HFEs) used in boutique applications such as electronics and anesthetics. These gases influence the climate system by trapping in the atmosphere heat that would otherwise escape to space. The GHGs vary in their capacity to trap heat. The GHGs also vary in terms of how long they remain in the atmosphere after being emitted, with the shortest-lived GHG remaining in the atmosphere for roughly a decade and the longest-lived GHG remaining for up to 50,000 years. Because of these long atmospheric lifetimes, all of the major GHGs become well mixed throughout the global atmosphere regardless of emission origin.

Global atmospheric CO<sub>2</sub> concentration increased about 35 percent from the pre-industrial era to 2005. The global atmospheric concentration of CH<sub>4</sub> has increased by 148 percent from pre-industrial levels, and the N<sub>2</sub>O concentration has increased 18 percent. The observed increase in concentration of these gases can be attributed primarily to human activities. The atmospheric concentration of industrial fluorinated gases - HFCs, PFCs, SF<sub>6</sub> - and other fluorinated compounds are relatively low but are increasing rapidly; these gases are entirely anthropogenic in origin.

Due to sheer quantity of emissions, CO<sub>2</sub> is the largest contributor to GHG concentrations followed by CH<sub>4</sub>.

Combustion of fossil fuels (e.g., coal, oil, gas) is the largest source of CO<sub>2</sub> emissions in the U.S. The other GHGs are emitted from a variety of activities. These emissions are compiled by EPA in the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* (Inventory) and reported to the UNFCCC<sup>1</sup> on an annual basis<sup>2</sup>. A more detailed discussion of the Inventory is provided in Section I.D below.

Because GHGs have different heat trapping capacities, they are not directly comparable without translating them into common units. The GWP, a metric that incorporates both the heat-trapping ability and atmospheric lifetime of each GHG, can be used to develop comparable numbers by adjusting all GHGs relative to the GWP of CO<sub>2</sub>. When quantities of the different GHGs are multiplied by their GWPs, the different GHGs can be compared on a CO<sub>2</sub>e basis.

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<sup>1</sup> For more information about the UNFCCC, please refer to: [www.unfccc.int](http://www.unfccc.int). See Articles 4 and 12 of the UNFCCC treaty. Parties to the Convention, by ratifying, "shall develop, periodically update, publish and make available...national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies..."

<sup>2</sup> The U.S. submits the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* to the Secretariat of the UNFCCC as an annual reporting requirement. The UNFCCC treaty, ratified by the U.S. in 1992, sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. The U.S. has submitted the GHG inventory to the United Nations every year since 1993. The annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks* is consistent with national inventory data submitted by other UNFCCC Parties, and uses internationally accepted methods for its emission estimates.



The GWP of CO<sub>2</sub> is 1.0, and the GWP of other GHGs are expressed relative to CO<sub>2</sub>. For example, CH<sub>4</sub> has a GWP of 21, meaning each metric ton of CH<sub>4</sub> emissions would have 21 times as much impact on global warming (over a 100-year time horizon) as a metric ton of CO<sub>2</sub> emissions. The GWPs of the other gases are listed in the proposed rule, and range from the hundreds up to 23,900 for SF<sub>6</sub>.<sup>3</sup> Aggregating all GHGs on a CO<sub>2</sub>e basis at the source level allows a comparison of the total emissions of all the gases from one source with emissions from other sources.

For additional information about GHGs, climate change, climate science, etc. please see EPA's climate change Web site found at <http://www.epa.gov/climatechange/>.

#### B. What is Climate Change?

Climate change refers to any significant changes in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period. Historically, natural factors such as volcanic eruptions and changes in

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<sup>3</sup> EPA has chosen to use GWPs published in the IPCC SAR (furthermore referenced as "SAR GWP values"). The use of the SAR GWP values allows comparability of data collected in this proposed rule to the national GHG inventory that EPA compiles annually to meet U.S. commitments to the UNFCCC. To comply with international reporting standards under the UNFCCC, official emission estimates are to be reported by the U.S. and other countries using SAR GWP values. The UNFCCC reporting guidelines for national inventories were updated in 2002 but continue to require the use of GWPs from the SAR. The parties to the UNFCCC have also agreed to use GWPs based upon a 100-year time horizon although other time horizon values are available. For those fluorinated compounds included in this proposal that not listed in the SAR, EPA is using the most recent available GWPs, either the IPCC Third Assessment Report or Fourth Assessment Report. For more specific information about the GWP of specific GHGs, please see Table A-1 in the proposed 40 CFR part 98, subpart A.

the amount of energy released from the sun have affected the earth's climate. Beginning in the late 18<sup>th</sup> century, human activities associated with the industrial revolution have also changed the composition of the earth's atmosphere and very likely are influencing the earth's climate.<sup>4</sup> The heating effect caused by the buildup of GHGs in our atmosphere enhances the Earth's natural greenhouse effect and adds to global warming. As global temperatures increase other elements of the climate system, such as precipitation, snow and ice cover, sea levels, and weather events, change. The term "climate change," which encompasses these broader effects, is often used instead of "global warming."

According to the IPCC, warming of the climate system is "unequivocal," as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. Global mean surface temperatures have risen by 0.74°C (1.3°F) over the last 100 years. Global mean surface temperature was higher during the last few decades of the 20th century than during any comparable period during the preceding four centuries. U.S.

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<sup>4</sup> IPCC: Climate Change 2007: The Physical Science Basis, February 2, 2007 (<http://www.ipcc.ch/>)

temperatures also warmed during the 20<sup>th</sup> and into the 21<sup>st</sup> century; temperatures are now approximately 0.56°C (1.0°F) warmer than at the start of the 20<sup>th</sup> century, with an increased rate of warming over the past 30 years. Most of the observed increase in global average temperatures since the mid-20<sup>th</sup> century is very likely due to the observed increase in anthropogenic GHG concentrations.

According to different scenarios assessed by the IPCC, average global temperature by end of this century is projected to increase by 1.8 to 4.0°C (3.2 to 7.2°F) compared to the average temperature in 1990. The uncertainty range of this estimate is 1.1 to 6.4°C (2.0 to 11.5°F). Future projections show that, for most scenarios assuming no additional GHG emission reduction policies, atmospheric concentrations of GHGs are expected to continue climbing for most if not all of the remainder of this century, with associated increases in average temperature. Overall risk to human health, society and the environment increases with increases in both the rate and magnitude of climate change.

For additional information about GHGs, climate change, climate science, etc. please see EPA's climate change Web site found at <http://www.epa.gov/climatechange/>.

### C. Statutory Authority

On December 26, 2007, President Bush signed the FY2008 Consolidated Appropriations Act which authorized funding for EPA to "develop and publish a draft rule not later than 9 months after the date of enactment of this Act, and a final rule not later than 18 months after the date of enactment of this Act, to require mandatory reporting of GHG emissions above appropriate thresholds in all sectors of the economy of the United States." Consolidated Appropriations Act, 2008, Pub. L. No.110-161, 121 Stat 1844, 2128 (2008).

The accompanying joint explanatory statement directed EPA to "use its existing authority under the Clean Air Act" to develop a mandatory GHG reporting rule. "The Agency is further directed to include in its rule reporting of emissions resulting from upstream production and downstream sources, to the extent that the Administrator deems it appropriate." EPA has interpreted that language to confirm that it may be appropriate for the Agency to exercise its CAA authority to require reporting of the quantity of fuel or chemical that is produced or imported from upstream sources such as fuel suppliers, as well as reporting of emissions from facilities (downstream sources) that directly emit GHGs from their processes or from fuel combustion, as appropriate. The joint explanatory

statement further states that “[t]he Administrator shall determine appropriate thresholds of emissions above which reporting is required, and how frequently reports shall be submitted to EPA. The Administrator shall have discretion to use existing reporting requirements for electric generating units” under section 821 of the 1990 CAA Amendments.

EPA is proposing this rule under its existing CAA authority. EPA also proposes that the rule require the reporting of the GHG emissions resulting from the quantity of fossil fuel or industrial gas that is produced or imported from upstream sources such as fuel suppliers, as well as reporting of GHG emissions from facilities (downstream sources) that directly emit GHGs from their processes or from fuel combustion, as appropriate. This proposed rule would also establish appropriate thresholds and frequency for reporting.

Section 114(a) (1) of the CAA authorizes the Administrator to, *inter alia*, require certain persons (see below) on a one-time, periodic or continuous basis to keep records, make reports, undertake monitoring, sample emissions, or provide such other information as the Administrator may reasonably require. This information may be required of any person who (i) owns or operates an

emission source, (ii) manufactures control or process equipment, (iii) the Administrator believes may have information necessary for the purposes set forth in this section, or (iv) is subject to any requirement of the Act (except for manufacturers subject to certain title II requirements). The information may be required for the purposes of developing an implementation plan, an emission standard under sections 111, 112 or 129, determining if any person is in violation of any standard or requirement of an implementation plan or emissions standard, or "carrying out any provision" of the Act (except for a provision of title II with respect to manufacturers of new motor vehicles or new motor vehicle engines).<sup>5</sup> Section 208 of the CAA provides EPA with similar broad authority regarding the manufacturers of new motor vehicles or new motor vehicle engines, and other persons subject to the requirements of parts A and C of title II.

The scope of the persons potentially subject to a section 114(a)(1) information request (e.g., a person "who the Administrator believes may have information necessary for the purposes set forth in" section 114(a)) and the

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<sup>5</sup> Although there are exclusions in section 114(a)(1) regarding certain title II requirements applicable to manufacturers of new motor vehicle and motor vehicle engines, section 208 authorizes the gathering of information related to those areas.

reach of the phrase "carrying out any provision" of the Act are quite broad. EPA's authority to request information reaches to a source not subject to the CAA, and may be used for purposes relevant to *any* provision of the Act. Thus, for example, utilizing sections 114 and 208, EPA could gather information relevant to carrying out provisions involving research (e.g., section 103(g)); evaluating and setting standards (e.g., section 111); and endangerment determinations contained in specific provisions of the Act (e.g., 202); as well as other programs.

Given the broad scope of sections 114 and 208 of the CAA, it is appropriate for EPA to gather the information required by this rule because such information is relevant to EPA's carrying out a wide variety of CAA provisions. For example, emissions from direct emitters should inform decisions about whether and how to use section 111 to establish NSPS for various source categories emitting GHGs, including whether there are any additional categories of sources that should be listed under section 111(b). Similarly, the information required of manufacturers of mobile sources should support decisions regarding treatment of those sources under sections 202, 213 or 231 of the CAA. In addition, the information from fuel suppliers would be relevant in analyzing whether to proceed, and particular

options for how to proceed, under section 211(c) regarding fuels, or to inform action concerning downstream sources under a variety of Title I or Title II provisions. For example, the geographic distribution, production volumes and characteristics of various fuel types and subtypes may also prove useful in setting NSPS or Best Available Control Technology limits for some combustion sources.

Transportation distances from fuel sources to end users may be useful in evaluating cost effectiveness of various fuel choices, increases in transportation emissions that may be associated with various fuel choices, as well as the overall impact on energy usage and availability. The data overall also would inform EPA's implementation of section 103(g) of the CAA regarding improvements in nonregulatory strategies and technologies for preventing or reducing air pollutants. This section, which specifically mentions CO<sub>2</sub>, highlights energy conservation, end-use efficiency and fuel-switching as possible strategies for consideration and the type of information collected under this rule would be relevant. The above discussion is not a comprehensive listing of all the possible ways the information collected under this rule could assist EPA in carrying out any provision of the CAA. Rather it illustrates how the



information request fits within the parameters of EPA's CAA authority.

D. Inventory of U.S. GHG Emissions and Sinks

The *Inventory of U.S. Greenhouse Gas Emissions and Sinks* (Inventory), prepared by EPA's Office of Atmospheric Programs in coordination with the Office of Transportation and Air Quality, is an impartial, policy-neutral report that tracks annual GHG emissions. The annual report presents historical U.S. emissions of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>.

The U.S. submits the Inventory to the Secretariat of the UNFCCC as an annual reporting requirement. The UNFCCC treaty, ratified by the U.S. in 1992, sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. The U.S. has submitted the GHG inventory to the United Nations every year since 1993. The annual Inventory is consistent with national inventory data submitted by other UNFCCC Parties, and uses internationally accepted methods for its emission estimates.

In preparing the annual Inventory, EPA leads an interagency team that includes DOE, USDA, DOT, DOD, the State Department, and others. EPA collaborates with hundreds of experts representing more than a dozen Federal

agencies, academic institutions, industry associations, consultants, and environmental organizations. The Inventory is peer-reviewed annually by domestic experts, undergoes a 30-day public comment period, and is also peer-reviewed annually by UNFCCC review teams.

The most recent GHG inventory submitted to the UNFCCC, the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006* (April 2008), estimated that total U.S. GHG emissions were 7,054.2 million metric tons of CO<sub>2</sub>e in 2006. Overall emissions have grown by 15 percent from 1990 to 2006. CO<sub>2</sub> emissions have increased by 18 percent since 1990. CH<sub>4</sub> emissions have decreased by 8 percent since 1990, while N<sub>2</sub>O emissions have decreased by 4 percent since 1990. Emissions of HFCs, PFCs, and SF<sub>6</sub> have increased by 64 percent since 1990. The combustion of fossil fuels (i.e., petroleum, coal, and natural gas) was the largest source of GHG emissions in the U.S., and accounted for approximately 80 percent of total CO<sub>2</sub>e emissions.

The Inventory is a comprehensive top-down national assessment of national GHG emissions, and it uses top-down national energy data and other national statistics (e.g., on agriculture). To achieve the goal of comprehensive national emissions coverage for reporting under the UNFCCC, most GHG emissions in the report are calculated via

activity data from national-level databases, statistics, and surveys. The use of the aggregated national data means that the national emissions estimates are not broken-down at the geographic or facility level. In contrast, this reporting rule focuses on bottom-up data and individual sources above appropriate thresholds. Although it would provide more specific data, it would not provide full coverage of total annual U.S. GHG emissions, as is required in the development of the Inventory in reporting to the UNFCCC.

The mandatory GHG reporting rule would help to improve the development of future national inventories for particular source categories or sectors by advancing the understanding of emission processes and monitoring methodologies. Facility, unit, and process level GHG emissions data for industrial sources would improve the accuracy of the Inventory by confirming the national statistics and emission estimation methodologies used to develop the top-down inventory. The results can indicate shortcomings in the national statistics and identify where adjustments may be needed.

Therefore, although the data collected under this rule would not replace the system in place to produce the comprehensive annual national Inventory, it can serve as a

useful tool to better improve the accuracy of future national-level inventories.

At the same time, EPA solicits comment on whether the submission of the Inventory to the UNFCCC could be utilized to satisfy the requirements of the rule promulgated by EPA pursuant to the FY2008 Consolidated Appropriations Act.

For more information about the Inventory, please refer to the following Web site:

<http://www.epa.gov/climatechange/emissions/usinventoryreport.html>.

E. How does this proposal relate to U.S. government and other climate change efforts?

The proposed mandatory GHG reporting program would provide EPA, other government agencies, and outside stakeholders with economy-wide data on facility-level (and in some cases corporate-level) GHG emissions. Accurate and timely information on GHG emissions is essential for informing some future climate change policy decisions. Although additional data collection (e.g., for other source categories such as indirect emissions or offsets) may be required as the development of climate policies evolves, the data collected in this rule would provide useful information for a variety of policies. For example, through data collected under this rule, EPA would gain a better

understanding of the relative emissions of specific industries, and the distribution of emissions from individual facilities within those industries. The facility-specific data would also improve our understanding of the factors that influence GHG emission rates and actions that facilities are already taking to reduce emissions. In addition, the data collected on some source categories such as landfills and manure management, which can be covered by the CAA, could also potentially help inform offset program design by providing fundamental data on current baseline emissions for these categories.

Through this rulemaking, EPA would be able to track the trend of emissions from industries and facilities within industries over time, particularly in response to policies and potential regulations. The data collected by this rule would also improve the U.S. government's ability to formulate a set of climate change policy options and to assess which industries would be affected, and how these industries would be affected by the options. Finally, EPA's experience with other reporting programs is that such programs raise awareness of emissions among reporters and other stakeholders, and thus contribute to efforts to identify reduction opportunities and carry them out.

The goal is to have this GHG reporting program supplement and complement, rather than duplicate, U.S. government and other GHG programs (e.g., State and Regional based programs). As discussed in Section I.D of this preamble, EPA anticipates that facility-level GHG emissions data would lead to improvements in the quality of the Inventory.

As discussed in Section II of this preamble, a number of EPA voluntary partnership programs include a GHG emissions and/or reductions reporting component (e.g., Climate Leaders, the Natural Gas STAR program). Because this mandatory reporting program would have much broader coverage than the voluntary programs, it would help EPA learn more about emissions from facilities not currently included in these programs and broaden coverage of these industries.

Also discussed in Section II of this preamble, DOE EIA implements a voluntary GHG registry under section 1605(b) of the Energy Policy Act. Under EIA's "1605(b) program," reporters can choose to prepare an entity-wide GHG inventory and identify specific GHG reductions made by the entity<sup>6</sup>. EPA's proposed mandatory GHG program would have a

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<sup>6</sup> Under the 1605(b) program an "entity" is defined as "the whole or part of any business, institution, organization or household that is

much broader set of reporters included, primarily at the facility<sup>7</sup> rather than entity-level, but this proposed rule is not designed with the specific intent of reporting of emission reductions, as is the 1605(b) program.

Again, in Section II, existing State and Regional GHG reporting and reduction programs are summarized. Many of those programs may be broader in scope and more aggressive in implementation. States collecting that additional information may have determined that types of data not collected by this proposal are necessary to implement a variety of climate efforts. While EPA's proposal was specifically developed in response to the Appropriations Act, we also acknowledge, similar to the States, there may be a need to collect additional data from sources subject to this rule as well as other sources depending on the types of policies the Agency is developing and implementing (e.g., indirect emissions and offsets). Addressing climate

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recognized as an entity under any U.S. Federal, State or local law that applies to it; is located, at least in part, in the U.S.; and whose operations affect U.S. greenhouse gas emissions."

(<http://www.pi.energy.gov/enhancingGHGregistry/>)

<sup>7</sup> For the purposes of this proposal, facility means any physical property, plant, building, structure, source, or stationary equipment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas. Operators of military installations may classify such installations as more than a single facility based on distinct and independent functional groupings within contiguous military properties.

change may require a suite of policies and programs and this proposal for a mandatory reporting program is just one effort to collect information necessary to inform those policies. There may well be subsequent efforts depending on future policy direction and/or requests from Congress.

F. How does this proposal relate to EPA's Climate Change ANPR?

On July 30, 2008, EPA published an ANPR on "Regulating Greenhouse Gas Emissions under the Clean Air Act" (73 FR 44354). The ANPR presented information relevant to, and solicited public comment on, issues regarding the potential regulation of GHGs under the CAA, including EPA's response to the U.S. Supreme Court's decision in *Massachusetts v. EPA*, 127 S.Ct. 1438 (2007). EPA's proposing the mandatory GHG reporting rule does not indicate that EPA has made any final decisions related to the questions identified in the ANPR. Any information collected under the mandatory GHG reporting program would assist EPA and others in developing future climate policy<sup>8</sup>.

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<sup>8</sup> At this time, a regulation requiring the reporting of GHG emissions and emissions-related data under CAA sections 114 and 208 does not trigger the need for EPA to develop or revise regulations under any other section of the CAA, including the PSD program. See memorandum entitled "EPA's Interpretation of Regulations that Determine Pollutants Covered By Federal Prevention of Significant Deterioration (PSD) Permit Program" (Dec. 18, 2008). EPA is reconsidering this memorandum and will be seeking public comment on the issues raised in it. That proceeding, not this rulemaking, would be the appropriate venue for submitting



G. How was this proposed rule developed?

In response to the FY2008 Consolidated Appropriations Amendment, EPA has developed this proposed rulemaking. The components of this development are explained in the following subsections.

1. Identifying the Goals of the GHG Reporting System

The mandatory reporting program would provide comprehensive and accurate data which would inform future climate change policies. Potential future climate policies include research and development initiatives, economic incentives, new or expanded voluntary programs, adaptation strategies, emission standards, a carbon tax, or a cap-and-trade program. Because we do not know at this time the specific policies that may be adopted, the data reported through the mandatory reporting system should be of sufficient quality to support a range of approaches. Also, consistent with the Appropriations Act, the reporting rule proposes to cover a broad range of sectors of the economy.

To these ends, we identified the following goals of the mandatory reporting system:

- X Obtain data that is of sufficient quality that it can be used to support a range of future climate change policies and regulations.

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comments on the issue of whether monitoring regulations under the CAA should trigger the PSD program.

- X Balance the rule coverage to maximize the amount of emissions reported while excluding small emitters.
- X Create reporting requirements that are consistent with existing GHG reporting programs by using existing GHG emission estimation and reporting methodologies to reduce reporting burden, where feasible.

## 2. Developing the Proposed Rule

In order to ensure a comprehensive consideration of GHG emissions, EPA organized the development of the proposal around seven categories of processes that emit GHGs: Downstream sources of emissions: (1) Fossil Fuel Combustion: Stationary, (2) Fossil Fuel Combustion: Mobile, (3) Industrial Processes, (4) Fossil Fuel Fugitive<sup>9</sup> Emissions, (5) Biological Processes and Upstream sources of emissions: (6) Fuel Suppliers, and (7) Industrial GHG Suppliers.

For each category, EPA evaluated the requirements of existing GHG reporting programs, obtained input from stakeholders, analyzed reporting options, and developed the general reporting requirements and specific requirements for each of the GHG emitting processes.

## 3. Evaluation of Existing GHG Reporting Programs

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<sup>9</sup> The term "fugitive" often refers to emissions that cannot reasonably pass through a stack, chimney, vent or other functionally equivalent opening. This definition of fugitives is used throughout the preamble, except in Section W Oil and Natural Gas Systems, which uses a slightly modified definition based on the Intergovernmental Panel on Climate Change.

A number of State and regional GHG reporting systems currently are in place or under development. EPA's goal is to develop a reporting rule that, to the extent possible and appropriate, would rely on similar protocols and formats of the existing programs and, therefore, reduce the burden of reporting for all parties involved. Therefore, each of the work groups performed a comprehensive review of existing voluntary and mandatory GHG reporting programs, as well as guidance documents for quantifying GHG emissions from specific sources. These GHG reporting programs and guidance documents included the following:

- X International programs, including the IPCC, the EU Emissions Trading System, and the Environment Canada reporting rule;
- X U.S. national programs, such as the U.S. GHG inventory, the ARP, voluntary GHG partnership programs (e.g., Natural Gas STAR), and the DOE 1605(b) voluntary GHG registry;
- X State and regional GHG reporting programs, such as TCR, RGGI, and programs in California, New Mexico, and New Jersey;
- X Reporting protocols developed by nongovernmental organizations, such as WRI/WBCSD; and
- X Programs from industrial trade organizations, such as the American Petroleum Institute's Compendium of GHG Estimation Methodologies for the Oil and Gas Industry and the Cement Sustainability Initiative's CO<sub>2</sub> Accounting and Reporting Standard for the Cement Industry, developed by WBCSD.

In reviewing these programs, we analyzed the sectors covered, thresholds for reporting, approach to indirect emissions reporting, the monitoring or emission estimating

methods used, the measures to assure the quality of the reported data, the point of monitoring, data input needs, and information required to be reported and/or retained. We analyzed these provisions for suitability to a mandatory, Federal GHG reporting program, and compiled the information. The full review of existing GHG reporting programs and guidance may be found in the docket at EPA-HQ-OAR-2008-0508-054. Section II of this preamble summarizes the fundamental elements of these programs.

#### 4. Stakeholder Outreach to Identify Reporting Issues

Early in the development process, we conducted a proactive communications outreach program to inform the public about the rule development effort. We solicited input and maintained an open door policy for those interested in discussing the rulemaking. Since January 2008, EPA staff held more than 100 meetings with over 250 stakeholders. These stakeholders included:

- X Trade associations and firms in potentially affected industries/sectors;
- X State, local, and Tribal environmental control agencies and regional air quality planning organizations;
- X State and regional organizations already involved in GHG emissions reporting, such as TCR, CARB, and WCI;
- X Environmental groups and other nongovernmental organizations.
- X We also met with DOE and USDA which have programs relevant to GHG emissions.

During the meetings, we shared information about the statutory requirements and timetable for developing a rule. Stakeholders were encouraged to provide input on key issues. Examples of topics discussed were, existing GHG monitoring and reporting programs and lessons learned, thresholds for reporting, schedule for reporting, scope of reporting, handling of confidential data, data verification, and the role of States in administering the program. As needed, the technical work groups followed up with these stakeholder groups on a variety of methodological, technical, and policy issues. EPA staff also provided information to Tribes through conference calls with different Indian working groups and organizations at EPA and through individual calls with Tribal board members of TCR.

For a full list of organizations EPA met with during development of this proposal, see the memo found at EPA-HQ-OAR-2008-0508-055.

## **II. Summary of Existing Federal, State, and Regional Emission Reporting Programs**

A number of voluntary and mandatory GHG programs already exist or are being developed at the State, Regional, and Federal levels. These programs have different scopes and purposes. Many focus on GHG emission

reduction, whereas others are purely reporting programs. In addition to the GHG programs, other Federal emission reporting programs and emission inventories are relevant to the proposed GHG reporting rule. Several of these programs are summarized in this section.

In developing the proposed rule, we carefully reviewed the existing reporting programs, particularly with respect to emissions sources covered, thresholds, monitoring methods, frequency of reporting and verification. States may have, or intend to develop, reporting programs that are broader in scope or are more aggressive in implementation because those programs are either components of established reduction programs (e.g., cap and trade) or being used to design and inform specific complementary measures (e.g., energy efficiency). EPA has benefitted from the leadership the States have shown in developing these programs and their experiences. Discussions with States that have already implemented programs have been especially instructive. Where possible, we built upon concepts in existing Federal and State programs in developing the mandatory GHG reporting rule.

#### A. Federal Voluntary GHG Programs

EPA and other Federal agencies operate a number of voluntary GHG reporting and reduction programs that EPA

reviewed when developing this proposal, including Climate Leaders, several Non-CO<sub>2</sub> voluntary programs, the CHP partnership, the SmartWay Transport Partnership program, the National Environmental Performance Track Partnership, and the DOE 1605(b) voluntary GHG registry. There are several other Federal voluntary programs to encourage emissions reductions, clean energy, or energy efficiency, and this summary does not cover them all. This summary focuses on programs that include voluntary GHG emission inventories or reporting of GHG emission reduction activities for sectors covered by this proposed rulemaking.

Climate Leaders.<sup>10</sup> Climate Leaders is an EPA partnership program that works with companies to develop GHG reduction strategies. Over 250 industry partners in a wide range of sectors have joined. Partner companies complete a corporate-wide inventory of GHG emissions and develop an inventory management plan using Climate Leaders protocols. Each company sets GHG reductions goals and submits to EPA an annual GHG emissions inventory documenting their progress. The annual reporting form provides corporate-wide emissions by type of emissions source.

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<sup>10</sup> For more information about the Climate Leaders program please see: <http://www.epa.gov/climateleaders/>

Non-CO<sub>2</sub> Voluntary Partnership Programs.<sup>11</sup> Since the 1990s, EPA has operated a number of non-CO<sub>2</sub> voluntary partnership programs aimed at reducing emissions from GHGs such as CH<sub>4</sub>, SF<sub>6</sub>, and PFCs. There are four sector-specific voluntary CH<sub>4</sub> reduction programs: Natural Gas STAR, Landfill Methane Outreach Program, Coalbed Methane Outreach Program and AgSTAR. In addition, there are sector-specific voluntary emission reduction partnerships for high GWP gases. The Natural Gas STAR partnership encourages companies across the natural gas and oil industries to adopt practices that reduce CH<sub>4</sub> emissions. The Landfill Methane Outreach Program and Coalbed Methane Outreach Program encourage voluntary capture and use of landfill and coal mine CH<sub>4</sub>, respectively, to generate electricity or other useful energy. These partnerships focus on achieving CH<sub>4</sub> reductions. Industry partners voluntarily provide technical information on projects they undertake to reduce CH<sub>4</sub> emissions on an annual basis, but they do not submit CH<sub>4</sub> emissions inventories. AgSTAR encourages beneficial use of agricultural CH<sub>4</sub> but does not have partner reporting requirements.

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<sup>11</sup> For more information about the Non-CO<sub>2</sub> Voluntary Partnership Programs please see: <http://www.epa.gov/nonco2/voluntaryprograms.html>



There are two sector specific partnerships to reduce SF<sub>6</sub> emissions: the SF<sub>6</sub> Emission Reduction Partnership for Electric Power Systems, with over 80 participating utilities, and an SF<sub>6</sub> Emission Reduction Partnership for the Magnesium Industry. Partners in these programs implement practices to reduce SF<sub>6</sub> emissions and prepare corporate-wide annual inventories of SF<sub>6</sub> emissions using protocols and reporting tools developed by EPA. There are also two partnerships focused on PFCs. The Voluntary Aluminum Industrial Partnership promotes technically feasible and cost effective actions to reduce PFC emissions. Industry partners track and report PFC emissions reductions. Similarly, the Semiconductor Industry Association and EPA formed a partnership to reduce PFC emissions. A third party compiles data from participating semiconductor companies and submits an aggregate (not company-specific) annual PFC emissions report.

CHP Partnership.<sup>12</sup> The CHP Partnership is an EPA partnership that cuts across sectors. It encourages use of CHP technologies to generate electricity and heat from the same fuel source, thereby increasing energy efficiency and reducing GHG emissions from fuel combustion. Corporate and

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<sup>12</sup> For more information about the CHP Partnership please see:  
<http://www.epa.gov/chp/>

institutional partners provide data on existing and new CHP projects, but do not submit emissions inventories.

SmartWay Transport Partnership.<sup>13</sup> The SmartWay Transport Partnership program is a voluntary partnership between freight industry stakeholders and EPA to promote fuel efficiency improvements and GHG emissions reductions. Over 900 companies have joined including freight carriers (railroads and trucking fleets) and shipping companies. Carrier and shipping companies commit to measuring and improving the efficiency of their freight operations using EPA-developed tools that quantify the benefits of a number of fuel-saving strategies. Companies report progress annually. The GHG data that carrier companies report to EPA is discussed further in Section V.QQ.4b of this preamble.

National Environmental Performance Track Partnership.<sup>14</sup> The Performance Track Partnership is a voluntary partnership that recognizes and rewards private and public facilities that demonstrate strong environmental performance beyond current requirements. Performance Track is designed to augment the existing regulatory system by

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<sup>13</sup> For more information about SmartWay please see:  
<http://www.epa.gov/smartway/>

<sup>14</sup> For more information about Performance Track please see:  
<http://www.epa.gov/perftrac/index.htm>

creating incentives for facilities to achieve environmental results beyond those required by law. To qualify, applicants must have implemented an independently-assessed environmental management system, have a record of sustained compliance with environmental laws and regulations, commit to achieving measurable environmental results that go beyond compliance, and provide information to the local community on their environmental activities. Members are subject to the same legal requirements as other regulated facilities. In some cases, EPA and states have reduced routine reporting or given some flexibility to program members in how they meet regulatory requirements. This approach is recognized by more than 20 states that have adopted similar performance-based leadership programs.

1605(b) Voluntary Registry.<sup>15</sup> The DOE EIA established a voluntary GHG registry under section 1605(b) of the Energy Policy Act of 1992. The program was recently enhanced and a final rule containing general reporting guidelines was published on April 21, 2006 (71 FR 20784). The rule is contained in 10 CFR part 300. Unlike EPA's proposal which requires of reporting of GHG emissions from facilities over a specific threshold, the DOE 1605(b)

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<sup>15</sup> For more information about DOE's 1605(b) programs please see: <http://www.pi.energy.gov/enhancingGHGregistry/>

registry allows anyone (e.g., a public entity, private company, or an individual) to report on their emissions and their emission reduction projects to the registry. Large emitters (e.g., anyone that emits over 10,000 tons of CO<sub>2</sub>e per year) that wish to register emissions reductions must submit annual company-wide GHG emissions inventories following technical guidelines published by DOE and must calculate and report net GHG emissions reductions. The program offers a range of reporting methodologies from stringent direct measurement to simplified calculations using default factors and allows the reporters to report using the methodological option they choose. In addition, as mentioned above, unlike EPA's proposal, sequestration and offset projects can also be reported under the 1605(b) program. There is additional flexibility offered to small sources who can choose to limit annual inventories and emission reduction reports to just a single type of activity rather than reporting company-wide GHG emissions, but must still follow the technical guidelines. Reported data are made available on the Web in a public use database.

Summary. These voluntary programs are different in nature from the proposed mandatory GHG emissions reporting rule. Industry participation in the programs and reporting

to the programs is entirely voluntary. A small number of sources report, compared to the number of facilities that would likely be affected by the proposed mandatory GHG reporting rule. Most of the EPA voluntary programs do not require reporting of annual emissions data, but are instead intended to encourage GHG reduction projects/activities and track partner's successes in implementing such projects. For the programs that do include annual emissions reporting (e.g., Climate Leaders, DOE 1605(b)) the scope and level of detail are different. For example, Climate Leaders annual reports are generally corporate-wide and do not contain the facility and process-level details that would be needed by a mandatory program to verify the accuracy of the emissions reports.

At the same time, aspects of the voluntary programs serve as useful starting points for the mandatory GHG reporting rules. GHG emission calculation principles and protocols have been developed for various types of emission sources by Climate Leaders, the DOE 1605(b) program, and some partnerships such as the SF<sub>6</sub> reduction partnerships and SmartWay. Under these protocols, reporting companies monitor process or operating parameters to estimate GHG emissions, report annually, and retain records to document their GHG estimates. Through the voluntary programs, EPA,

DOE, and participating companies have gained understanding of processes that emit GHGs and experience in developing and reviewing GHG emission inventories.

#### B. Federal Mandatory Reporting Programs

Sulfur Dioxide (SO<sub>2</sub>) and Nitrogen Oxides (NO<sub>x</sub>) Trading Programs. The ARP and the NO<sub>x</sub> Budget Trading Program are cap-and-trade programs designed to reduce emissions of SO<sub>2</sub> and NO<sub>x</sub><sup>16</sup>. As a part of those programs facilities with EGUs that serve a generator larger than 25 MW are required to report emissions. The 40 CFR part 75 CEMS rule establishes monitoring and reporting requirements under these programs. The regulations in 40 CFR part 75 require continuous monitoring and quarterly and annual emissions reporting of CO<sub>2</sub> mass emissions,<sup>17</sup> SO<sub>2</sub> mass emissions, NO<sub>x</sub> emission rate, and heat input. Part 75 contains specifications for the types of monitoring systems that may be used to determine CO<sub>2</sub> emissions and sets forth operations, maintenance, and QA/QC requirement for each system. In some cases, EGUs are allowed to use simplified procedures other than CEMS (e.g., monitoring fuel feed rates and conducting periodic sampling and analyses of fuel carbon content) to determine CO<sub>2</sub>

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<sup>16</sup> For more information about these cap and trade programs see <http://www.epa.gov/airmarkt/>

<sup>17</sup> The requirements regarding CO<sub>2</sub> emissions reporting apply only to ARP sources and are pursuant to section 821 of the CAA Amendments of 1990, Pub. L. No. 101-549.

emissions. Under the regulations, affected EGUs must submit detailed quarterly and annual CO<sub>2</sub> emissions reports using standardized electronic reporting formats. If CEMS are used, the quarterly reports include hourly CEMS data and other information used to calculate emissions (e.g., monitor downtime). If alternative monitoring programs are used, detailed data used to calculate CO<sub>2</sub> emissions must be reported.

The joint explanatory statement accompanying the FY2008 Consolidated Appropriations Amendment specified that EPA could use the existing reporting requirements for electric generating units under section 821 of the 1990 CAA Amendments.<sup>18</sup> As described in Sections V.C. and V.D. of this preamble, because the part 75 regulations already require reporting of high quality CO<sub>2</sub> data from EGUs, the GHG reporting rule proposes to use the same CO<sub>2</sub> data rather than require additional reporting of CO<sub>2</sub> from EGUs. They would, however, have to include reporting of the other GHG emissions, such as CH<sub>4</sub> and N<sub>2</sub>O, at their facilities.

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<sup>18</sup> The joint explanatory statement refers to "Section 821 of the Clean Air Act" but section 821 was part of the 1990 CAA Amendments not codified into the CAA itself.

TRI. TRI requires facility-level reporting of annual mass emissions of approximately 650 toxic chemicals.<sup>19</sup> If they are above established thresholds, facilities in a wide range of industries report including manufacturing industries, metal and coal mining, electric utilities, and other industrial sectors. Facilities must submit annual reports of total stack and fugitive emissions of the listed toxic chemicals using a standardized form which can be submitted electronically. No information is reported on the processes and emissions points included in the total emissions. The data reported to TRI are not directly useful for the GHG rule because TRI does not include GHG emissions and does not identify processes or emissions sources. However, the TRI program is similar to the proposed GHG reporting rule in that it requires direct emissions reporting from a large number of facilities (roughly 23,000) across all major industrial sectors. Therefore, EPA reviewed the TRI program for ideas regarding program structure and implementation.

Vehicle Reporting. EPA's existing criteria pollutant emissions certification regulations, as well as the fuel economy testing regulations which EPA administers as part

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<sup>19</sup> For more information about TRI and what chemicals are on the list, please see: <http://www.epa.gov/tri/>



of the CAFE program, require vehicle manufacturers to measure and report CO<sub>2</sub> for essentially all of their light duty vehicles. In addition, many engine manufacturers currently measure CO<sub>2</sub> as an integral part of calculating emissions of criteria pollutants, and some report CO<sub>2</sub> emissions to EPA in some form.

### C. EPA Emissions Inventories

#### U.S. Inventory of Greenhouse Gas Emissions and Sinks.

As discussed in Section I.D of this preamble, EPA prepares the *U.S. Inventory of Greenhouse Gas Emissions and Sinks* every year. The details of this Inventory, the methodologies used to calculate emissions and its relationship to this proposal are discussed in Section I.D of this preamble.

NEI.<sup>20</sup> EPA compiles the NEI, a database of air emissions information provided primarily by State and local air agencies and Tribes. The database contains information on stationary and mobile sources that emit criteria air pollutants and their precursors, as well as hazardous air pollutants. Stationary point source emissions that must be inventoried and reported are those that emit over a threshold amount of at least one criteria pollutant. Many

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<sup>20</sup> For more information about the NEI please see:  
<http://www.epa.gov/ttn/chief/net/>

States also inventory and report stationary sources that emit amounts below the thresholds for each pollutant. The NEI includes over 60,000 facilities. The information that is required consists of facility identification information; process information detailing the types of air pollution emission sources; air pollution emission estimates (including annual emissions); control devices in place; stack parameters; and location information. The NEI differs from the proposed GHG reporting rule in that the NEI contains no GHG data, and the data are reported primarily by State agencies rather than directly reported by industries<sup>21</sup>. However, in developing the proposed rule, EPA used the NEI to help determine sources that might need to report under the GHG reporting rule. We considered the types of facility, process and activity data reported in NEI to support the emissions data as a possible model for the types of data to be reported under the GHG reporting rule. We also considered systems that could be used to link data reported under the GHG rule with data for the same facilities in the NEI.

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<sup>21</sup> As discussed in section IV of the preamble, tropospheric ozone (O<sub>3</sub>) is a GHG. The precursors to tropospheric O<sub>3</sub> (e.g., NO<sub>x</sub>, VOCs, etc) are reported to the NEI by States and then EPA models tropospheric O<sub>3</sub> based on that precursor data.

#### D. Regional and State Voluntary Programs for GHG Emissions Reporting

A number of States have demonstrated leadership and developed corporate voluntary GHG reporting programs individually or joined with other States to develop GHG reporting programs as part of their approaches to addressing GHG emissions. EPA has benefitted from this leadership and the States' experiences; discussions with those that have already implemented programs have been especially instructive. Section V of the preamble describes the proposed methods for each source category. The different options considered have been particularly informed by the States' expertise. This section of the preamble summarizes two prominent voluntary efforts. In developing the greenhouse rules, EPA reviewed the relevant protocols used by these programs as a starting point. We recognize that these programs may have additional monitoring and reporting requirements than those outlined in the proposed rule in order to provide distinct program benefits.

CCAR.<sup>22</sup> CCAR is a voluntary GHG registry already in use in California. CCAR has released several methodology

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<sup>22</sup> For more information about CCAR please see:  
<http://www.climateregistry.org/>

documents including a general reporting protocol, general certification (verification) protocol, and several sector-specific protocols. Companies submit emissions reports using a standardized electronic system. Emission reports may be aggregated at the company level or reported at the facility level.

TCR.<sup>23</sup> TCR is a partnership formed by U.S. and Mexican States, Canadian provinces, and Tribes to develop standard GHG emissions measurement and verification protocols and a reporting system capable of supporting mandatory or voluntary GHG emission reporting rules and policies for its member States. TCR has released a General Reporting Protocol that contains procedures to measure and calculate GHG emissions from a wide range of source categories. They have also released a general verification protocol, and an electronic reporting system. Founding reporters (companies and other organizations that have agreed to voluntarily report their GHG emissions) implemented a pilot reporting program in 2008. Annual reports would be submitted covering six GHGs. Corporations must report facility-specific emissions, broken out by type of emission source

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<sup>23</sup> For more information about TCR please see:  
<http://www.theclimateregistry.org/>

(e.g., stationary combustion, electricity use, direct process emissions) within the facility.

E. State and Regional Mandatory Programs for GHG Emissions Reporting and Reduction

Several individual States and regional groups of States have demonstrated leadership and are developing or have developed mandatory GHG reporting programs and GHG emissions control programs. This section of the preamble summarizes two regional cap-and-trade programs and several State mandatory reporting rules. We recognize that, like the current voluntary regional and State programs, State and regional mandatory reporting programs may evolve or develop to include additional monitoring and reporting requirements than those included in the proposed rule. In fact, these programs may be broader in scope or more aggressive in implementation because the programs are either components of established reduction programs (e.g., cap and trade) or being used to design and inform specific complementary measures (e.g., energy efficiency).

RGGI.<sup>24</sup> RGGI is a regional cap-and-trade program that covers CO<sub>2</sub> emissions from EGUs that serve a generator greater than 25 MW in member States in the mid-Atlantic and

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<sup>24</sup> For more information about RGGI please see: <http://www.rggi.org/>

Northeast. The program goal is to reduce CO<sub>2</sub> emissions to 10 percent below 1990 levels by the year 2020. RGGI will utilize the CO<sub>2</sub> reported to and verified by EPA under 40 CFR part 75 to determine compliance of the EGUs in the cap-and-trade program. In addition, the EGUs in RGGI that are not currently reporting to EPA under the ARP and NO<sub>x</sub> Budget program (e.g., co-generation facilities) will start reporting their CO<sub>2</sub> data to EPA for QA/QC, similar to the sources already reporting. Certain types of offset projects will be allowed, and GHG offset protocols have been developed. The States participating in RGGI have adopted State rules (based on the model rule) to implement RGGI in each State. The RGGI cap-and-trade program took effect on January 1, 2009.

WCI.<sup>25</sup> WCI is another regional cap-and-trade program being developed by a group of Western States and Canadian provinces. The goal is to reduce GHG emissions to 15 percent below 2005 levels by the year 2020. Draft options papers and program scope papers were released in early 2008, public comments were reviewed, and final program design recommendations were made in September 2008. Other elements of the program, such as reporting requirements,

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<sup>25</sup> For more information about WCI please see:  
<http://www.westernclimateinitiative.org/>

market operations, and offset program development continues. Several source categories are being considered for inclusion in the cap and trade framework. The program might be phased in, starting with a few source categories and adding others over time. Points of regulation for some source categories, calculation methodologies, and other reporting program elements are under development. The WCI is also analyzing alternative or complementary policies other than cap-and-trade that could help reach GHG reduction goals. Options for rule implementation and for coordination with other rules and programs such as TCR are being investigated.

A key difference between the Federal mandatory GHG reporting rule and the RGGI and WCI programs is that the Federal mandatory GHG rule is solely a reporting requirement. It does not in any way regulate GHG emissions or require any emissions reductions.

State Mandatory GHG Reporting Rules. Seventeen States have developed, or are developing, mandatory GHG reporting rules.<sup>26</sup> The docket contains a summary of these State mandatory rules (EPA-HQ-OAR-2008-0508-056). Final rules have not yet been developed by some of the States, so

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<sup>26</sup> These include: California, Colorado, Connecticut, Delaware, Hawaii, Iowa, Maine, Maryland, Massachusetts, New Jersey, New Mexico, North Carolina, Oregon, Virginia, Washington, West Virginia, and Wisconsin.

details of some programs are unknown. Reporting requirements have taken effect in twelve States as of 2009; the rest start between 2010 and 2012. Reporting is typically annual, although some States require quarterly reporting for EGUs, consistent with RGGI and the ARP.

State rules differ with regard to which facilities must report and which GHGs must be reported. Some States require all facilities that must obtain Title V permits to report GHG emissions. Others require reporting for particular sectors (e.g., large EGUs, cement plants, refineries). Some State rules apply to any facility with stationary combustion sources that emit a threshold level of CO<sub>2</sub>. Some apply to any facility, or to facilities within listed industries, if their emissions exceed a specified threshold level of CO<sub>2</sub>e. Many of the State rules apply to six GHGs (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>); others apply only to CO<sub>2</sub> or a subset of the six gases. Most require reporting at the facility level, or by unit or process within a facility.

The level of specificity regarding GHG monitoring and calculation methods varies. Some of the States refer to use of protocols established by TCR or CCAR. Others look to industry-specific protocols (such as methods developed by the American Petroleum Institute), to accepted



international methodologies such as IPCC, and/or to emission factors in EPA's Compilation of Air Pollutant Emission Factors (known as AP-42<sup>27</sup>) or other EPA guidance.

California Mandatory GHG Reporting Rule.<sup>28</sup> CARB's mandatory reporting rule is an example of a State rule that covers multiple source categories and contains relatively detailed requirements, similar to this proposal developed by EPA. According to the CARB proposed rule (originally proposed October 19, 2007, and revised on December 5, 2007), monitoring must start on January 1, 2009, and the first reports will be submitted in 2010. The rule requires facility-level reporting of all GHGs, except PFCs, from cement manufacturing plants, electric power generation and retail, cogeneration plants, petroleum refineries, hydrogen plants, and facilities with stationary combustion sources emitting greater than 25,000 tons CO<sub>2</sub> per year. California requires 40 CFR part 75 data for EGUs. The California rule contains specific GHG estimation methods that are largely consistent with CCAR protocols, and also rely on American Petroleum Institute protocols and IPCC/EU protocols for certain types of sources. California continues to

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<sup>27</sup> See *Compilation of Air Pollutant Emission Factors*, Fifth Edition: <http://www.epa.gov/ttn/chief/ap42/index.html> ac/index.html.

<sup>28</sup> For more information about CA mandatory reporting program please see: <http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm>

participate in other national and regional efforts, such as TCR and WCI, to assist with developing consistent reporting tools and procedures on a national and regional basis.

F. How the Proposed Mandatory GHG Reporting Program is Different from the Federal and State Programs EPA Reviewed

The various existing State and Federal programs EPA reviewed are diverse. They apply to different industries, have different thresholds, require different pollutants and different types of emissions sources to be reported, rely on different monitoring protocols, and require different types of data to be reported, depending on the purposes of each program. None of the existing programs require nationwide, mandatory GHG reporting by facilities in a large number of sectors, so EPA's proposed mandatory GHG rule development effort is unique in this regard.

Although the mandatory GHG rule is unique, EPA carefully considered other Federal and State programs during development of the proposed rule. Documentation of our review of GHG monitoring protocols for each source category used by Federal, State, and international voluntary and mandatory GHG programs, and our review of State mandatory GHG rules can be found at EPA-HQ-OAR-2008-0508-056. The proposed monitoring and GHG calculation methodologies for many source categories are the same as,

or similar to, the methodologies contained in State reporting programs such as TCR, CCAR, and State mandatory GHG reporting rules and similar to methodologies developed by EPA voluntary programs such as Climate Leaders. The reporting requirements set forth in 40 CFR part 75 are also being used for this proposed rule. Similarity in proposed methods would help maximize the ability of individual reporters to submit the emissions calculations to multiple programs, if desired. EPA also continues to work closely with States and State-based groups to ensure that the data management approach in this proposal would lead to efficient submission of data to multiple programs. Section V of this preamble includes further information on the selection of monitoring methods for each source category.

The intent of this proposed rule is to collect accurate and consistent GHG emissions data that can be used to inform future decisions. One goal in developing the rule is to utilize and be consistent with the GHG protocols and requirements of other State and Federal programs, where appropriate, to make use of existing cooperative efforts and reduce the burden to facilities submitting reports to other programs. However, we also need to be sure the mandatory reporting rule collects facility-specific data of sufficient quality to achieve the Agency's objectives for

this rule. Therefore, some reporting requirements of this proposed rule are different from the State programs. The remaining sections of this preamble further describe the proposed rule requirements and EPA's rationale for all of the requirements.

EPA seeks comment on whether the conclusions drawn during its review of existing programs are accurate and invites data to demonstrate if, and if so how, the goals and objectives of this proposed mandatory reporting system could be met through existing programs. In particular, comments should address how existing programs meet the breadth of sources reporting, thresholds for reporting, consistency and stringency of methods for reporting, level of reporting, frequency of reporting and verification of reports included in this proposal.

### **III. Summary of the General Requirements of the Proposed Rule**

The proposed rule would require reporting of annual emissions of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, SF<sub>6</sub>, HFCs, PFCs, and other fluorinated gases (as defined in proposed 40 CFR part 98, subpart A). The rule would apply to certain downstream facilities that emit GHGs, upstream suppliers of fossil fuels and industrial GHGs, and manufacturers of vehicles

and engines.<sup>29</sup> We are proposing that reporting be at the facility<sup>30</sup> level, except that certain suppliers of fossil fuels and industrial gases and manufacturers of vehicles and engines would report at the corporate level.

A. Who must report?

Owners and operators of the following facilities and supply operations would submit annual GHG emission reports under the proposal:

X A facility that contains any of the source categories listed below in any calendar year starting in 2010. For these facilities, the GHG emission report would cover all sources in any source category for which calculation methodologies are provided in proposed 40 CFR part 98, subparts B through JJ.

- Electricity generating facilities that are subject to the ARP, or that contain electric generating units that collectively emit 25,000 metric tons of CO<sub>2</sub>e or more per year<sup>31</sup>.
- Adipic acid production.
- Aluminum production.
- Ammonia manufacturing.

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<sup>29</sup> We are proposing to incorporate the reporting requirements for manufacturers of motor vehicles and engines into the existing reporting requirements of 40 CFR parts 86, 89, 90, 91, 92, 94, 1033, 1039, 1042, 1045, 1048, 1051, and 1054.

<sup>30</sup> For the purposes of this proposal, facility means any physical property, plant, building, structure, source, or stationary equipment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas. Operators of military installations may classify such installations as more than a single facility based on distinct and independent functional groupings within contiguous military properties.

<sup>31</sup> This does not include portable equipment or generating units designated as emergency generators in a permit issued by a state or local air pollution control agency. As described in section V. C of the preamble we are taking comment on whether or not a permit should be required.

- Cement production.
- Electronics - Semiconductor, MEMS, and LCD (LCD) manufacturing facilities with an annual production capacity that exceeds any of the thresholds listed in this paragraph -  
Semiconductors: 1,080 m<sup>2</sup> silicon, MEMS: 1,202 m<sup>2</sup> silicon, LCD: 235,700 m<sup>2</sup> LCD.
- Electric power systems that include electrical equipment with a total nameplate capacity that exceeds 17,820 lbs (7,838 kg) of SF<sub>6</sub> or PFCs.
- HCFC-22 production.
- HFC-23 destruction processes that are not colocated with a HCFC-22 production facility and that destroy more than 2.14 metric tons of HFC-23 per year.
- Lime manufacturing.
- Nitric acid production.
- Petrochemical production.
- Petroleum refineries.
- Phosphoric acid production.
- Silicon carbide production.
- Soda ash production.
- Titanium dioxide production.
- Underground coal mines that are subject to quarterly or more frequent sampling by MSHA of ventilation systems.
- Municipal landfills that generate CH<sub>4</sub> in amounts equivalent to 25,000 metric tons CO<sub>2</sub>e or more per year.
- Manure management systems that emit CH<sub>4</sub> and N<sub>2</sub>O in amounts equivalent to 25,000 metric tons CO<sub>2</sub>e or more per year.

X Any facility that emits 25,000 metric tons CO<sub>2</sub>e or more per year in combined emissions from stationary fuel combustion units, miscellaneous use of carbonates and all of the source categories listed below that are located at the facility in any calendar year starting in 2010. For these facilities, the GHG emission report would cover all source categories for which

calculation methodologies are provided in proposed 40 CFR part 98, subparts B through JJ of the rule.

- Electricity Generation<sup>32</sup>
- Electronics - Photovoltaic Manufacturing
- Ethanol Production
- Ferroalloy Production
- Fluorinated Greenhouse Gas Production
- Food Processing
- Glass Production
- Hydrogen Production
- Iron and Steel Production
- Lead Production
- Magnesium Production
- Oil and Natural Gas Systems
- Pulp and Paper Manufacturing
- Zinc Production
- Industrial Landfills
- Wastewater

X Any facility that in any calendar year starting in 2010 meets all three of the conditions listed in this paragraph. For these facilities, the GHG emission report would cover emissions from stationary fuel combustion sources only. For 2010 only, the facilities can submit an abbreviated emissions report according to proposed 40 CFR 98.3(d).

- The facility does not contain any source in any source category designated in the above two paragraphs;
- The aggregate maximum rated heat input capacity of the stationary fuel combustion units at the facility is 30 mmBtu/hr or greater; and

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<sup>32</sup> This does not include portable equipment or generating units designated as emergency generators in a permit issued by a state or local air pollution control agency. As described in section V. C of the preamble we are taking comment on whether or not a permit should be required.

- The facility emits 25,000 metric tons CO<sub>2</sub>e or more per year from all stationary fuel combustion sources<sup>33</sup>.
- X Any supplier of any of the products listed below in any calendar year starting in 2010. For these suppliers, the GHG emissions report would cover all applicable products for which calculation methodologies are provided in proposed 40 CFR part 98, subparts KK through PP.
- Coal.
  - Coal-based liquid fuels.
  - Petroleum products.
  - Natural gas and NGLs.
  - Industrial GHGs: All producers of industrial GHGs, importers and exporters of industrial GHGs with total bulk imports or total bulk exports that exceed 25,000 metric tons CO<sub>2</sub>e per year.
  - CO<sub>2</sub>: All producers of CO<sub>2</sub>, importers and exporters of CO<sub>2</sub> or a combination of CO<sub>2</sub> and other industrial GHGs with total bulk imports or total bulk exports that exceed 25,000 metric tons CO<sub>2</sub>e per year.
- X Manufacturers of mobile sources and engines would be required to report emissions from the vehicles and engines they produce, generally in terms of an emission rate.<sup>34</sup> These requirements would apply to emissions of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, and, where appropriate, HFCs. Manufacturers of the following vehicle and engine types would need to report: (1) manufacturers of passenger cars, light trucks, and medium-duty passenger vehicles (2) manufacturers of highway heavy-duty engines and complete vehicles, (3) manufacturers of nonroad diesel engines and nonroad large spark-ignition engines, (4) manufacturers of nonroad small spark-ignition engines, marine spark-ignition engines,

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<sup>33</sup> This does not include portable equipment or generating units designated as emergency generators in a permit issued by a state or local air pollution control agency. As described in section V. C of the preamble we are taking comment on whether or not a permit should be required.

<sup>34</sup> As discussed in Section V.QQ, manufacturers below a size threshold would be exempt.



personal watercraft, highway motorcycles, and recreational engines and vehicles, (5) manufacturers of locomotive and marine diesel engines, and (6) manufacturers of jet and turboprop aircraft engines.

#### B. Schedule for Reporting

Facilities and suppliers would begin collecting data on January 1, 2010. The first emissions report would be due on March 31, 2011, for emissions during 2010.<sup>35,36</sup> Reports would be submitted annually. Facilities with EGUs that are subject to the ARP would continue to report CO<sub>2</sub> mass emissions quarterly, as required by the ARP, in addition to providing the annual GHG emissions reports under this rule. EPA is proposing that the rule require the submission of GHG emissions data on an ongoing, annual basis. The snapshot of information provided by a one-time information collection request would not provide the type of ongoing information which could inform the variety of potential policy options being evaluated for addressing climate change. EPA is taking comment on other possible options, including a commitment to review the continued need for the information at a specific later date, or a sunset provision. Once subject to this reporting rule, a facility or supply operation would continue to submit

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<sup>35</sup> Unless otherwise noted, years and dates in this notice refer to calendar years and dates.

<sup>36</sup> There is a discussion in section I.IV of this preamble that takes comment on alternative reporting schedules.

reports even if it falls below the reporting thresholds in future years.

C. What do I have to report?

The report would include total annual GHG emissions in metric tons of CO<sub>2</sub>e aggregated for all the source categories and for all supply categories for which emission calculation methods are provided in part 98. The report would also separately present annual mass GHG emissions for each source category and supply category, by gas. Separate reporting requirements are provided for vehicle and engine manufacturers. These sources would be required to report emissions from the vehicles and engines they produce, generally in terms of an emission rate.

Within a given source category, the report also would break out emissions at the level required by the respective subpart (e.g., reporting could be required for each individual unit for some source categories and for each process line for other source categories).

In addition to GHG emissions, you would report certain activity data (e.g., fuel use, feedstock inputs) that were used to generate the emissions data. The required activity data are specified in each subpart. For some source categories, additional data would be reported to support QA/QC and verification.

EPA would protect any information claimed as CBI in accordance with regulations in 40 CFR part 2, subpart B. However, note that in general, emission data collected under CAA sections 114 and 208 cannot be considered CBI.<sup>37</sup>

D. How do I submit the report?

The reports would be submitted electronically, in a format to be specified by the Administrator after publication of the final rule.<sup>38</sup> To the extent practicable, we plan to adapt existing facility reporting programs to accept GHG emissions data. We are developing a new electronic data reporting system for source categories or suppliers for which it is not feasible to use existing reporting mechanisms.

Each report would contain a signed certification by a Designated Representative of the facility. On behalf of the owner or operator, the Designated Representative would certify under penalty of law that the report has been prepared in accordance with the requirements of 40 CFR part 98 and that the information contained in the report is true

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<sup>37</sup> Although CBI determinations are usually made on a case-by-case basis, EPA has issued guidance in an earlier Federal Register notice on what constitutes emissions data that cannot be considered CBI (956 FR 7042 - 7043, February 21, 1991).

<sup>38</sup> For more information about the reporting format please see section VI of this preamble.

and accurate, based on a reasonable inquiry of individuals responsible for obtaining the information.

E. What records must I retain?

Each facility or supplier would also have to retain and make available to EPA upon request the following records for five years in an electronic or hard-copy format as appropriate:

- X A list of all units, operations, processes and activities for which GHG emissions are calculated;
- X The data used to calculate the GHG emissions for each unit, operation, process, and activity, categorized by fuel or material type;
- X Documentation of the process used to collect the necessary data for the GHG emissions calculations;
- X The GHG emissions calculations and methods used;
- X All emission factors used for the GHG emissions calculations;
- X Any facility operating data or process information used for the GHG emissions calculations;
- X Names and documentation of key facility personnel involved in calculating and reporting the GHG emissions;
- X The annual GHG emissions reports;
- X A log book documenting any procedural changes to the GHG emissions accounting methods and any changes to the instrumentation critical to GHG emissions calculations;
- X Missing data computations;
- X A written QAPP;
- X Any other data specified in any applicable subpart of proposed 40 CFR part 98. Examples of such data could include the results of sampling and analysis procedures required by the subparts (e.g., fuel heat

content, carbon content of raw materials, and flow rate) and other data used to calculate emissions.

**IV. Rationale for the General Reporting, Recordkeeping and Verification Requirements that Apply to All Source Categories**

This section of the preamble explains the rationales for EPA's proposals for various aspects of the rule. This section applies to all of the source categories in the preamble (further discussed in Sections V.B through V.PP of this preamble) with the exception of mobile sources (discussed in Section V.QQ of this preamble). The proposals EPA is making with regard to mobile sources are extensions of existing EPA programs and therefore the rationales and decisions are discussed wholly within that section. With respect to the source categories B through PP, EPA is particularly interested in receiving comments on the following issues:

(1) Reporting thresholds. EPA is interested in receiving data and analyses on thresholds. In particular, we solicit comment on whether the thresholds proposed are appropriate for each source category or whether other emissions or capacity based thresholds should be applied. If suggesting alternative thresholds, please discuss whether and how they would achieve broad emissions coverage and result in a reasonable number of reporters.

(2) Methodologies. EPA is interested in receiving data, technical information and analyses relevant to the methodology approach. We solicit comment on whether the methodologies selected by EPA are appropriate for each source category or whether alternative approaches should be adopted. In particular, EPA would like information on the technical feasibility, costs, and relative improvement in accuracy of direct measurement at facilities. If suggesting an alternative methodology (e.g., using established industry default factors or allowing industry groups to propose an industry specific emission factor to EPA), please discuss whether and how it provides complete and accurate emissions data, comparable to other source categories, and also reflects broadly agreed upon calculation procedures for that source category.

(3) Frequency and year of reporting. EPA is interested in receiving data and analyses regarding frequency of reporting and the schedule for reporting. In particular, we solicit information regarding whether the frequency of data collection and reporting selected by EPA is appropriate for each source category or whether alternative frequencies should be considered (e.g., quarterly or every few years). If suggesting an alternative frequency, please discuss whether and how it

ensures that EPA and the public receive the data in a timely fashion that allow it to be relevant for future policy decisions. EPA is proposing 2010 data collection and 2011 reporting, however, we are interested in receiving comment on alternative schedules if we are unable to meet our goal.

(4) Verification. EPA is interested in receiving data and analyses regarding verification options. We solicit input on whether the verification approach selected by EPA is appropriate for each source category or whether an alternative approach should be adopted. If suggesting an alternative verification approach, please discuss how it weighs the costs and burden to the reporter and EPA as well as the need to ensure the data are complete, accurate, and available in the timely fashion.

(5) Duration of the program. EPA is interested in receiving data and analyses regarding options for the duration of the GHG emissions information collection program in this proposed rule. By duration, EPA means for how many years the program should require the submission of information. EPA solicits input on whether the duration selected by EPA is appropriate for each source category or whether an alternative approach should be adopted. If suggesting an alternative duration, please discuss how it

impacts the need to ensure the data are sufficient to inform the variety of potential policy decisions regarding climate change under consideration.

#### A. Rationale for Selection of GHGs to Report

The proposed rule would require reporting of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>, and other fluorinated compounds (e.g., NF<sub>3</sub> and HFEs) as defined in the rule<sup>39</sup>. These are the most abundantly emitted GHGs that result from human activity. They are not currently controlled by other mandatory Federal programs and, with the exception of the CO<sub>2</sub> emissions data reported by EGUs subject to the ARP<sup>40</sup>, GHG emissions data are also not reported under other mandatory Federal programs. CO<sub>2</sub> is the largest contributor of GHGs directly emitted by human activities, and is a significant driver of climate change. The anthropogenic combined heating effect of CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>, and the other fluorinated compounds are also significant: about 40 percent as large as the CO<sub>2</sub> heating effect according to the Fourth Assessment Report of the IPCC.

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<sup>39</sup> The GWPs for the GHGs to be reported are found in Table A-1 of proposed 40 CFR part 98, subpart A.

<sup>40</sup> Pursuant to regulations established under section 821 of the CAA Amendments of 1990, hourly CO<sub>2</sub> emissions are monitored and reported quarterly to EPA. EPA performs a series of QA/QC checks on the data and then makes it available on the Web site (<http://epa.gov/camddataandmaps/>) usually within 30 days after receipt.



The IPCC focuses on CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub> for both scientific assessments and emissions inventory purposes because these are long-lived, well-mixed GHGs not controlled by the Montreal Protocol as Substances that Deplete the Ozone Layer. These GHGs are directly emitted by human activities, are reported annually in EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, and are the common focus of the climate change research community. The IPCC also included methods for accounting for emissions from several specified fluorinated gases in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.<sup>41</sup> These gases include fluorinated ethers, which are used in electronics, anesthetics, and as heat transfer fluids. Like the other six GHGs for which emissions would be reported, these fluorinated compounds are long-lived in the atmosphere and have high GWP. In many cases these fluorinated gases are used in expanding industries (e.g., electronics) or as substitutes for HFCs. As such, EPA is proposing to include reporting of these gases to ensure that the Agency has an accurate

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<sup>41</sup> 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The National Greenhouse Gas Inventories Programme, H.S. Eggleston, L. Buendia, K. Miwa, T. Ngara, and K. Tanabe (eds), hereafter referred to as the "2006 IPCC Guidelines" are found at: <http://www.ipcc.ch/ipccreports/methodology-reports.htm>. For additional information on these gases please see Table A-1 in proposed 40 CFR part 98, subpart A and the Suppliers of Industrial GHGs TSD (EPA-HQ-OAR-2008-0508-041)

understanding of the emissions and uses of these gases, particularly as those uses expand.

There are other GHGs and aerosols that have climatic warming effects that we are not proposing to include in this rule: water vapor, CFCs, HCFCs, halons, tropospheric O<sub>3</sub>, and black carbon. There are a number of reasons why we are not proposing to require reporting of these gases and aerosols under this rule. For example, these GHGs and aerosols are not covered under any State or Federal voluntary or mandatory GHG program, the UNFCCC or the *Inventory of U.S. Greenhouse Gas Emissions and Sinks*. Nonetheless, we request comment on the selection of GHGs that are or are not included in the proposed rule; include data supporting your position on why a GHG should or should not be included. More detailed discussions for particular substances that we do not propose including in this rule follow.

Water Vapor. Water vapor is the most abundant naturally occurring GHG and, therefore, makes up a significant share of the natural, background greenhouse effect. However, water vapor emissions from human activities have only a negligible effect on atmospheric concentrations of water vapor. Significant changes to global atmospheric concentrations of water vapor occur

indirectly through human-induced global warming, which then increases the amount of water vapor in the atmosphere because a warmer atmosphere can hold more moisture. Therefore, changes in water vapor concentrations are not an initial driver of climate change, but rather an effect of climate change which then acts as a positive feedback that further enhances warming. For this reason, the IPCC does not list direct emissions of water vapor as an anthropogenic forcing agent of climate change, but does include this water vapor feedback mechanism in response to human-induced warming in all modeling scenarios of future climate change. Based on this recognition that anthropogenic emissions of water vapor are not a significant driver of anthropogenic climate change, EPA's annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks* does not include water vapor, and GHG inventory reporting guidelines under the UNFCCC do not require data on water vapor emissions.

ODS. The CFCs, HCFCs, and halons are all strong anthropogenic GHGs that are long-lived in the atmosphere and are adding to the global anthropogenic heating effect. Therefore, these gases share common climatic properties with the other GHGs discussed in this preamble. The production and consumption of these substances (and, hence,

their anthropogenic emissions) are being controlled and *phased out*, not because of their effects on climate change, but because they deplete stratospheric O<sub>3</sub>, which protects against harmful ultraviolet B radiation. The control and phase-out of these substances in the U.S. and globally is occurring under the Montreal Protocol on Substances that Deplete the Ozone Layer, and in the U.S. under Title VI of the CAA as well.<sup>42</sup> Therefore, the climate change research and policy community typically does not focus on these substances, precisely because they are essentially already being addressed with non-climate policy mechanisms. The UNFCCC does not cover these substances, and instead defers their treatment to the Montreal Protocol.

Tropospheric Ozone. Increased concentrations of tropospheric O<sub>3</sub> are causing a significant anthropogenic warming effect, but, unlike the long-lived GHGs, tropospheric O<sub>3</sub> has a short atmospheric lifetime (hours to weeks), and therefore its concentrations are more variable over space and time. For these reasons, its global heating

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<sup>42</sup> Under the Montreal Protocol, production and consumption of CFCs were phased out in developed countries in 1996 (with some essential use exemptions) and are scheduled for phase-out by 2010 in developing countries (with some essential use exemptions). For halons the schedule was 1994 for phase out in developed countries and 2010 for developing countries; HCFC production was frozen in 2004 in developed countries, and in 2016 production will be frozen in developing countries; and HCFC consumption phase-out dates are 2030 for developed countries and 2040 in developing countries.

effect and relevance to climate change tends to entail greater uncertainty compared to the well-mixed, long-lived GHGs. Tropospheric O<sub>3</sub> is not addressed under the UNFCCC. Moreover, tropospheric O<sub>3</sub> is already listed as a NAAQS pollutant and its precursors are reported to States. Tropospheric O<sub>3</sub> is subsequently modeled based on the precursor data reported to the NEI.

Black Carbon. Black carbon is an aerosol particle that results from incomplete combustion of the carbon contained in fossil fuels, and it remains in the atmosphere for about a week. There is some evidence that black carbon emissions may contribute to climate warming by absorbing incoming and reflected sunlight in the atmosphere and by darkening clouds, snow and ice. While the net effect of anthropogenic aerosols has a cooling effect (CCSP 2009), there is considerable uncertainty in quantifying the effects of black carbon on radiative forcing and whether black carbon specifically has direct or indirect warming effects. The National Academy of Sciences states "Regulations targeting black carbon emissions or ozone precursors would have combined benefits for public health and climate"<sup>43</sup> while also indicating that the level of

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<sup>43</sup> National Academy of Sciences, "Radiative Forcing of Climate Change: Expanding the Concept and Addressing Uncertainties," October 2005.

scientific understanding regarding the effect of black carbon on climate is "very low." The direct and indirect radiative forcing properties of multiple aerosols, including sulphates, organic carbon, and black carbon, are not well understood. While mobile diesel engines have been the largest black carbon source in the U.S., these emissions are expected to be reduced significantly over the next several decades based on CDPFs for new vehicles.

#### B. Rationale for Selection of Source Categories to Report

Section III of this preamble lists the source categories that would submit reports under the proposed rule. The source categories identified in this list were selected after considering the language of the Appropriations Act and the accompanying explanatory statement, and EPA's experience in developing the U.S. GHG Inventory. The Appropriations Act referred to reporting "in all sectors of the economy" and the explanatory statement directed EPA to include "emissions from upstream production and downstream sources to the extent the Administrator deems it appropriate."<sup>44</sup> In developing the proposed list, we also used our significant experience in quantifying GHG emissions from source categories across the

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<sup>44</sup> To read the full appropriations language please refer to the links on this Web site:  
<http://www.epa.gov/climatechange/emissions/ghgrulemaking.html>

economy for the *Inventory of U.S. Greenhouse Gas Emissions and Sinks*.

As a starting point, EPA first considered all anthropogenic sources of GHG emissions. The term "anthropogenic" refers to emissions that are produced as a result of human activities (e.g., combustion of coal in an electric utility or CH<sub>4</sub> emissions from a landfill). This is in contrast to GHGs that are emitted to the atmosphere as a result of natural activities, such as volcanoes. Anthropogenic emissions may be of biogenic origin (manure lagoons) or non-biogenic origin (e.g., coal mines). Consistent with existing international, national, regional, and corporate-level GHG reporting programs, this proposal includes only anthropogenic sources.

As a second step, EPA considered all of the source categories in the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* because, as described in Section I.D of this preamble, it is a top-down assessment of anthropogenic sources of emissions in the U.S. Furthermore, the Inventory has been independently reviewed by national and international experts and is considered to be a comprehensive representation of national-level GHG emissions and source categories relevant for the U.S.

As a third step, EPA also carefully reviewed the recently completed 2006 IPCC Guidelines for National Greenhouse Gas Inventories for additional source categories that may be relevant for the U.S. These international guidelines are just beginning to be incorporated into national inventories. The 2006 IPCC Guidelines identified one additional source category for consideration (fugitive emissions from fluorinated GHG production).

As a fourth step, once EPA had a complete list of source categories relevant to the U.S., the Agency systematically reviewed those source categories against the following criteria to develop the list to the source categories included in the proposal:

(1) include source categories that emit the most significant amounts of GHG emissions, while also minimizing the number of reporters, and

(2) include source categories that can be measured with an appropriate level of accuracy.

To accomplish the first criterion, EPA set reporting thresholds, as described in Section IV.C of this preamble, that are designed to target large emitters. When the proposed thresholds are applied, the source categories included in this proposal meet the criterion of balancing the emissions coverage with a reasonable number of



reporters. For more detailed information about the coverage of emissions and number of reporters see the Thresholds TSD (EPA-HQ-OAR-2008-0508-046) and the RIA (EPA-HQ-OAR-2008-0508-002).

The second criterion was to require reporting for only those sources for which measurement capabilities are sufficiently accurate and consistent. Under this criterion, EPA considered whether or not facility reporting would be as effective as other means of obtaining emissions data. For some sources, our understanding of emissions is limited by lack of knowledge of source-specific factors. In instances where facility-specific calculations are feasible and result in sufficiently accurate and consistent estimates, facility-level reporting would improve current inventory estimates and EPA's understanding of the types and levels of emissions coming from large facilities, particularly in the industrial sector. These source categories have been included in the proposal. For other source categories, uncertainty about emissions is related more to the unavailability of emission factors or simple models to estimate emissions accurately and at a reasonable cost at the facility-level. Under this criterion, we would require facility-level reporting only if reporting would provide more accurate estimates than can be obtained by

other means, such as national or regional-level modeling. For an example, please refer to the discussion below on emissions from agricultural sources and other land uses.

As the Agency completed its four step evaluation of source categories to include in the proposal, some source categories were excluded from consideration and some were added. The reasons for the additions and deletions are explained below. In general, the proposed reporting rule covers almost all of the source categories in the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Reporting by direct emitters. Consistent with the appropriations language regarding reporting of emissions from "downstream sources," EPA is proposing reporting requirements from facilities that directly emit GHGs above a certain threshold as a result of combustion of fuel or processes. The majority of the direct emitters included in this proposal are large facilities in the electricity generation or industrial sectors. In addition, many of the electricity generation facilities are already reporting their CO<sub>2</sub> emissions to EPA under existing regulations. As such, these facilities have only a minimal increase in the amount of data they have to provide EPA on their CH<sub>4</sub> and N<sub>2</sub>O emissions. The typical industrial facilities that are

required to report under this proposal have emissions that are substantially higher than the proposed thresholds and are already doing many of the measurements and quantifications of emissions required by this proposal through existing business practices, voluntary programs, or mandatory State-level GHG reporting programs.

For more information about the thresholds included in this proposal please refer to Section IV.C of this preamble and for more information about the requirements for specific sources refer to Section V of this preamble.

Reporting by fuel and industrial GHG suppliers.<sup>45</sup>

Consistent with the appropriations language regarding reporting of emissions from "upstream production," EPA is proposing reporting requirements from upstream suppliers of fossil fuel and industrial GHGs. In the context of GHG reporting, "upstream emissions" refers to the GHG emissions potential of a quantity of industrial gas or fossil fuel supplied into the economy. For fossil fuels, the emissions potential is the amount of CO<sub>2</sub> that would be produced from complete combustion or oxidation of the carbon in the fuel. In many cases, the fossil fuels and industrial GHGs supplied by producers and importers are used and ultimately

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<sup>45</sup> In this context, suppliers include producers, importers, and exporters of fossil fuels and industrial GHGs.

emitted by a large number of small sources, particularly in the commercial and residential sectors (e.g., HFCs emitted from home A/C units or GHG emissions from individual motor vehicles).<sup>46</sup> To cover these direct emissions would require reporting by hundreds or thousands of small facilities. To avoid this impact, the proposed rule does not include all of those emitters, but instead requires reporting by the suppliers of industrial gases and suppliers of fossil fuels. Because the GHGs in these products are almost always fully emitted during use, reporting these supply data would provide an accurate estimate of national emissions while substantially reducing the number of reporters.<sup>47</sup> For this reason, the proposed rule requires reporting by suppliers of coal and coal-based products, petroleum products, natural gas and NGLs, CO<sub>2</sub> gas, and other industrial GHGs. We are not proposing to require reporting by suppliers of biomass-based fuels, or renewable fuels, due to the fact that GHGs emitted upon combustion of these fuels are traditionally taken into account at the point of biomass production. However, we seek comment on this

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<sup>46</sup> While EPA is not proposing any reporting requirements in this rule for operators of mobile source fleets, we are requesting comment in Section V.QQ.4.b of the Preamble.

<sup>47</sup> As an example of estimating the CO<sub>2</sub> emissions that result from the combustion of fossil fuels, please see, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 - Energy, Chapter 1 - Introduction (<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>)

approach and note that producers of some biomass-based fuels (e.g., ethanol) would be subject to reporting requirements for their on-site emissions under this proposal, similar to other fuel producers. For more information about these source categories please see the source-specific discussions in Section V of this preamble.

There is inherent double-reporting of emissions in a program that includes both upstream and downstream sources. For example, coal mines would report CO<sub>2</sub> emissions that would be produced from combustion of the coal supplied into the economy, and the receiving power plants are already reporting CO<sub>2</sub> emissions to EPA from burning the coal to generate electricity. This double-reporting is nevertheless consistent with the appropriations language, and provides valuable information to EPA and stakeholders in the development of climate change policy and programs. Policies such as low-carbon fuel standards can only be applied upstream, whereas end-use emission standards can only be applied downstream. Data from upstream and downstream sources would be necessary to formulate and assess the impacts of such potential policies. EPA recognizes the double-reporting and as discussed in Section I.D of this preamble does not intend to use the upstream

and downstream emissions data as a replacement for the national emissions estimates found in the Inventory.

It is possible to construct a reporting system with no double-reporting. For example, such a system could include fossil fuel combustion-related emissions upstream only, based on the fuel suppliers, supplemented by emissions reported downstream for industrial processes at select industries (e.g., CO<sub>2</sub> process emissions from the production of cement); fugitive emissions from coal, oil, and gas operations; biological processes and mobile source manufacturers. Industrial GHG suppliers could be captured completely upstream, thereby removing reporting obligations from the use of the industrial gases by large downstream users (e.g., magnesium production and SF<sub>6</sub> in electric power systems). Under this option, the total number of facilities affected is approximately 32% lower than the proposed option, and the private sector costs are approximately 26% lower than the proposed option. The emissions coverage remains largely the same as the proposed option although it is important to note that some process related emissions may not be captured due to the fact that downstream combustion sources would not be covered under this option. A source with process emission plus combustion emissions would only have to report their process emission,

thus the exclusion of downstream combustion could result in some sources being under the threshold. For more information about this analysis and the differences in the number of reporters and coverage of emissions, please see the RIA (EPA-HQ-OAR-2008-0508-002).

Emissions from agricultural sources and other land uses. The proposed rule does not require reporting of GHG emissions from enteric fermentation, rice cultivation, field burning of agricultural residues, composting (other than as part of a manure management system), agricultural soil management, or other land uses and land-use changes, such as emissions associated with deforestation, and carbon storage in living biomass or harvested wood products. As discussed in Section V of this preamble, the proposal does include reporting of emissions from manure management systems.

EPA reports on the GHG emissions and sinks associated with agricultural and land-use sources in the *Inventory of U.S. Greenhouse Gas Emissions and Sinks*. In the agriculture sector, the U.S. GHG inventory report estimated that agricultural soil management, which includes fertilizer application (including synthetic and manure fertilizers, etc.), contributed N<sub>2</sub>O emissions of 265 million metric tons CO<sub>2</sub>e in 2006 and enteric fermentation

contributed CH<sub>4</sub> emissions of 126 million metric tons CO<sub>2</sub>e in 2006. These amounts reflect 3.8 percent and 1.8 percent of total GHG emissions from anthropogenic sources in 2006. Rice cultivation, agricultural field burning, and composting (other than as part of a manure management system) contributed emissions of 5.9, 1.2, and 3.3 million metric tons CO<sub>2</sub>e, respectively in 2006. Total carbon fluxes, rather than specific emissions from deforestation, for U.S. forestlands and other land uses and land-use changes were also reported in the U.S. GHG inventory report.

The challenges to including these direct emission source categories in the rule are that practical reporting methods to estimate facility-level emissions for these sources can be difficult to implement and can yield uncertain results. For more information on uncertainty for these sources, please refer to the TSD for Biological Process Sources Excluded from this Rule (EPA-HQ-OAR-2008-0508-045). Furthermore, these sources are characterized by a large number of small emitters. In light of these challenges, we have determined that it is impractical to require reporting of emissions from these sources in the proposed rule at this time for the reasons explained below.



For these sources, currently, there are no direct greenhouse gas emission measurement methods available except for research methods that are prohibitively expensive and require sophisticated equipment. Instead, limited modeling-based methods have been developed for voluntary GHG reporting protocols which use general emission factors, and large-scale models have been developed to produce comprehensive national-level emissions estimates, such as those reported in the U.S. GHG inventory report.

To calculate emissions using emission factor or carbon stock change approaches, it would be necessary for landowners to report on management practices, and a variety of data inputs. Activity data collection and emission factor development necessary for emissions calculations at the scale of individual reporters can be complex and costly.

For example, for calculating emissions of N<sub>2</sub>O from agricultural soils, data on nitrogen inputs necessary for accurate emissions calculations include: synthetic fertilizer, organic amendments (manure and sludge), waste from grazing animals, crop residues, and mineralization of soil organic matter. While some activity data can be collected with reasonable certainty, the emissions

estimates could still have a high degree of uncertainty because the emission factors available for individual reporters do not reflect the variety of conditions (e.g., soil type, moisture) that need to be considered for accurate estimates.

Without reasonably accurate facility-level emissions factors and the ability to accurately measure all facility-level calculation variables at a reasonable cost to reporters, facility-level emissions reporting would not improve our knowledge of GHG emissions relative to national or regional-level emissions models and data available from national databases. While a systematic measurement program of these sources could improve understanding of the environmental factors and management practices that influence emissions, this type of measurement program is technically difficult and expensive to implement, and would be better accomplished through an empirical research program that establishes and maintains rigorous measurements over time.

Despite the issues associated with reporting by the agriculture and land use sectors, threshold analyses were conducted for several source categories within these sectors as part of their consideration for inclusion in this rule. For some agricultural source categories, the

number of individual farms covered at various thresholds was estimated. The resulting analyses showed that for most of these sources no facilities would exceed any of the thresholds evaluated.

Because facility-level reporting is impracticable, the proposed rule contains other provisions to improve our understanding of emissions from these source categories. For example, agricultural soil management is a significant source of N<sub>2</sub>O. Activity data, including synthetic nitrogen-based fertilizer applications, influence N<sub>2</sub>O emissions from this agricultural source category. To gain additional information on synthetic nitrogen-based fertilizers, EPA is proposing that the industrial facilities reporting under this rule include information on the production and nitrogen content of fertilizers as part of their annual reports to EPA. It is estimated that all of the synthetic nitrogen-based fertilizer produced in the U.S. is manufactured by industrial facilities that are covered under this rule due to onsite combustion-related and industrial process emissions (e.g., ammonia manufacturing facilities). The reporting requirements are contained in proposed 40 CFR part 98, subpart A.

EPA is requesting comment on this approach. In particular, the Agency is looking for information on the

usefulness of the fertilizer data for estimating N<sub>2</sub>O emissions from agricultural soils, and also on including other possible reporters of synthetic nitrogen-based fertilizers, such as fertilizer wholesalers or distributors, or importers in order to develop a better understanding of the source of N<sub>2</sub>O emissions from fertilizer use.

For additional background information on emissions from agricultural sources and other land use, please refer to the TSD for Biological Process Sources Excluded from this Rule (EPA-HQ-OAR-2008-0508-045).

### C. Rationale for Selection of Thresholds

The proposed rule would establish reporting thresholds at the facility level.<sup>48,49,50</sup> Only those facilities that

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<sup>48</sup> Facilities reporting under this rule will likely have more than one source category within their facility (e.g., a petroleum refinery would have to report on its refinery process, combustion, landfill and wastewater emissions).

<sup>49</sup> For the purposes of this rule, facility means any physical property, plant, building, structure, source, or stationary equipment located on one or more contiguous or adjacent properties in actual physical contact or separated solely by a public roadway or other public right-of-way and under common ownership or common control, that emits or may emit any greenhouse gas. Operators of military installations may classify such installations as more than a single facility based on distinct and independent functional groupings within contiguous military properties.

<sup>50</sup> A different threshold approach is proposed for vehicle and engine manufacturers (when reporting emissions from the vehicles and engines they produce). Here, EPA proposes to exempt small businesses from reporting requirements, instead of applying an emission-based threshold.

exceed a threshold as specified in proposed 40 CFR part 98, subpart A would be required to submit annual GHG reports.

The thresholds are expressed in several ways (e.g., actual emissions or capacity). The use of these different types of thresholds is discussed later in this section, but most correspond to an annual facility-wide emission level of 25,000 metric tons of CO<sub>2</sub>e, and the thresholds result in covering approximately 85-90 percent of U.S. emissions. That level is largely consistent with many of the existing GHG reporting programs, including California, which also has a 25,000 metric ton of CO<sub>2</sub>e threshold. Furthermore, many industry stakeholders that EPA met with expressed support for a 25,000 metric ton of CO<sub>2</sub>e threshold because it sufficiently captures the majority of GHG emissions in the U.S., while excluding smaller facilities and sources.<sup>51</sup> The three exceptions to the 25,000 metric ton of CO<sub>2</sub>e threshold are electricity production at selected units subject to existing Federal programs, fugitive emissions from coal mining, and emissions from mobile sources. These thresholds were selected to be consistent with existing thresholds for reporting similar data to EPA and the MSHA. The proposed thresholds maximized the rule coverage with

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<sup>51</sup> To view a summary of EPA's outreach efforts please refer to EPA-HQ-OAR-2008-0508-055.

over 85 percent of U.S. emissions reported by approximately 13,000 reporters, while keeping reporting burden to a minimum and excluding small emitters.

Consideration of alternative emissions thresholds. In selecting the proposed threshold level, we considered two lower emission threshold alternatives and one higher alternative. We collected available data on each industry and analyzed the implication of various thresholds in terms of number of facilities and level of emissions covered at both the industry level and the national level. We also performed a similar analysis for each proposed source category to determine if there were reasons to develop a different threshold in specific industry sectors. From these analyses, we concluded that a 25,000 metric ton threshold suited the needs of the reporting program by providing comprehensive coverage of emissions with a reasonable number of reporters and that having a uniform threshold was an equitable approach. This conclusion took into account our finding that a threshold other than 25,000 metric tons of CO<sub>2</sub>e might appear to achieve an appropriate balance between number of facilities and emissions covered for a limited number of source categories. Our conclusions about the alternative thresholds are summarized below and in the Thresholds TSD (EPA-HQ-OAR-2008-0508-046), and the

considerations for individual source categories are explained in Section V of this preamble.

The lower threshold alternatives that we considered were 1,000 metric tons of CO<sub>2</sub>e per year, and 10,000 metric tons of CO<sub>2</sub>e per year. Both broaden national emissions coverage but do so by disproportionately increasing the number of affected facilities (e.g., increasing the number of reporters by an order of magnitude in the case of a 1,000 metric tons CO<sub>2</sub>e/yr threshold and doubling the number of reporters in the case of a 10,000 metric tons CO<sub>2</sub>e/yr threshold). The majority of stakeholders were opposed to these lower thresholds for that reason - the gains in emissions coverage are not adequately balanced against the increased number of affected facilities.

A 1,000 metric ton of CO<sub>2</sub>e per year threshold would increase the number of affected facilities by an order of magnitude over the proposed threshold. The effect of a 1,000 metric ton threshold would be to change the focus of the program from large to small emitters. This threshold would impose reporting costs on tens of thousands of small businesses that in total would amount to less than 10 percent of national GHG emissions.

A 10,000 metric ton of CO<sub>2</sub>e per year threshold approximately doubles the number of facilities affected

compared to a 25,000 metric ton threshold. The effect of a 10,000 metric ton threshold would only improve national emissions coverage by approximately 1 percent. The extra data that would result from a 10,000 metric ton threshold would do little to further the objectives of the program. EPA believes the 25,000 metric ton threshold more effectively targets large industrial emitters, which are responsible for some 90 percent of U.S. emissions. Similarly, California's mandatory GHG reporting program also based their selection of a 25,000 metric ton threshold on similar results at the State level.<sup>52</sup>

We also considered 100,000 metric tons of CO<sub>2</sub>e per year as an alternative threshold but concluded that it fails to satisfy two key objectives. First, it may exclude enough emitters in certain source categories such that the emissions data would not adequately cover key sectors of the economy. At 100,000 metric tons CO<sub>2</sub>e per year, reporting for several large industry sectors would be rather significantly fragmented, resulting in an incomplete picture of direct emissions from that sector. For example, at a 100,000 metric ton of CO<sub>2</sub>e threshold in ammonia manufacturing, approximately 22 out of 24 facilities would

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<sup>52</sup> For more information on CA analysis please see <http://www.arb.ca.gov/regact/2007/ghg2007/isor.pdf>



have to report; in nitric acid production, approximately 40 out of 45 facilities would have to report; in lime manufacturing, 52 out of 89 facilities would have to report; and in pulp and paper, 410 out of 425 facilities would have to report. Several stakeholders we met with stressed this potential fragmentation as a concern and requested that EPA include all facilities in a particular sector to simplify compliance, even if there was some uncertainty about whether all facilities in an industry would technically meet a particular threshold. For more information about the impact of thresholds on different industries, please see the source-specific discussion in Section V of this preamble.

The data collected by this rulemaking is intended to support analyses of future policy options. Those options may depend on harmonization with State or even international reporting programs. Several States and regional GHG programs are using thresholds that are comparable in scope to a 25,000 metric ton of CO<sub>2</sub>e per year threshold.<sup>53</sup> As noted earlier, California specifically chose a threshold of 25,000 metric ton of CO<sub>2</sub>e after

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<sup>53</sup> For more information about what different States are requiring, see section II of this preamble, the "Summary of Existing State GHG Rules" memorandum and "Review of Existing Programs" memorandum found at EPA-HQ-OAR-2008-0508-056 and 054.

analyzing CO<sub>2</sub> data from the air quality management districts because they concluded that level provided the correct balance of emissions coverage and number of reporters. Implementing a national reporting program using a 100,000, 10,000 or 1,000 metric ton of CO<sub>2</sub>e per year limit would result in a fragmentary dataset insufficient in detail or coverage, or a more burdensome reporting requirement, and these options would be inconsistent with what many other GHG programs are requiring today.

In addition to the typical emissions thresholds associated with GHG reporting and reduction programs (e.g., 25,000 metric tons CO<sub>2</sub>e), under the CAA, there are (1) the Title V program that requires all major stationary sources, including all sources that emit or have the potential to emit over 100 tons per year of an air pollutant, to hold an operating permit<sup>54</sup> and (2) the PSD/NSR program that requires new major sources and sources that are undergoing major modifications to obtain a permit. A major source for PSD is defined as any source that emits or has the potential to emit either 100 or 250 tons per year of a regulated

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<sup>54</sup> Other sources required to obtain Title V operating permits include all sources that are required to have PSD permits, "affected sources" under the ARP, and sources subject to NSPS or NESHAP (although non-major sources under those programs can be exempted by rule).

pollutant, dependent on the source category.<sup>55</sup> In nonattainment areas, the major source threshold for NSR is at most 100 tons per year, and is less in some areas depending on the pollutant and the nonattainment classification of the area.

EPA performed some preliminary analyses to generally estimate the existing stock of major sources in order to then estimate the approximate number of new facilities that could be required to obtain NSR/PSD permits<sup>56</sup>. For example, if the 100 and 250 tons per year thresholds were applied in the context of GHGs, the Agency estimates the number of PSD permits required to be issued each year would increase by more than a factor of 10 (i.e., more than 2,000 to 3,000 permits per year). The additional permits would generally be issued to smaller industrial sources, as well as large office and residential buildings, hotels, large retail establishments, and similar facilities.

For more information about the affect of thresholds considered for this rule on the number of reporters, emissions coverage and costs, please see Table VIII-2 in

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<sup>55</sup> The 100 tons per year level is the level at which existing sources in 28 industry categories listed in the CAA are classified as major sources for the PSD program. The 250 tons per year level is the level at which existing sources in all other categories are classified as major sources for PSD purposes.

<sup>56</sup> For more information about the major source analysis please see docket number EPA-HQ-OAR-2008-0318.

Section VIII of this preamble and Table IV-47 of the RIA found at EPA-HQ-OAR-2008-0508-002.

Determining applicability to the rule. The thresholds listed in proposed 40 CFR part 98, subpart A fall into three groups: capacity, emissions, or "all in." The thresholds developed are generally equivalent to a threshold of 25,000 metric tons of CO<sub>2</sub>e per year of actual emissions.

EPA carefully examined thresholds and source categories that might be able to report utilizing a capacity metric, for example, tons of product produced per year. A capacity-based threshold could be the least burdensome alternative for reporting because a facility would not have to estimate emissions to determine if the rule applies. However, EPA faced two key challenges in trying to develop capacity thresholds. First, in most cases we did not have sufficient data to determine an appropriate capacity threshold. Secondly, for some source categories defining the appropriate capacity metric was not feasible. For example, for some source categories, GHG emissions are not related to production capacity, but are more affected by design and operating factors.

The scope of the proposed emission threshold is emissions from all applicable source categories located

within the physical boundary of a facility. To determine emissions to compare to the threshold, a facility that directly emits GHGs would estimate total emissions from all source categories for which emission estimation methods are provided in proposed 40 CFR part 98, subparts C through JJ. The use of total emissions is necessary because some facilities are comprised of multiple process units or collocated source categories that individually may not be large emitters, but that emit significant levels of GHGs collectively. The calculation of total emissions for the purposes of determining whether a facility exceeds the threshold should not include biogenic CO<sub>2</sub> emissions (e.g., those resulting from combustion of biofuels). Therefore, these emissions, while accounted for and reported separately, are not considered in a facility's emissions totals.

In order to ensure that the reporting of GHG emissions from all source categories within a facility's boundaries is not unduly burdensome, EPA has proposed flexibility in two ways. First, a facility would only have to report on the source categories for which there are methods provided in this rule. EPA has proposed methods only for source categories that typically contribute a relatively significant amount to a facility's total GHG emissions

(e.g., EPA has not provided a method for a facility to account for the CH<sub>4</sub> emissions from coal piles). Second, for small facilities, EPA has proposed simplified emission estimation methods where feasible (e.g., stationary combustion equipment under a certain rating can use a simplified mass balance approach as opposed to more rigorous direct monitoring).

The proposed emissions threshold is based on actual emissions, with a few exceptions described below. An actual emission metric accounts for actual operating practices at each facility. A threshold based on potential emissions would bring in far more facilities including many small emitters. For example, under a potential emissions threshold, a facility that operates one shift a day would have to estimate emissions assuming three shifts per day, and would have to assume continuous use of feedstocks or fuels that result in the highest rate of GHG emissions absent enforceable limitations. Such an approach would be inconsistent with the twin goals of collecting accurate data on actual GHG emissions to the atmosphere and excluding small emitters from the rule. However, we note that emissions thresholds in some CAA rules are based on actual or potential emissions. Moreover, although actual emissions may change year to year due to fluctuations in

the market and other factors, potential emissions are less subject to yearly fluctuations. We solicit comment on how considerations of actual and potential emissions should be incorporated into the proposed threshold.

There is one source category that has a proposed threshold based on GHG generation instead of emissions - municipal landfills. In this case, a GHG generation threshold is more appropriate because some landfills have installed CH<sub>4</sub> gas recovery systems. A gas recovery system collects a percentage of the generated CH<sub>4</sub>, and destroys it, through flaring or use in energy recovery equipment. The use of a threshold based on GHG generation prior to recovery is proposed because it ensures reporting from landfills that have similar CH<sub>4</sub> emission generating activities (e.g., ensures that landfills of similar size and management practices are reporting).

As described in Section III of this preamble, in the case of 19 source categories all of the facilities that have that particular source category within their boundaries would be subject to the proposed rule. For these facilities, our analysis indicated that all facilities with that source category emit more than 25,000 metric tons of CO<sub>2</sub>e per year or that only a few facilities emit marginally below this level. These source categories

include large manufacturing operations such as petroleum refineries and cement production. This simplifies the applicability determination for facilities with these source categories.

When determining if a facility passes a relevant applicability threshold, direct emissions from the source categories would be assessed separately from the emissions from the supplier categories. For example, a company that produces and supplies coal would be subject to reporting as a supplier of coal (40 CFR part 98, subpart KK), because coal suppliers is an "all in" supplier category. But the company would separately evaluate whether or not emissions from their underground coal mines (40 CFR part 98, subpart FF) would also be reported.

In addition, the source categories listed in proposed 40 CFR 98.2(a)(1) and (2) and the supply operations listed in proposed 40 CFR 98.2(a)(4) represent EPA's best estimate of the large emitters of GHGs or large suppliers of fuel and industrial GHGs. In order to ensure that all large emitters are included in this reporting program, proposed 40 CFR 98.2(a)(3) also covers any facility that emits more than 25,000 metric tons of CO<sub>2</sub>e per year from stationary fuel combustion units at source categories that are not listed in proposed 40 CFR 98.2(a)(2). To minimize the



reporting burden, such facilities would be required to submit an annual report that covers stationary combustion emissions.

Furthermore, we recognize that a potentially large number of facilities would need to calculate their emissions in order to determine whether or not they had to report under proposed 40 CFR 98.2(a)(3). Therefore, to further minimize the burden on those facilities, we are proposing that any facility that has an aggregate maximum rated heat input capacity of the stationary fuel combustion units less than 30 mmBtu/hr may presume it has emissions below the threshold. According to our analysis, a facility with stationary combustion units that have a maximum rated heat input capacity of less than 30 mmBtu/hr, operating full time (e.g., 8,760 hours per year) with all types of fossil fuel would not exceed 25,000 metric tons CO<sub>2</sub>e/yr (EPA-HQ-OAR-2008-0508-049). Under this approach, we estimate that approximately 30,000 facilities would have to assess whether or not they had to report according to proposed 40 CFR 98.2(a)(3).<sup>57</sup> Of the 30,000, approximately

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<sup>57</sup> This estimate is based on the Energy and Environmental Analysis, "Characterization of the U.S. Industrial/Commercial Boiler Population" (2005) (EPA-HQ-OAR-2008-0508-050). We assumed 3 boilers per manufacturing facility and 1 boiler per commercial facility. For additional information on the impact to these 30,000 facilities, please see the ICR and RIA (EPA-HQ-OAR-2008-0508-002).

13,000 facilities would likely meet the threshold and have to report. Therefore, an additional 17,000 facilities may have to assess their applicability but potentially not meet the threshold for reporting. We concluded that is a reasonable number of assessments in order to ensure all large emitters in the U.S. are included in this reporting program. We are seeking comment on (1) whether the presumption for maximum rated heat input capacity of 30 mmBtu/hr is appropriate, (2) whether a different (lower or higher) mmBtu/hr capacity presumption should be set and (3) whether other capacity thresholds should be developed for different types of facilities. The comments should contain data and analysis to support the use of different thresholds.

We are proposing that once a facility is subject to this reporting rule, it would continue to submit annual reports even if it falls below the reporting thresholds in future years (As discussed in section IV.K. of this preamble, EPA is proposing that this rule require the submission of data into the foreseeable future, although EPA is soliciting comment on other options.). The purpose of the thresholds is to exclude small sources from reporting. For sources that trigger the thresholds, it is important for the purpose of policy analysis to be able to

track trends in emissions and understand factors that influence emission levels. The data would be most useful if the population of reporting sources is consistent, complete and not varying over time.

The one exception to the proposed requirement to continue submitting reports even if a facility falls below the reporting threshold is active underground coal mines. When coal is no longer produced at a mine, the mine often becomes abandoned. As discussed in Section V.FF of this preamble, we are proposing to exclude abandoned coal mines from the proposed rule, and therefore methods are not proposed for this source category.

We recognize that in some cases, this provision of "once in, always in" could potentially act as a disincentive for some facilities to reduce their emissions because under this proposal those facilities that did lower their emissions below the threshold would have to continue to report. To address this issue in California, CARB's mandatory reporting rule offers a facility that has emissions under the threshold for three consecutive years the opportunity to be exempt from the reporting program. We request comment on whether EPA should develop a similar process for this reporting program. Comments should include specifics on how the exemption process could work,

e.g., the number of years a facility is under the threshold before they could be exempt, the quantity of emissions reductions required before a facility could be exempt, whether a facility should formally apply to EPA for an exemption or if it is automatic, etc.

EPA requests comment on the need for developing simplified emissions calculation tools for certain source categories to assist potential reporters in determining applicability. These simplified calculation tools would provide conservatively high emission estimates as an aid in identifying facilities that could be subject to the rule. Actual facility applicability would be determined using the methods presented for each source category in the rule.

For additional information about the threshold analysis EPA conducted see the Thresholds TSD (EPA-HQ-OAR-2008-0508-046) and the individual source category discussions in Section V of this preamble. In addition, Section V.QQ of this preamble describes the threshold for vehicle and engine manufacturers, which is a different approach from what is described in this section.

#### D. Rationale for Selection of Level of Reporting

EPA is proposing facility-level reporting for most source categories under this program. Specifically, the owner or operator of a facility would be required to report

its GHG emissions from all source categories for which there are methods developed and listed in this proposal. For example, a petroleum refinery would have to report its emissions resulting from stationary combustion, production processes, and any fugitive or biological emissions. Facility-level reporting by owners or operators is consistent with other CAA or State-level regulatory programs that typically require facility or unit level data and compliance (e.g., ARP, NSPS, RGGI, and the California and New Mexico mandatory GHG reporting rules). This approach allows flexibility for firms to determine whether the owner or operator of the facility would report and avoids the challenges of establishing complex reporting rules based on equity or operational control.

In addition to reporting emissions at the total facility level, the emissions would also be broken out by source category (e.g., a petroleum refinery would separately identify its emissions for refinery production processes, wastewater, onsite landfills, and any other source categories listed in proposed 40 CFR part 98, subpart A that are located onsite). This would enable EPA to understand what types of emission sources are being reported, determine that the facility is reporting for all required source categories, and use the source-category

specific estimates for future policy development. Within each source category, further breakout of emissions by process or unit may be specified. Information on process or unit-level reporting and associated rationale is contained in the source category sections within Section V of this preamble.

Although many voluntary programs such as Climate Leaders or TCR have corporate-level reporting systems, EPA concluded that corporate-level reporting is overly complex under a mandatory system involving many reporters and thus is not appropriate for this rule, except where discussed below. Complex ownership structures and the frequent changes in ownership structure make it difficult to establish accountability over time and ensure consistent and uniform data collection at the facility-level. Because the best technical knowledge of emitting processes and emission levels exists at the facility level, this is where responsibility for reporting should be placed. Furthermore, the ability to differentiate and track the level and type of emissions by facility, unit or process, is essential for development of certain types of future policy (e.g., NSPS).

The only exception to facility level reporting is for some supplier source categories (e.g., importers of fuels

and industrial GHGs or manufacturers of motor vehicles and engines). Importers are not individual facilities in the traditional sense of the word. The type of information reported by motor vehicle and engine manufacturers is an extension of long-standing existing reporting requirements (e.g., reporting of criteria emissions rates from vehicle and engine manufacturers) and as such does not necessitate a change in reporting level. The reporting level for these source categories is specified in Section V of this preamble.

#### E. Rationale for Selecting the Reporting Year

EPA is proposing that the monitoring and reporting requirements would start on January 1, 2010<sup>58</sup>. The first report to EPA would be submitted by March 31, 2011, and would cover calendar year 2010. The year 2011 is therefore referred to as the first reporting year, and includes 2010 data (there is a discussion later in this section that takes comment on alternative approaches to the reporting year). EPA is requesting comment on whether or not we should select an alternative reporting date that

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<sup>58</sup> The exception is for vehicle and engine manufacturers when reporting emissions from the vehicles and engines they produce. For these sources, reporting requirements would apply beginning with the 2011 model year.

corresponds with the requirements of an existing reporting system.

For existing facilities that meet the applicability criteria in proposed 40 CFR part 98, subpart A, monitoring would begin on January 1, 2010. For new facilities that begin operation after January 1, 2010, monitoring would begin with the first month that the facility is operating and end on December 31 of that same calendar year in which they start operating. Each subsequent monitoring year would begin on January 1 and end on December 31 of each calendar year. EPA is proposing that new facilities monitor and report emissions for the first partial year after they begin operating so that EPA has as complete an inventory as possible of GHG emissions for each calendar year.

Due to the comprehensive reporting and monitoring requirements in this proposal, the Agency has concluded that it is not appropriate to require reporting of historical emissions data for years before 2010. Compiling, submitting, and verifying historical data according to the methodologies specified in this rule would create additional burdens on both the affected facilities and the Agency, and much of the needed data might not be available. Because Federal policy for GHG emissions is



still being developed, the Agency's focus is on collecting data of known quality that is generated on a consistent basis. Collecting historic emissions data would introduce data of unknown quality that would not be comparable to the data reported under the program for years 2011 and beyond.

The first year of monitoring for existing facilities would begin on January 1, 2010. This schedule would give existing facilities lead time after the date the rule is promulgated to prepare for monitoring and reporting. Preparation would include studying the final rule, determining whether it applies to the facility, identifying the requirements with which the facility must comply, and preparing to monitor and collect the required data needed to calculate and report GHG emissions.

A beginning date of January 1, 2010 would allow sufficient time to begin monitoring and collecting data because many of the parameters that would need to be monitored under the proposed rule are already monitored by facilities for process management and accounting reasons (e.g., feedstock input rates, production output, fuel purchases). In addition, the monitoring methods specified by the rule are already well-known and documented; and monitoring devices required by the rule are routinely available, in ready supply (e.g., flow meters, automatic

data recorders), and in some cases already installed. These same monitoring devices are already required by other air quality programs with which many of these same facilities are already complying.

It is reasonable for new sources that start operation after January 1, 2010, to begin monitoring the first month of operation because new sources would be aware of the rule requirements when they design the facility and its processes and obtain permits. They can plan the data collection and reporting processes and install needed monitoring equipment as they build the facility and begin operating the monitoring equipment when they begin operating the facility.

We recognize that although the Agency plans to issue the final rule in sufficient time to begin monitoring on January 1, 2010, we may be unable to meet that goal. Therefore, we are interested in receiving comments on alternative effective dates, including the following two options:

- X Report 2010 data in 2011 using best available data: Under this scenario, the rule would be effective January 1, 2010, allowing affected facilities to use either the methods in proposed 40 CFR part 98 or best available data. As in the current proposal, the report would be submitted on March 31, 2011, and then full data collection, using the methods in 40 CFR part 98 would begin in 2011, with that report sent to EPA on March 31, 2012. Under this approach, EPA solicits

comment on the types of best available data and methods that should be allowed in 2010, by source category, (e.g., fuel consumption, emissions by process, default emissions factors, fuel receipts, etc.) as well as additional basic data that should be reported (e.g., facility name, location). This approach is similar to the CARB mandatory reporting rule, which allowed affected facilities to report 2009 emissions in 2010 using best available data, and then requires 2010 data collection in 2011 using the methods in the rule. The advantages of this approach are that the dates of the proposal remain intact and EPA receives basic information, including emissions and fuel data from all affected facilities in 2011. Furthermore, this approach can ease facilities into the program by giving them potentially a full year to implement the required methods and install any necessary equipment. For example, this option encourages the use of the methods in 40 CFR part 98 but if that is not possible, it allows the use of best available data (e.g., if a facility does not have a required flow meter installed for 2010 they can substitute the data from their fuel receipts in the calculation). The disadvantage of this approach is that it delays full data collection using the methods in the rule by 1 year from what is proposed. Further, in some cases, this approach could lead to data that is of lesser quality than the data we would receive using the methods in 40 CFR part 98. In other cases, because sources are already following the methods in 40 CFR part 98 (e.g., stationary combustion units in the ARP), the quality of the data would remain unchanged under this option. Given the objective of this rule to collect comprehensive and accurate data to inform future policies and the interest in Congress in developing climate change legislation, any delay in receiving that data could adversely affect the ability to inform those policies. That said, the data we would receive in 2011 under this option would at least provide basic information about the types, locations, emissions and fuel consumption from facilities in the United States.

- X Report 2011 data in 2012: Under this scenario, the rule would require that affected facilities begin collecting data January 1, 2011 and submit the first reports to EPA on March 31, 2012. The methods in the proposed rule would remain unchanged and the only

difference is that this option would delay implementation of the rule by one year. The advantages of this approach are that affected facilities would have a substantial amount of time to prepare for this reporting rule, including implementing the method and installing equipment. In addition, we would have even more time to conduct outreach and guidance to affected facilities. The disadvantages of this approach are that it delays implementation of this rule by a year and does not offer a mechanism for EPA to receive crucial data, even basic data, necessary to inform future policy and regulatory development. Furthermore, in some cases affected facilities are already implementing the methods required by proposed 40 CFR part 98 (e.g., stationary combustion units in the ARP) or are familiar with the methods, and have all of the necessary equipment or processes in place to monitor emissions consistent with the methods in 40 CFR part 98. Therefore, delaying implementation by a year not only deprives EPA of valuable data to support future policy development, but at the same time, does not provide any real advantage to these facilities.

Proposed 40 CFR part 98, subpart A, specifies numerical reporting thresholds for different direct emitters or supply operations. A facility or supply operation that exceeds any of these reporting thresholds in 2010 would submit a full emissions report in reporting year 2011, which contains calendar year 2010 data. The facilities and supply operations that contain many of the source categories that are listed in 40 CFR part 98, subpart A are larger facilities that have been participating in a variety of mandatory and voluntary GHG emissions programs. Therefore, those facilities and supply operations should be familiar with the methods and able to

comply with the requirements and submit a full report without significant burden.

As discussed earlier, if a facility does not have any of the source categories listed in proposed 40 CFR 98.2 (a)(1) or (2), but has stationary combustion onsite that exceeds the GHG reporting threshold in 2010, they would still be required to estimate GHG emissions in 2010 and report in 2011. However, because those facilities would not contain any of the source categories specifically identified in proposed 40 CFR 98.2 (a)(1) or (2) and tend to be smaller facilities in diverse industrial sectors, they may require some extra time to implement the requirements of this rule. As such, they would be allowed to use an abbreviated facility report using simplified emission estimation methods for the first year (i.e., for calendar year 2010) and would not be required to complete a full report until the second reporting year (i.e., 2012).

The abbreviated report would allow the facility to use default fuel-specific CO<sub>2</sub> emission factors. They would not be required to determine actual fuel carbon content or to use a CEMS to determine CO<sub>2</sub> emissions, as they may otherwise be required to do with a full report. This provision for abbreviated reporting requirements has been proposed because there are potentially many facilities that are not

in the listed industries, but are required to report solely due to stationary combustion sources at their facility. These include numerous and diverse sources in a wide variety of industries, some of which may not be as familiar with GHG monitoring and reporting. Such sources may often need more time to determine if they are above the threshold and subject to the rule and, if they are, to implement the full monitoring and reporting systems required. Therefore, the abbreviated report with simpler estimating methodologies is being proposed for these sources for the first year of monitoring and reporting.

EPA proposes that the annual GHG emissions reports would be submitted no later than March 31 for the previous calendar year's reporting period. Three months is a reasonable time to compile and review the information needed for the annual GHG emissions report and to prepare and submit the report. The data needed to estimate emissions and compile the report would be collected by the facility on an ongoing basis throughout the year, so facilities could begin data summary during the year as the data are collected. For example, they could compile needed GHG calculation input data (e.g., fuel use or raw material consumption data) or emission data on a periodic basis (e.g., monthly or quarterly) throughout the year and then

total it at the end of the year. Therefore, only the most recently collected information would need to be compiled and a final set of calculations would need to be performed before the final report is assembled. Given the nature of the methodologies contained in the rule, three months is sufficient time to calculate emissions, quality-assure, certify, and submit the data.

#### F. Rationale for Selecting the Frequency of Reporting

EPA is proposing that all affected facilities would have to submit annual GHG emission reports. Facilities with ARP units that report CO<sub>2</sub> emissions data to EPA on a quarterly basis would continue to submit quarterly reports as required by 40 CFR part 75, in addition to providing the annual GHG reports. The annual CO<sub>2</sub> mass emissions from the ARP reports would simply be converted to metric tons and included in the GHG report. This approach should not impose a significant burden on ARP sources.

We have determined that annual reporting is sufficient for policy development. It is consistent with other existing mandatory and voluntary GHG reporting programs at the State and Federal levels (e.g., TCR, several individual State mandatory GHG reporting rules, EPA voluntary partnership programs, the DOE voluntary GHG registry). However, as future policies develop it may be necessary to

reconsider the reporting frequency and require more or less frequent reporting (e.g., quarterly or every few years). For example, under future programs or policy initiatives, particularly if regulatory in nature (e.g., a cap-and-trade program similar to the ARP) it may be more appropriate require quarterly reporting.

### G. Rationale for the Emissions Information to Report

#### 1. General Content of Reports

Generally, we propose that facilities report emissions for all source categories at the facility for which methods have been defined in any subpart of proposed 40 CFR part 98. Facilities would report (1) total annual GHG emissions in metric tons CO<sub>2</sub>e and (2) separately present annual mass emissions of each individual GHG for each source category at the facility<sup>59</sup>. Reporting of CO<sub>2</sub>e allows a comparison of total GHG emissions across facilities in varying categories which emit different GHGs. Knowledge of both individual gases emitted and total CO<sub>2</sub>e emissions would be valuable for future policy development and help EPA quantify the relative contribution of each gas to a source category's emissions, while maintaining the transparency of reporting

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<sup>59</sup> Consistent with the IPCC, the CARB reporting rule and the EU Emission Trading System, the proposed rule requires units to separately report the biogenic portion of their total annual CO<sub>2</sub> emissions.



total mass of individual gases released by facility, unit, or process.

Emissions would be reported at the level (facility, process, unit) at which the emission calculation methods are specified in each applicable subpart. For example, if a pulp and paper mill has three boilers and a wastewater treatment operation, the facility would report emissions for each boiler (according to the methodologies presented in proposed 40 CFR part 98, subpart C), the wastewater treatment operation (according to proposed 40 CFR part 98, subpart II), and from chemical recovery units, lime kilns, and makeup chemicals (according to proposed 40 CFR part 98, subpart AA). In addition, the report would include summary information on certain process operating data that influence the level of emissions and that are necessary to calculate GHG emissions and verify those calculations using the methodologies in the rule. Examples of these data include fuel type and amount, raw material inputs, or production output. The specific process information to report varies for each source category and is specified in each subpart.

Furthermore, in addition to any specific requirements for reporting emissions from electricity generation in Sections V.C and V.D of this preamble, EPA is proposing

that all facilities and supply operations affected by this rule would also report the quantity of electricity generated onsite. The generation of onsite electricity can represent a relatively significant fraction of onsite fuel use. We seek comment on whether this information would be useful to support future climate policy development, given the other data related to GHG emissions from electricity generation already collected under other sections of this proposed rule. At this point, we do not propose separate reporting of the onsite electricity generation by generation source (e.g., combined heat and power or renewable or fossil-based) due to the burden on reporters, but we recognize the potential value of being able to discern the quantity of electricity being generated from renewable and non-renewable sources. We are seeking comment on the value of collecting this data; and if it is collected, whether there is a need to separately report the kilowatt-hours by type of generation source.

We are also taking comment on, but not proposing at this time, requiring facilities and supply operations affected by the proposed rule to also report the quantity of electricity purchased. For many industrial facilities, purchased electricity represents a large part of onsite energy consumption, and their overall GHG emissions

footprint when taking into account the indirect emissions from fossil fuel combusted for the electricity generated. Together, the reporting of electricity purchase data and onsite generation could provide a better understanding of how electricity is used in the economy and the major industry sectors.

Many existing reporting programs require reporting of indirect emissions (e.g., Climate Leaders, CARB, TCR, DOE 1605(b) program). In general, the protocols for these programs follow the methods developed by WRI/WBCSD for the quantification and reporting of indirect emissions from the purchase of electricity. The WRI/WBCSD protocol outlines three scopes to help delineate direct and indirect emission sources, with the stated goal to improve transparency, and provide utility for different types of organizations and different types of climate policies and business goals. Scope 1 includes direct GHG emissions occurring from sources that are owned or controlled by the business. Scope 2 includes indirect GHG emissions resulting from the generation of purchased electricity, heat, and/or steam. Scope 3 is optional and includes other types of indirect emissions (e.g., from production of purchased materials, waste disposal or employee transportation).

We are taking comment on, but not proposing at this time, an approach that would require the reporting of electricity purchase data, and not indirect emissions, because these data are more readily available to all facilities. Through the review of existing reporting programs that require the reporting of indirect emissions data it was determined that there are multiple ways proposed to calculate indirect emissions from electricity purchases. This reflects the challenge associated with determining the specific fossil fuel mix used to generate the electricity consumed by a facility, and thus the indirect emissions that should be attributed to the facility. Although indirect emissions data would not be directly reported under this approach, it would enable indirect emissions for facilities to be calculated. This option also would be the least burdensome to reporting facilities since the data would be easily available.

The information that is proposed to be reported reflects the data that could support analyses of GHG emissions for future policy development and ensure the data are accurate and comparable across source categories. Besides total facility emissions, it benefits policymakers to understand: (1) the specific sources of the emissions and the amounts emitted by each unit/process to effectively

interpret the data, and (2) the effect of different processes, fuels, and feedstocks on emissions. This level of reporting should not be overly burdensome because many of these data already are routinely monitored and recorded by facilities for business reasons. The remainder of the reported data would need to be collected to determine GHG emissions.

The report would contain a signed certification from a representative designated by the owner or operator of a facility affected by this rule. This "Designated Representative" would act as a legal representative between the source and the Agency. The use of the Designated Representative would simplify the administration of the program while ensuring the accountability of an owner or operator for emission reports and other requirements of the mandatory GHG reporting rule. The Designated Representative would certify that data submitted are complete, true, and accurate. The Designated Representative could appoint an alternate to act on their behalf, but the Designated Representative would maintain legal responsibility for the submission of complete, true, and accurate emissions data and supplemental data.

Besides these general reporting requirements, the specific reporting requirements for each source category

are described in the methodological discussions in Section V of this preamble.

## 2. De minimis Reporting for Minor Emission Points

A number of existing GHG reporting programs contain “de minimis” provisions. The goal of a de minimis provision is to avoid imposing excessive reporting costs on minor emission points that can be burdensome or infeasible to monitor. Existing GHG reporting programs recognize that it may not be possible or efficient to specify the reporting methods for every source that must be reported and, therefore, have some type of provision to reduce the burden for smaller emissions sources. Depending on the program, the reporter is allowed to either not report a subset of emissions (e.g., 2 to 5 percent of facility-level emissions) or use simplified calculation methods for de minimis sources.

We analyzed the de minimis provisions of existing reporting rules and concluded that there is no need to exclude a percentage of emissions from reporting under this proposal. EPA recognizes the potential burden of reporting emissions for smaller sources. The proposal addresses this concern in several ways. First, only those facilities over the established thresholds would be required to report. Smaller facilities would not be subject to the program.

Second, for those facilities subject to the rule, only emissions from those source categories for which methods are provided would be reported. Methods are not proposed for what are typically smaller sources of emissions (e.g., coal piles on industrial sites). Third, because some facilities subject to the rule could still have some relatively small sources, the proposal includes simplified emissions estimation methods for smaller sources, where appropriate. For example, small stationary combustion units could use a default emission factor and heat rate to estimate emissions, and no fuel measurements would be required. Where simplified methods are proposed, they are described in the relevant discussions in Section V of this preamble.

Our analysis showed that the GHG reporting programs with de minimis exclusions are structured differently than our proposed rule. For example, most rules with de minimis exclusions require corporate level reporting of all emission sources. Under these programs, some corporations must report emissions from numerous remote facilities and must report emissions from small onsite equipment (e.g., lawn mowers). For these programs, a de minimis exclusion avoids potentially unreasonable reporting burdens. The recent trend in these programs, however, is to require full

reporting of all required GHG emissions, but allow simplified calculation procedures for small sources. In contrast to these other reporting programs, today's proposed rule would affect only larger facilities, would require reporting of significant emission points only, and would contain simplified reporting where practicable. Accordingly, a de minimis exclusion is not necessary. EPA requests comment on whether this approach to smaller sources of emissions is appropriate or if we should include some type of de minimis provision.

For additional information on the treatment of de minimis in existing GHG reporting programs, please refer to the "Reporting Methods for Small Emission Points (De Minimis Reporting)" (EPA-HQ-OAR-2008-0508-048).

### 3. Recalculation and Missing Data

Most voluntary and mandatory GHG reporting programs include provisions for operators to revise previously submitted data. For example, some voluntary programs require reporters to revise their base year emissions calculations if there is a significant change in the boundary of a reporter, a change in methodologies or input data, a calculation error, or a combination of the above that leads to a significant change in emissions.

Recalculation procedures particularly appear to be central



in voluntary GHG reporting programs that are also tracking emissions reductions.

Moreover, some programs (e.g., ARP) have detailed provisions for filling in data gaps that are missing in the required report. For example, in ARP, these procedures apply when CEMS are not functioning and as a result several hours of the required hourly data are missing. Note, however, that merely filling in data gaps that are missing or correcting calculation errors does not relieve an operator from liability for failure to properly calculate, monitor and test as required.

For this mandatory GHG reporting program, EPA concluded it was important to have missing data procedures in order to ensure there is a complete report of emissions from a particular facility. However, because this program requires annual reporting rather than quarterly reporting of hourly data as in ARP, the missing data provision often require the facility to redo the test or calculation of emissions. Section V of the preamble details the missing data procedures for facilities reporting to this program. EPA is seeking comment on whether to include a provision to require a minimum standard for reported data (e.g., only 10 percent of the data reported can be generated using missing data procedures).

In addition to establishing procedures for missing data, there may be benefit in requiring previously submitted data to be recalculated in order to ensure that the GHG emissions reported by a facility are as accurate as possible. The proposed California mandatory GHG reporting program, for example, allows reporters to revise submitted emissions data if errors are identified, subject to approval by the program.

EPA is considering whether or not to include provisions to require facilities to correct previously submitted data under certain circumstances. However, these benefits must also be weighed against the additional costs associated with requiring reporters to recalculate and resubmit previous data, and the magnitude of the emissions changes expected from such recalculations. Moreover, even if EPA were to allow recalculation of submitted data or accept data submitted using missing data procedures, that would not relieve the reporter of their obligation to report data that are complete, accurate and in accordance with the requirements of this rule. Although submitting recalculated data or data using missing data procedures would correct the data that are wrong, that resubmission or missing data procedures does not necessarily reverse the potential rule violation and would not relieve the reporter

of any penalties associated with that violation. EPA is seeking comment on whether the mandatory GHG reporting program should include provisions to require reporters to submit recalculated data and under what circumstances such recalculations should be required.

#### H. Rationale for Monitoring Requirements

In selecting the monitoring requirements for the proposed rule, EPA's goal is to collect data of sufficient accuracy and quality to be used to inform future climate policy development and support a range of possible policies and regulations. Future policies and regulations could range from research and development initiatives to regulatory programs (e.g., cap-and-trade programs). Accurate and timely information is critical to making policy decisions and developing programs. However, EPA recognizes that methods that provide the most accurate data may also entail higher data collection costs. In selecting a general monitoring approach, EPA considered the relative accuracy and costs of different approaches, the monitoring methods already in use within the regulated industries, and consistency with the monitoring approaches required by various Federal and State mandatory and voluntary GHG reporting programs. Measurement methods can range from continuous direct emissions measurements to simple

calculation methods that rely on default factors and assumptions. EPA considered four broad monitoring approaches for the mandatory GHG rule. These general approaches (options 1 through 4) and the rationale for the selected approach are described in this section. After a general approach was selected, EPA developed the specific proposed monitoring methods for each source category as described in Section V of this preamble.

Option 1. Direct Emission Measurement. Option 1 would require direct measurement of GHGs for all source categories where direct measurement is feasible. It would require installation of CEMS for CO<sub>2</sub> in the stacks from stationary combustion units and industrial processes. The approach would be similar to 40 CFR part 75 that require coal-fired EGUs to install, operate, and maintain CEMS for SO<sub>2</sub> and NO<sub>x</sub> emissions and report hourly emissions data (although some lower-emitting units have the option to use fuel sampling and fuel flow rate metering to determine emissions). Like 40 CFR part 75, the direct measurement approach would have detailed requirements for the CEMS including stringent QA/QC requirements to monitor accuracy and precision.

Direct measurement is not technically feasible in all cases. For example, CEMS are not available for many of the

GHGs that must be reported. Direct measurement is also infeasible for emissions that are not captured and emitted through a stack, such as CH<sub>4</sub> emissions from the surface of landfills or fugitive emissions from selected oil and natural gas operations. For sources where direct measurement is not technically feasible, this option would require the use of rigorous methods with a comparable level of accuracy to CEMS.

The direct measurement option has the highest degree of certainty of the data reported. It is also the most costly because all facilities where direct measurement is feasible would need to install, operate, and maintain emission monitors. Most facilities currently do not have CEMS to measure GHG emissions.

Option 2. Combination of Direct Emission Measurement and Facility-Specific Calculations. This option would require direct measurement of emissions from units at facilities that already are required to collect and report data using CEMS under other Federally enforceable programs (e.g., ARP, NSPS, NESHAP, SIPs). In some cases, this may require upgrading existing CEMS that currently monitor criteria pollutants to also monitor CO<sub>2</sub>.

Facilities that do not have units that have CEMS installed would have the choice to either directly measure

emissions or to use facility-specific GHG calculation methods. The measurement and calculation methods for each source category would be specified in each subpart. Depending on the source category, methods could include mass balance; measurement of the facility's use of fuels, raw materials, or additives combined with site-specific measured carbon content of these materials; or other procedures that rely on facility-specific data. For the supplier source categories (e.g., those that supply fuels or industrial GHGs), this option would require reporting of production, import, and export data. The supplier companies already closely track these data for financial and other reasons.

This option provides a relatively high degree of certainty and takes advantage of existing practices at facilities. This option is less costly than option 1 because most facilities are not required to install CEMS and can, in many cases, make use of data they are already collecting for other reasons.

Option 3. Simplified Calculation Methods. Under option 3, facilities would calculate emissions using simple inputs (e.g., total annual production) that are usually already measured for other reasons, and EPA-supplied default emission factors (many of which have been developed by

industry consortiums, such as the World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD) (Cement Sustainability Initiative) Protocol). The default emission factors would represent national average factors. These methods and emission factors would not take into account facility-specific differences in processes or in the composition of raw materials, fuels, or products.

Under this option, the only facilities that would have to use more rigorous monitoring or site-specific calculations methods are facilities that are already required to report emissions under 40 CFR part 75. These facilities would continue to follow the CO<sub>2</sub> monitoring and reporting requirements of 40 CFR part 75.

Data collected under this option would have a lower degree of certainty than options 1 or 2. Furthermore, many facilities are already calculating GHG emissions to a higher degree of certainty for business reasons or for other mandatory or voluntary reporting programs, and option 3 would not make use of such available data. However, the cost to facilities is lower than under options 1 and 2.

Option 4. Reporter's Choice of Methods. Under this approach, reporters would have flexibility to select any measurement or calculation method and any emission factors

for determining emissions. The rule would not prescribe any methods or present any specific options for determining emissions.

Data collected under this option would not be comparable across a given industry and across reporters subject to the program, thereby minimizing the usefulness of the data to support future policymaking. Although some facilities might choose to use direct measurement because CEMS are already installed at the facility, other facilities would select default calculations. This option would be the lowest cost to reporters.

Proposed Option. For the proposed rule, EPA selected option 2 (combination of direct measurement and facility-specific calculations) as the general monitoring approach. This option results in relatively high quality data for use in developing climate policies and supporting a wide range of potential future policy options. Because we do not yet know which specific policy options the data may ultimately be used to support, the reported GHG emission estimates should have a sufficient degree of certainty such that they could be used to help develop a potential variety of programs.

Option 2 strikes a balance between data accuracy and cost. It makes use of existing data and methodologies to



the extent feasible, and avoids the cost of installing and operating CEMS at numerous facilities. It is consistent with the types of methods contained in other GHG reporting programs (e.g., TCR, California programs, Climate Leaders). Because this option specifies methods for each source category, it should result in data that are comparable across facilities.

Option 1 (direct emission measurement) was not chosen because the cost to the reporters if all facilities had to install continuous emission monitoring systems would be unreasonably high in the absence of a defined policy that would require this type of monitoring. However, under the selected option, facilities that already use CEMS would still be required to use them for purposes of the GHG reporting rule.

Option 3 (simplified calculation methods) was not chosen because the data would be less accurate than option 2 and would not make use of site-specific data that many facilities already have available and refined calculation approaches that many facilities are already using. Option 3 would also be inconsistent with several other GHG reporting programs such as TCR and California programs that contain more site-specific calculation methods for several of the source categories.

Option 4 (reporter's choice of methods) was not proposed because the accuracy and reliability of the reported data would be unknown and would vary from one reporter to the next. Because consistent methods would not be used under this option, the reported data would not be comparable across similar facilities. The lack of comparability would undermine the use of the data to support policy decisions.

EPA requests comments on the selected monitoring approach and on other potential options and their advantages and disadvantages.

#### I. Rationale for Selecting the Recordkeeping Requirements

EPA is proposing that each facility that would be required to submit an annual GHG report would also keep the following records, in addition to any records prescribed in each applicable subpart:

- X A list of all units, operations, processes and activities for which GHG emissions are calculated;
- X The data used to calculate the GHG emissions for each unit, operation, process, and activity, categorized by fuel or material type;
- X Documentation of the process used to collect the necessary data for the GHG emissions calculations;
- X The GHG emissions calculations and methods used;
- X All emission factors used for the GHG emissions calculations;
- X Any facility operating data or process information used for the GHG emissions calculations;

- X Names and documentation of key facility personnel involved in calculating and reporting the GHG emissions;
- X The annual GHG emissions reports;
- X A log book documenting any procedural changes to the GHG emissions accounting methods and any changes to the instrumentation critical to GHG emissions calculations;
- X Missing data computations;
- X A written QAPP;
- X Any other data specified in any applicable subpart of proposed 40 CFR part 98. Examples of such data could include the results of sampling and analysis procedures required by the subparts (e.g., fuel heat content, carbon content of raw materials, and flow rate) and other data used to calculate emissions.

These data are needed to verify the accuracy of reported GHG emission calculations and, if needed, to reproduce GHG emission estimates using the methods prescribed in the proposed rule. Since the above information must be collected in order to calculate GHG emissions, the added burden of maintaining records of that information should be minimal.

Each facility would be required to retain all required records for at least 5 years. Records would be maintained for this period so that a history of compliance could be demonstrated and questions about past emission estimates could be resolved, if needed.

The records would be required to be kept in an electronic or hard-copy format (as appropriate) that is

readily accessible within a reasonable time for onsite inspection and auditing. They would be recorded in a form that can be easily inspected and reviewed. The allowance of a variety of electronic and hard copy formats for records allows flexibility for facilities to use a system that meets their needs and is consistent with other facility records maintenance practices, thereby minimizing the recordkeeping burden.

#### J. Rationale for Verification Requirements

##### 1. General Approach to Verification Proposed in this Rule

GHG emissions reported under this rule would be verified to ensure accuracy and completeness so that EPA and the public could be confident in using the data for developing climate policies and potential future regulations. To ensure the completeness and quality of data reported to the program, the Agency proposes self-certification with EPA verification. Under this approach, all reporters subject to this rule would certify that the information they submit to EPA is truthful, accurate and complete. EPA would then review the emissions data and supporting data submitted by reporters to verify that the GHG emission reports are complete, accurate, and meet the reporting requirements of this rule.

Given the scope of this rulemaking, this approach is consistent with many EPA regulatory programs. That said, this proposal does not preclude that in the future, as climate policies evolve, EPA may consider third party verification for other programs (e.g., offsets). Furthermore, many programs in the States and Regions may be broader in scope and the use of third party verifiers may be appropriate to meet the needs of those programs.

In addition, under the authorities of CAA sections 114 and 208, EPA has the authority to independently conduct site visits to observe monitoring procedures, review records, and verify compliance with this rule (see Section VII of this preamble for further information on compliance and enforcement). For vehicle and engine manufacturers, EPA is not proposing additional verification requirements beyond the current emissions testing and certification procedures. These procedures include well-established methods for assuring the completeness and quality of reported emission test data and EPA is proposing to include the new GHG reporting requirements as part of these methods.

## 2. Options Considered

In selecting this proposed approach to verification, the Agency reviewed verification requirements and

procedures under a number of existing EPA regulatory programs, as well as existing domestic and international GHG reporting programs. Additional information on this review and the verification approaches can be found in a technical memorandum ("Review of Verification Systems in Environmental Reporting Programs," EPA-HQ-OAR-2008-0508-047). Based on this review, EPA considered three alternative approaches to verification: (1) self-certification without independent verification, (2) self-certification with third-party verification, and (3) self-certification with EPA verification.

Option 1. Self-certification without independent verification. Under this option, the Designated Representative of the reporting facility would be required to sign and submit a certification statement as part of each annual emissions report. The certification would affirm that the report has been prepared in accordance with the requirements of the GHG reporting rule, and that the emissions data and other information reported is true and accurate to the best knowledge and belief of the certifying official. The reasons for requiring self-certification are contained in Section IV.G of this preamble. Under option 1, EPA would not independently verify the accuracy and consistency of the reported data. Furthermore, because

this approach does not include independent verification by EPA or a third party, the facility would not have to submit the detailed data needed to verify emissions estimates. Such information would be retained at the facility. For example, facilities would not be required to submit detailed monitoring data, activity data (e.g., fuel use, raw material consumption, production rates), carbon content measurements, or emission factor data used to calculate emissions.

Option 1 is a low burden option for reporters submitting data for this rule. Reporters under this option would not have to pay for third-party verifiers and would not necessarily have to submit the additional data required under the other options. In addition, EPA would not incur the expense of conducting verification of the reported data or certifying independent verifiers to conduct verification activities. The major disadvantages of this approach are the greater potential for inconsistent and inaccurate data in the absence of independent verification and the lower level of confidence that the public, stakeholders and EPA may have in the data.

Option 2. Self-certification with third-party verification. Under this approach, reporters would submit the same self-certification statements as under option 1.

In addition, reporters would be required to hire independent third-party verifiers. The third-party verifiers would review the emissions report and the underlying monitoring system records, activity data collection, calculation procedures, and documentation, and submit a verification statement that the reported emissions are accurate and free of material misstatement. Under this approach, records supporting the GHG emissions calculations would be retained at the facility for compliance purposes and provided to the verifiers, but not submitted to EPA. In addition, as discussed below, EPA would have to establish a system to certify the independent verifiers.

Self-certification with third-party verification provides greater assurance of accuracy and impartiality than self-certification without verification. While this option is consistent with some existing domestic and international GHG reporting programs such as TCR, the California mandatory reporting rule, CCAR, and the EU Emission Trading System, the majority of industry stakeholders that met with EPA are opposed to this approach for this rulemaking, primarily due to the additional cost. Compared to option 1, the third-party verification approach places two additional costs on reporters: (1) reporters would need to hire and pay verifiers, at a cost of



thousands of dollars per reporting facility, and (2) reporters would incur costs to assemble and provide to verifiers detailed supporting data for the emission estimates.

To ensure consistency and quality of the third-party verifications, EPA would need to develop verification protocols, establish a system to qualify and accredit the third-party verifiers, and conduct ongoing oversight and auditing of verifications to be sure that third-party verifications continue to be conducted in a consistent and high quality manner.

As mentioned above, as climate policy evolves, it may be appropriate for EPA to consider the use of third party verification in other circumstances (e.g., offsets).

Option 3. Self-certification with EPA verification.

Under this option, reporters would submit the same self-certification as under option 1. Reporters also would assemble data to support their emissions estimates, similar to option 2 but submit it to EPA in their annual emission reports, rather than to a third party verifier. EPA would review the emissions estimates and the supporting data contained in the reports, and perform other activities (e.g., comparison of data across similar facilities, site

visits) to verify that the reported emissions data are accurate and complete.

EPA verification provides greater assurance of accuracy and impartiality than self-reporting without verification. Compared to a third-party verification system, there would be a consistent approach to verification from one centralized verifier rather than a variety of separate verifiers although this option would require EPA to ensure consistency if it chose to use its own contractors to support its verification activities. In addition, a centralized verification system would provide greater ability to the government to identify trends and outliers in data and thus assist with targeted enforcement planning. Finally, an EPA verification approach is consistent with other EPA emissions reporting programs including EPA's ARP<sup>60</sup>. The cost to the reporter is intermediate between options 1 and 2. Although this approach would not subject reporters to the cost of paying for third-party verifiers, reporters would have to assemble and submit detailed supporting data to ensure proper verification by EPA. An EPA verification program would

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<sup>60</sup> For a description of how verification is conducted in ARP please see, "Fundamentals of Successful Monitoring, Reporting, and Verification under a Cap-and-Trade Program". John Schakenbach, Robert Vollaro, and Reynaldo Forte, U.S. EPA/OAP. *Journal of the Air and Waste Management Association* 56:1576-1583. November 2006. (EPA-HQ-OAR-2008-0508-051).

result in greater costs to the Agency than options 1 and 2, but due to economies of scale may result in lower overall costs.

### 3. Selection of Self-Certification with EPA Verification as the Proposed Approach

EPA is proposing self-certification with EPA verification (option 3) because it ensures that data reported under this rule are consistent, accurate, and complete. In addition, we are seeking comment on requiring third-party verification for suppliers of petroleum products, many of whom currently report to EPA under the Office of Transportation and Air Quality's fuels programs. Third-party verification could be reasonable in these instances because this rule, to some extent, would build on existing transportation fuels programs that already require audits of records maintained by these suppliers by independent certified public accountants or certified internal auditors. For more information about the approach to fuel suppliers please refer to Section V of this preamble.

EPA is successfully using self certification with EPA verification in a number of other emissions reporting programs. EPA verification option provides greater assurance of the accuracy, completeness, and consistency of

the reported data than option 1 (no independent verification) and consistent with feedback from industry stakeholders, does not require reporters to hire third-party verifiers (option 2). In addition, EPA verification option does not require the establishment of an accreditation and approval program for third-party verifiers although it would require EPA to ensure consistency if it chose to use its own contractors to support its verification activities.

EPA judged that option 1 (no independent verification) does not ensure sufficient quality data for the possible future uses of the data. The potential inconsistency, inaccuracy, and increased uncertainty of the data collected under option 1 would make the data less useful for informing decisions on climate policy and supporting the development of a wide range of potential future policies and regulations.

We selected EPA verification (option 3) instead of third-party verification (option 2) because EPA verification is consistent with other EPA programs, has lower costs to reporters than option 2, and would result in a consistent verification approach applied to all submitted data. Even with a verifier accreditation and approval process, the third-party verification approach could entail

a risk of inconsistent verifications because verification responsibilities are spread amongst numerous verifiers. Given the potential diversity of verifiers, the quality and thoroughness of verifications may be inconsistent and EPA audit and enforcement oversight would become the predominant factor in ensuring uniformity. Under option 2, EPA would also need to develop and administer a process to ensure that verifiers hired by the reporting facilities do not have conflicts of interest. Such a program could require EPA to review numerous individual conflict of interest screening determinations made each time a reporter hires a third-party verifier. Finally, EPA verification would likely avoid any delays that may be introduced by third-party verification and better ensure the timely reporting and use of the reported data. Some reporting programs provide four to six months after the annual emissions report is submitted for third-party verification. That said, as mentioned above, depending on the scope or type of program (e.g., offsets), EPA may consider the use of third party verification in the future as policy options evolve.

The Agency recognizes that, in some instances, data submitted by reporters under this rule may have been independently verified as the result of other mandatory or

voluntary GHG reporting programs or by other Federal, State or local regulations. Whether or not data have been independently verified outside of the requirements of this proposed GHG reporting rule, EPA has concluded for the purposes of this proposal it is important to apply the same verification requirements to all affected facilities in order to ensure equity across all reporters and consistent data collection for policy analysis and public information.

K. Rationale for Selection of Duration of the Program

EPA is proposing that the rule require the reporting of GHG emissions data on an ongoing, annual basis. Other approaches that EPA considered include a one-time collection of information and collection of a limited duration (e.g., a three-year data collection effort).

EPA does not believe that a one-time data collection effort is consistent with the legislative history of the FY 2008 Consolidated Appropriations Act, which instructed EPA to develop a rule to require the reporting of GHG emissions. Typically, a rule is not required to undertake a one-time information collection request. Moreover, the President's FY 2010 Budget, as well as initial Congressional budgets for the remainder of FY 2009 indicate that policy makers anticipate that the information will be collected for multiple years.

For example, on February 6, 2009, Senators Feinstein, Boxer, Snowe and Klobuchar sent a letter to EPA's Administrator Lisa Jackson and OMB's Director Peter Orszag stating that this program allowed EPA to "gather critical baseline data on greenhouse gas emissions, which is essential information that policymakers need to craft an effective climate change approach." In addition, in recent testimony from John Stephenson, Director of Natural Resources and Environment at the Government Accountability Office<sup>61</sup>, stated that when setting baselines for past regulatory policies, averaging data "across several years also helped to ensure that the baseline reflected changes in emissions that can result in a given year due to economic and other conditions." The testimony further noted the because EPA's ARP was able to average several years worth of data when setting the baseline for SO<sub>2</sub> reductions, the program "achieved greater assurances that it reduced emissions from historical levels" as opposed to the EU who did not have enough data to set accurate baselines for the first phase of the EU Emissions Trading System. Furthermore, EPA's experience with certain CAA

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<sup>61</sup> High Quality Greenhouse Gas Emissions Data are a Cornerstone of Programs to Address Climate Change, Statement of John Stephenson, Director, Natural Resources and Environment, Government Accountability Office, February 24, 2009.

programs show that a one-time snapshot of information is not always representative of normal operations, and hence emissions, of a facility. *See, e.g.,* Final New Source Review (NSR) Reform Rules, 68 Fed. Reg. 80186, 80199 (2002). Finally, as discussed earlier, a multi-year reporting program allows EPA to track trends in emissions and understand factors that influence emissions levels.

EPA also considered a multi-year program that would sunset at a date certain in the future (e.g., three years) absent subsequent regulatory action by EPA to extend it. EPA decided against this approach because it would unnecessarily limit the debate about potential policy options to address climate change. At this time, it would be premature to guess at what point in the future this information may be less relevant to decision-making. Rather, a more prudent approach is to maintain the program until such time in the future when it is determined that the information for one or more source categories is no longer relevant to decision-making, or is adequately provided in the context of regulatory program (e.g., CAA NSPS). Notably, EPA crafted the requirements in this rule with the potential monitoring, recordkeeping and reporting requirements for any future regulations addressing GHG emissions in mind. EPA solicits comment on all of these



possible approaches, including whether EPA should commit to revisit the continued necessity of the reporting program at a future date.

**V. Rationale for the Reporting, Recordkeeping and Verification Requirements for Specific Source Categories**

Section V of this preamble discusses the source categories covered by the proposed rule. Each section presents a description of a source category and the proposed threshold, monitoring methods, missing data procedures, and reporting and recordkeeping requirements.

**A. Overview of Reporting for Specific Source Categories**

Once you have determined that your facility exceeds any reporting threshold specified in 40 CFR 98.2(a), you would have to calculate and report GHG emissions, or alternate information as required (e.g., production and imports for industrial GHG suppliers) for all source categories at your facility for which there are measurement methods provided. The threshold determination is separately assessed for suppliers (fossil fuel suppliers and industrial GHG suppliers) and downstream source categories.

Facilities, or corporations, where relevant, that trigger only the threshold for upstream fossil fuel or industrial GHG supply (proposed 40 CFR part 98, subparts KK

through PP) need only follow the methods in those respective sections. Facilities (or corporations) that contain source categories that also have downstream sources of emissions (e.g., proposed 40 CFR part 98, subparts B through JJ), or facilities that are exclusively downstream sources of emissions may have to monitor and report GHG emissions using methods presented in multiple sections. For example, a food processing facility should review Section V.C (General Stationary Fuel Combustion), Section V.HH (Landfills) and Section V.II (Wastewater Treatment) in addition to Section V.M (Food Processing) of this preamble. Table 2 of this preamble (in the "Supplementary Information" section of this preamble) provides a cross walk to aid facilities in identifying potentially relevant source categories. The cross-walk table should only be seen as a guide as to the types of source categories that may be present in any given facility and therefore the methodological guidance in Section V of this preamble that should be reviewed. Additional source categories (beyond those listed in Table 2 of this preamble) may be relevant to a given reporter. Similarly, not all listed source categories would be relevant to all reporters. The remainder of this overview summarizes the general approach

to calculating and reporting these downstream sources of emissions.

Consistent with the requirements in the proposed 40 CFR part 98, subpart A, facilities would have to report GHG emissions from all source categories located at their facility - stationary combustion, process (e.g., iron and steel), fugitive (e.g., oil and gas) or biologic (e.g., landfills) sources of GHG emissions. The methods presented typically account for normal operating conditions, as well as SSM, where significant (e.g., HCFC-22 production and oil and gas systems). Although SSM is not specifically addressed for many source categories, emissions estimation methodologies relying on CEMS or mass balance approaches would capture these different operating conditions.

For many facilities, calculating facility-wide emissions would simply involve adding GHG emissions calculated under Section V.C of this preamble (General Stationary Fuel Combustion Sources) and emissions calculated under the source-specific subpart. For other facilities, particularly selected sources in Sections V.E through V.JJ of this preamble that rely on mass balance approaches or the use of CEMS, the proposed methods would (depending on the operating conditions and configuration of the plant) capture both combustion and process-related

emissions and there is no need to separately quantify combustion-related emissions using the methods presented in Section V.C of this preamble.

Generally, the proposed method depends on the equipment you currently have installed at the facility.

Sources with CEMS. If you have CEMS that meet the requirements in proposed 40 CFR part 98, subpart C you would be required to quantify and report the CO<sub>2</sub> emissions that can be monitored using the existing CEMS. Non-CO<sub>2</sub> combustion-related emissions would be estimated consistent with proposed 40 CFR part 98, subpart C, and other non-CO<sub>2</sub> emissions would be estimated using the source-specific methods provided.

(1) Where the CEMS capture both combustion- and process-related emissions you would be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate emissions from the industrial source. In this case, use of the additional methods provided in the source-specific discussions would not be required.

(2) Where the CEMS do not capture both combustion and process-related emissions, you should refer to the source-specific sections that provide methods for calculating

process emissions. You would also be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate any stationary fuel combustion emissions from the industrial source.

Sources without CEMS. If you do not have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to carry out facility-specific calculations to estimate process emissions. You would also be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate any stationary fuel combustion emissions from the industrial source.

#### B. Electricity Purchases

At this time, we are not proposing that facilities report information to us regarding their electricity purchases or indirect emissions from electricity consumption. However, we carefully considered proposing that all facilities that report to us also report their total purchases of electricity. This section describes our deliberations and outlines potential methods for monitoring

and reporting electricity purchases. We generally seek comment on the value of collecting information on electricity purchases. Further, we are specifically interested in receiving feedback on the approach outlined below.

#### 1. Definition of the Source Category

The electric utility sector is the largest emitter of GHG emissions in the U.S. The level of GHG emissions associated with electricity use is determined not just by the fuel and combustion technology onsite at the power plant, but also by customer demand for electricity. Accordingly, electricity use and the efficiency of this use indirectly affect the emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from the combustion of fossil fuel at electric generating stations.

For many facilities, purchased electricity represents a large part of onsite energy consumption, and their overall GHG emissions footprint when taking into account the indirect emissions from fossil fuel combusted for the electricity generated. Therefore, the reporting of electricity purchase data from facilities could provide a better understanding of how electricity is used in the economy and the major sectors. We would propose not to provide for adjustments to take into account the purchases of renewable energy credits or other mechanisms.

If included, this source category would include electricity purchases, but not include electricity generated onsite (i.e., facility-operated power plants, emergency back-up generators, or any portable, temporary, or other process internal combustion engines). General requirements for all reporters subject to the proposed rule to report on total kilowatt hours of electricity generated onsite is discussed in Section IV.G of the preamble. Calculating emissions from onsite electricity generation is addressed in Sections V.C. and V.D of this preamble.

For additional background information on indirect emissions from electricity purchases, please refer to the Electricity Purchases TSD (EPA-HQ-OAR-2008-0508-003).

## 2. Selection of Reporting Threshold

Three options for reporting thresholds could be considered for the reporting of indirect emissions from purchased electricity (i.e., GHG emissions from the production of purchased electricity). These options would be as follows:

Option 1: Do not require any reporting on electricity purchases or associated indirect emissions from electricity purchases as part of this rule.

Option 2: Require reporting on purchased electricity from all facilities that are already required to report their GHG emissions under this rule.

Option 3: Require reporting of indirect emissions from purchased electricity for facilities that exceed a prescribed total facility emissions threshold (including indirect emissions from the purchased electricity). Reporting for this option could be proposed either in terms of electricity purchases or calculated indirect CO<sub>2</sub>e emissions based on purchased electricity. This option would require an additional number of reporters, based on their annual electricity purchases, to report indirect emissions.

No additional facilities to those already reporting their emissions data under this rule would be affected by the first or second options. The number of additional facilities affected by the third proposed threshold is estimated to be approximately: 250 facilities at a 100,000 metric tons CO<sub>2</sub>e threshold; 5,000 total facilities at a 25,000 metric tons CO<sub>2</sub>e threshold; 15,000 total facilities at a 10,000 metric tons CO<sub>2</sub>e threshold; and 185,000 total facilities at a 1,000 metric tons CO<sub>2</sub>e threshold.

Under all threshold options, reporting of information related to electricity purchases would apply to entities



reporting at the facility level. This provision would not apply to source categories that we propose report at the corporate level (e.g., importers and exporters of industrial GHGs, local distribution companies, etc.). These companies in many cases may own large facilities such as refineries which already have a reporting obligation for direct emissions and electricity purchases.

Given the above considerations, our preferred option would be option 2. Purchased electricity is considered to be a significant portion of the GHG emissions of most industrial facilities, therefore the collection of indirect emissions from purchased electricity could be seen as an important component of the GHG mandatory reporting rule. Although such a reporting requirement would not provide EPA with emissions information, it could provide the necessary underlying data to develop emissions estimates in the future if this were necessary.

The reporting of electricity purchase data directly instead of calculated indirect emissions would be preferred due to the difficulties in identifying the appropriate electrical grid or electrical plant emission factor for converting a facility's electricity purchases to GHG emissions. EPA does not have data to evaluate the uncertainty of applying national, regional or State

emission factors to electricity consumption at a given facility, versus undertaking detailed studies to determine the actual emissions from electricity purchases.

Under Option 2, all facilities that are already required to report their GHG emissions under this rule would also have to quantify and report their annual electricity purchases. The total purchased electricity would include electricity purchased from all sources (i.e., fossil fuel power plants, green power generating facilities, etc.). It should be noted that under this approach, data from large sources of indirect emissions due to electricity usage (e.g., non-industrial commercial buildings) would not be collected.

### 3. Selection of Proposed Monitoring Methods

Purchased electricity could be quantified through the use of purchase receipts or similar records provided by the electricity provider. The facility could choose to use data from facility maintained electric meters in addition to or in lieu of data from an electricity provider (e.g., electricity purchase receipts, etc.), provided that this data could be demonstrated to accurately reflect facility electricity purchases. However, purchase receipts or electricity provider data would be the preferred method of quantifying a facility's electricity purchases. Because

facilities would be expected to retain these data as part of routine financial records, the only additional burden of collecting this information would be to retain the records in a readily available manner.

In identifying the options outlined above, we reviewed five reporting programs and guidelines: (1) EPA Climate Leaders Program, (2) the CARB Mandatory Greenhouse Gas Emissions Program, (3) TRI, (4) the DOE 1605(b) program, and (5) the GHG Protocol developed jointly by WRI and WBCSD. In general, these protocols follow the methods presented in WRI/WBCSD for the quantification and reporting of indirect emissions from the purchase of electricity.

See the Electricity Purchases TSD (EPA-HQ-OAR-2008-0508-003) for more information.

#### 4. Selection of Procedures for Estimating Missing Data

If we were to collect information on electricity purchases, we would propose that a facility be required to make all attempts to collect electricity records from their electricity provider. In the event that there were missing electricity purchase records, the facility would estimate its electricity purchases for the missing data period based on historical data (i.e., previous electricity purchase records). Any historical data used to estimate missing data should represent similar circumstances to the period

over which data are missing (e.g., seasonal). If a facility were using electric meter data and had a missing data period, the facility could use a substitute data value developed by averaging the quality-assured values metered values for kilowatt-hours of electricity use immediately before and immediately after the missing data period.

#### 5. Selection of Data Reporting Requirements

If we were to collect information on electricity purchases, we would propose that a facility report total annual purchased electricity in kilowatt-hours for the entire facility.

#### 6. Selection of Records That Must Be Retained

If we were to collect information on electricity purchases, we would propose that the owner or operator maintain monthly electricity purchase records for all operations and buildings. If electric meter data were used, then monthly logs of the electric meter readings would also be proposed to be maintained.

### C. General Stationary Fuel Combustion Sources

#### 1. Definition of the Source Category

Stationary fuel combustion sources are devices that combust solid, liquid, or gaseous fuel generally for the purposes of producing electricity, generating steam, or providing useful heat or energy for industrial, commercial,

or institutional use, or reducing the volume of waste by removing combustible matter. Stationary fuel combustion sources include, but are not limited to, boilers, combustion turbines, engines, incinerators, and process heaters. The combustion process may be used to: (a) generate steam or produce useful heat or energy for industrial, commercial, or institutional use; (b) produce electricity; or (c) reduce the volume of waste by removing combustible matter. As discussed in Section III of this preamble and proposed 40 CFR part 98, subpart A, this section applies to facilities with stationary fuel combustion sources that (a) have emissions greater than or equal to 25,000 metric tons CO<sub>2</sub>e/yr; or (b) are referred to this section by other source categories listed in proposed 40 CFR 98.2(a)(1) or (2).

Combustion of fossil fuels in the U.S. is the largest source of GHG emissions in the nation, producing three principal greenhouse gases: CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. For the purposes of this rule, CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O would be reported by stationary fuel combustion sources. The emission rate of CO<sub>2</sub> is directly proportional to the carbon content of the fuel, and virtually all of the carbon is oxidized to CO<sub>2</sub>. The emission rates of CH<sub>4</sub> and N<sub>2</sub>O are much less predictable, as these gases are by-products of incomplete or inefficient

combustion, and depend on many factors such as combustion technology and other considerations. The CO<sub>2</sub> emissions generated by fuel combustion far exceed the CH<sub>4</sub> and N<sub>2</sub>O emissions (CH<sub>4</sub> and N<sub>2</sub>O contribute less than 1 percent of combined U.S. GHG emissions from stationary combustion, on a CO<sub>2</sub>e basis), however, under this proposed rule, CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O would all be reported by stationary fuel combustion sources. EPA is proposing to not require reporting of emissions from portable equipment or generating units designated as emergency generators in a permit issued by a state or local air pollution control agency. We request comment on whether or not a permit should be required for these emergency generators.

A wide and diverse segment of the U.S. economy engages in stationary combustion, principally the combustion of fossil fuels. According to the "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006", the nationwide GHG emissions from stationary fossil fuel combustion are approximately 3.75 billion metric tons CO<sub>2</sub>e per year. This estimate includes both large and small stationary sources and represents more than 50 percent of total GHG emissions in the U.S.

EPA's proposed rule presents methods for calculating GHG emissions from stationary combustion, both at

unspecified facilities as well as facilities in source categories listed in proposed 40 CFR 98.2(a)(1) and (2), which are based on the fuel combusted and the size of the stationary equipment (e.g., the maximum heat input capacity in mmBtu/hr). EPA already collects CO<sub>2</sub> emissions data from electricity generating units in the ARP<sup>62</sup>, which combust the vast majority of coal consumed in the U.S. annually. So, while detailed requirements are provided for facilities that combust solid fuels, these methods are likely to affect only a small percentage of facilities reporting under proposed 40 CFR part 98 (as separate methods, in proposed 40 CFR 98.40, would be used by electricity generating units already reporting under the requirements of ARP). In presenting methodologies in the following sections, EPA further notes that the majority of reporters under proposed 40 CFR part 98, subpart C would use the methods prescribed for stationary combustion equipment combusting natural gas.

Table C-1 of this preamble illustrates the methods for calculating CO<sub>2</sub> emissions for different types of reporters based on the fuel being combusted at the facility and the size of the stationary combustion equipment. The

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<sup>62</sup> It should be noted, as discussed in section V.D, EPA already collects over 90% of total CO<sub>2</sub> emissions from U.S. coal combustion through the 40 CFR part 75 requirements of ARP.

calculations for CH<sub>4</sub> and N<sub>2</sub>O that are presented in subsequent subsections are to be applied to all fuel types and are not contingent upon the stationary combustion equipment size.

**Table C-1. Four-Tiered Approach for Calculating CO<sub>2</sub> Emissions from Stationary Combustion Sources**

Combustion Unit Size	Additional Requirement(s)	Methodological Tier Required <sup>a</sup>
Solid Fossil Fuel (e.g., Coal)		
> 250 mmBtu/hour	- Unit has operated more than 1,000 hours a year <sup>b</sup> - Unit has existing, certified gas monitors or stack gas volumetric flow rate monitor (or both); and - Facility has an established monitoring infrastructure and meets specific QA/QC requirements.	4
	- Unit does not meet conditions above.	3
≤ 250 mmBtu/hr	- Unit operates more than 1,000 hours a year <sup>b</sup> - Unit has existing, certified CO <sub>2</sub> or O <sub>2</sub> concentration monitor and stack gas volumetric flow rate monitor; and - Facility has an established monitoring infrastructure and meets specific QA/QC requirements.	4
	- Unit does not meet conditions above. - Monthly measured HHV is available.	2
	- Unit does not meet conditions above. - Monthly measured HHV is not available.	1
Gaseous Fossil Fuel (e.g., Natural Gas)		
> 250 mmBtu/hr	None	3
≤ 250 mmBtu/hr	- Monthly measured HHV is available.	2
	- Monthly measured HHV is not available.	1
Fossil Liquid Fuel (e.g., Diesel)		
> 250 mmBtu/hr	None	3



Combustion Unit Size	Additional Requirement(s)	Methodological Tier Required <sup>a</sup>
≤ 250 mmBtu/hr	- Monthly measured HHV is available.	2
	- Monthly measured HHV is not available.	1
Biomass or Biomass-Derived Fuels (e.g., wood)		
All Sizes	- EPA has provided a default CO <sub>2</sub> emission factor and a default heating value for the fuel.	1
All Sizes	- EPA has provided a default CO <sub>2</sub> emission factor for specific fuel to be used with that fuel's measured heating value.	2
All Sizes	- EPA has not provided a default CO <sub>2</sub> emission factor for specific fuel to be used with that fuel's measured heating value.	3
MSW		
> 250 tons MSW/day	- Unit has operated more than 1,000 hours a year <sup>b</sup> - Unit has existing, certified gas monitors or stack gas volumetric flow rate monitor (or both); and - Facility has an established monitoring infrastructure and meets specific QA/QC requirements.	4
	- Unit does not meet conditions above.	2
≤ 250 tons MSW/day	- Unit operates more than 1,000 hours a year <sup>b</sup> - Unit has existing, certified CO <sub>2</sub> concentration monitor and stack gas volumetric flow rate monitor; and - Facility has an established monitoring infrastructure and meets specific QA/QC requirements.	4
	- Unit does not meet conditions above.	2

<sup>a</sup> Minimum tier level to be used by reporters. Reporters required to use Tier 1, 2, or 3 have the option to use a higher tier methodology.

<sup>b</sup> Hours of operation in any year since 2005.

Note: Facilities with units reporting CO<sub>2</sub> data to ARP should refer to Section V.D of this preamble (Electricity Generation).

## 2. Selection of Reporting Threshold

In developing the threshold for facilities with stationary combustion equipment, EPA considered an emissions-based threshold of 1,000, 10,000, 25,000, and

100,000 metric tons CO<sub>2</sub>e. Table C-2 of this preamble illustrates the emissions covered and the number of facilities that would be covered under these various thresholds. It should be noted that Table C-2 of this preamble only includes facilities with stationary combustion equipment that are not covered in other subparts of the proposed rule. For this reason, the total emissions presented in Table C-2 of this preamble appear as a lower total than presented previously (the general discussion in Section C.1 of this preamble), where emissions from all stationary combustion equipment are being discussed.

**Table C-2. Threshold Analysis for Unspecified Industrial Stationary Fuel Combustion**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions (Million metric tons CO <sub>2</sub> e)	Total Number of Facilities	Emissions Covered		Facilities Covered	
			Million metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	410	350,000	250	61%	32,000	9.1%
10,000	410	350,000	230	56%	8,000	2.3%
25,000	410	350,000	220	54%	3,000	0.9%
100,000	410	350,000	170	41%	1,000	0.3%

In calculating emissions for this analysis, and for the proposed threshold, only CO<sub>2</sub> from the combustion of fossil fuels, in combination with all CH<sub>4</sub> and N<sub>2</sub>O emissions, are considered. CO<sub>2</sub> emissions from biomass are not considered as part of the determination of the threshold level. This treatment of biomass fuels is consistent with the IPCC Guidelines and the annual Inventory of U.S.

Greenhouse Gas Emissions and Sinks, which account for the release of these CO<sub>2</sub> emissions in accounting for carbon stock changes from agriculture, forestry, and other land-use. CH<sub>4</sub> and N<sub>2</sub>O emissions from combustion of biomass are counted as part of stationary combustion within the IPCC and national U.S. GHG inventory frameworks.

The purpose of the general stationary combustion source category is to capture significant emitters of stationary combustion GHG emissions that are not covered by the specific source categories described elsewhere in this preamble. Therefore, EPA is proposing a threshold for reporting emissions from stationary combustion at 25,000 metric tons CO<sub>2</sub>e<sup>63</sup>. EPA selected the proposed 25,000 metric tons CO<sub>2</sub>e threshold as it appears to strike the best balance between covering a high percentage of nationwide GHG emissions and keeping the number of affected facilities manageable. As illustrated in Table C-2 of this preamble, selecting a 25,000 metric tons CO<sub>2</sub>e threshold achieves the greatest incremental gain in coverage with the lowest increase in the number of covered sources.

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<sup>63</sup> As described previously, the threshold only includes CO<sub>2</sub> from the combustion of fossil fuels and CH<sub>4</sub> and N<sub>2</sub>O emissions from all fuel combustion. CO<sub>2</sub> emissions from biomass are not considered as part of the determination of the threshold level.

The 100,000 metric tons CO<sub>2</sub>e threshold was not proposed because EPA believes it would exclude too many significant emitters of GHG emissions that are not required to report pursuant to the other provisions of this rule. EPA believes that most of the population of facilities over a 100,000 metric tons CO<sub>2</sub>e threshold is known either through source category studies or existing EPA reporting programs.

The 10,000 metric tons CO<sub>2</sub>e threshold showed a smaller incremental gain in emissions coverage from a higher threshold than the 25,000 metric tons CO<sub>2</sub>e threshold, while greatly increasing the incremental number of reporters (as illustrated in Table C-2 of this preamble). The 1,000 metric tons CO<sub>2</sub>e threshold greatly increases the total number of reporters for this rule and places an unnecessary administrative burden on EPA, while not greatly increasing nationwide emissions coverage of stationary combustion sources.

In addition, although there is considerable uncertainty as to the number of facilities under a 25,000 metric tons CO<sub>2</sub>e threshold, there is evidence to indicate that moving the threshold from 25,000 to 10,000 metric tons CO<sub>2</sub>e would have a disproportionate impact on the commercial sector. It should also be noted that this concern is even more applicable to the 1,000 metric tons CO<sub>2</sub>e threshold.

EPA concluded that a 25,000 metric tons CO<sub>2</sub>e threshold would better achieve a comprehensive economy wide coverage of emissions while focusing reporting efforts on large industrial emitters. In particular, it would address the considerable uncertainties in the 25,000 to 100,000 metric tons CO<sub>2</sub>e emissions range, both as to the number of reporters and the magnitude of emissions. EPA believes that a 25,000 metric tons CO<sub>2</sub>e threshold would help in gathering data from a reasonable number of reporters for which little information is currently known without imposing undue administrative burden.

EPA also considered including GHG emissions from the combustion of biomass fuels in the emission threshold calculations. Therefore, the proposed rule states that GHG emissions from biomass fuel combustion are to be excluded when evaluating a facility's status with respect to the 25,000 metric tons CO<sub>2</sub>e reporting threshold. This is similar to the approach taken by the IPCC and various other GHG emission inventories.

Finally, EPA considered a heat input capacity-based threshold (such as all facilities with stationary combustion equipment rated over 100 mmBtu/hr maximum heat input capacity). A complete, reliable set of heat input capacity data was unavailable for all facilities that might

be subject to this rule, thus this type of threshold could not be thoroughly evaluated.

For a full discussion of the threshold analysis and for background information on this threshold determination, please refer to the Thresholds TSD (EPA-HQ-OAR-2008-0508-046). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

EPA's proposed methods for calculating GHG emissions from stationary fuel combustion sources is consistent with existing domestic and international protocols, as well as monitoring programs currently implemented by EPA. Those protocols and programs generally utilize either a direct measurement approach based on concentrations of combustion exhaust gases through a stack, or a direct measurement approach based on the quantity of fuel combusted and the characteristics of the fuel (e.g., heat content, carbon content, etc.). As the magnitude of CO<sub>2</sub> emissions released by stationary combustion sources relative to CH<sub>4</sub> and N<sub>2</sub>O is greater (even on a CO<sub>2</sub>e basis), more guidance is provided on the application of specific monitoring and calculation methods for CO<sub>2</sub>. EPA is proposing simpler calculation methods for CH<sub>4</sub> and N<sub>2</sub>O.

For facilities which have EGUs subject to the ARP reporting requirements under 40 CFR part 75, refer to Section V.D of this preamble regarding those units. For other units located at that facility (i.e., units that are not reporting to the ARP), the facility would use the calculation methods presented below.

The discussions which follow in this subsection will focus on methods for: (a) the calculation of CO<sub>2</sub> emissions from fuel combustion; (b) the calculation for the separate reporting of biogenic CO<sub>2</sub> emissions; (c) reporting biogenic CO<sub>2</sub> emissions from MSW; (d) the calculation of CH<sub>4</sub> and N<sub>2</sub>O emissions; and (e) the calculation of additional CO<sub>2</sub> emissions from the sorbent in combustion control technology systems.

a. CO<sub>2</sub> Emissions from Fuel Combustion

To monitor and calculate CO<sub>2</sub> emissions from stationary combustion sources, EPA is proposing a four-tiered approach, which would be applied either at the unit or facility level. The most stringent emissions calculation methods would apply to large stationary combustion units that are fired with solid fuels and that have existing CEMS equipment. This is due to the complexity of monitoring solid fuel consumption and the heterogeneous nature of solid fuels. Furthermore, because of the significant mass

of CO<sub>2</sub> emissions that are released by these large units, combining stringent methods and existing monitoring equipment is justified.

The next level of methodological stringency applies to large stationary combustion units that are fired with liquid or gaseous fuels. The stringency of the methods reflects the homogenous nature of these fuels and the ability to monitor fuel consumption more precisely. However, in cases where there is greater heterogeneity in the fuels (e.g., refinery fuel gas) more frequent analyses of liquid and gaseous fuels is required.

For smaller combustion units, EPA is proposing to allow the use of more simplified emissions calculation methods that rely on relationships between the heat content of the fuel (a generally known parameter) and the CO<sub>2</sub> emission factor associated with the fuel's characteristics.

The following subsections present EPA's proposed four-tiered approach in order from the most rigorous to the least stringent, and describe how it must be used by affected facilities. The applicability of the four measurement tiers, based on unit size and fuel type, is summarized in Table C-1 of this preamble. These CO<sub>2</sub> emission calculation methods would, in some cases, be applied at the unit level, and in other cases at the



facility level (for further discussion, see "Selection of Data Reporting Requirements" below). Affected facilities would have the flexibility to use higher-tier methods (i.e., more stringent methods) than the ones required by this rule.

Tier 4. The Tier 4 methodology would require the use of certified CEMS to quantify CO<sub>2</sub> mass emissions, where existing CEMS equipment is installed. The existing installed CEMS must include a gas monitor of any kind or a flow monitor (or both). Generally, a CO<sub>2</sub> monitor and a stack gas volumetric flow rate monitor would be required to calculate CO<sub>2</sub> emissions, although in some cases, in lieu of a CO<sub>2</sub> concentration monitor, data from a certified oxygen (O<sub>2</sub>) concentration monitor and fuel-specific F-factors could be used to calculate hourly CO<sub>2</sub> concentrations. An appropriate upgrade of the existing CEMS would be required: (1) if the gas monitor is neither a CO<sub>2</sub> concentration monitor nor an O<sub>2</sub> concentration monitor and (2) if a flow monitor is not already installed.

Any CEMS that would be used to quantify CO<sub>2</sub> emissions would also have to be certified and undergo on-going quality-assurance testing according to the procedures specified in either: (1) 40 CFR part 75; or (2) 40 CFR part 60, Appendix B; or (3) a State monitoring program.

The Tier 4 method, and the use of CEMS (with any required monitor upgrades), is required for solid fossil fuel-fired units with a maximum heat input capacity greater than 250 mmBtu/hr (and for units with a capacity to combust greater than 250 tons per day of MSW). The use of an O<sub>2</sub> monitor to determine CO<sub>2</sub> concentrations would not be allowed for units combusting MSW. EPA is unaware of carbon-based F-factors for MSW that would be appropriate for converting O<sub>2</sub> readings to CO<sub>2</sub> concentrations for this rule. Therefore, units combusting MSW would need to use a CO<sub>2</sub> monitor to calculate CO<sub>2</sub> emissions.

For smaller solid fossil fuel-fired units (i.e., less than or equal to 250 mmBtu/hr or 250 tons per day of MSW), EPA would require the use of Tier 4 if all the monitors needed to calculate CO<sub>2</sub> mass emissions (i.e., CO<sub>2</sub> gas monitor and flow monitor) are already installed, and certified and quality assured as described above.

In addition, in order to be subject to the Tier 4 requirements, the unit must have been operated for 1,000 hours or more in any calendar year since 2005.

The incremental cost of adding a diluent gas (CO<sub>2</sub> or O<sub>2</sub>) monitor or a flow monitor, or both, to meet Tier 4 monitoring requirements would likely not be unduly burdensome for a large unit that combusts solid fossil

fuels or MSW, operates frequently, and is already required to install, certify, maintain, and operate CEMS and to perform on-going QA testing of the existing monitors. The cost of compliance with the proposed rule would be even less for units that already have all of the necessary monitors in place. Cost estimates are provided in the RIA (EPA-HQ-OAR-2008-0508-002). In addition, EPA is allowing provisions to monitor common stack configurations. Please refer to Section V.C.5 of this preamble, on data reporting requirements, for further information on reporting where there are common stack configurations.

Reporters would follow the reporting requirements stated in proposed 40 CFR part 98, subpart A. However, EPA is allowing a January 1, 2011 compliance date to install CEMS to meet the Tier 4 requirements, if either a diluent gas monitor, flow monitor, or both, must be added. The January 1, 2011 deadline would allow sufficient time to purchase, install, and certify any additional monitor(s) needed to quantify CO<sub>2</sub> mass emissions. Until that time, affected units subject to that deadline would be allowed to use the Tier 3 methodology in 2010.

Tier 3. The Tier 3 calculation methodology would require periodic determination of the carbon content of the fuel, using consensus standards listed in the proposed 40

CFR part 98 (e.g., ASTM methods) and direct measurement of the amount of fuel combusted. This methodology is required for liquid and gaseous fossil fuel-fired units with a maximum heat input capacity greater than 250 mmBtu/hr, and is required for solid fossil fuel-fired units that are not subject to the Tier 4 provisions. In addition, EPA is proposing that a facility may use the Tier 3 calculation methodology to calculate facility-wide CO<sub>2</sub> emissions (rather than unit-by-unit emissions) when the same liquid or gaseous fuel is used across the facility and a common direct measurement of fuel consumed is available (e.g., a natural gas meter at the facility gate). This flexibility is consistent with existing protocols and methodologies allowed by EPA in existing programs. Please refer to the subsequent subsection on data reporting requirements for further information on the use of fuel data from common supply lines.

The required frequency for carbon content determinations for the Tier 3 calculation methodology would be monthly for natural gas, liquid fuels, and solid fuels (monthly molecular weight determinations are also required for gaseous fuels). Daily determinations for other gaseous fuels (e.g., refinery gas, process gas, etc.) would be required. The daily fuel sampling requirement for units

that combust "other" gaseous fuels would likely not be overly burdensome, because the types of facilities that burn these fuels are likely to have equipment in place (e.g., on-line gas chromatographs) to continuously monitor the fuels' characteristics in order to optimize process operation. Solid fuel samples would be taken weekly and composited, but would only be analyzed once a month. Also, fuel sampling and analysis would be required only for those days or months when fuel is combusted in the unit.

For liquid and gaseous fuels, Tier 3 would require direct measurement of the amount of fuel combusted, using calibrated fuel flow meters. Alternatively, for fuel oil, tank drop measurements could be used. Solid fuel consumption would be quantified using company records. For quality-assurance purposes, EPA proposes that all oil and gas flow meters would have to be calibrated prior to the first reporting year. EPA recommends the use of the fuel flow meter calibration methods in 40 CFR part 75, but, alternatively, the manufacturer's recommended procedure could be used. Tank drop measurements and carbon content determinations would be made using the appropriate methods incorporated by reference.

Tier 2. The Tier 2 calculation methodology would require that the HHVs of each fuel combusted would be

measured monthly. EPA is proposing that the Tier 2 method be used by units with heat input capacities of 250 mmBtu/hr or less, combusting fuels for which EPA has provided default CO<sub>2</sub> emission factors in the proposed rule. Fuel consumption would be based on company records. Please refer to the subsequent subsection on data reporting requirements for further information on the aggregation of units.

Tier 1. Under Tier 1, the annual CO<sub>2</sub> mass emissions would be calculated using the quantity of each type of fuel combusted during the year, in conjunction with fuel-specific default CO<sub>2</sub> emission factors and default HHVs. The amount of fuel combusted would be determined from company records. The default CO<sub>2</sub> emission factors and HHVs are national-level default factors. The Tier 1 method may be used by any small unit if EPA has provided the fuel-specific HHV and emission factors in proposed 40 CFR part 98, subpart C. However, if the owner or operator routinely performs fuel sampling and analysis on a monthly (or more frequent) basis to determine the HHV and other properties of the fuel, or if monthly HHV data are provided by the fuel supplier, Tier 1 could not be used but instead Tier 2 (or a higher tier) would have to be used.

EPA considered several alternative CO<sub>2</sub> emission calculation methods of varying stringency for stationary combustion units. The most stringent method would have required all combustion units at the affected facilities to use 40 CFR part 75 monitoring methodologies. However, this option was not pursued because it would have likely imposed an undue cost burden, particularly on smaller entities. For homogenous fuels, this additional cost burden would probably not lead to significant increases in accuracy compared with Tiers 1-3.

For coal combustion, EPA evaluated a number of calculation methods used in other mandatory and voluntary GHG emissions reporting programs. In general, these methods require relatively infrequent fuel sampling, do not take into account the heat input capacity of stationary combustion equipment, and use company records to estimate fuel consumption. Given the heterogeneous characteristics of coal, EPA determined that the procedures used in these other programs are not rigorous enough for this proposed rule and would introduce significant uncertainty into the CO<sub>2</sub> emissions estimates, especially for larger combustion units.

EPA considered allowing the use of default emission factors, default HHVs, and company records to quantify

annual fuel consumption for all stationary combustion units, regardless of size or the type of fuel combusted. The Agency decided to limit the use of this type of calculation methodology to smaller combustion units. The proposed rule reflects this, by allowing use of the Tier 1 and Tier 2 calculation methodologies at units with a maximum heat input capacity of 250 mmBtu/hr or less.

For gaseous fuel combustion, EPA considered calculation methodologies based on an assumption that all gaseous fuels are homogeneous. However, the Agency decided against this approach because the characteristics of certain gaseous fuels can be quite variable, and mixtures of gaseous fuels are often heterogeneous in composition. Therefore, the proposed rule requires daily sampling for all gaseous fuels except for natural gas.

Finally, EPA considered allowing affected facilities to rely exclusively on the results of fuel sampling and analysis provided by fuel suppliers, rather than performing periodic on-site sampling for all variables. The Agency decided not to propose this because in most instances, only the fuel heating value, not the carbon content, is routinely provided by fuel suppliers. Therefore, EPA proposes to allow fuel suppliers to provide fuel HHVs for the Tier 2 calculation method. However, EPA is requesting



comment on integrating the fuel supplier requirements of this proposed rule with both the Tier 1 and Tier 2 calculation methodologies.

b. CO<sub>2</sub> Emissions from Biomass Fuel Combustion

Today's proposed rule requires affected facilities with units that combust biomass fuels to report the annual biogenic CO<sub>2</sub> mass emissions separately. As previously described, this is consistent with the approach taken in the IPCC and national U.S. GHG inventory frameworks. EPA is proposing distinct methods to determine the biogenic CO<sub>2</sub> emissions from a stationary combustion source combusting a biomass or biomass-derived fuel depending upon which tier is used for reporting other fuel combustion CO<sub>2</sub> emissions.

Where Tier 4 is not required, EPA is allowing the Tier 1 method to be used to calculate biogenic CO<sub>2</sub> emissions for fuels in which EPA has provided default CO<sub>2</sub> emission factors and a default HHV in the proposed rule. If default values are not provided by EPA, the facility would use the Tier 2 or Tier 3 method, as appropriate, to calculate the biogenic CO<sub>2</sub> emissions.

For units required to use Tier 4, total CO<sub>2</sub> emissions are directly measured using CEMS. Except when MSW is combusted, EPA proposes that facilities perform a supplemental calculation to determine the biogenic CO<sub>2</sub> and

non-biogenic CO<sub>2</sub> portions of the measured CO<sub>2</sub> emissions. The facility would use company records on annual fossil fuel combusted to calculate the annual volume of CO<sub>2</sub> emitted from that fossil fuel combustion. This value would then be subtracted from the total volume of CO<sub>2</sub> emissions measured to obtain the volume of biogenic CO<sub>2</sub> emissions. The volume ratio of biogenic CO<sub>2</sub> emissions to total CO<sub>2</sub> emissions would then be applied to the measured total CO<sub>2</sub> emissions to determine the biogenic CO<sub>2</sub> emissions.

c. CO<sub>2</sub> Emissions from MSW

EPA is proposing a separate calculation method for a unit that combusts MSW, which can include biomass components. For units subject to Tier 4, as described above, an additional analysis would be required to separately report any biogenic CO<sub>2</sub> emissions. The reporter would be required to use ASTM methods listed in the rule to sample and analyze the CO<sub>2</sub> in the flue gas once each quarter, in order to determine the relative percentages of fossil fuel-based carbon (e.g., petroleum-based plastics) and biomass carbon (e.g., newsprint) in the effluent when MSW is combusted in the unit. The measured ratio of biogenic to fossil CO<sub>2</sub> concentrations is then applied to the measured or calculated total CO<sub>2</sub> emissions to determine biogenic CO<sub>2</sub> emissions.

The GHG emission calculation methods for units combusting MSW would be used in conjunction with EPA's proposed calculation method for the annual unit heat input, based on steam production and the design characteristics of the combustion unit.

For units that combust MSW, EPA considered allowing a manual sorting approach to be used to determine the biomass and non-biomass fractions of the fuel, based on defined and traceable input streams. However, this approach is not considered practical, given the highly variable composition of MSW. To eliminate this uncertainty, EPA believes that more rigorous and standardized ASTM methods should be used to determine the biogenic percentage of the CO<sub>2</sub> emissions when MSW is combusted.

d. CH<sub>4</sub> and N<sub>2</sub>O Emissions from All Fuel Combustion

As described previously, EPA is allowing simplified emissions calculation methods for CH<sub>4</sub> and N<sub>2</sub>O. The annual CH<sub>4</sub> and N<sub>2</sub>O emissions would be estimated using EPA-provided default emission factors and annual heat input values. The calculation would either be done at the unit level or the facility level, depending upon the tier required for estimating CO<sub>2</sub> emissions (and using the same heat input value reported from the CO<sub>2</sub> calculation method).

A CEMS methodology was not selected for measuring N<sub>2</sub>O primarily because the cost impacts of requiring the installation of CEMS is high in comparison to the relatively low amount of N<sub>2</sub>O emissions (even on a CO<sub>2</sub>e basis) that would be emitted from stationary combustion equipment.

EPA considered requiring periodic stack testing to derive site-specific emission factors for CH<sub>4</sub> and N<sub>2</sub>O. This approach has the advantage of ensuring a higher level of accuracy and consistency among reporters. However, it was decided that this option was too costly for the small improvement in data quality that it might achieve. The CH<sub>4</sub> and N<sub>2</sub>O emissions from stationary combustion are relatively low compared to the CO<sub>2</sub> emissions. The proposed approach, i.e., using fuel-specific default emission factors to calculate CH<sub>4</sub> and N<sub>2</sub>O emissions, is in accordance with methods used in other programs and provides data of sufficient accuracy. However, given the unit-level approach for calculating CO<sub>2</sub> emissions, EPA is requesting comments on the use of more technology-specific CH<sub>4</sub> and N<sub>2</sub>O emission factors that could be applied in unit-level calculations.

e. CO<sub>2</sub> Emissions from Sorbent

For fluidized bed boilers and for units equipped with flue gas desulfurization systems or other acid gas emission controls with sorbent injection, CO<sub>2</sub> emissions would be accounted for and reported using simplified methods. These methods are based on the quantity of limestone or other sorbent material used during the year, if not accounted for using the Tier 4 calculation methodology.

In summary, EPA is proposing to allow facilities flexibility in measuring and monitoring stationary fuel combustion sources by: (1) allowing most smaller combustion units (depending upon facility-level considerations described above) to use the Tier 1 and Tier 2 calculation methods; (2) allowing Tier 3 to be widely used, with few restrictions; (3) limiting the requirement to use Tier 4 to certain solid fuel-fired combustion units located at facilities where there is an established monitoring infrastructure; and (4) allowing simplified methodologies to calculate CH<sub>4</sub> and N<sub>2</sub>O emissions. In addition, EPA is using a maximum heat input capacity determination of 250 mmBtu/hr to distinguish between large and small units. This approach is common to many existing EPA programs.

EPA believes that the proposed default CO<sub>2</sub> emission factors and high heat values used in Tiers 1 and 2 and the ASTM methods incorporated by reference for the carbon

content determinations required by Tier 3 are well-established and minimize uncertainty.

In proposing this tiered approach, EPA acknowledges that, in the case of solid fuels, a simple, standardized way of measuring the amount of solid fuel combusted in a unit is not proposed. In view of this, the proposed rule would require the owner or operator to keep detailed records explaining how company records are used to quantify solid fuel usage. These records would describe the procedures used to calibrate weighing equipment and other measurement devices, and would include scientifically-based estimates of the accuracy of these devices. EPA therefore solicits comment on ways to ensure that the feed rate of solid fuel to a combustion device is accurately measured.

#### 4. Selection of Procedures for Estimating Missing Data

The proposed rule requires the use of substitute data whenever a quality-assured value of a parameter that is used to calculate GHG emissions is unavailable, commonly referred to as "missing data." For units using the CO<sub>2</sub> calculation methodologies in Tiers 2 and 3, when HHV, fuel carbon content, or fuel molecular weight data are missing, the substitute data value would be the average of the quality-assured values of the parameter immediately before and immediately after the missing data period. When Tier 3

or Tier 4 is used and fuel flow rate or stack gas flow rate data is missing, the substitute data values would be the best available estimates of these parameters, based on process and operating data (e.g., production rate, load, unit operating time, etc.) This same substitute data approach would be used when fuel usage data and sorbent usage data are missing. The proposed rule provides that the reporter would be required to document and keep record of the procedures used to determine the appropriate substitute data values.

EPA considered more conservative missing data procedures for the proposed rule, such as requiring higher substitute data values for longer missing data periods, but decided against proposing these procedures out of concern that GHG emissions might be significantly overestimated.

#### 5. Selection of Data Reporting Requirements

In addition to the facility-level information that would be reported under proposed 40 CFR part 98, subpart A, the proposed rule would require the reporter to submit certain unit-level data for the stationary combustion units at each affected facility. This additional information would require reporting of the unit type, its maximum rated heat input, the type of fuel combusted in the unit during the report year, the methodology used to calculate CO<sub>2</sub>

emissions for each type of fuel combusted, and the total annual GHG emissions from the unit.

To reduce the reporting burden, the proposed rule would allow reporting of the combined GHG emissions from multiple units at the facility instead of requiring emissions reporting for each individual unit, in certain instances. Three types of emissions aggregation would be allowed. First, the combined GHG emissions from a group (or groups) of small units at a facility could be reported, provided that the combined maximum rated heat input of the units in the group does not exceed 250 mmBtu/hr. Second, the combined GHG emissions from units in a common stack configuration could be reported, if CEMS are used to continuously monitor the CO<sub>2</sub> emissions at the common stack. Third, if a facility combusts the same type of homogeneous oil or gaseous fuel through a common supply line, and the total amount of fuel consumed through that the supply line is accurately measured using a calibrated fuel flow meter, the combined GHG emissions from the facility could be reported.

Different levels of verification data are required depending upon which tier is used for reporting. For Tier 1, only the total quantity of each type of fuel combusted during the report year would be reported. For Tier 2, the



quantity of each type of fuel combusted during each measurement period would be reported, along with all high heat values used in the emissions calculations, the methods used to determine the HHVs, and information indicating which HHVs (if any) are substitute data values.

For Tier 3, the quantity of each type of fuel combusted during each measurement period (day or month) would be reported, along with all carbon content values and, if applicable, molecular weight measurements used in the emissions calculations, with information indicating which ones (if any) are substitute data values. In addition, the results of all fuel flow meter calibrations would be reported along with information indicating which analytical methods were used for the carbon content determinations, flow meter calibrations and (if applicable) oil tank drop measurements.

For Tier 4, the number of unit operating days and hours would be reported, along with daily CO<sub>2</sub> mass emission totals, the number of hours of substitute data used in the annual emissions calculations, the results of the initial CEMS certification tests and the major ongoing QA tests.

If MSW is combusted in the unit, the owner or operator would be required to report the results of the quarterly sample analyses used to determine the biogenic percentage

of CO<sub>2</sub> emissions in the effluent. If combinations of fossil and biomass fuels are combusted and CEMS are used to measure CO<sub>2</sub> emissions, the annual volumes of biogenic and fossil CO<sub>2</sub> would be reported, along with the F-factors and fuel gross calorific values used in the calculations, and the biogenic percentage of the annual CO<sub>2</sub> emissions.

Finally, for units that use acid gas scrubbing with sorbent injection but are not equipped with CEMS, the owner or operator would be required to report information on the type and amount of sorbent used.

#### 6. Selection of Records That Must Be Retained

In addition to meeting the general recordkeeping requirements in proposed 40 CFR part 98, subpart A, whenever company records are used to estimate fuel consumption (e.g., when the Tier 1 or 2 emissions calculation methodology is used) and sorbent consumption, EPA proposes to require the owner or operator to keep on file a detailed explanation of how fuel usage is quantified, including a description of the QA procedures that are used to ensure measurement accuracy (e.g., calibration of weighing devices and other instrumentation).

As discussed in Section IV of this preamble and proposed 40 CFR part 98, subpart A, there are a number of facilities that are not part of a source category listed in

40 CFR 98.2(1)(a) or (2) but have stationary combustion equipment emitting GHG emissions. In 2010, those facilities would have to determine whether or not they are subject to the requirements of this rule (i.e., if their emissions are 25,000 metric tons CO<sub>2</sub>e/yr or higher). In order to reduce the burden on those facilities, we are proposing that facilities with an aggregate maximum heat input capacity of less than 30 mmBtu/hr from stationary combustion units are automatically exempt from the proposed 40 CFR part 98. Based on our assessment of the maximum amount of GHG emissions likely from units of that size that burn fossil fuels (e.g, coal, oil or gas) and operate continuously through the year, such a facility would still be below the 25,000 metric tons CO<sub>2</sub>e threshold. The purpose for having this provision is to exempt small facilities from having to estimate emissions to determine if they are subject to the rule, and re-estimate whenever there are process changes.

#### D. Electricity Generation

##### 1. Definition of the Source Category

This section of the preamble addresses GHG emissions reporting for facilities with EGUs that are in the ARP, and are subject to the CO<sub>2</sub> emissions reporting requirements of Section 821 of the CAA Amendments of 1990. All other

facilities using stationary fuel combustion equipment to generate electricity should refer to Section V.C of this preamble (General Stationary Fuel Combustion Sources) to understand EPA's proposed approach for GHG emissions reporting.

Electricity generating units in the ARP reported CO<sub>2</sub> emissions of 2,262 million metric tons CO<sub>2</sub>e in 2006. This represents almost one third of total U.S. GHG emissions and over 90 percent of CO<sub>2</sub> emissions from electricity generation. EPA has been receiving these CO<sub>2</sub> data since 1995<sup>64</sup>.

## 2. Selection of Reporting Threshold

If a facility includes within its boundaries at least one EGU that is subject to the ARP, the facility would be subject to the mandatory GHG emissions reporting of proposed 40 CFR part 98, subpart D. Facilities with EGUs in the ARP would not be expected to report any new CO<sub>2</sub> data. Therefore, EPA expects that the GHG emissions reporting requirements of this rule would not be overly burdensome for facilities already reporting to the ARP.

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<sup>64</sup> This data can be accessed at: <http://epa.gov/camddataandmaps>.

For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

For ARP units, the CO<sub>2</sub> mass emissions data already reported to EPA under 40 CFR part 75 would be used in the annual GHG emissions reports required under this proposed rule. The annual CO<sub>2</sub> mass emissions (i.e., English short tons) reported for an ARP unit would simply be converted to metric tons and then included in the GHG emissions report for the facility.

As CH<sub>4</sub> and N<sub>2</sub>O emissions are not required to be reported under 40 CFR part 75, the facility would consult the proposed methods in proposed 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources) for calculating CH<sub>4</sub> and N<sub>2</sub>O from the ARP units.

The additional units at an affected facility that are not in the ARP would use the GHG calculation methods specified and required in proposed 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources).

### 4. Selection of Procedures for Estimating Missing Data

The proposed missing data substitution procedures for CH<sub>4</sub> and N<sub>2</sub>O emissions from ARP units and all GHG emissions from units at the facility not in ARP are discussed in

Section V.C.4 of this preamble, under General Stationary Fuel Combustion Sources.

5. Selection of Data Reporting Requirements

The proposed data reporting requirements are discussed in Section V.C.5 of this preamble, under General Stationary Fuel Combustion Sources.

6. Selection of Records That Must Be Retained.

The records that must be retained regarding CH<sub>4</sub> and N<sub>2</sub>O emissions from ARP units and all GHG emissions from units at the facility not in the ARP are discussed in Section V.C.6 of this preamble, under General Stationary Fuel Combustion Sources.

E. Adipic Acid Production

1. Definition of the Source Category

Adipic acid is a white crystalline solid used in the manufacture of synthetic fibers, plastics, coatings, urethane foams, elastomers, and synthetic lubricants. Commercially, it is the most important of the aliphatic dicarboxylic acids, which are used to manufacture polyesters. Adipic acid is also used in food applications.

Adipic acid is produced through a two-stage process. The first stage usually involves the oxidation of cyclohexane to form a cyclohexanone/cyclohexanol mixture.

The second stage involves oxidizing this mixture with nitric acid to produce adipic acid.

National emissions from adipic acid production were estimated to be 9.3 million metric tons CO<sub>2</sub>e (less than 0.1 percent of U.S. GHG emissions) in 2006. These emissions include both process-related emissions (N<sub>2</sub>O) and on-site stationary combustion emissions (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O). The main GHG emitted from adipic acid production is N<sub>2</sub>O, which is generated as a by-product of the nitric acid oxidation stage of the manufacturing process, and it is emitted in the waste gas stream. Process N<sub>2</sub>O emissions alone were estimated at 5.9 million metric tons CO<sub>2</sub>e, or 64 percent of the total GHG emissions in 2006, while on-site stationary combustion emissions account for the remaining 3.4 million metric tons CO<sub>2</sub>e, or 36 percent of the total.

Process emissions from the production of adipic acid vary with the types of technologies and level of emission controls employed by a facility. DE for N<sub>2</sub>O emissions can vary from 90 to 98 percent using abatement technologies such as nonselective catalytic reduction. In 1998, the three major adipic acid production facilities in the U.S. had control systems in place. Only one small facility, representing approximately two percent of adipic acid production, does not control for N<sub>2</sub>O.

As part of this proposed rule, stationary combustion emissions would be estimated and reported according to the applicable procedures in proposed 40 CFR part 98, subpart C. For additional background information on adipic acid production, please refer to the Adipic Acid Production TSD (EPA-HQ-OAR-2008-0508-005).

## 2. Selection of Reporting Threshold

In developing the threshold for adipic acid production, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e. Table E-1 of this preamble illustrates that the various thresholds do not affect the amount of emissions or number of facilities that would be covered.

**Table E-1. Threshold Analysis for Adipic Acid Production**

Threshold level metric tons CO <sub>2</sub> e/yr	Total National Emissions	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	9,300,000	4	9,300,000	100%	4	100%
10,000	9,300,000	4	9,300,000	100%	4	100%
25,000	9,300,000	4	9,300,000	100%	4	100%
100,000	9,300,000	4	9,300,000	100%	4	100%

Facility-level emissions estimates based on known facility capacities for the four known adipic acid facilities suggests that each of the facilities would be at least five times over the 100,000 metric tons CO<sub>2</sub>e threshold based on just process-related emissions. Because all



adipic acid production facilities would have to report under any of the emission thresholds that were examined, we propose that all adipic acid production facilities be required to report. This would simplify rule applicability and avoid any burden for the source to perform unnecessary calculations.

For a full discussion of the threshold analysis, please refer to the Adipic Acid Production TSD (EPA-HQ-OAR-2008-0508-005). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating adipic acid production process emissions (e.g. 2006 IPCC Guidelines, U.S. Inventory, DOE 1605(b), and TRI). These methodologies coalesce around the four options discussed below.

Option 1. Default emission factors would be applied to total facility production of adipic acid. The emissions would be calculated using the total production of adipic acid and the highest international default emission factor available in the 2006 IPCC Guidelines. This option assumes

no abatement of N<sub>2</sub>O emissions. This approach is consistent with IPCC Tier 1 and the DOE 1605(b) "C" rated estimation method.

Option 2. Default emission factors would be applied on a site-specific basis using the specific type of abatement technology used and the adipic acid production activity. The amount of N<sub>2</sub>O emissions would be determined by multiplying the technology-specific emission factor by the production level of adipic acid. This approach is consistent with 1605(b) "B" rated estimation method, IPCC Tier 2, and TCR's "B" rated estimation method.

Option 3. Periodic direct emission measurement of N<sub>2</sub>O emissions would be used to determine the relationship between adipic acid production and the amount of N<sub>2</sub>O emissions; i.e., to develop a facility-specific emissions factor. The facility-specific emissions factor and production rate (activity level) would be used to calculate the emissions. The facility-specific emission factor would be developed from a single annual test. Production rate is most likely already measured at facilities. Existing procedures would be followed to measure the production rate during the performance test and on a quarterly basis thereafter. After the initial test, annual testing of N<sub>2</sub>O emissions would be required each year to estimate the

emission factor and applied to production to estimate emissions. The yearly testing would assist in verifying the emission factor. Testing would also be required whenever the production rate is changed by more than 10 percent from the production rate measured during the most recent performance test. Option 3 and the following Option 4 are approaches consistent with IPCC Tier 3, DOE 1605(b) "A" and TCR's "A2" rated estimation methods.

Option 4. CEMS would be used to directly measure the N<sub>2</sub>O process emissions. CEMS would be used to directly measure N<sub>2</sub>O concentration and flow rate to directly determine N<sub>2</sub>O emissions. Measuring N<sub>2</sub>O emissions directly with CEMS is feasible, but adipic acid production facilities are currently only using NO<sub>x</sub> CEMS to comply with State programs (e.g. Texas). Half of the adipic acid production facilities are located in Texas where NO<sub>x</sub> CEMS are required in O<sub>3</sub> nonattainment areas under Control of Air Pollution from Nitrogen Compounds (TX Chap 117(Reg 7)).

Proposed option: We propose Option 3 to quantify process emissions from all adipic acid facilities. In addition, you would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from stationary combustion.

We identified Options 3 and 4 as the approaches providing the lowest uncertainty and the best site-specific estimates based on differences in process operation and abatement technologies. Option 3 requires annual monitoring of N<sub>2</sub>O emissions and the establishment of a facility-specific emissions factor that relates N<sub>2</sub>O emissions with adipic acid production rate.

Option 4 was not chosen as the required method because, while N<sub>2</sub>O CEMS are available, there is no existing EPA method for certifying N<sub>2</sub>O CEMS, and the cost impact of requiring the installation of CEMS is high in comparison to the relatively low amount of emissions that would be quantified from the adipic acid production sector. NO<sub>x</sub> CEMS only capture emissions of NO and NO<sub>2</sub> and not N<sub>2</sub>O. Although the amount of NO<sub>x</sub> and N<sub>2</sub>O emissions from adipic acid production may be directly related, direct measurement of NO<sub>x</sub> does not automatically correlate to the amount of N<sub>2</sub>O in the same exhaust stream. Periodic testing of N<sub>2</sub>O emissions (Option 3) would not indicate changes in emissions over short periods of time, but it does offer direct measurement of GHGs.

We request comment on the advantages and disadvantages of using Options 3 and 4. After consideration of public comments, we may promulgate one or more of these options or

a combination based on the additional information that is provided.

We decided against Options 1 and 2 because facility-specific emission factors are more appropriate for reflecting differences in process design and operation. According to IPCC, the default emission factors for adipic acid are relatively certain because they are derived from the stoichiometry of the chemical reaction employed to oxidize nitric acid. However, there is still uncertainty in the amount of  $N_2O$  that is generated. This variability is a result of differences in the composition of cyclohexanone and cyclohexanol feedstock. Variability also arises if adipic acid is produced from use of other feedstocks, such as phenol or hydrogen peroxide. Facility-specific emission factors would be based on actual feedstock composition rather than an assumed composition.

The various approaches to monitoring GHG emissions are elaborated in the Adipic Acid Production TSD (EPA-HQ-OAR-2008-0508-005).

#### 4. Selection of Procedures for Estimating Missing Data

For process sources that use Option 3 (facility-specific emission factor), no missing data procedures would apply because the facility-specific emission factor is derived from an annual performance test and used in each

calculation. The emission factor would be multiplied by the production rate, which is readily available. If the test data are missing or lost, the test would have to be repeated. Therefore, 100 percent data availability would be required.

#### 5. Selection of Data Reporting Requirements

We propose that facilities submit their total annual N<sub>2</sub>O emissions from adipic acid production, as well as any stationary fuel combustion emissions. In addition we propose that facilities submit the following data, which are the basis of the calculations and are needed to understand the emissions data and verify the reasonableness of the reported emissions. The data submitted on an annual basis should include annual adipic acid production capacity, total adipic acid production, facility-specific emission rate factor used, abatement technology used, abatement technology efficiency, abatement utilization factor, and number of facility operating hours in calendar year.

Capacity, actual production, and operating hours support verification of the emissions data provided by the facility. The production rate can be determined through sales records or by direct measurement using flow meters or

weigh scales. This industry generally measures the production rate as part of normal operating procedures.

A list of abatement technologies would be helpful in assessing the widespread use of abatement in the adipic acid source category, cataloging any new technologies that are being used, and documenting the amount of time that the abatement technologies are being used.

A full list of data to be reported is included in the proposed 40 CFR part 98, subparts A and E.

#### 6. Selection of Records That Must Be Retained

We propose that facilities maintain records of annual testing of N<sub>2</sub>O emissions, calculation of the facility-specific emission rate factor, hours of operation, annual adipic acid production, adipic acid production capacity, and N<sub>2</sub>O emissions. These records hold values directly used to calculate the emissions that are reported and are necessary to allow determination of whether the GHG emissions monitoring calculations were done correctly. A full list of records that must be retained on site is included in the proposed 40 CFR part 98, subparts A and E.

#### F. Aluminum Production

##### 1. Definition of the Source Category

This source category includes primary aluminum production facilities. Secondary aluminum production

facilities would not be required to report emissions under Subpart F. Aluminum is a light-weight, malleable, and corrosion-resistant metal that is used in manufactured products in many sectors including transportation, packaging, building and construction. As of 2005, the U.S. was the fourth largest producer of primary aluminum, with approximately eight percent of the world total (Aluminum Production TSD (EPA-HQ-OAR-2008-0508-006)). The production of primary aluminum—in addition to consuming large quantities of electricity—results in process-related emissions of CO<sub>2</sub> and two PFCs: perfluoromethane (CF<sub>4</sub>) and perfluoroethane (C<sub>2</sub>F<sub>6</sub>). Only these process-related emissions are discussed here. Stationary fuel combustion source emissions must be monitored and reported according to proposed 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources), which is discussed in Section V.C of this preamble.

CO<sub>2</sub> is emitted during the primary aluminum smelting process when alumina (aluminum oxide, Al<sub>2</sub>O<sub>3</sub>) is reduced to aluminum using the Hall-Héroult reduction process. The reduction of the alumina occurs through electrolysis in a molten bath of natural or synthetic cryolite (Na<sub>3</sub>AlF<sub>6</sub>). The reduction cells contain a carbon lining that serves as the cathode. Carbon is also contained in the anode, which can



be a carbon mass of paste, coke briquettes, or prebaked carbon blocks from petroleum coke. During reduction, most of the carbon in the anode is oxidized and released to the atmosphere as CO<sub>2</sub>. In addition, a smaller amount of CO<sub>2</sub> is released during the baking of anodes for use in smelters using prebake technologies.

In addition to CO<sub>2</sub> emissions, the primary aluminum production industry is also a source of PFC emissions. During the smelting process, if the alumina ore content of the electrolytic bath falls below critical levels required for electrolysis, rapid voltage increases occur, which are termed "anode effects." These anode effects cause carbon from the anode and fluorine from the dissociated molten cryolite bath to combine, thereby producing emissions of CF<sub>4</sub> and C<sub>2</sub>F<sub>6</sub>. For any particular individual smelter, the magnitude of emissions for a given level of production depends on the frequency and duration of these anode effects. As the frequency and duration of the anode effects increase, emissions increase. In addition, even at constant levels of production and anode effect minutes, emissions vary among smelter technologies (e.g., Center-Work Prebake vs. Side-Work Prebake) and among individual smelters using the same smelter technology due to differing operational practices.

Total U.S. Emissions. According to the U.S. GHG Inventory total process-related GHG emissions from primary aluminum production in the U.S. are estimated to be 6.4 million metric tons CO<sub>2</sub>e in 2006. Process emissions of CO<sub>2</sub> from the 14 aluminum smelters in the U.S. were estimated to be 3.9 million metric tons CO<sub>2</sub>e in 2006. Process emissions of CF<sub>4</sub> and C<sub>2</sub>F<sub>6</sub> from aluminum smelters were estimated to be 2.5 million metric tons CO<sub>2</sub>e in 2006. In 2006, 13 of the 14 primary aluminum smelters in the U.S. accounted for the vast majority of primary aluminum emissions. The remaining smelter was idle through most of 2006, restarting at the end of the year.

Emissions to be Reported. We propose to require reporting of the following types of emissions from primary aluminum production: process emissions of PFCs, process emissions of CO<sub>2</sub> from consumption of the anode during electrolysis (for both Prebake and Søderberg cells), and process emissions of CO<sub>2</sub> from the anode baking process (for Prebake cells only).

Another potential source of process CO<sub>2</sub> emissions is coke calcining. We request comment on whether any U.S. smelters operate calcining furnaces and the extent of these process emissions.

## 2. Selection of Reporting Threshold

We propose to require all owners or operators of primary aluminum facilities to report the total quantities of PFC and CO<sub>2</sub> process emissions. In 2006, 5 companies operated 14 primary aluminum for at least part of the year. (One of these smelters operated only briefly at the end of the year.) All primary aluminum smelters that operated throughout 2006 would be covered at all capacity and emissions-based thresholds considered in this analysis.

In developing the threshold for primary aluminum, we considered the emissions thresholds 1,000, 10,000, 25,000, and 100,000 metric tons CO<sub>2</sub>e per year (metric tons CO<sub>2</sub>e/yr). These emissions thresholds translate to 64, 640, 1,594, and 6,378 metric tons primary aluminum produced, respectively, based on use of the 2006 IPCC default emission factors and assuming side-worked prebake cells and 100 percent capacity utilization as shown in Table F-1 of this preamble.

**Table F-1: Threshold Analysis for Aluminum Production Based on 2006 Emissions and Facility Production Capacity**

Emission Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	6,402,000	14	6,402,000	100	14	100
10,000	6,402,000	14	6,397,000	99.9	13	93
25,000	6,402,000	14	6,397,000	99.9	13	93
100,000	6,402,000	14	6,397,000	99.9	13	93
<b>Production Capacity Threshold metric tons Al/year</b>						
64	6,402,000	14	6,402,000	100	14	100
640	6,402,000	14	6,402,000	100	14	100
1,594	6,402,000	14	6,402,000	100	14	100

6,378	6,402,000	14	6,402,000	100	14	100
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We propose that all primary aluminum facilities be subject to reporting. All smelters that operated in 2006 would be required to report if a 10,000, 25,000, or 100,000 metric tons CO<sub>2</sub>e per year threshold were used. Requiring all facilities to report would simplify the rule, avoid the need for facilities to estimate emissions to determine applicability, and ensure complete coverage of emissions from this source category. It results in little extra burden for the industry since few if any additional facilities would be required to report (compared to the thresholds considered). Significant fluctuations in capacity utilization do occur; aluminum smelters sometimes shut down for long periods. Under the proposed rule, facilities that did not operate at all during the previous year would still have to submit a report; however, reporting would be minimal. (Zero production implies zero emissions.)

For a full discussion of the threshold analysis, please refer to the Aluminum Production TSD (EPA-HQ-OAR-2008-0508-006). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

This section of this preamble provides monitoring methods for calculating and reporting process CO<sub>2</sub> and PFC emissions only. If a facility has stationary fuel combustion it would need to also refer to proposed 40 CFR part 98, subpart C for methods for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O and would be required to follow the calculation procedures, monitoring and QA/QC methods, recordkeeping requirements as described.

Protocols and guidance reviewed for this analysis include the 2006 IPCC Guidelines, EPA's Voluntary Aluminum Industrial Partnership, the Inventory of U.S. Greenhouse Gas Emissions and Sinks, the International Aluminum Institute's Aluminum Sector Greenhouse Gas Protocol, the Technical Guidelines for the Voluntary Reporting of Greenhouse Gases (1605(b)) Program, EPA's Climate Leaders Program, and TRI.

The methods described in these protocols and guidance coalesce around the methods described by the International Aluminum Institute's Aluminum Sector Greenhouse Gas Protocol and the 2006 IPCC Guidelines. These methods range from Tier 1 approaches based on aluminum production to Tier 3 approaches based primarily on smelter-specific data. The

IPCC Tier 3 and International Aluminum Institute methods are essentially the same.

Proposed Method for Monitoring PFC Emissions. The proposed method for monitoring PFC emissions from aluminum processing is similar to the Tier 3 approach in the 2006 IPCC Guidelines for primary aluminum production. The proposed method requires smelter-specific data on aluminum production, anode effect minutes per cell day (anode effect-mins/cell-day), and recently measured slope coefficients. The slope coefficient represents kg of  $\text{CF}_4$ /metric ton of aluminum produced divided by anode effect minutes per cell-day. The cell-day is the number of cells operating multiplied by the number of days of operation, per the 2006 IPCC Guidelines. The following describes how to calculate  $\text{CF}_4$  and  $\text{C}_2\text{F}_6$  emissions based on the slope method.  $\text{CF}_4$  emissions equal the slope coefficient for  $\text{CF}_4$  (kg  $\text{CF}_4$ /metric ton Al)/anode effect-Mins/cell-day) times metal production (metric tons Al). Annual anode effect calculations and records should be the sum of anode effect minutes per cell day and production by month.  $\text{C}_2\text{F}_6$  emissions equal emissions of  $\text{CF}_4$  times the weight fraction of  $\text{C}_2\text{F}_6/\text{CF}_4$  (kg  $\text{C}_2\text{F}_6$ /kg  $\text{CF}_4$ ).

Both the IPCC Tier 3 method and the less accurate IPCC Tier 2 method are based on these equations and parameters.

The critical distinction between the two methods is that the Tier 3 method requires smelter-specific slope coefficients while the Tier 2 method relies on default, technology-specific slope coefficients. Of the currently operating U.S. smelters, all but one has measured a smelter-specific coefficient at least once. However, as discussed below, some smelters may need to update these measurements if they occurred more than 3 years ago.

Use of the Tier 3 approach significantly improves the precision of a smelter's PFC emissions estimate. For individual facilities using the most common smelter technology in the U.S., the uncertainty (95 percent confidence interval) of estimates developed using the Tier 2 approach is  $\pm 50$  percent,<sup>65</sup> while the uncertainty of estimates developed using the Tier 3 approach is approximately  $\pm 15$  percent (Aluminum Production TSD (EPA-HQ-OAR-2008-0508-006)). For a typical U.S. smelter emitting 175,000 metric tons CO<sub>2</sub>e in PFCs, these errors result in

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<sup>65</sup> The most common smelter technology in the U.S. is the center-worked prebake technology. The 2006 IPCC Guidelines provide a 95 percent confidence interval of  $\pm 6$  percent for the center-worked prebake technology default slope coefficient. However, this range is not the range within which the slope coefficient from a single center-worked prebake technology has a 95 percent chance of falling. Instead, it is the range within which the true mean of all center-worked prebake technology slope factors has a 95 percent chance of falling. This appears to depart from the usual convention for expressing the uncertainties related to the use of default coefficients in the Guidelines.

absolute uncertainties of  $\pm 88,000$  metric tons CO<sub>2</sub>e and  $\pm 26,000$  metric tons CO<sub>2</sub>e, respectively. The reduction in uncertainty associated with moving from the Tier 2 to the Tier 3 approach, 62,000 metric tons CO<sub>2</sub>e, is as large as the emissions from many of the sources that would be subject to the rule. We concluded the extra burden to facilities of measuring the smelter-specific slope coefficients is justified by the considerable improvement in the precision of the reported emissions.

Measurement of Slope Coefficients. We propose that slope coefficients be measured using a method similar to the USEPA/International Aluminum Institute Protocol for Measurement of Tetrafluoromethane and Hexafluoroethane from Primary Aluminum Production. The protocol establishes guidelines to ensure that measurements of smelter-specific slope-coefficients are consistent and accurate (e.g., representative of typical smelter operating conditions and emission rates). These guidelines include recommendations for documenting the frequency and duration of anode effects, measuring aluminum production, sampling design, measurement instruments and methods, calculations, QA/QC, and measurement frequency.

During the past few years, multiple U.S. smelters have adopted changes to their production process which are



likely to have changed their slope coefficients.<sup>66</sup> These include the adoption of slotted anodes and improvements to process control algorithms. Although some U.S. smelters have recently updated their measurements of smelter-specific coefficients, others may not have.

We understand that two smelting companies in the U.S., Rio Tinto Alcan and Alcoa, have the necessary equipment and teams in-house to measure smelter-specific slope factors. These two companies account for 11 out of 15 of the operating smelters in the U.S. The remaining facilities would need to hire a consultant to conduct a measurement study once every three years to accurately determine their slope coefficients. The cost of hiring a consultant to conduct the measurement study is probably significantly lower than the capital, labor and O&M costs of the equipment, training, and maintenance required to conduct the measurements in-house. While the cost to implement a Tier 3 approach is significantly greater than the cost to implement a Tier 2 approach, the benefit of reduced uncertainty is considerable (approximately 40 percent), as noted above.

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<sup>66</sup> Aluminum Production TSD (EPA-HQ-OAR-2008-0508-006).

We request comment on the proposal that all smelters be required to measure their smelter-specific slope coefficients at least once every three years. We considered, but are not proposing, to exempt "high performing" smelters, as defined by the 2006 IPCC Guidelines, from the requirement to measure their smelter-specific slope coefficients more than once. The Guidelines define "high-performing" smelters as those that operate with less than 0.2 anode effect minutes per cell day or less than 1.4 millivolt overvoltage. The Guidelines state, "no significant improvement can be expected in the overall facility GHG inventory by using the Tier 3 method rather than the Tier 2 method." (IPCC, page 4.53, footnote 1). However, EPA believes there is benefit to EPA and to industry of periodic evaluation of the correlation of the smelter-specific slope coefficient and actual emissions, even in situations of low anode effect minutes per cell day or overvoltage.

The Overvoltage Method. Another Tier 3 method included in the IPCC Guidelines is the Overvoltage Method. This method relates PFC emissions to an overvoltage coefficient, anode effect overvoltage, current efficiency, and aluminum production. The overvoltage method was developed for smelters using the Pechiney technology. We

request comment on whether any U.S. smelters are using the Pechiney technology and, if so, on whether these smelters should be permitted to use the Overvoltage Method.

Proposed Method for Monitoring Process CO<sub>2</sub> Emissions.

If you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate stationary fuel combustion CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate process and stationary fuel combustion CO<sub>2</sub> emissions from the industrial source. Also, refer to proposed 40 CR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O.

If your facility does not have stationary combustion, or if you do not currently have CEMS that meet the requirements outlined in proposed 40 CR part 98, subpart C, or where the CEMS would not adequately account for process CO<sub>2</sub> emissions, the proposed monitoring method for process CO<sub>2</sub> emissions is similar to the IPCC Tier 2 approach, which relies on industry defaults rather than smelter-specific values for concentrations of minor anode components.

CO<sub>2</sub> emitted during electrolysis. We propose to require that CO<sub>2</sub> emitted during electrolysis be calculated based on metal production and net anode consumption using a mass balance approach that assumes all carbon from net anode consumption is ultimately emitted as CO<sub>2</sub>. Since the concentrations of the non-carbon components are small (typically less than one percent to five percent), facility-specific data on them is not as critical to the precision of emission estimates as is facility-specific data on net anode consumption. Tier 3 improves the accuracy of the results but the improvement in accuracy is not expected to exceed 5 percent per the 2006 IPCC Guidelines. Although we do not propose to require the use of the Tier 3 approach, we would allow and encourage smelter operators to use facility-specific data on anode non-carbon components when that data were available.

For prebake cells, CO<sub>2</sub> emissions are equal to net prebaked anode consumption per metric ton aluminum times total metal production times the percent weight of sulfur and ash content in the baked anode times the molecular mass of CO<sub>2</sub>.

CO<sub>2</sub> emissions from Søderberg cells are a function of total metal production, paste consumption, emissions of cyclohexane soluble matter, percent binder and sulfur

content in paste, percent ash and hydrogen content in pitch, percent weight of sulfur and ash content in calcined coke, carbon in skimmed dust from Søderberg cells, and the carbon atomic mass ratio.

The data reported by companies participating in EPA's Voluntary Aluminum Industrial Partnership has generally not included smelter-specific values for each of these variables. However, most participants in the Voluntary Aluminum Industrial Partnership have used either data on paste consumption (for Søderberg cells) or on net anode consumption (for Prebake cells), along with some smelter-specific data on impurities, to develop a hybrid IPCC Tier 2/3 estimate (i.e., combination of smelter-specific and default factors).

CO<sub>2</sub> emitted during anode baking. We propose that CO<sub>2</sub> emitted during anode baking be calculated based on a mass balance approach involving chemical contents of the anodes and packing materials. No anode baking emissions occur when using Søderberg cells, since these cells are not baked before aluminum smelting, but rather, bake in the electrolysis cell during smelting.

CO<sub>2</sub> emissions from pitch volatiles combustion equal the initial weight from green anode minus hydrogen content minus baked anode production minus waste tar collected

times the molecular weight of CO<sub>2</sub>. CO<sub>2</sub> emissions from bake furnace packing material are a function of packing coke consumption times baked anode production times the percent weight sulfur and ash content in packing coke.

As is the case for CO<sub>2</sub> emitted during electrolysis, the IPCC Tier 2 approach for anode baking relies on industry-wide defaults for minor anode components, requiring smelter-specific data only for the initial weight of green anodes and for baked anode production. The IPCC Tier 3 approach requires smelter-specific values for all parameters. Again, the concentrations of minor components are small, limiting their impact on the estimate of CO<sub>2</sub> emissions from anode baking. In addition, anode baking emissions account for approximately 10 percent of total CO<sub>2</sub> process emissions, so reducing the uncertainty in this estimate would have only a minor impact on the overall CO<sub>2</sub> process estimate. For EPA's Voluntary Aluminum Industrial Partnership program, many smelters report only some smelter-specific values for the concentrations of minor anode components. In light of these considerations, we propose to require the Tier 2 method for estimating CO<sub>2</sub> emissions from anode baking, with the option to use facility-specific data on impurity concentrations when that data is available.

Other Options Considered. We are not proposing IPCC's Tier 1 methodology for calculating PFC emissions. Although this methodology is simple, the default emission factors for PFCs have large uncertainties due to the variability in anode effect frequency and duration. Since 1990, all U.S. smelters have sharply reduced their anode effect frequency and duration; through 2006, average anode minutes per cell day have declined by approximately 85 percent, lowering U.S. smelter emission rates well below those of the IPCC Tier 1 defaults. Consequently, as discussed above, the Tier 3 methodology has been proposed.

For CO<sub>2</sub>, we are not proposing IPCC's Tier 1 methodology for calculating emissions. The difference in uncertainty between emission estimates developed using IPCC Tier 1 and Tier 2/3 approaches for U.S. smelters is notably lower than the difference for the PFC estimates. However, as part of typical operations, facilities regularly monitor inputs to higher Tier methods (e.g., consumption of anodes); consequently, the incremental cost to use the IPCC Tier 2 or a Tier 2/3 hybrid estimate are small.

#### 4. Selection of Procedures for Estimating Missing Data

Where anode effect minutes per cell day data points are missing, the average anode effect minutes per cell day of the remaining measurements within the same reporting

period may be applied. These parameters are typically logged by the process control system as part of the operations of nearly all aluminium production facilities and the uncertainties in these data are low.

It is likely that aluminum production levels would be well known, since businesses rely on accurate monitoring and reporting of production levels. The 2006 IPCC Guidelines specify an uncertainty of less than 1 percent in the data for the annual production of aluminum. The likelihood for missing data is low.

For CO<sub>2</sub> emissions, the uncertainty in recording anode consumption as baked anode consumption or coke consumption is estimated to be only slightly higher than for aluminium production, less than 2 percent per the 2006 IPCC Guidelines. This is also an important parameter in smelter operations and is routinely/continuously monitored. Again, the likelihood for missing data is low.

##### 5. Selection of Data Reporting Requirements

In addition to annual GHG emissions data, facilities would be required to submit annual aluminum production and smelter technology used. The following PFC-specific information would also be required to be reported on an annual basis: anode effect minutes per cell-day, and anode effect frequency and duration. Smelters would also be



required to submit smelter-specific slope coefficient; the last date when smelter-specific slope coefficient was measured; certification that measurements of slope coefficients were conducted in accordance with the method identified in proposed 40 CFR part 98, subpart F; and the parameters used by the smelter to measure the frequency and duration of anode effects.

The following CO<sub>2</sub>-specific information would be reported on an annual basis: anode consumption for pre-bake cells, paste consumption for Søderberg cells, and smelter-specific inputs to the CO<sub>2</sub> process equations (e.g., levels of impurities) that were used in the calculation. Exact data elements required would vary depending on smelter technology.

These records consist of values that are used to calculate the emissions and are necessary to enable verification that the GHG emissions monitoring and calculations were done correctly.

#### 6. Selection of Records That Must Be Retained

In addition to the data reported, we propose that facilities maintain records on monthly production by smelter, anode effect minutes per cell-day or anode effect overvoltage by month, facility specific emission coefficient linked to anode effect performance, and net

anode consumption for Prebake cells or paste consumption for Søderberg cells.

These records consist of data that would be used to calculate the GHG emissions and are necessary to verify that the emissions monitoring and calculations are done correctly.

## G. Ammonia Manufacturing

### 1. Definition of the Source Category

Ammonia is a major industrial chemical that is mainly used as fertilizer, directly applied as anhydrous ammonia, or further processed into urea, ammonium nitrates, ammonium phosphates, and other nitrogen compounds. Ammonia also is used to produce plastics, synthetic fibers and resins, and explosives.

Ammonia can be produced through three processes: steam reforming, solid fuel gasification, and brine electrolysis. The production of ammonia typically uses conventional steam reforming or solid fuel gasification and generates both combustion and process-related greenhouse gas emissions. The production of ammonia through the brine electrolysis process does not produce process GHG emissions, although it releases GHGs from combustion of fuels to support the electrolysis process. We have not identified any

facilities in the U.S. producing ammonia through the brine electrolysis process.

Catalytic steam reforming of ammonia generates process-related CO<sub>2</sub>, primarily through the use of natural gas as a feedstock. One plant located in Kansas is manufacturing ammonia from petroleum coke feedstock. This and other natural gas-based and petroleum coke-based feedstock processes produce CO<sub>2</sub> and hydrogen, the latter of which is used in the manufacture of ammonia.

Not all of the CO<sub>2</sub> produced in the manufacture of ammonia is emitted directly to the atmosphere. Both ammonia and CO<sub>2</sub> are used as raw materials in the production of urea (CO(NH<sub>2</sub>)<sub>2</sub>), which is another type of nitrogenous fertilizer that contains carbon (C) and nitrogen (N). The carbon from ammonia production that is used to manufacture urea is assumed to be released into the environment as CO<sub>2</sub> during urea use. Therefore, the majority of CO<sub>2</sub> emissions associated with urea consumption are those that result from its use as a fertilizer. For CO<sub>2</sub> collected and used onsite or transferred offsite, you must follow the methodology provided in proposed 40 CFR part 98, subpart PP (Suppliers of CO<sub>2</sub>).

Some facilities produce for sale a combination of ammonia, methanol, and hydrogen. We propose that

facilities report their process-related GHG emissions in the source category corresponding to the primary NAICS code for the facility. For example, a facility that primarily produces ammonia but also produces methanol would report in the ammonia manufacturing source category. Since CO<sub>2</sub> is used to produce methanol, it does not get emitted directly into the atmosphere. These facilities would account for the CO<sub>2</sub> used to produce methanol through the methodology provided in proposed 40 CFR part 98, subpart G (Ammonia Manufacturing).

National emissions from ammonia manufacturing were estimated to be 14.6 million metric tons CO<sub>2</sub> equivalent (<0.25 percent of U.S. GHG emissions in 2006). These emissions include both process related CO<sub>2</sub> emissions and on-site stationary combustion emissions (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) from 24 manufacturing facilities across the U.S. Process-related emissions account for 7.6 million metric tons CO<sub>2</sub>, or 52 percent of the total, while on-site stationary combustion emissions account for the remaining 7.0 million metric tons CO<sub>2</sub> equivalent emissions.

For additional background information on ammonia manufacturing, please refer to the Ammonia Manufacturing TSD (EPA-HQ-OAR-2008-0508-007).

## 2. Selection of Reporting Threshold

In developing the reporting threshold for ammonia manufacturing, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e. Table G-1 of this preamble illustrates the emissions and facilities that would be covered under these various thresholds.

**Table G-1. Threshold Analysis for Ammonia Manufacturing**

Threshold level metric tons CO <sub>2</sub> e/yr	Total National Emissions	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	14,543,007	24	14,543,007	100%	24	100%
10,000	14,543,007	24	14,543,007	100%	24	100%
25,000	14,543,007	24	14,543,007	100%	24	100%
100,000	14,543,007	24	14,449,519	99%	22	92%

Facility-level emissions estimates based on known plant capacities suggest that all known facilities, except two, exceed the 100,000 metric tons CO<sub>2</sub>e threshold. Where information was available, emission estimates were adjusted to account for CO<sub>2</sub> consumption during urea production, and this was taken into account in the threshold analysis. In order to simplify the proposed rule and avoid the need for the source to calculate and report whether the facility exceeds the threshold value, we propose that all ammonia manufacturing facilities are required to report.

For a full discussion of the threshold analysis, please refer to the Ammonia Manufacturing TSD (EPA-HQ-OAR-2008-0508-007). For specific information on costs,

including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international monitoring guidelines and protocols include methodologies for estimating both combustion and process-related emissions from ammonia manufacturing (e.g. 2006 IPCC Guidelines, U.S. Inventory, DOE 1605(b), and TCR). These methodologies coalesce around the following four options which we considered for quantifying emissions from ammonia manufacture:

Option 1. The first method found in existing protocols estimates emissions by applying a default emission factor to total ammonia produced. This approach estimates only process-related emissions. This approach is consistent with IPCC Tier 1 and DOE 1605 (b) "C" rated estimation methods.

Option 2. A second method consists of performing a mass balance calculation using default carbon content values for feedstock (from the U.S. DOE). Using default carbon content for fuel would not provide the same level of accuracy as using facility-specific carbon contents. This approach is consistent with IPCC Tier 2, DOE 1605 (b) and TCR's "B" rated estimation methods.

Option 3. The third option is based on the IPCC Tier 3 method for determining CO<sub>2</sub> emissions from ammonia manufacture. This method calculates emissions based on the monthly measurements of the total feedstock consumed (quantity of natural gas or other feedstock) and the monthly carbon content of the feedstock. All carbon in the feedstock is assumed to be oxidized to CO<sub>2</sub>. The accuracy and certainty of this approach is directly related to the accuracy of the feedstock usage and the carbon content of the feedstock. If the measurements or readings are made and verified according to established QA/QC methods, the resulting emission calculations are as accurate as possible. For CO<sub>2</sub> collected and used onsite or transferred offsite, you must follow the methodology provided in proposed 40 CFR part 98, subpart PP of this part (Suppliers of CO<sub>2</sub>). This approach is also consistent with DOE's 1605 (b) "A" rated method and TCR's "A2" rated estimation methods.

Option 4. The fourth option is using CEMS to directly measure CO<sub>2</sub> emissions. While this method does tend to provide the most accurate emissions measurements, it is likely the costliest of all the monitoring methods.

Proposed Option. Under the proposed rule, if you are required to use an existing CEMS to meet the requirements

outlined in proposed 40 CFR part 98, subpart C and the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions from the industrial source.

For facilities that do not currently have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, or where the CEMS does not measure CO<sub>2</sub> process emissions, the proposed monitoring method is Option 3. You would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from stationary combustion.

The proposed monitoring method is Option 3. Options 3 and 4 provide the most accurate estimates from site-specific conditions. Option 3 is consistent with current feedstock monitoring practices at facilities within this industry, thereby minimizing costs. For CO<sub>2</sub> collected and used onsite or transferred offsite, you must follow the methodology provided in proposed 40 CFR part 98, subpart PP (Suppliers of CO<sub>2</sub>).

In general, we decided against existing methodologies that relied on default emission factors or default values for carbon content of materials because the differences among facilities could not be discerned, and such default



approaches are inherently inaccurate for site-specific determinations. The use of default values is more appropriate for sector-wide or national total estimates from aggregated activity data than for determining emissions from a specific facility.

The various approaches to monitoring GHG emissions are elaborated in the Ammonia Manufacturing TSD (EPA-HQ-OAR-2008-0508-007).

#### 4. Selection of Procedures for Estimating Missing Data

The proposed rule requires the use of substitute data whenever a quality-assured value of a parameter that is used to calculate GHG emissions is unavailable, or "missing." For missing feedstock supply rates, use the lesser of the maximum supply rate that the unit is capable of processing or the maximum supply rate that the meter can measure. There are no missing data procedures for carbon content. A re-test must be performed if the data from any monthly measurements are determined to be invalid.

#### 5. Selection of Data Reporting Requirements

We propose that facilities that estimate their process CO<sub>2</sub> emissions under proposed 40 CFR part 98, subpart G, submit their process CO<sub>2</sub> emissions data and the following additional data on an annual basis. These data are the basis for calculations and are needed for us to understand

the emissions data and verify the reasonableness of the reported emissions. We propose facilities submit the following data on an annual basis for each process unit: the total quantity of feedstock consumed for ammonia manufacturing, the monthly analyses of carbon content for each feedstock used in ammonia manufacturing. A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and G.

#### 6. Selection of Records That Must Be Retained

We propose that each ammonia manufacturing facility maintain records of monthly carbon content analyses, and the method used to determine the quantity of feedstock used. These records consist of values that are directly used to calculate the emissions that are reported and are necessary to enable verification that the GHG emissions monitoring and calculations were done correctly.

#### H. Cement Production

##### 1. Definition of the Source Category

Hydraulic Portland cement, the primary product of the cement industry, is a fine gray or white powder produced by heating a mixture of limestone, clay, and other ingredients at high temperature. Limestone is the single largest ingredient required in the cement-making process, and most cement plants are located near large limestone deposits.

CO<sub>2</sub> from the chemical process of cement production is the second largest source of industrial CO<sub>2</sub> emissions in the U.S.

During the cement production process, calcium carbonate (CaCO<sub>3</sub>) (usually from limestone and chalk) is combined with silica-containing materials (such as sand and shale) and is heated in a cement kiln at a temperature of about 1,450°C (2,400°F). The CaCO<sub>3</sub> forms calcium oxide (or CaO) and CO<sub>2</sub> in a process known as calcination or calcining. Very small amounts of carbonates other than CaCO<sub>3</sub>, such as magnesium carbonates and non-carbonate organic carbon may also be present in the raw materials, both of which contribute to generation of additional CO<sub>2</sub>. The product from the cement kiln is clinker, an intermediate product, and the CO<sub>2</sub> generated as a by-product. The CO<sub>2</sub> is released to the atmosphere.

Additional CO<sub>2</sub> emissions are generated with the formation of partially calcinated cement kiln dust. During clinker production, some of the clinker precursor materials (instead of forming clinker) are entrained in the flue gases exiting the kiln as non-calcinated, partially calcinated, or fully calcinated cement kiln dust<sup>67</sup>. Cement

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<sup>67</sup> Cement Production TSD (EPA-HQ-OAR-2008-0508-008).

Kiln Dust is collected from the flue gas in dust collection equipment and can either be recycled back to the kiln or be sent offsite for disposal, depending on its quality.

Organic carbon in raw materials is also emitted as CO<sub>2</sub> as raw material is heated.

National GHG emissions from cement production were estimated to be 86.83 million metric tons CO<sub>2</sub>e in 2006. These emissions include both process-related emissions (CO<sub>2</sub>) and on-site stationary combustion emissions (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) from 107 cement production facilities. Process-related emissions account for over half of emissions (45.7 million metric tons CO<sub>2</sub>), while on-site stationary combustion emissions account for the remaining 41.1 million metric tons CO<sub>2</sub>e emissions.

For additional background information on cement production, please refer to the Cement Production TSD (EPA-HQ-OAR-2008-0508-008).

## 2. Selection of Reporting Threshold

In developing the threshold for cement manufacturing, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e. Table H-1 of this preamble illustrates the emissions and facilities that would be covered under these thresholds.

**Table H-1. Threshold Analysis for Cement Manufacturing**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions (MMTCO <sub>2</sub> e)	Total Number of Facilities	Emissions Covered		Facilities Covered	
			Million metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	86.83	107	86.83	100%	107	100%
10,000	86.83	107	86.83	100%	107	100%
25,000	86.83	107	86.83	100%	107	100%
100,000	86.83	107	86.74	99.9%	106	99.9%

All emissions thresholds examined covered over 99.9 percent of CO<sub>2</sub>e emissions from cement facilities. Only one plant out of 107 in the dataset would be excluded by a 100,000 metric tons CO<sub>2</sub>e threshold. All facilities would be included under a 25,000 metric tons CO<sub>2</sub>e threshold. Therefore, EPA is proposing that all cement production facilities are required to report. Having no threshold covers all of the cement production process emissions without increasing the number of facilities that must report and simplifies the rule.

For a full discussion of the threshold analysis, please refer to the Cement Production TSD (EPA-HQ-OAR-2008-0508-008). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating process-related emissions from cement

manufacturing (e.g., the 2006 IPCC Guidelines, U.S. Inventory, DOE 1605(b), CARB mandatory GHG emissions reporting program, EPA's Climate Leaders, the EU Emissions Trading System, and the Cement Sustainability Initiative Protocol). These methodologies coalesce around four different options.

Option 1. Apply a default emission factor to the total quantity of clinker produced at the facility. The quantity of clinker produced could be directly measured, or a clinker fraction could be applied to the total quantity of cement produced.

Option 2. Apply site-specific emission factors to the quantity of clinker produced.

Option 3. Measure the carbonate inputs to the furnace. Under this "kiln input" approach, emissions are calculated by weighing the mass of individual carbonate species sent to the kiln, multiplying by the emissions factor (relating CO<sub>2</sub> emissions to carbonate content in the kiln feed), and subtracting for uncalcined cement kiln dust.

Option 4. Direct measurement of emissions using CEMS.

Proposed Option. Based on the agency's review of the above approaches, we propose two different methods for

quantifying GHG emissions from cement manufacturing, depending on current emissions monitoring at the facility.

CEMS Method. Under the proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate all CO<sub>2</sub> emissions from the industrial source. Also, refer to proposed 40 CFR part 98, subpart C (discussed in Section V.C of this preamble) to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O.

Calculation Method (Option 2). For facilities that do not currently have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, or where the CEMS would not adequately account for process emissions, we propose that these facilities calculate emissions following Option 2 outlined below. You would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from stationary combustion. The cement production section provides only those procedures for calculating and reporting process-related emissions.

Under Option 2, we propose that facilities develop facility-specific emission factors relating CO<sub>2</sub> emissions to clinker production for each individual kiln. The emission factor relating CO<sub>2</sub> emissions to clinker production would be based on the percent of measured carbonate content in the clinker (measured on a monthly basis) and the fraction of calcination achieved. The clinker emission factor is then multiplied by the monthly clinker production to estimate monthly process-related CO<sub>2</sub> emissions from cement production. Annual emissions are calculated by summing CO<sub>2</sub> emissions over 12 months across all kilns at the facility.

Most current protocols propose this method, but allow facilities to apply a national default emission factor. We propose the development of a facility-specific emission factor based on the understanding that facilities analyze the carbonate contents of their raw materials to the kiln on a frequent basis, either on a daily basis or every time there is a change in the raw material mix.

Cement Kiln Dust. The CO<sub>2</sub> emissions attributable to calcined material in the cement kiln dust not recycled back to the kiln must be added to the estimate of CO<sub>2</sub> emissions from clinker production. To establish a cement kiln dust adjustment factor, we propose that facilities conduct a chemical analysis on a quarterly basis to estimate the



plant-specific fraction of uncalcined carbonate in the cement kiln dust from each kiln, that is not recycled to the kiln each quarter. Again, this method provides reasonable accuracy and is highly consistent with the prevailing methods presented in existing protocols.

TOC Content in Raw Materials. The CO<sub>2</sub> emissions attributable to the TOC content in raw material must be added to the estimate of CO<sub>2</sub> emissions from clinker production and cement kiln dust. We propose that facilities conduct an annual chemical analysis to determine the organic content of the raw material on an annual basis. The emissions are calculated from the TOC content by multiplying the organic content by the amount of raw material consumed annually.

Other Options Considered. We considered three alternative options to estimate process-related emissions from cement production. The first method considered was to apply default emission factors to clinker production (either based on measurement of clinker, or by applying a clinker fraction to cement production). Applying default emission factors to clinker production is one of the most common approaches in existing protocols. However, we have determined that applying default emission factors to clinker production is more appropriate for national-level

emissions estimates than facility-specific estimates, where data are readily available to develop site-specific emission factors.

In some protocols, this method requires correcting for purchases and sales of clinker, such that a facility is only accounting for emissions from the clinker that is manufactured on site. This approach provides better emissions data than protocols where the method does not correct for clinker purchases and sales. In some protocols, the method requires reporters to start with cement production, estimate the clinker fraction, and then estimate the carbonate input used to produce the clinker. Conceptually, this might not be any different than the kiln input approach as the facility would ultimately have to identify and quantify the carbonate inputs to the kiln.

The kiln input approach was considered, but not proposed, because it would not lead to significantly reduced uncertainty in the emissions estimate over the clinker based approach, where a site-specific emission factor is developed using periodic sampling of the carbonate mix into the kiln. The primary difference is the proposed clinker-based approach requires a monthly analysis of the degree of calcination achieved in the clinker in order to develop the facility-specific emissions factor,

whereas the kiln input approach would require monthly monitoring of the inputs and outputs of the kiln. We concluded that although the kiln input does not improve certainty estimates significantly, it could potentially be more costly depending on the carbonate input sampling frequency.

Early domestic and international guidance documents for estimating process CO<sub>2</sub> emissions from cement production offered the option of applying a default emission factor to cement production (e.g. IPCC Tier 1, DOE 1605(b) "C" rated approach). This is no longer considered an acceptable method in national inventories therefore we did not consider it further for developing a mandatory GHG reporting rule.

The various approaches to monitoring GHG emissions are elaborated in the Cement Production TSD (EPA-HQ-OAR-2008-0508-008).

#### 4. Selection of Procedures for Estimating Missing Data

For facilities with CEMs, we propose that facilities follow the missing data procedures in proposed 40 CFR part 98, subpart C, which are also discussed in Section V.C of this preamble.

For facilities without CEMs, we propose that no missing data procedures would apply because the emission

factors used to estimate CO<sub>2</sub> emissions from clinker and cement kiln dust production are derived from routine tests of carbonate contents. In the event data on carbonate content analysis is missing we propose that the facility undertake a new analysis of carbonate contents. We are not proposing any missing data allowance for clinker and cement kiln dust production data. The likelihood for missing input, clinker and cement kiln dust production data is low, as businesses closely track their purchase of production inputs, quantity of clinker produced, and quantity of cement kiln dust discarded.

#### 5. Selection of Data Reporting Requirements

We propose that facilities submit annual CO<sub>2</sub> emissions from cement production, as well as any stationary fuel combustion emissions. In addition, facilities using CEMS would be required to follow the data reporting requirements in proposed 40 CFR part 98, subpart C. Facilities using the clinker-based approach would be required to report annual clinker production, annual cement kiln dust production, number of kilns, site-specific clinker emission factor, the total annual fraction of cement kiln dust recycled to the kiln, and the quantity of CO<sub>2</sub> captured for use and the end use, if known. In addition, we propose that facilities submit their annual analysis of carbonate

composition, the total annual fraction of calcination achieved (for each carbonate), organic carbon content of the raw material, and the amount of raw material consumed annually. These data, used as the basis of the calculations, are needed for EPA to understand the emissions data and verify reasonableness of the reported emissions. A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and H.

#### 6. Selection of Records That Must Be Retained

In addition to the data reported, we propose that facilities using the clinker-based approach to calculate emissions keep records of monthly carbonate consumption, monthly cement production, monthly clinker production, results from monthly chemical analysis of carbonates, documentation of calculated site specific clinker emission factor, quarterly cement kiln dust production, total annual fraction calcination achieved, organic carbon content of the raw material, and the amount of raw material consumed annually. These records include values directly used to calculate the reported emissions; and these records are necessary to verify the estimated GHG emissions. A full list of records that must be retained onsite is included in proposed 40 CFR part 98, subparts A and H.

#### I. Electronics Manufacturing

## 1. Definition of the Source Category

The electronics industry uses multiple long-lived fluorinated GHGs such as PFCs, HFCs, SF<sub>6</sub>, and NF<sub>3</sub> during manufacturing of semiconductors, liquid crystal displays (LCDs), microelectrical mechanical systems (MEMs), and photovoltaic cells (PV). We are also seeking comment below on the inclusion of light-emitting diodes (LEDs), disk readers and other products as part of the electronics manufacturing source category.

The fluorinated gases (at room temperature) are used for plasma etching of silicon materials and cleaning deposition tool chambers. Additionally, semiconductor manufacturing employs fluorinated GHGs (typically liquids at room temperature) as heat transfer fluids. The most common fluorinated GHGs in use are HFC-23, CF<sub>4</sub>, C<sub>2</sub>F<sub>6</sub>, NF<sub>3</sub> and SF<sub>6</sub>, although other compounds such as perfluoropropane (C<sub>3</sub>F<sub>8</sub>) and perfluorocyclobutane (c-C<sub>4</sub>F<sub>8</sub>) are also used (EPA, 2008a).

Electronics manufacturers may also use N<sub>2</sub>O as the oxygen source for chemical vapor deposition of silicon oxynitride or silicon dioxide. Besides dielectric film etching and chamber cleaning, much smaller quantities of fluorinated gases are used to etch polysilicon films and refractory metal films like tungsten. Table I-1 of this

preamble presents the fluorinated GHGs typically used during manufacture of each of these electronics devices.

**Table I-1. Fluorinated GHGs Used by the Electronics Industry**

Product Type	Fluorinated GHGs Used During Manufacture
Electronics (e.g., Semiconductor, MEMS, LCD, PV)	CF <sub>4</sub> , C <sub>2</sub> F <sub>6</sub> , C <sub>3</sub> F <sub>8</sub> , c-C <sub>4</sub> F <sub>8</sub> , c-C <sub>4</sub> F <sub>8</sub> O, C <sub>4</sub> F <sub>6</sub> , C <sub>5</sub> F <sub>8</sub> , CHF <sub>3</sub> , CH <sub>2</sub> F <sub>2</sub> , NF <sub>3</sub> , SF <sub>6</sub> , and Heat Transfer Fluids (CF <sub>3</sub> -(O-CF(CF <sub>3</sub> )-CF <sub>2</sub> ) <sub>n</sub> -(O-CF <sub>2</sub> ) <sub>m</sub> -O-CF <sub>3</sub> , C <sub>n</sub> F <sub>2n+2</sub> , C <sub>n</sub> F <sub>2n+1</sub> (O)C <sub>m</sub> F <sub>2m+1</sub> , C <sub>n</sub> F <sub>2n</sub> O, (C <sub>n</sub> F <sub>2n+1</sub> ) <sub>3</sub> N) <sup>a</sup>

<sup>a</sup> IPCC Guidelines do not specify the fluorinated GHGs used by the MEMS industry. Literature reviews revealed that CF<sub>4</sub>, SF<sub>6</sub>, and the Bosch process (consisting of alternating steps of SF<sub>6</sub> and c-C<sub>4</sub>F<sub>8</sub>) are used to manufacture MEMS. For further information, see the Electronics Manufacturing TSD (EPA-HQ-OAR-2008-0508-009).

The etching process uses plasma-generated fluorine atoms, which chemically react with exposed dielectric film to selectively remove the desired portions of the film. The material removed as well as undissociated fluorinated gases flow into waste streams and, unless emission control systems are employed, into the atmosphere.

Chambers used for depositing dielectric films are cleaned periodically using fluorinated and other gases. During the cleaning cycle the gas is converted to fluorine atoms in plasma, which etches away residual material from chamber walls, electrodes, and chamber hardware. Undissociated fluorinated gases and other products pass from the chamber to waste streams and, unless emission control systems are employed, into the atmosphere.

In addition to emissions of unreacted gases, some fluorinated compounds can also be transformed in the plasma processes into different fluorinated GHGs which are then exhausted, unless abated, into the atmosphere. For example, when  $C_2F_6$  is used in cleaning or etching,  $CF_4$  is generated and emitted as a process by-product.

Fluorinated GHG liquids (at room temperature) such as fully fluorinated linear, branched or cyclic alkanes, ethers, tertiary amines and aminoethers, and mixtures thereof are used as heat transfer fluids at several semiconductor facilities to cool process equipment, control temperature during device testing, and solder semiconductor devices to circuit boards. The fluorinated heat transfer fluid's high vapor pressures can lead to evaporative losses during use.<sup>68</sup> We are seeking comment on the extent of use and annual replacement quantities of fluorinated liquids as heat transfer fluids in other electronics sectors, such as their use for cooling or cleaning during LCD manufacture.

Total U.S. Emissions. Emissions of fluorinated GHGs from an estimated 216 electronics facilities were estimated to be 6.1 million metric tons  $CO_2e$  in 2006. Below is a breakdown of emissions by electronics product type.

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<sup>68</sup> Electronics Manufacturing TSD (EPA-HQ-OAR-2008-0508-009); 2006 IPCC Guidelines.



Semiconductors. Emissions of fluorinated GHGs, including heat transfer fluids, from 175 semiconductor facilities were estimated to be 5.9 million metric tons CO<sub>2</sub>e in 2006. Of the total estimated semiconductor emissions, 5.4 million metric tons CO<sub>2</sub>e are from etching/chamber cleaning and 0.5 million metric tons CO<sub>2</sub>e are from heat transfer fluid usage. Partners of the *PFC Reduction/Climate Partnership for Semiconductors* comprise approximately 80 percent of U.S. semiconductor production capacity. These partners have committed to reduce their emissions (exclusive of heat transfer fluid emissions) to 10 percent below their 1995 levels by 2010, and their emissions have been on a general decline toward attainment of this goal since 1999.

MEMs. Emissions of fluorinated GHGs from 12 facilities were estimated to be 0.03 million metric tons CO<sub>2</sub>e in 2006.

LCDs. Emissions of fluorinated GHGs from 9 facilities were estimated to be 0.02 million metric tons CO<sub>2</sub>e in 2006.

PVs. Emissions of fluorinated GHGs from 20 PV facilities were estimated to be 0.07 million metric tons CO<sub>2</sub>e in 2006. We request comment on the number and capacity of thin film (i.e., amorphous silicon) and other PV

manufacturing facilities in the U.S. using fluorinated GHGs.

Emissions to be Reported. This section details our proposed requirements for reporting fluorinated GHG and N<sub>2</sub>O emissions from the following processes and activities:

- (1) Plasma etching;
- (2) Chamber cleaning;
- (3) Chemical vapor deposition using N<sub>2</sub>O as the oxygen source; and
- (4) Heat transfer fluid use.

Our understanding is that only semiconductor facilities use heat transfer fluids; we request comment on this assumption.

For additional background information on the electronics industry, refer to the Electronics Manufacturing TSD (EPA-HQ-OAR-2008-0508-009).

## 2. Selection of Reporting Threshold

For manufacture of semiconductors, LCDs, and MEMs, we are proposing capacity-based thresholds equivalent to an annual emissions threshold of 25,000 metric tons CO<sub>2</sub>e. For manufacture of PVs for which we have less information on use and emissions of fluorinated GHGs, we are proposing an emissions threshold of 25,000 metric tons of CO<sub>2</sub>e.

We are seeking comment on the inclusion of LEDs, disk readers and other products in the electronics manufacturing source category. Given that the manufacturing process for these devices is similar to other electronics, we are specifically interested in seeking feedback on the level of emissions from their manufacture and whether subjecting these products to an emissions threshold of 25,000 metric ton CO<sub>2</sub>e would be appropriate.

In our analysis, we considered emission thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e per year. Table I-2 of this preamble shows emissions and facilities that would be captured by the respective emissions thresholds.

**Table I-2. Threshold Analysis for Electronics Industry**

Emission Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Facilities	Percent
1,000	5,984,462	216	5,972,909	99.8%	173	80%
10,000	5,984,462	216	5,840,411	98%	118	55%
25,000	5,984,462	216	5,708,283	95%	96	44%
100,000	5,984,462	216	4,708,283	79%	54	25%

We selected the 25,000 metric tons CO<sub>2</sub>e per year threshold because this threshold maximizes emissions reporting, while excluding small facilities that do not contribute significantly to the overall GHG emissions.

We propose to use a production-based threshold based on the rated capacities of facilities, as opposed to an emissions-based threshold, where possible, because it simplifies the applicability determination. Therefore, we derived production capacity thresholds that are approximately equivalent to metric tons CO<sub>2</sub>e using IPCC Tier 1 default emissions factors and assuming 100 percent capacity utilization. Where IPCC Tier 1 default factors were unavailable (i.e., MEMs), the emissions factor was estimated based on those of semiconductors for the relevant fluorinated GHGs. The proposed capacity-based thresholds are 1,000 m<sup>2</sup> silicon for semiconductors; 4,000 m<sup>2</sup> silicon for MEMs; and 236,000 m<sup>2</sup> LCD for LCDs. Table I-3 of this preamble shows the estimated emissions and number of facilities that would report for each source under the proposed capacity-based thresholds. PV is not shown in the table because we are proposing an emissions threshold due to lack of information.

**Table I-3. Summary of Rule Applicability under the Proposed Capacity-Based Thresholds.**

Emissions Source	Capacity-based Threshold	Total National Facilities	Total Emissions of Source (metric tons CO <sub>2</sub> e)	Emissions Covered		Facilities Covered	
				metric tons CO <sub>2</sub> e/yr	Per-cent	Facilities	Per-cent
Semi-conductors	1,080 silicon m <sup>2</sup>	175	5,741,676	5,492,066	96%	91	52%
MEMs	1,020 silicon m <sup>2</sup>	12	146,115	96,164	66%	2	17%

Emissions Source	Capacity-based Threshold	Total National Facilities	Total Emissions of Source (metric tons CO <sub>2</sub> e)	Emissions Covered		Facilities Covered	
				metric tons CO <sub>2</sub> e/yr	Per-cent	Facilities	Per-cent
LCD	235,700 LCD m <sup>2</sup>	9	23,632	0	0%	0	0%

The proposed capacity-based thresholds are estimated to cover about 50 percent of semiconductor facilities and between 0 percent and 20 percent of the facilities manufacturing MEMs and LCDs. At the same time, the thresholds are expected to cover nearly 96 percent of fluorinated GHG emissions from semiconductor facilities, and 0 percent and 66 percent of fluorinated GHG emissions from facilities manufacturing LCDs and MEMs, respectively. Combined these emissions are estimated to account for close to 94 percent of fluorinated GHG emissions from electronics as a whole.

We are proposing capacity-based thresholds for the electronics industry, where possible, because electronics manufacturers may employ emissions control equipment (e.g., thermal oxidizers, fluorinated GHG capture recycle systems) to lower their fluorinated GHG emissions. In addition, capacity-based thresholds would permit facilities to quickly determine whether or not they must report under this rule.

When abatement equipment is used, electronics manufacturers often estimate their emissions using the manufacturer-published DRE for the equipment. However, abatement equipment may fail to achieve its rated DRE either because it is not being properly operated and maintained or because the DRE itself was incorrectly measured due to a failure to account for the effects of dilution. (For example,  $\text{CF}_4$  can be off by as much as a factor of 20 to 50 and  $\text{C}_2\text{F}_6$  can be off by a factor of up to 10 because of failure to properly account for dilution.) In either event, the actual emissions from facilities employing abatement equipment may exceed estimates based on the rated DREs of this equipment and may therefore exceed the 25,000 metric tons  $\text{CO}_2\text{e}$  threshold without the knowledge of the facility operators. Measuring and reporting emission control device performance is therefore important for developing an accurate estimate of emissions. As discussed below, we propose an emission estimation method that would account for destruction by abatement equipment only if facilities verified the performance of their abatement equipment using one of two methods. If facilities choose not to verify the performance of their abatement equipment, the estimation method would not account for any destruction by the abatement device.

For additional background information on the threshold analysis, refer to the Electronics Manufacturing TSD (EPA-HQ-OAR-2008-0508-009). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

#### a. Etching and Cleaning Emissions

Fluorinated GHG Emissions. Under the proposed rule, large semiconductor facilities (defined as facilities with annual capacities of greater than 10,500 m<sup>2</sup> silicon) would be required to estimate their fluorinated GHG emissions from etching and cleaning using an approach based on the IPCC Tier 3 method, and all other facilities would be required to use an approach based on the IPCC Tier 2b method. We have determined that large semiconductor facilities are already using Tier 3 methods and/or have the necessary data readily available either in-house or from suppliers to apply the highest tier method. The difference between the proposed approaches and the IPCC methods is that the proposed approaches include stricter requirements for quantifying the gas destroyed by abatement equipment, as described below. None of the IPCC methods require a standard protocol to estimate DREs of abatement equipment.

Given that the actual DRE of the abatement equipment can be significantly smaller (by up to a factor of 50) compared to the manufacturer rated DRE, we are proposing verification of the DREs using a standard reporting protocol (Burton, 2007).

Under the proposed rule, we estimate that 17 percent of all semiconductor manufacturing facilities would be required to report using an IPCC Tier 3 approach (equivalent to 29 facilities out of 175 total facilities) and that 56 percent of total semiconductor emissions (equivalent 3.4 million metric tons CO<sub>2</sub>e out of a total 5.9 million metric tons CO<sub>2</sub>e emissions) would be reported using the IPCC Tier 3 approach.

Method for Large Facilities. The IPCC Tier 3 approach uses company-specific data on (1) gas consumption, (2) gas utilization, (3) by-product formation, and (4) DRE for all emission abatement processes at the facility.

Information on gas consumption by process is often gathered as business as usual<sup>69</sup>, and information on gas utilization, by-product formation, and DRE for each process

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<sup>69</sup> In the RIA for this rulemaking, we have conservatively included the costs of gathering, consolidating, and checking process-specific gas consumption information. However, we believe that this information is already gathered in many cases for purposes of internal process control and/or emissions reporting under EPA's voluntary PFC Reduction Program for the Semiconductor Industry.



is readily available from tool manufacturers and can also be experimentally measured on-site at the facility. We propose that the DRE for abatement equipment be experimentally measured using the protocol described below.

The guidance prepared by International SEMATECH Technology Transfer #0612485A-ENG (December 2006) must be followed when preparing gas utilization and by-product formation measurements. We have determined that electronics manufacturers commonly track fluorinated GHG consumption using flow metering systems calibrated to  $\pm 1$  percent or better accuracy. Thus the equation for estimating emissions does not account for cylinder heels. However, a facility may choose to estimate consumption by weighing fluorinated GHG cylinders when placed into and taken out of service, as is common practice by the magnesium industry.

The use of the IPCC Tier 3 method and standard site-specific DRE measurement would provide the most certain and practical emission estimates for large facilities. The uncertainty associated with an IPCC Tier 3 approach is lower than any of the other IPCC approaches, and is on the order of  $\pm 30$  percent at the 95 percent confidence interval. We estimate that the Tier 3 approach would not impose a significant burden on facilities because large semiconductor facilities are already using Tier 3 methods

and/or have the necessary data to do so readily available, as noted above.

Method for Other Semiconductor, LCD, MEMS, and PV Facilities. The IPCC Tier 2b approach is based on gas consumption by process type (i.e. etch or chamber clean) multiplied by default factors for utilization, by-product formation, and destruction. We are proposing that site-specific DRE measurements be used for quantifying the amount of gas destroyed. The DRE measurements would be determined using the protocol described below.

The Tier 2b approach does not account for variation among individual processes or tools and, therefore, the estimated emissions have an uncertainty about twice as high as that of IPCC Tier 3 estimates. However, we have concluded that the IPCC Tier 3 method would be unduly burdensome to the estimated 146 facilities with annual production less than 10,500 m<sup>2</sup> silicon. We estimate that the IPCC Tier 2b approach would not impose a significant burden on facilities because it requires only minimal fluorinated gas usage tracking by major production process type. These production input data are readily available at all U.S. manufacturing facilities.

N<sub>2</sub>O Emissions. We are proposing that electronics manufacturers use a simple mass-balance approach to

estimate emissions of N<sub>2</sub>O during etching and chamber cleaning. This methodology assumes N<sub>2</sub>O is not converted or destroyed during etching or chamber cleaning, due to lack of N<sub>2</sub>O utilization data. We request comment on utilization factors for N<sub>2</sub>O during etching and chamber cleaning, and any data on N<sub>2</sub>O by-product formation.

Verification of DRE. For facilities that employ abatement devices and wish to reflect the emission reductions due to these devices in their emissions estimates, two methods are proposed for verifying the DRE of the equipment. Either method may be followed.

The first method would require facilities (or their equipment suppliers) to test the DRE of the equipment using an industry standard protocol, such as the one under development by EPA as part of the *PFC Reduction/Climate Partnership for Semiconductors* (not yet published). This draft protocol requires facilities to experimentally determine the effective dilution through the abatement device and to measure abatement DRE during actual or simulated process conditions. The second method would require facilities to buy equipment that has been tested by an independent third party (e.g., UL) using an industry standard protocol such as the one under development by EPA. Under this approach, manufacturers would pay the third

party to select random samples of each model and test them. Because testing would not need to be obtained for every piece of equipment sold, this approach would probably be less expensive than in-house testing by electronics manufacturers, but it may not capture the full range of conditions under which the abatement equipment would actually be used.

We believe that the proposed DRE measurement method is generally robust, but we are requesting comment on one aspect of that method. We are concerned that the DREs measured and calculated for  $\text{CF}_4$  may vary depending on the mix of input gases used in the electronics manufacturing process. The calculated DRE for  $\text{CF}_4$  may be influenced by the formation of  $\text{CF}_4$  from other PFCs during the destruction process itself, and different input gases have different  $\text{CF}_4$  byproduct formation rates. This means that a DRE for  $\text{CF}_4$  calculated using one set of input gases might over- or under-estimate  $\text{CF}_4$  emissions when applied to another set of input gases (or even the original set in different proportions). We request comment on the likelihood and potential severity of such errors and on how they might be avoided.

Facilities pursuing either DRE verification method would also be required to use the equipment within the

manufacturer's specified equipment lifetime, operate the equipment within manufacturer specified limits for the gas mix and exhaust flow rate intended for fluorinated GHG destruction, and maintain the equipment according to the manufacturer's guidelines. We request comment on these proposed requirements.

b. Emissions of Heat Transfer Fluids

We propose that electronics manufacturers use the IPCC Tier 2 approach, which is a mass-balance approach, to estimate the emissions of each fluorinated heat transfer fluid. The IPCC Tier 2 approach uses company-specific data and accounts for differences among facilities' heat transfer fluids (which vary in their GWPs), leak rates, and service practices. It has an uncertainty on the order of  $\pm 20$  percent at the 95 percent confidence interval according to the 2006 IPCC Guidelines. The Tier 2 approach is preferable to the IPCC Tier 1 approach, which relies on a default emissions factor to estimate heat transfer fluid emissions and has relatively high uncertainty compared to the Tier 2 approach.

c. Review of Existing Reporting Programs and Methodologies

We reviewed the PFC Reduction/Climate Partnership for the Semiconductor Industry, U.S. GHG Inventory, 1605(b), EPA Climate Leaders, WRI, TRI, and the World Semiconductor

Council methods for estimating etching and cleaning emissions. All of the methods draw from both the 2000 and 2006 IPCC Guidelines.

Etching and Cleaning. For etching and cleaning emissions, we considered the 2006 IPCC Tier 1 and Tier 2a methods, as well as a Tier 2b/3 hybrid which would apply Tier 3 to the most heavily used fluorinated GHGs in all facilities.

The Tier 1 approach is based on the surface area of substrate (e.g., silicon, LCD or PV-cell) produced during manufacture multiplied by a default gas-specific emission factor. The advantages of the Tier 1 approach lie in its simplicity. However, this method does not account for the differences among process types (i.e., etching versus cleaning), individual processes, or tools, leading to uncertainties in the default emission factors of up to 200 percent at the 95 percent confidence interval.<sup>70</sup> Facilities routinely monitor gas consumption as part of business as usual, making it technically feasible to employ a method of at least IPCC Tier 2a complexity or higher without additional data collection efforts.

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<sup>70</sup> This uncertainty refers only to semiconductors and LCDs. Tier 1 emission factor uncertainty for PV was not estimated in the 2006 IPCC Guidelines.

The Tier 2a approach is based on the gas consumption multiplied by default factors for utilization, by-product formation, and destruction. The Tier 2a approach is relatively simple, given that gas consumption data is collected as part of business as usual. However, due to variation in gas utilization between etching and cleaning processes, the estimated emissions using Tier 2a have greater uncertainty than Tier 2b estimated emissions.

Tier 2b/3 hybrid approach involves requiring Tier 3 reporting for all facilities, but only for the top three gases emitted at each facility. For all other gases, the Tier 2b approach would be required. The top three gases emitted, based on data in the Inventory of U.S. GHG Emissions and Sinks, are C<sub>2</sub>F<sub>6</sub>, CF<sub>4</sub>, and SF<sub>6</sub> (EPA, 2008a). These top three gases accounted for approximately 80 percent of total fluorinated GHG emissions from semiconductor manufacturing during etching and chamber cleaning in 2006. The uncertainty associated with the Tier 2b/3 hybrid approach has not been determined, but is estimated to be between the uncertainty for a Tier 2b and Tier 3 approach.

We did not select the Tier 1 and Tier 2a methods due to the greater uncertainty inherent in these approaches. Although the Tier 2b/3 hybrid approach would provide more

accurate emissions estimates for small facilities, we concluded that the Tier 2b method with site-specific DRE measurements would provide sufficient accuracy without the additional monitoring and recordkeeping requirements of the Tier 3 method.

We propose collecting emissions data from MEMS manufacturers meeting the threshold criterion although no IPCC default emission factors exist for MEMS and the IPCC emission factors for semiconductor and LCD manufacturing may not be reliable for MEMS. Therefore, we are seeking information on emissions and emission factors for both MEMS and LCD manufacturing.

Heat Transfer Fluids. For heat transfer fluid emissions, we reviewed both the IPCC Tier 1 and IPCC Tier 2 approaches. The Tier 1 approach for heat transfer fluid emissions is based on the utilization capacity of the semiconductor facility multiplied by a default emission factor. Although the Tier 1 approach has the advantages of simplicity, it is less accurate than the Tier 2 approach according to the 2006 IPCC Guidelines.

#### 4. Selection of Procedures for Estimating Missing Data

Where facility-specific process gas utilization rates and by-product gas formation rates are missing, facilities can estimate etching/cleaning emissions by applying



defaults from the next lower Tier (e.g., IPCC Tier 2b or Tier 2a) to estimate missing data. However, facilities must limit their use of defaults from the next lower Tier to less than 5 percent of their emissions estimate.

Default values for estimating DRE would not be permitted. DRE values must be estimated as zero in the absence of facility-specific DREs that have been measured using a standard protocol. Gas consumption is collected as business as usual and is not expected to be missing; therefore, it would not be permitted to revert to the Tier 1 approach for estimating emissions. When estimating heat transfer fluid emissions during semiconductor manufacture, the use of the mass-balance approach requires correct records for all inputs. Should the facility be missing records for a given input, it may be possible that the heat transfer fluid supplier has information in their records for the facility.

#### 5. Selection of Data Reporting Requirements

Owners and operators would be required to report GHG emissions for the facility, for all plasma etching processes, all chamber cleaning, all chemical vapor deposition processes, and all heat transfer fluid use. Along with their emissions, facilities would be required to report the following: method used (i.e., 2b or 3), mass of

each gas fed into each process type, production capacity in terms of substrate surface area (e.g., silicon, PV-cell, LCD), factors used for gas utilization, by-product formation and their sources/uncertainties, emission control technology DREs and their uncertainties, fraction of gas fed into each process type with emissions, control technologies, description of abatement controls, inputs in the mass-balance equation (for heat transfer fluid emissions), example calculation, and emissions uncertainty estimate.

These data form the basis of the calculations and are needed for us to understand the emissions data and verify the reasonableness of the reported emissions.

#### 6. Selection of Records That Must Be Retained

We propose that facilities keep records of the following: data actually used to estimate emissions, records supporting values used to estimate emissions, the initial and any subsequent tests of the DRE of oxidizers, the initial and any subsequent tests to determine emission factors for process, and abatement device calibration/maintenance records.

These records consist of values that are directly used to calculate the emissions that are reported and are

necessary to enable verification that the GHG emissions monitoring and calculations are done correctly.

## J. Ethanol Production

### 1. Definition of the Source Category

Ethanol is produced primarily for use as a fuel component, but is also used in industrial applications and in the manufacture of beverage alcohol. Ethanol can be produced from the fermentation of sugar, starch, grain, and cellulosic biomass feedstocks, or produced synthetically from ethylene or hydrogen and carbon monoxide.

The sources of GHG emissions at ethanol production facilities that must be reported under the proposed rule are stationary fuel combustion, onsite landfills, and onsite wastewater treatment.

Proposed requirements for stationary fuel combustion emissions are set forth in proposed 40 CFR part 98, subpart C.

Proposed requirements for landfill emissions are set forth in Section V.HH of this preamble. Data is unavailable on landfilling at ethanol facilities, but it is our understanding that some of these facilities may have landfills with significant CH<sub>4</sub> emissions. For more information on landfills at industrial facilities, please refer to the Ethanol Production TSD (EPA-HQ-OAR-2008-0508-

010). EPA is seeking comment on available data sources for landfilling practices at ethanol production facilities.

The wastewater generated at ethanol production facilities is handled in a variety of ways, with dry milling and wet milling facilities generally treating wastewaters differently. In 2006, CH<sub>4</sub> emissions from wastewater treatment at ethanol production facilities were 68,200 metric tons CO<sub>2</sub>e. Proposed requirements for GHG emissions from wastewater treatment are set forth in Section V.II of this preamble. For more information on wastewater treatment at ethanol production facilities, please refer to the Ethanol Production TSD (EPA-HQ-OAR-2008-0508-010).

As noted in Section IV.B of this preamble under the heading "Reporting by fuel and industrial gas suppliers", ethanol producers and other suppliers of biomass-based fuel are not required to report GHG emissions from their products under this proposal, and we seek comment on this approach.

## 2. Selection of Reporting Threshold

The proposed threshold for reporting emissions from ethanol production facilities is 25,000 metric tons CO<sub>2</sub>e total emissions from stationary fuel combustion, landfills, and onsite wastewater treatment. Table J-1 of this

preamble illustrates the emissions and facilities that would be covered under various thresholds.

**Table J-1. Threshold Analysis for Ethanol Production**

Threshold Level	National Emissions mtCO <sub>2</sub> e	Total Number of Facilities	Emissions Covered		Facilities Covered	
			mtCO <sub>2</sub> e /year	Percent	Number	Percent
1,000 mtCO <sub>2</sub> e	Not estimated	140	Not estimated	Not estimated	>101	>72%
10,000 mtCO <sub>2</sub> e	Not estimated	140	Not estimated	Not estimated	>94	>67%
25,000 mtCO <sub>2</sub> e	Not estimated	140	Not estimated	Not estimated	>86	>61%
100,000 mtCO <sub>2</sub> e	Not estimated	140	Not estimated	Not estimated	>43	>31%

Data were unavailable to estimate emissions from landfills at ethanol refineries, or to estimate the combined wastewater treatment and stationary fuel combustion emissions at facilities. Data on stationary fuel combustion were used to estimate the minimum number of facilities that would meet each of the facility-level thresholds examined. The 25,000 metric tons CO<sub>2</sub>e threshold results in a reasonable number of reporters, and is consistent with thresholds for other source categories.

For more information on this analysis, please refer to the Ethanol Production TSD (EPA-HQ-OAR-2008-0508-010). EPA is seeking comment on the analysis and on alternative data sources for stationary combustion at ethanol production facilities. For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Refer to Sections V.C, V.HH, and V.II of this preamble for monitoring methods for general stationary fuel combustion sources, landfills, and wastewater treatment occurring on-site at ethanol production facilities.

### 4. Selection of Procedures for Estimating Missing Data

Refer to Sections V.C, V.HH, and V.II of this preamble for procedures for estimating missing data for general stationary fuel combustion sources, landfills, and industrial wastewater treatment occurring on-site at ethanol production facilities.

### 5. Selection of Data Reporting Requirements

Refer to Sections V.C, V.HH, and V.II of this preamble for reporting requirements for general stationary fuel combustion sources, landfills, and industrial wastewater treatment occurring on-site at ethanol production facilities. In addition, you would be required to report the quantity of CO<sub>2</sub> captured for use (if applicable) and the end use, if known. For more information on reporting requirements for CO<sub>2</sub> capture, please refer to Section V.PP of this preamble.

### 6. Selection of Records That Must Be Maintained

Refer to Sections V.C, V.HH, and V.GG of this preamble for recordkeeping requirements for stationary fuel

combustion, landfills, and industrial wastewater treatment occurring on-site at ethanol production facilities.

#### K. Ferroalloy Production

##### 1. Definition of the Source Category

A ferroalloy is an alloy of iron with at least one other metal such as chromium, silicon, molybdenum, manganese, or titanium. For this proposed rule, we are defining the ferroalloy production source category to consist of any facility that uses pyrometallurgical techniques to produce any of the following metals: ferrochromium, ferromanganese, ferromolybdenum, ferronickel, ferrosilicon, ferrotitanium, ferrotungsten, ferrovanadium, silicomanganese, or silicon metal. Ferroalloys are used extensively in the iron and steel industry to impart distinctive qualities to stainless and other specialty steels, and serve important functions during iron and steel production cycles. Silicon metal is included in the ferroalloy metals category due to the similarities between its production process and that of ferrosilicon. Silicon metal is used in alloys of aluminum and in the chemical industry as a raw material in silicon-based chemical manufacturing.

The basic process used at U.S. ferroalloy production facilities is a batch process in which a measured mixture

of metals, carbonaceous reducing agents, and slag forming materials are melted and reduced in an electric arc furnace. The carbonaceous reducing agents typically used are coke or coal. Molten alloy tapped from the electric arc furnace is casted into solid alloy slabs which are further mechanically processed for sale as product or disposed in landfills.

Ferroalloy production results in both combustion and process-related GHG emissions. The major source of GHG emissions from a ferroalloy production facility are the process-related emissions from the electric arc furnace operations. These emissions, which consist primarily of CO<sub>2</sub> with smaller amounts of CH<sub>4</sub>, result from the reduction of the metallic oxides and the consumption of the graphite (carbon) electrodes during the batch process.

Total nationwide GHG emissions from ferroalloy production facilities operating in the U.S. were estimated to be approximately 2.3 million metric tons CO<sub>2</sub>e for the year 2006. Process-related GHG emissions were 2.0 million metric tons CO<sub>2</sub>e (86 percent of the total emissions). The remaining 0.3 million metric tons CO<sub>2</sub>e (14 percent of the total emissions) were combustion GHG emissions.

Additional background information about GHG emissions from the ferroalloy production source category is available



in the Ferroalloy Production TSD (EPA-HQ-OAR-2008-0508-011).

## 2. Selection of Reporting Threshold

Ferroalloy production facilities in the U.S. vary in the specific types of alloy products produced. In developing the threshold for ferroalloy production facilities, we considered using annual GHG emissions-based threshold levels of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e. Table K-1 of this preamble presents the estimated emissions and number of facilities that would be subject to GHG emissions reporting, based upon emission estimates using production capacity data for the nine U.S. facilities that produce either ferrosilicon, silicon metal, ferrochromium, ferromanganese, or silicomanganese alloys. We were unable to obtain production data for an estimated five additional facilities that produce ferromolybdenum and ferrotitanium alloys.

**Table K-1. Threshold Analysis for Ferroalloy Production Facilities**

Threshold Level (metric tons CO <sub>2</sub> e/yr)	Total National Emissions (metric tons CO <sub>2</sub> e/yr)	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	2,343,990	9	2,343,990	100%	9	100%
10,000	2,343,990	9	2,343,990	100%	9	100%
25,000	2,343,990	9	2,343,990	100%	9	100%
100,000	2,343,990	9	2,276,639	97%	8	89%

Table K-1 of this preamble shows that all nine of the facilities would be required to report emissions at all thresholds except 100,000 metric tons CO<sub>2</sub>e, when considering combustion and process-related emissions. The rule could be simplified for these facilities by making the rule applicable to all ferroalloy production facilities. However, because the threshold analysis did not include all of the facilities in the ferroalloy source category that potentially could be subject to the rule, we have decided that it is appropriate to include a reporting threshold level. The proposed threshold selected for reporting emissions from ferroalloy production facilities is 25,000 metric tons CO<sub>2</sub>e per year consistent with the threshold level being proposed for other source categories. This threshold level would avoid placing a reporting burden on any small specialty ferroalloy production facility which may operate as a small business while still requiring the reporting of GHG emissions from the ferroalloy production facilities releasing most of the GHG emissions in the source category. A full discussion of the threshold selection analysis is available in the Ferroalloy Production TSD (EPA-HQ-OAR-2008-0508-011). For specific information on costs, including unamortized first year

capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

We reviewed existing methodologies used by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Canadian Mandatory Greenhouse Gas Reporting Program, the Australian National Greenhouse Gas Reporting Program, and EU Emissions Trading System. In general, the methodologies used for estimating process related GHG emissions at the facility level coalesce around the following four options.

Option 1. Apply a default emission factor to ferroalloy production. This is a simplified emission calculation method using only default emission factors to estimate process-related CO<sub>2</sub> and CH<sub>4</sub> emissions. The method requires multiplying the amount of each ferroalloy product type produced by the appropriate default emission factors from the 2006 IPCC Guidelines.

Option 2. Perform a monthly carbon balance using measurements of the carbon content of specific process inputs and process outputs and the amounts of these materials consumed or produced during a specified reporting period. This option is applicable to estimating only CO<sub>2</sub> emissions from an electric arc furnace, and is the IPCC Tier 3 approach and the higher order methods in the

Canadian and Australian reporting programs. Implementation of this method requires you to determine the carbon contents of carbonaceous material inputs to and outputs from the electric arc furnaces. Facilities determine carbon contents through analysis of representative samples of the material or from information provided by the material suppliers. In addition, the quantities of these materials consumed and produced during production would be measured and recorded. To obtain the CO<sub>2</sub> emissions estimate, the average carbon content of each input and output material is multiplied by the corresponding mass consumed and a conversion of carbon to CO<sub>2</sub>. The difference between the calculated total carbon input and the total carbon output is the estimated CO<sub>2</sub> emissions to the atmosphere. This method assumes that all of the carbon is converted during the process. For estimating the CH<sub>4</sub> emissions from the electric arc furnace, selection of this option for estimating CO<sub>2</sub> emissions would still require using the Option 1 approach of applying default emission factors to estimate CH<sub>4</sub> emissions.

Option 3. Use CO<sub>2</sub> emissions data from a stack test performed using U.S. EPA test methods to develop a site-specific process emissions factor which is then applied to quantity measurement data of feed material or product for

the specified reporting period. This monitoring method is applicable to electric arc furnace configurations for which the GHG emissions are contained within a stack or vent. Using site-specific emissions factors based on short-term stack testing is appropriate for those facilities where process inputs (e.g., feed materials, carbonaceous reducing agents) and process operating parameters remain relatively consistent over time.

Option 4. Use direct emission testing of CO<sub>2</sub> emissions. For electric arc furnace configurations in which the process off-gases are contained within a stack or vent, direct measurement of the CO<sub>2</sub> emissions can be made by continuously measuring the off-gas stream CO<sub>2</sub> concentration and flow rate using a CEMS. Using a CEMS, the total CO<sub>2</sub> emissions tabulated from the recorded emissions measurement data would be reported annually. If a ferroalloy production facility uses an open or semi-open electric arc furnace for which the CO<sub>2</sub> emissions are not fully captured and contained within a stack or vent (i.e., a significant portion of the CO<sub>2</sub> emissions escape capture by the hood and are release directly to the atmosphere), then another GHG emission estimation method other than direct measurement would be more appropriate.

Proposed Option. Under the proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the requirements of proposed 40 CFR part 98, subpart C, to estimate CO<sub>2</sub> emissions from the industrial source. Also, refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O.

For facilities that do not currently have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, or where CEMS would not adequately account for process emissions, the proposed monitoring method is Option 2. You would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from stationary combustion. This section of the preamble provides procedures only for calculating and reporting process-related emissions.

Given the variability of the alloy products produced and carbonaceous reducing agents used at U.S. ferroalloy production facilities, we concluded that using facility-specific information under Option 2 is preferred for estimating CO<sub>2</sub> emissions from electric arc furnaces. This

method is consistent with IPCC Tier 3 methods and the preferred approaches for estimating emissions in the Canadian and Australian mandatory reporting programs. We consider the additional burden of the material measurements required for the carbon balance small in relation to the increased accuracy expected from using this site-specific information to calculate CO<sub>2</sub> emissions.

Emissions data collected under Option 3 would have the lowest uncertainty, expected to be less than 5 percent. For Option 2, the material-specific emission factors would be expected to be within 10 percent, which would provide less uncertainty overall than for Option 1, which may have uncertainty of 25 to 50 percent. The use of the default CO<sub>2</sub> emission factors under Option 1 would be more appropriate for GHG estimates from aggregated process information on a sector-wide or nationwide basis than for determining GHG emissions from specific facilities.

In comparison to the CO<sub>2</sub> emissions levels from an electric arc furnace, the CH<sub>4</sub> emissions compose a small fraction of the total GHG emissions from electric arc furnace operations at a ferroalloy production facility. The proposed Option 2 above doesn't account for CH<sub>4</sub>. Considering the amount that CH<sub>4</sub> emissions contribute to the total GHG emissions and the absence of facility-specific

methods in other reporting systems, we are proposing that facilities use Option 1 and the IPCC default emission factors to estimate CH<sub>4</sub> emissions from electric arc furnaces at ferroalloy production facilities. This method provides reasonable estimates of the magnitude of the CH<sub>4</sub> emissions from the units without the need for owners or operator to conduct on-site CH<sub>4</sub> emissions measurements.

We also decided against Option 3 because of the potential for significant variations at ferroalloy production facilities in the characteristics and quantities of the electric arc furnace inputs (e.g., metal ores, carbonaceous reducing agents) and process operating parameters. A method using periodic, short-term stack testing would not be practical or appropriate for those ferroalloy production facilities where the electric arc furnace inputs and operating parameters do not remain relatively consistent over the reporting period.

The various approaches to monitoring GHG emissions are elaborated in the Ferroalloy Production TSD (EPA-HQ-OAR-2008-0508-011).

#### 4. Selection of Procedures for Estimating Missing Data

In cases when an owner or operator calculates CO<sub>2</sub> and CH<sub>4</sub> emissions using a carbon balance or an emission factor, the proposed rule would require the use of substitute data



whenever a quality-assured value of a parameter that is used to calculate GHG emissions is unavailable, or "missing." If the carbon content analysis of carbon inputs or outputs is missing or lost, the substitute data value would be the average of the quality-assured values of the parameter immediately before and immediately after the missing data period. The likelihood for missing process input and output data is low, as businesses closely track their purchase of production inputs. In those cases when an owner or operator uses direct measurement by a CO<sub>2</sub> CEMS, the missing data procedures would be the same as the Tier 4 requirements described for general stationary combustion sources in Section V.C of this preamble.

#### 5. Selection of Data Reporting Requirements

The proposed rule would require reporting of the total annual CO<sub>2</sub> and CH<sub>4</sub> emissions for each electric arc furnace at a ferroalloy production facility, as well as any stationary fuel combustion emissions. In addition we propose that additional information which forms the basis of the emissions estimates also be reported so that we can understand and verify the reported emissions. This additional information includes the total number of electric arc furnaces operated at the facility, the facility ferroalloy product production capacity, the annual

facility production quantity for each ferroalloy product, the number of facility operating hours in calendar year, and quantities of carbon inputs and outputs if applicable. A complete list of data to be reported is included in the proposed 40 CFR part 98, subparts A and K.

#### 6. Selection of Records That Must Be Retained

Maintaining records of the information used to determine the reported GHG emissions are necessary to enable us to verify that the GHG emissions monitoring and calculations were done correctly. We propose that all affected facilities maintain records of product production quantities, and number of facility operating hours each month. If you use the carbon balance procedure, you would record for each carbon-containing input material consumed or used and output material produced the monthly material quantity, monthly average carbon content determined for material, and records of the supplier provided information or analyses used for the determination. If you use the CEMS procedure, you would maintain the CEMS measurement records.

#### L. Fluorinated GHG Production

##### 1. Definition of the Source Category

This source category covers emissions of fluorinated GHGs that occur during the production of HFCs, PFCs, SF<sub>6</sub>,

NF<sub>3</sub>, and other fluorinated GHGs such as fluorinated ethers. Specifically, it covers emissions that are never counted as "mass produced" under the proposed requirements for suppliers of industrial GHGs discussed in Section OO of this preamble. These emissions include fluorinated GHG products that are emitted upstream of the production measurement and fluorinated GHG byproducts that are generated and emitted either without or despite recapture or destruction.<sup>71</sup> These emissions exclude generation and emissions of HFC-23 during the production of HCFC-22, which are discussed in Section O of this preamble.

Emissions can occur from leaks at flanges and connections in the production line, during separation of byproducts and products, during occasional service work on the production equipment, and during the filling of tanks or other containers that are distributed by the producer (e.g., on trucks and railcars). Fluorinated GHG emissions from U.S. facilities producing fluorinated GHGs are estimated to range from 0.8 percent to 2 percent of the

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<sup>71</sup> Byproducts that are emitted or destroyed at the production facility are excluded from the proposed definition of "produce a fluorinated GHG." Any HFC-23 generated during the production of HCFC-22 is also excluded from this definition, even if the HFC-23 is recaptured. However, other fluorinated GHG byproducts that are recaptured for any reason would be considered to be "produced."

amount of fluorinated GHGs produced, depending on the facility.

In 2006, 12 U.S. facilities produced over 350 million metric tons CO<sub>2</sub>e of HFCs, PFCs, SF<sub>6</sub>, and NF<sub>3</sub>. These facilities are estimated to have emitted approximately 5.3 million metric tons CO<sub>2</sub>e of HFCs, PFCs, SF<sub>6</sub>, and NF<sub>3</sub>, based on an emission rate of 1.5 percent. We estimate that an additional 6 facilities produced approximately 1 million metric tons CO<sub>2</sub>e of fluorinated anesthetics. At an emission rate of 1.5 percent, these facilities would emit approximately 15,000 metric tons CO<sub>2</sub>e of these anesthetics.

The production of fluorinated gases causes both combustion and fluorinated GHG emissions. Fluorinated GHG production facilities would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from stationary fuel combustion. In addition, these facilities would be required to report their production of industrial GHGs under proposed 40 CFR part 98, subpart OO. This section of the preamble discusses only the procedures for calculating and reporting emissions of fluorinated GHGs.

## 2. Selection of Reporting Threshold

We propose that owners and operators of facilities estimate and report fluorinated GHG and combustion

emissions if those emissions together exceed 25,000 metric tons CO<sub>2</sub>e.

In developing the threshold, we considered emissions thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e and their capacity equivalents. Facility-specific emissions were estimated by multiplying an emission factor of 1.5 percent by the estimated production at each facility. The capacity thresholds were developed based on emissions of fluorinated GHGs, assuming full capacity utilization and an emission rate of 2 percent of production. Because EPA had little information on combustion-related emissions at fluorinated GHG production facilities, these emissions were not incorporated into the capacity thresholds or the threshold analysis. Table L-1 of this preamble illustrates the HFC, PFC, SF<sub>6</sub>, and NF<sub>3</sub> emissions and facilities that would be covered under these various thresholds.

**Table L-1. Threshold Analysis for Fluorinated GHG Emissions from Production of HFCs, PFCs, SF<sub>6</sub>, and NF<sub>3</sub>**

Threshold Level (metric tons CO <sub>2</sub> e/r)	Total National Emissions (metric tons CO <sub>2</sub> e)	Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e	Percent	Number	Percent
Emission-Based Thresholds						
1,000	5,300,000	12	5,300,000	100%	12	100%
10,000	5,300,000	12	5,300,000	100%	12	100%
25,000	5,300,000	12	5,300,000	100%	12	100%
100,000	5,300,000	12	5,100,000	97%	9	75%
Production Capacity-Based Thresholds						

Threshold Level (metric tons CO <sub>2</sub> e/r)	Total National Emissions (metric tons CO <sub>2</sub> e)	Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e	Percent	Number	Percent
50,000	5,300,000	12	5,300,000	100%	12	100%
500,000	5,300,000	12	5,300,000	100%	12	100%
1,250,000	5,300,000	12	5,300,000	100%	12	100%
5,000,000	5,300,000	12	5,200,000	98%	10	83%

As can be seen from the tables, most HFC, PFC, SF<sub>6</sub>, and NF<sub>3</sub> production facilities would be covered by all emission- and capacity-based thresholds. Although we do not have facility-specific production information for producers of fluorinated anesthetics, we believe that few or none of these facilities are likely to have emissions above the proposed threshold.

EPA requests comment on whether it should adopt a capacity-based threshold for this sector, and if so, what fluorinated GHG and combustion-related emission rates should be used to develop this threshold. Where EPA has reasonably good information on the relationship between production capacity and emissions, and where this relationship does not vary excessively from facility to facility, EPA is generally proposing capacity-based thresholds to make it easy for facilities to determine whether or not they must report. In this case, however, EPA has little data on combustion emissions and their likely magnitude compared to fluorinated GHG emissions from this source.

As noted above, the capacity thresholds in Table L-1 of this preamble were developed based on a fluorinated GHG emission rate of 2 percent of production. While EPA believes that this emission rate is an upper-bound for fluorinated GHGs, neither the rate nor the thresholds account for combustion-related emissions. Thus, it is possible that the production capacities listed in Table L-1 of this preamble are inappropriately high.

In the event that a capacity-based threshold were adopted, facilities would be required to multiply the production capacity of each production line by the GWP of the fluorinated GHG produced on that line. Facilities would then be required to sum the resulting CO<sub>2</sub>e capacities across all lines. Where more than one fluorinated GHG could be produced by a production line, yielding more than one possible production capacity for that line in CO<sub>2</sub>e terms, facilities would be required to use the highest possible production capacity (in CO<sub>2</sub>e terms) in their threshold calculations.

A full discussion of the threshold selection analysis is available in the Fluorinated GHG Production TSD (EPA-HQ-OAR-2008-0508-012). For specific information on costs, including unamortized first year capital expenditures,

please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

In developing this proposed rule, we reviewed a number of protocols for estimating fluorinated GHG emissions from fluorocarbon production, such as the 2006 IPCC Guidelines. In general, these protocols present three methods. In the first approach, a default emission factor is applied to the total production of the plant. In the second approach, fluorinated GHG emissions are equated to the difference between the mass of reactants fed into the process and the sum of the masses of the main product and those of any by-products and/or wastes. In the third approach, the composition and mass flow rate of the gas streams actually vented to the atmosphere are monitored either continuously or during a period long enough to establish an emission factor.

If you produce fluorinated GHGs, we are proposing that you monitor fluorinated GHG emissions using the second approach, known as the mass-balance or yield approach. There are two variants of the mass-balance approach. In the first variant, only some of the reactants and products, including the fluorinated GHG product, are considered. In the second variant, all of the reactants, products, and by-



products are considered. Both variants are discussed in more detail in the Fluorinated GHG Production TSD (EPA-HQ-OAR-2008-0508-012).

We are proposing that you monitor emissions using the first variant. In this approach, you would calculate the difference between the expected production of each fluorinated GHG based on the consumption of reactants and the measured production of that fluorinated GHG, accounting for yield losses related to byproducts (including intermediates permanently removed from the process) and wastes. Yield losses that could not be accounted for would be attributed to emissions of the fluorinated GHG product. This calculation would be performed for each reactant, and estimated emissions of the fluorinated GHG product would be equated to the average of the results obtained for each reactant. If fluorinated GHG byproducts were produced and were not completely recaptured or completely destroyed, you would also estimate emissions of each fluorinated GHG byproduct.

To carry out this approach, you would daily weigh or meter each reactant fed into the process, the primary fluorinated GHG produced by the process, any reactants permanently removed from the process (i.e., sent to the thermal oxidizer or other equipment, not immediately

recycled back into the process), any byproducts generated, and any streams that contain the product or byproducts and that are recaptured or destroyed. For these measurements you would be required to use scales and/or flowmeters with an accuracy and precision of 0.2 percent of full scale. If monitored process streams included more than one component (product, byproducts, or other materials) in more than trace concentrations,<sup>72</sup> you would be required to monitor concentrations of products and byproducts in these streams at least daily using equipment and methods (e.g., gas chromatography) with an accuracy and precision of 5 percent or better at the concentrations of the process samples. Finally, you would be required to perform daily mass balance calculations for each product produced.

In general, we understand that production facilities already perform these measurements and calculations to the proposed level of accuracy and precision in order to monitor their processes and yields. However, we request comment on this issue. We specifically request comment on the proposed scope and frequency of process stream concentration measurements. As noted above, concentration measurements would be triggered when products or byproducts

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<sup>72</sup> EPA is proposing to define "trace concentration" as any concentration less than 0.1 percent by mass of the process stream.

occur in more than trace concentrations with other components in process streams (which include waste streams). However, it is possible that products or byproducts could occur in more than trace concentrations but still result in negligible yield losses (e.g., less than 0.2 percent). In this case, ignoring these losses may not significantly affect the accuracy of the overall GHG emission estimate. (This issue is discussed in more detail in the Fluorinated GHG Production TSD(EPA-HQ-OAR-2008-0508-012).) Similarly, decreasing the frequency of stream sampling may not have a significant impact on accuracy or precision if previous monitoring has shown that the concentrations of products and byproducts in process streams are stable or vary in a predictable and quantifiable way (e.g., seasonally due to differences in condenser cooling water temperature).

EPA recognizes that the proposed mass-balance approach would assume that all yield losses that are not accounted for are attributable to emissions of the fluorinated GHG product. In some cases, the losses may be untracked emissions or other losses of reactants or fluorinated by-products. In general, EPA understands that reactant flows are measured at the inlet to the reactor; thus, any losses of reactant that occur between the point of measurement and

the reactor are likely to be small. However, reactants that are recovered from the process, whether they are recycled back into it or removed permanently, may experience some losses that the proposed method does not account for. EPA requests comment on the extent to which such losses occur, and how these might be measured.

Fluorocarbon by-products, according to the IPCC Guidelines, generally have "radiative forcing properties similar to those of the desired fluorochemical." If this is always the case (with the exception of HFC-23 generated during production of HCFC-22, which is addressed in Section V.O of this preamble), then assuming by-product emissions are product emissions would not lead to large errors in estimating overall fluorinated GHG emissions. If the GWPs of emitted fluorinated by-products are sometimes significantly different from those of the fluorinated GHG product, and if the quantity of by-product emitted can be estimated (e.g., based on periodic or past sampling of process streams), then the quantity of emitted product could be adjusted to reflect this. EPA requests comment on whether it is necessary or practical to distinguish between emissions of fluorinated GHG products and emissions of fluorinated by-products, and if so, on the best approach for doing so.

We also request comment on the proposed accuracy and precision requirements for flowmeters and scales. If a waste or by-product stream is significantly smaller than the reactant and product streams, a less precise measurement of this stream (e.g., 0.5 percent) may not have a large impact on the precision of the fluorinated GHG emission estimate and may therefore be acceptable. Similarly, if a measurement is repeated multiple times over the course of the reporting period, the precision of individual measurements could be relaxed without seriously compromising the precision of the monthly or annual estimates. One way of adding flexibility to the precision requirements would be to require that the error of the fluorinated GHG emissions estimate be no greater than some fraction of the yield, e.g., 0.3 percent, on a monthly basis. Facilities could achieve this level of precision however they chose. We request comment on this issue and on the accuracy, precision, and cost of the proposed approach as a whole.

Analysis of Alternative Methods. EPA is not proposing the approach using the default emission factor. While this approach is simple, it is also highly imprecise; emissions in U.S. plants are estimated to vary from 0.8 percent to 2

percent of production, more than a factor of two.<sup>73</sup> Thus, applying a default factor (1.5 percent, for example) is likely to significantly overestimate emissions at some plants while significantly underestimating them at others.

EPA is not proposing the second variant of the mass-balance approach. This variant is implemented by comparing the total mass of reactants to the total mass of monitored products and byproducts, without regard for chemical identity. The drawbacks of this variant are that it is not the method currently used by facilities to track their production, and it would count losses of non-GHG products (e.g., HCl) as GHG emissions. EPA requests comment on this understanding and on the potential usefulness and accuracy of the second variant of the mass-balance approach for estimating fluorinated GHG emissions.

EPA is not proposing the third approach because it is our understanding that facilities do not routinely monitor their process vents, and therefore such monitoring is likely to be more expensive than the proposed mass-balance approach. However, the cost of monitoring may not be prohibitive, particularly if it is performed for a relatively short period of time for the purpose of

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<sup>73</sup> Fluorinated GHG Production TSD (EPA-HQ-OAR-2008-0508-012)

developing an emission factor, similar to the approach for estimating smelter-specific slope coefficients for aluminum production.<sup>74</sup> Moreover, if the vent monitoring approach reduces the uncertainty of the emissions measurement by even 10 percent relative to the mass-balance approach, this would reduce the absolute uncertainty at the typical production facility by 40,000 metric tons CO<sub>2</sub>e. (The extent to which uncertainty would be reduced would depend in part on the sensitivity and precision of the vent concentration measurements.)

For completeness, monitoring of process vents would need to be supplemented by monitoring of equipment leaks, whose emissions would not occur through process vents. To capture emissions from equipment leaks, we could require use of EPA Method 21 and the *Protocol for Equipment Leak Estimates* (EPA-453/R-95-017). The *Protocol* includes four methods for estimating equipment leaks. These are, from least to most accurate, the Average Emission Factor Approach, the Screening Ranges Approach, EPA Correlation Approach, and the Unit-Specific Correlation Approach. Most

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<sup>74</sup> Conversations with representatives of fluorocarbon producers indicate that robust emission factors could often be developed by monitoring emissions (and a related parameter, such as production) for one month under representative operating conditions. Where emissions vary seasonally (e.g., due to changes in condenser cooling water temperature), two separate monitoring periods of one month each would often suffice. However, the length and frequency of monitoring would depend on the variability of the process.

recent EPA leak detection and repair regulations require use of one of the Correlation Approaches in the *Protocol*. To use any approach other than the Average Emission Factor Approach, you would need to have (or develop) Response Factors relating concentrations of the target fluorinated GHG to concentrations of the gas with which the leak detector was calibrated. We understand that at least two fluorocarbon producers currently use methods in the *Protocol* to quantify their emissions of fluorinated GHGs with different levels of accuracy and precision.<sup>75</sup>

We request comment on the accuracies and costs of the approaches in the *Protocol* as they would be applied to fluorinated GHG production. We also request comment on the significance of equipment leaks compared to process vents as a source of fluorinated GHG emissions.

In addition, we request comment on whether we should require the vent monitoring approach, what sensitivity and precision would be appropriate for the vent concentration

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<sup>75</sup> One producer estimates HFC and other fluorocarbon emissions by using the Average Emission Factor Approach. This approach simply assigns an average emission factor to each component without any evaluation of whether or how much that component is actually leaking. The second producer estimates emissions using the Screening Ranges Approach, which assigns different emission factors to components based on whether the concentrations of the target chemical are above or below 10,000 ppmv. This producer has developed a Response Factor for HCFC-22, which is present in the same streams as the HFC-23 whose leaks are being estimated. (HFC-23 emissions are discussed in Section O of this preamble.)



measurements, and on the increase in cost and improvements in accuracy and precision that would be associated with this approach relative to the proposed approach.

Emissions from Evacuation of Returned Containers. We request comment on whether you should be required to measure and report fluorinated GHG emissions associated with the evacuation of cylinders or other containers that are returned to the facility containing either residual GHGs (heels) or GHGs that would be reclaimed or destroyed. We are not proposing to require reporting of these emissions because they are not associated with new production; instead, they are downstream emissions associated with earlier production.<sup>76</sup> Requiring reporting of these emissions could therefore lead to double-counting.<sup>77</sup>

Nevertheless, according to the 2006 IPCC Guidelines, the overall emission rate of a production facility can increase by nearly an order of magnitude (up to 8 percent) if the residual GHG remaining in the cylinders is vented to the atmosphere. One method of tracking such emissions

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<sup>76</sup>Emissions from the filling or refilling of containers with new product may or may not be covered by proposed 40 CFR part 98, subpart L, depending on where production is measured. If production is measured upstream of filling, then the emissions would not be covered by proposed 40 CFR part 98, subpart L. If production is measured downstream of filling, then the emissions would be covered by subpart L.

<sup>77</sup> However, this double-counting could be avoided if the emissions from returned cylinders were clearly distinguished from other production facility emissions in the emissions report.

would be to subtract the quantities of GHG reclaimed (purified) and sold or otherwise sent back to users from the quantities of residual and used GHGs returned to the facility in cylinders by users. This approach would be similar to the mass-balance approach proposed for estimating SF<sub>6</sub> emissions from users and manufacturers of electrical equipment.

Emissions of Fluorinated GHGs Associated with Production of ODS. We request comment on whether you should be required to report emissions of fluorinated GHGs associated with production of ODS (other than emissions of HFC-23 associated with production of HCFC-22, which are discussed in Section O of this preamble). These emissions would be by-product emissions, for example of HFCs, since the definition of fluorinated GHGs excludes ODS. We specifically request comment on the likely magnitude of these emissions, both in absolute terms and relative to fluorinated GHG emissions from fluorinated GHG production. We believe that these emissions may occur due to the chemical similarities between HFCs, HCFCs, and CFCs and the common use of halogen replacement chemistry to produce them. Although production of HCFCs and CFCs is limited under the regulations implementing Title VI of the CAA,

production of these substances for use as feedstocks is permitted to continue indefinitely.

#### 4. Selection of Procedures for Estimating Missing Data

In the event that a scale or flowmeter normally used to measure reactants, products, by-products, or wastes fails to meet an accuracy or precision test, malfunctions, or is rendered inoperable, we are proposing that facilities be required to estimate these quantities using other measurements where these data are available. For example, facilities that ordinarily measure production by metering the flow into the day tank could use the weight of product charged into shipping containers for sale and distribution as a substitute. It is our understanding that the types of flowmeters and scales used to measure fluorocarbon production (e.g., Coriolis meters) are generally quite reliable, and therefore that it should rarely be necessary to rely solely on secondary production measurements. In general, production facilities rely on accurate monitoring and reporting of the inputs and outputs of the production process.

If concentration measurements are unavailable for some period, we are proposing that the facility use the average of the concentration measurements from just before and just after the period of missing data.

There is one proposed exception to these requirements: if either method would result in a significant under- or overestimate of the missing parameter, then the facility would be required to develop an alternative estimate of the parameter and explain why and how it developed that estimate.

We request comment on these proposed methods for estimating missing data.

#### 5. Selection of Data Reporting Requirements

Under the proposed rule, owners and operators of facilities producing fluorinated GHGs would be required to report both their fluorinated GHG emissions and the quantities used to estimate them, including the masses of the reactants, products, by-products, and wastes, and, if applicable, the quantities of any product in the by-products and/or wastes (if that product is emitted at the facility). We are proposing that owners and operators report annual totals of these quantities.

Where fluorinated GHG production facilities have estimated missing data, you would be required to report the reason the data were missing, the length of time the data were missing, the method used to estimate the missing data, and the estimates of those data. Where the missing data was estimated by a method other than one of those

specified, the owner or operator would be required to report why the specified method would lead to a significant under- or overestimate of the parameter(s) and the rationale for the methods used to estimate the missing data.

We propose that facilities report these data because the data are necessary to verify facilities' calculations of fluorinated GHG emissions. We request comment on these proposed reporting requirements.

#### 6. Selection of Records That Must Be Retained

Under the proposed rule, owners and operators of facilities producing fluorinated GHGs would be required to retain records documenting the data reported, including records of daily and monthly mass-balance calculations and calibration records for flowmeters, scales, and gas chromatographs. These records are necessary to verify that the GHG emissions monitoring and calculations were performed correctly.

#### M. Food Processing

##### 1. Definition of the Source Category

Food processing facilities prepare raw ingredients for consumption by animals or humans. Many facilities in the meat and poultry, and fruit, vegetable, and juice processing industries have on-site wastewater treatment.

This can include the use of anaerobic and aerobic lagoons, screening, fat traps and dissolved air flotation. These facilities can also include onsite landfills for waste disposal. In 2006, CH<sub>4</sub> emissions from wastewater treatment at food processing facilities were 3.7 million metric tons CO<sub>2</sub>e, and CH<sub>4</sub> emissions from onsite landfills were 7.2 million metric tons CO<sub>2</sub>e. Data are not available to estimate stationary fuel combustion-related GHG emissions at food processing facilities.

Proposed requirements for stationary fuel combustion emissions are set forth in proposed 40 CFR part 98, subpart C.

Wastewater GHG emissions are described and considered in Section V.II of this preamble. For more information on wastewater treatment at food processing facilities, please refer to the Food Processing TSD (EPA-HQ-OAR-2008-0508-013).

Landfill GHG emissions are described and considered in Section V.HH of this preamble. For more information on landfills at food processing facilities, please refer to the Landfills TSD (EPA-HQ-OAR-2008-0508-034).

The sources of GHG emissions at food processing facilities that must be reported under the proposed rule

are stationary fuel combustion, onsite landfills and onsite wastewater treatment.

## 2. Selection of Reporting Threshold

We considered using annual GHG emissions-based threshold levels of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e for food processing facilities. The proposed threshold for reporting emissions from food processing facilities is 25,000 metric tons CO<sub>2</sub>e total emissions from combined stationary fuel combustion, on-site landfills, and on-site wastewater treatment. Table M-1 of this preamble illustrates the emissions and facilities that would be covered under these various thresholds.

**Table M-1. Threshold Analysis for Food Processing Facilities**

Threshold Level	National Emissions metric tons CO <sub>2</sub> e	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/year	Percent	Number	Percent
1,000 mtCO <sub>2</sub> e	NE	5,719	NE	NE	802	14.0
10,000 mtCO <sub>2</sub> e	NE	5,719	NE	NE	170	3.0
25,000 mtCO <sub>2</sub> e	NE	5,719	NE	NE	100	1.7
100,000 mtCO <sub>2</sub> e	NE	5,719	NE	NE	10	0.2

NE = Not Estimated

Data were unavailable at the time of this analysis to estimate stationary combustion emissions onsite, or the co-location of landfills and wastewater treatment at food processing facilities. Facility coverage based on onsite wastewater GHG emissions and landfill GHG emissions was

estimated as described in the Wastewater Treatment TSD and Landfills TSD (EPA-HQ-OAR-2008-0508-035) and (EPA-HQ-OAR-2008-0508-034). We estimate that at the 25,000 metric tons CO<sub>2</sub>e threshold, a small percentage of facilities are covered by this rule, resulting in potentially a large percentage of emissions data reporting from this significant emissions source but avoiding small facilities.

For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Refer to Sections V.C, V.HH, and V.II of this preamble for monitoring methods for general stationary fuel combustion sources, landfills, and wastewater treatment, respectively, occurring on-site at food production facilities.

### 4. Selection of Procedures for Estimating Missing Data

Refer to Sections V.C, V.HH, and V.II of this preamble for procedures for estimating missing data for general stationary fuel combustion sources, landfills, and wastewater treatment, respectively, occurring on-site at food processing facilities.

### 5. Selection of Data Reporting Requirements



Refer to Sections V.C, V.HH, and V.II of this preamble for reporting requirements for general stationary fuel combustion, landfills, and wastewater treatment, respectively, occurring on-site at food processing facilities. In addition, you would be required to report the quantity of CO<sub>2</sub> captured for use (if applicable) and the end use, if known.

#### 6. Selection of Records That Must Be Maintained

Refer to Sections V.C, V.HH, and V.II of this preamble for recordkeeping requirements for general stationary fuel combustion sources, landfills, and wastewater treatment, respectively, occurring on-site at food processing facilities.

### N. Glass Production

#### 1. Definition of the Source Category

Glass is a common commercial item that is produced by melting a mixture of minerals and other substances, then cooling the molten materials in a manner that prevents crystallization. Glass is typically classified as container glass, flat (or window) glass, or pressed and blown glass. Pressed and blown glass includes textile fiberglass, which is used primarily as a reinforcement material in a variety of products, as well as other types of glass. Wool fiberglass, which is commonly used for

insulation, is generally classified separately from textile fiberglass and other pressed and blown glass. However, for the purposes of GHG reporting, wool fiberglass production is included in the glass manufacturing source category.

Glass can be produced using a variety of raw material formulations. Most commercial glass is made using a soda-lime glass formulation, which consists of silica ( $\text{SiO}_2$ ), soda ( $\text{Na}_2\text{O}$ ), and lime ( $\text{CaO}$ ), with small amounts of alumina ( $\text{Al}_2\text{O}_3$ ), magnesia ( $\text{MgO}$ ), and other minor ingredients. Several specialty glasses, including fiberglass, are made using borosilicate or aluminoborosilicate recipes, which can consist primarily of silica and boric oxides, along with varying amounts of soda, lime, alumina, and other minor ingredients. Other formulations used in the production of specialty glasses include aluminosilicate and lead silicate formulations.

Major carbonates used in the production of glass are limestone ( $\text{CaCO}_3$ ), dolomite ( $\text{CaMg}(\text{CO}_3)_2$ ), and soda ash ( $\text{Na}_2\text{CO}_3$ ). The use of these carbonates in the furnace during glass manufacturing results in a complex high-temperature reaction that leads to process-related GHG emissions. Glass manufacturers may also use recycled scrap glass (cullet) in the production of glass, thereby reducing the carbonate input to the process and resulting GHG emissions.

National emissions from glass manufacturing were estimated to be 4.43 million metric tons CO<sub>2</sub>e (<0.1 percent of U.S. GHG emissions) in 2005. These emissions include both process-related emissions (CO<sub>2</sub>) and on-site stationary combustion emissions (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) from 374 glass manufacturing facilities across the U.S. and Puerto Rico. Process-related emissions account for 1.65 million metric tons CO<sub>2</sub>, or 37 percent of the total, while on-site stationary combustion sources account for the remaining 2.78 million metric tons CO<sub>2</sub>e emissions.

For additional background information on glass manufacturing, refer to the Glass Manufacturing TSD (EPA-HQ-OAR-2008-0508-014).

## 2. Selection of Reporting Threshold

In developing the threshold for glass manufacturing, we considered an emissions-based threshold of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e. Table N-1 of this preamble summarizes the emissions and number of facilities that would be covered under these various thresholds.

**Table N-1. Threshold Analysis for Glass Manufacturing**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions metric tons CO <sub>2</sub> e/yr	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	4,425,269	374	4,336,892	98%	217	58%
10,000	4,425,269	374	4,012,319	91%	158	42%

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions metric tons CO <sub>2</sub> e/yr	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
25,000	4,425,269	374	2,243,583	51%	55	15%
100,000	4,425,269	374	207,535	5%	1	0.3%

The glass manufacturing industry is heterogeneous in terms of the types of facilities. There are some relatively large, emissions-intensive facilities, but small artisan shops are common as well. For example, at a 1,000 metric tons CO<sub>2</sub>e threshold, 98 percent of emissions would be covered, with only 58 percent of facilities being required to report.

The proposed threshold for reporting emissions from glass manufacturing is 25,000 metric tons CO<sub>2</sub>e. We are proposing a 25,000 metric tons CO<sub>2</sub>e threshold to reduce the compliance burden on small businesses, while still including half of the GHG emissions from the industry. In comparison to the 100,000 metric tons CO<sub>2</sub>e threshold, the 25,000 metric tons CO<sub>2</sub>e threshold achieves reporting of 11 times more emissions while requiring less than 15 percent of the facilities to report. Compared to the 10,000 metric tons CO<sub>2</sub>e threshold, the 25,000 metric tons CO<sub>2</sub>e threshold captures more than half of those emissions, but only requires a third of the number of reporters. We consider

this a significant coverage of the emissions, while impacting a relatively small portion of the industry.

For a full discussion of the threshold analysis, please refer to the Glass Manufacturing TSD (EPA-HQ-OAR-2008-0508-014). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many of the domestic and international GHG monitoring guidelines and protocols include methodologies for estimating process-related CO<sub>2</sub> emissions from glass manufacturing (e.g., the 2006 IPCC Guidelines, U.S. Inventory, the Technical Guidelines for the DOE 1605(b), and the EU Emissions Trading System). These methodologies coalesce around four different options. Two options are output-based (production-based): one applies appropriate emission factors to the type of glass produced, and the other applies a default emission factor to total glass production. A third option is based on measuring the carbonate input to the furnace. The final option uses direct measurement to estimate emissions.

Option 1. The first production-based option we considered applies a default emission factor to the total

quantity of all glass produced, correcting for the amount of cullet supplied to the process.

Option 2. The second production-based approach we considered applies default emission factors to each of the types of glass produced at the facility (e.g., container, flat, pressed and blown, and fiberglass).

Option 3. The carbonate-input approach calculates emissions based on actual input data and the mass fractions of the carbonates that are volatilized and emitted as CO<sub>2</sub>. More specifically, this option considers the type, quantity, and mass fraction of carbonate inputs to the furnace and develops a facility-specific emission factor.

Option 4. This approach directly measures emissions using a CEMS. CEMS can be used to measure both combustion-related and process-related CO<sub>2</sub> emissions from glass melting furnaces. These emissions generally are exhausted through a common furnace stack. Therefore, separate CEMS would not be needed to quantify both types of emissions from glass melting furnaces.

Proposed Option. Under the proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub>

emissions, you would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions from the industrial source.

For facilities that do not currently have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, or where the CEMS would not adequately account for process emissions, the proposed monitoring method would require estimating combustion emissions and process emissions separately. For combustion emissions, you would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from stationary combustion. For process emissions, the carbonate input approach (Option 3) is proposed. This section of the preamble provides only those procedures for calculating and reporting process-related emissions.

To estimate process CO<sub>2</sub> emissions from glass melting furnaces, we propose that facilities measure the type, quantity, and mass fraction of carbonate inputs to each furnace and apply the appropriate emission factors for the carbonates consumed. This method for determining process emissions is consistent with the IPCC Tier 3 method.

The proposed rule distinguishes between carbonate-based minerals and carbonate-based raw materials used in glass production. Carbonate-based raw materials are fired

in the furnace during glass manufacturing. These raw materials are typically limestone, which is primarily  $\text{CaCO}_3$ ; dolomite, which is primarily  $\text{CaMg}(\text{CO}_3)_2$ ; and soda ash, which is primarily  $\text{Na}_2\text{CO}_3$ . Because it is the calcination of the mineral fraction of the raw material (e.g.,  $\text{CaCO}_3$  fraction in limestone) that leads to  $\text{CO}_2$  emissions, the purity of the limestone or other carbonate input is important for emissions estimation.

In order to assess the composition of the carbonate input, we propose that facilities use data from the raw material supplier to determine the carbonate-based mineral mass fraction of the carbonate-based raw materials charged to an affected glass melting furnace. As an alternative to using data provided by the supplier, facilities can assume a value of 1.0 for the mass fraction of the carbonate-based mineral in the carbonate-based raw material. We also propose that emissions are estimated under the assumption that 100 percent of the carbon in the carbonate-based raw materials is volatilized and released from the furnace as  $\text{CO}_2$ . Using the carbonate-based mineral mass fractions, the carbonate-based raw material feed rates, and the emission factors, the mass emissions of  $\text{CO}_2$  emitted from a glass melting furnace can be determined.



Using values of 1.0 for the carbonate-based mineral mass fractions is based on the assumption that the raw materials consist of 100 percent of the respective carbonate-based mineral (i.e., the limestone charged to the furnace consists of 100 percent  $\text{CaCO}_3$ , the dolomite charged consists of 100 percent  $\text{CaMg}(\text{CO}_3)_2$ , and the soda ash consists of 100 percent  $\text{Na}_2\text{CO}_3$ ). Using this assumption generally overestimates  $\text{CO}_2$  emissions. However, given the relative purity of the raw materials used to produce glass, this method provides accurate estimates of process  $\text{CO}_2$  emissions from glass melting furnaces, while avoiding the costs associated with sampling and analysis of the raw materials.

We have concluded that the carbonate input method specified in the proposed option is more certain as it involves measuring the consumption of each carbonate material charged to a glass melting furnace. According to the 2006 IPCC Guidelines, the uncertainty involved in the proposed carbonate input approach is 1 to 3 percent; in contrast, the uncertainty with using the default emission factor and cullet ratio for the production-based approach is 60 percent.

We considered use of a  $\text{CO}_2$  CEMS which does tend to provide the most accurate  $\text{CO}_2$  emissions measurements and can

measure both the combustion- and process-related CO<sub>2</sub> emissions. However, given the limited variability in the process inputs and outputs contributing to emissions from glass production, installation of CEMS would require significant additional burden to facilities given that few glass facilities currently have CO<sub>2</sub> CEMS.

We also considered, but decided not to propose, the production-based default emission factor-based approach referenced above for quantifying process-related CO<sub>2</sub> emissions based on the quantity of glass produced. In general, the default emission factor method results in less certainty because the method involves multiplying production data by emission factors that are based on default assumptions regarding carbonate-based mineral content and degree of calcination.

As part of normal business practices, glass manufacturing plants maintain the records that would be needed to calculate emissions under the proposed option. Given the greater accuracy associated with the input method and the minimal additional burden, we have determined that this requirement would not add additional burden to current practices at the facility, while providing accurate estimates of process-based CO<sub>2</sub> emissions.

The various approaches to monitoring GHG emissions are elaborated in the Glass Manufacturing TSD (EPA-HQ-OAR-2008-0508-014).

#### 4. Selection of Procedures for Estimating Missing Data

To estimate process emissions of CO<sub>2</sub> based on carbonate input, data are needed on the carbonate chemical analysis of the carbonate-based raw materials and the carbonate-based raw material input rate (process feed rate). Glass manufacturing facilities must monitor raw material feed rate carefully in order to maintain product quality. Therefore, we do not expect missing data on raw material input to be an issue. However, if these data were missing, we propose requiring facilities to use average data from the previous and following months for the mass of carbonate-based raw materials charged to the furnace. Given that glass furnaces generally operate continuously at a relatively constant production rate, we do not expect much variation in the amounts of carbonates charged to the furnace from month to month. Furthermore, it would be unusual for a glass manufacturing plant to change its glass formulation. Therefore, we believe using average data from the previous and following months would provide a reliable estimate of raw materials charged.

For missing data on carbonate-based mineral mass fractions, we propose requiring facilities to assume that the mass fraction of each carbonate-based mineral in the carbonate-based raw materials is 1.0. This assumption may result in a slight overestimate of emissions, but should still provide a reasonably accurate estimate of emissions for the period with missing data.

#### 5. Selection of Data Reporting Requirements

We propose that facilities report total annual emissions of CO<sub>2</sub> from each affected continuous glass melting furnace, as well as any stationary fuel combustion emissions. The proposed rule would also require facilities to report the quantity of each carbonate-based raw material charged to each continuous glass melting furnace in tons per year, and the quantity of glass produced by each continuous glass melting furnace. For facilities that calculate process emissions of CO<sub>2</sub> based on the mass fractions of carbonate-based minerals, the proposed rule would require facilities to report those values. These data are requested because they provide the basis for calculating process-based CO<sub>2</sub> emissions and are needed for us to understand the emissions data and verify the reasonableness of the reported emissions. The data on raw material composition and charge rates are needed to verify

process-based emissions of CO<sub>2</sub>. The data on glass production are needed to verify that the reported quantities of raw materials charged to continuous furnaces are reasonable. The production data also can be used to identify potential outliers.

A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and N.

#### 6. Selection of Records That Must Be Retained

In addition to the data to be reported, we propose that facilities retain monthly records of the data used to calculate GHG emissions. This would include records of the amounts of each carbonate-based raw material charged to a continuous glass melting furnace and glass production (by type). This requirement would be consistent with current business practices and the reporting requirements for emissions of other pollutants for the glass manufacturing industry.

The proposed rule also would require facilities to retain the results of all tests used to determine carbonate-based mineral mass fractions, as well as any other supporting information used in the calculation of GHG emissions. These data are directly used to calculate emissions that are reported and are necessary to enable

verification that the GHG emissions monitoring and calculations were performed correctly.

A full list of records that must be retained on site is included in proposed 40 CFR part 98, subparts A and N.

#### O. HCFC-22 Production and HFC-23 Destruction

##### 1. Definition of the Source Category

This source category includes the generation, emissions, sales, and destruction of HFC-23. The source category includes facilities that produce HCFC-22, generating HFC-23 in the process. This source category also includes facilities that destroy HFC-23, which are sometimes, but not always, also facilities that produce HCFC-22.

HFC-23 is generated during the production of HCFC-22. HCFC-22 is primarily employed in refrigeration and A/C systems and as a chemical feedstock for manufacturing synthetic polymers. Because HCFC-22 depletes stratospheric O<sub>3</sub>, its production for non-feedstock uses is scheduled to be phased out by 2020 under the CAA. Feedstock production, however, is permitted to continue indefinitely.

HCFC-22 is produced by the reaction of chloroform (CHCl<sub>3</sub>) and hydrogen fluoride (HF) in the presence of a catalyst, SbCl<sub>5</sub>. In the reaction, the chlorine in the chloroform is replaced with fluorine, creating HCFC-22.

Some of the HCFC-22 is over-fluorinated, producing HFC-23. Once separated from the HCFC-22, the HFC-23 may be vented to the atmosphere as an unwanted by-product, captured for use in a limited number of applications, or destroyed.

2006 U.S. emissions of HFC-23 from HCFC-22 production were estimated to be 13.8 million metric tons CO<sub>2</sub>e. This quantity represents a 13 percent decline from 2005 emissions and a 62 percent decline from 1990 emissions despite an 11 percent increase in HCFC-22 production since 1990. Both declines are primarily due to decreases in the HFC-23 emission rate. The ratio of HFC-23 emissions to HCFC-22 production has decreased from 0.022 to 0.0077 since 1990, a reduction of 66 percent. These decreases have occurred because an increasing fraction of U.S. HCFC-22 production capacity has adopted controls to reduce HFC-23 emissions. Three HCFC-22 production facilities operated in the U.S. in 2006, two of which used recapture and/or thermal oxidation to significantly lower their HFC-23 emissions. All three plants are part of a voluntary agreement to report and reduce their collective HFC-23 emissions.

The production of HCFC-22 and destruction of HFC-23 causes both combustion and HFC-23 emissions. HCFC-22 production and HFC-23 destruction facilities are required

to follow the requirements of proposed 40 CFR part 98, subpart C to estimate emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from stationary fuel combustion. This section of the preamble provides only those procedures for calculating and reporting generation, emissions, sales, and destruction of HFC-23.

For additional background information on HCFC-22 production, please refer to the HCFC-22 Production and HFC-23 Destruction TSD (EPA-HQ-OAR-2008-0508-015).

## 2. Selection of Reporting Threshold

We propose that all facilities producing HCFC-22 be required to report under this rule. Facilities destroying HFC-23 but not producing HCFC-22 would be required to report if they destroyed more than 25,000 metric tons CO<sub>2</sub>e of HFC-23.

For HCFC-22 production facilities, we considered emission-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e and capacity-based thresholds equivalent to these. The capacity-based thresholds are shown in Table O-1 of this preamble, and are based on full utilization of HCFC-22 capacity and the emission rate given for older plants in the 2006 IPCC Guidelines. (One plant is



relatively new, but the emission rate for older plants was used to be consistent and somewhat conservative.)

**Table O-1. Capacity-Based Thresholds**

Threshold Level (HCFC-22 capacity in tons)	Total National Emissions (metric tons CO <sub>2</sub> e)	Total National Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Facilities	Percent
2	13,848,483	3	13,848,483	100%	3	100%
21	13,848,483	3	13,848,483	100%	3	100%
53	13,848,483	3	13,848,483	100%	3	100%
214	13,848,483	3	13,848,483	100%	3	100%

Our analysis showed that all of the facilities, which have capacities ranging from 18,000 to 100,000 metric tons of HCFC-22, exceeded all of the capacity-based thresholds by wide margins. The smallest plant exceeded the largest capacity-based threshold by a factor of 85.

We are not presenting a table for emission-based thresholds because we do not have facility-specific emissions information. (Under the voluntary emission reduction agreement, total emissions from the three facilities are aggregated by a third party, who submits only the total to us.) Since two of the three facilities destroy or capture most or all of their HFC-23 by-product, one or both of them probably have emissions below at least some of the emission-based thresholds discussed above. However, if the thermal oxidizers malfunctioned, were not operated properly, or were unused for some other reason,

emissions of HFC-23 from each of the plants could easily exceed all thresholds. Reporting is therefore important both for tracking the considerable emissions of facilities that do not use thermal oxidation and for verifying the performance of thermal oxidation where it is used. For this reason, we propose that all HCFC-22 manufacturers report their HFC-23 emissions.

We are aware of one facility that destroys HFC-23 but does not produce HCFC-22. Although we do not know the precise quantity of HFC-23 destroyed by this facility, the Agency has concluded that the facility destroys a substantial share of the HFC-23 generated by the largest HCFC-22 production facility in the U.S. If the destruction facility destroys even one percent of this HFC-23, it is likely to destroy considerably more than the proposed threshold of 25,000 metric tons CO<sub>2</sub>e.

For additional background information on the threshold analysis for HCFC-22 production, please refer to the HCFC-22 Production and HFC-23 Destruction TSD (EPA-HQ-OAR-2008-0508-015). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

#### a. Review of Monitoring Methods

In developing these proposed requirements, we reviewed several protocols and guidance documents, including the 2006 IPCC Guidelines, guidance developed under our voluntary program for HCFC-22 manufacturers, the WRI/WBCSD protocols, the TRI, the TSCA Inventory Update Rule, The DOE 1605(b) Voluntary Reporting Program, EPA Climate Leaders, and TRI.

We also considered the findings and conclusions of a recent report that closely reviewed the methods that facilities use to estimate and assure the quality of their estimates of HCFC-22 production and HFC-23 emissions. As noted above, the production facilities currently estimate and report these quantities to us (across all three plants) under a voluntary agreement. The report, by RTI International, is entitled "Verification of Emission Estimates of HFC-23 from the Production of HCFC-22: Emissions from 1990 through 2006" and is available in the docket for this rulemaking.

The 2008 Verification Report found that the estimation methods used by the three HCFC-22 facilities currently operating in the U.S. were all equivalent to IPCC Tier 3 methods. Under the Tier 3 methodology, facility -specific emissions are estimated based on direct measurement of the HFC-23 concentration and the flow rate of the streams,

accounting for the use of emissions abatement devices (thermal oxidizers) where they are used. In general, Tier 3 methods for this source category yield far more accurate estimates than Tier 2 or Tier 1 methods. Even at the Tier 3 level, however, the emissions estimation methods used by the three facilities differed significantly in their levels of absolute uncertainty. The uncertainty of the one facility that does not thermally destroy its HFC-23 emissions dominates the uncertainty for the national emissions from this source category.

In general, the methods proposed in this rule are very similar to the procedures already being undertaken by the facilities to estimate HFC-23 emissions and to assure the quality of these estimates. The differences (and the rationale for them) are discussed in the HCFC-22 Production and HFC-23 Destruction TSD (EPA-HQ-OAR-2008-0508-015).

b. Proposed Monitoring Methods

This section of the preamble includes two proposed monitoring methods for HCFC-22 production facilities and one for HFC-23 destruction facilities. The proposed monitoring methods differ for HCFC-22 facilities that do and do not use a thermal oxidizer connected to the HCFC-22 production equipment. All the monitoring methods rely on measurements of HFC-23 concentrations in process or

emission streams and on measurements of the flow rates of those streams, although the proposed frequency of these measurements varies.

Proposed Methods for Estimating HFC-23 Emissions from Facilities that Do Not Use a Thermal Oxidizer or Facilities that Use a Thermal Oxidizer that is Not Directly Connected to the HCFC-22 Production Equipment. Under the proposed rule, you would be required to:

(1) Monitor the concentration of HFC-23 in the reaction product stream containing the HFC-23 (which could be either the HCFC-22 or the HCl product stream) on at least a daily basis. This proposed requirement is intended to account for day-to-day fluctuations in the rate at which HFC-23 is generated; this rate can vary depending on process conditions.

(2) Monitor the mass flow of the product stream containing the HFC-23 either directly or by weighing the other reaction product. The other product could be either HCFC-22 or HCl. Plants would be required to make or sum these measurements on at least a daily basis. If the HCFC-22 or HCl product were measured significantly downstream of the reactor (e.g., at storage tanks or the shipping dock), facilities would be required to add a factor that accounted for losses to the measurement. This factor would be 1.5

percent or another factor that could be demonstrated, to the satisfaction of the Administrator, to account for losses. This adjustment is intended to account for upstream product losses, which are estimated to range from one to two percent. Without the adjustment, HCFC-22 production and therefore HFC-23 generation at affected facilities would be systematically underestimated (negatively biased). A one- to two-percent underestimate could translate into an underestimate of HFC-23 emissions of 100,000 metric tons CO<sub>2</sub>e or more for each affected facility.

We request comment on this proposed approach for compensating for the negative bias caused by HCFC-22 emissions. We specifically request comment on the 1.5 percent factor, which is the midpoint of the one-to-two-percent range of product loss rates cited by the affected facility. We also request comment on what methods and data would be required verify a loss rate other than 1.5 percent, if a facility wished to demonstrate a lower loss rate. One option would be a mass-balance approach using measurements with very fine precisions (e.g., 0.2 percent or better).

(3) Facilities that do not use a thermal oxidizer connected to the HCFC-22 production equipment would also be

required to estimate the mass of HFC-23 produced either by multiplying the HFC-23 concentration measurement by the mass flow of the stream containing both the HFC-23 and the other product or by multiplying the ratio of the concentrations of HFC-23 and of the other product by the mass of the other product.

(4) Facilities would also be required to measure the masses of HFC-23 sold or sent to other facilities for destruction. This step would ensure that any losses of HFC-23 during filling of containers were included in the HFC-23 emission estimates for facilities that capture HFC-23 for use as a product or for transfer to a destruction facility.

(5) Facilities would also be required to estimate the HFC-23 emitted by subtracting the masses of HFC-23 sold or sent for destruction from the mass of HFC-23 generated.

This calculation assumes that all production that is not sold or sent to another facility for destruction is emitted. Such emissions may be the result of the packaging process; additional emissions can be attributed to the number of flanges in a line and other on-site equipment that is specific to each facility.

Proposed Methods for Estimating HFC-23 Emissions from Plants that Use a Thermal Oxidizer Connected to the HCFC-22

Production Equipment. Under the proposed rule, you would be required to estimate HFC-23 emissions from equipment leaks, process vents, and the thermal oxidizer. To estimate emissions from leaks, you would be required to estimate the number of leaks using EPA Method 21 of 40 CFR part 60, Appendix A-7 and a leak definition of 10,000 ppmv. Leaks registering above and below 10,000 ppmv would be assigned different default emission rates, depending on the component and service (gas or light liquid). These leak rates would be drawn from Table 2-5 from the *Protocol for Equipment Leak Estimates* (EPA-453/R-95-017) and data on the concentration of HFC-23 in the process stream.<sup>78</sup> (The relevant portions of Table 2-5 are included in the proposed regulatory text for this rule.) To estimate emissions from process vents, you would be required to use the results of annual emissions tests at process vents, adjusting for changes in HCFC-22 production rates since the measurements occurred. Tests would have to be conducted in accordance with EPA Method 18 of 40 CFR part 60, Appendix A-6,

*Measurement of Gaseous Organic Compounds by Gas*

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<sup>78</sup> Although EPA recognizes that the proposed method for estimating emissions from equipment leaks is rather uncertain, EPA believes that the level of precision is not unreasonable given the small size of the HFC-23 emissions that would be estimated using the method. These emissions are estimated to account for a fraction of a percent of U.S. HFC-23 emissions from this source.



*Chromatography.* Although HFC-23 emissions from process vents are believed to be quite low, this monitoring would ensure that any year-to-year variability in the emission rate was captured by the reporting. Finally, to estimate emissions from the thermal oxidizer, you would be required to apply the DE of the oxidizer to the mass of HFC-23 fed into the oxidizer.

Destruction. Under the proposed rule, if you use thermal oxidation to destroy HFC-23 you would be required to measure the quantities of HFC-23 fed into the oxidizer. You would also be required to account for any decreases in the DE of the oxidizer that occurred when the oxidizer was not operating properly (as defined in State or local permitting requirements and/or oxidizer manufacturer specifications). Finally, you would be required to perform annual HFC-23 concentration measurements by gas chromatography to confirm that emissions from the oxidizer were as low as expected based on the rated DE of the device. If emissions were found to be higher, then facilities would have the option of using the DE implied by the most recent measurements or of conducting more extensive measurements of the DE of the device.

As discussed in the HCFC-22 Production and HFC-23 Destruction TSD (EPA-HQ-OAR-2008-0508-015), the initial

testing and parametric monitoring that facilities currently perform on their oxidizers provides general assurance that the oxidizer is performing correctly. However, the proposed requirement to measure HFC-23 concentrations at the oxidizer outlet would provide additional assurance at relatively low cost. Even a one- or two-percent decline in the DE of the oxidizer could lead to emissions of over 100,000 metric tons CO<sub>2</sub>e, making this a particularly important factor to monitor accurately.

Startups, shutdowns, and malfunctions. Under the proposed rule, if you produce HCFC-22 you would be required to account for HFC-23 production and emissions that occur as a result of startups, shutdowns, and malfunctions. This would be done either by recording HFC-23 production and emissions during these events, or documenting that these events do not result in significant HFC-23 production and/or emissions. Depending on the circumstances, startups, shutdowns, and malfunctions (including both the process equipment and any thermal oxidation equipment) can be significant sources of emissions, and the Agency believes that emissions during these process disturbances should therefore be tracked.

Precision and Accuracy Requirements. We are proposing to require that HCFC-22 production facilities and HFC-23

destruction facilities monitor the masses that would be reported under this rule using flowmeters, weigh scales, or a combination of volumetric and density measurements with an accuracy and precision of 1.0 percent of full scale or better. Our understanding is that some HCFC-22 production facilities currently use devices with this level of accuracy and precision. However, flowmeters with considerably better precisions are available, e.g., 0.2 percent. We request comment on the option of requiring plants to use flowmeters or scales with an accuracy and precision of 0.2 percent or some other precision better than 1 percent. Given the large quantities of HFC-23 generated by each plant, this higher precision may be appropriate.

We are also proposing to require that HCFC-22 production facilities and HFC-23 destruction facilities measure concentrations using equipment and methods with an accuracy and precision of 5 percent or better at the concentrations of the samples.

Calibration Requirements. Under the proposed rule, if you produce HCFC-22 or destroy HFC-23 you would be required to perform the following activities to assure the quality of their measurements and estimates:

(1) Calibrate gas chromatographs used to determine the concentration of HFC-23 by analyzing, on a monthly basis, certified standards with known HFC-23 concentrations that are in the same range (percent levels) as the process samples. This proposed requirement is intended to verify the accuracy and precision of gas chromatographs at the concentrations of interest; calibration at other concentrations does not verify this accuracy with the same level of assurance. The proposed requirement is similar to requirements in protocols for the use of gas chromatography, such as EPA Method 18, *Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*.

(2) Initially verify each weigh scale, flow meter, and combination of volumetric and density measurements used to measure quantities that are to be reported under this rule, and calibrate it thereafter at least every year. We request comment on these proposed requirements.

#### 4. Selection of Procedures for Estimating Missing Data

We are proposing that in the cases when an upstream flow meter (i.e., near reactor outlet) is ordinarily used but is not available for some period, the facility can compensate by using downstream production measures (e.g., quantity shipped) and adding 1.5 percent to account for product losses. If HFC-23 concentration measurements are

unavailable for some period, we propose that the facility use the average of the concentration measurements from just before and just after the period of missing data.

There is one proposed exception to these requirements: if either method would result in a significant under- or overestimate of the missing parameter (e.g., because the monitoring failure was linked to a process disturbance that is likely to have significantly increased the HFC-23 generation rate), then the facility would be required to develop an alternative estimate of the parameter and explain why and how it developed that estimate.

We request comment on these methods for estimating missing data. We also request comment on the option of estimating missing production data based on consumption of reactants, assuming complete stoichiometric conversion.

#### 5. Selection of Data Reporting Requirements

If you produce HCFC-22 and do not use a thermal oxidizer connected to the HCFC-22 production equipment, you would be required to report the total mass of the HFC-23 generated in metric tons, the mass of any HFC-23 packaged for sale in metric tons, the mass of any HFC-23 sent off site for destruction in metric tons, and the mass of HFC-23 emitted in metric tons. If you produce HCFC-22 and destroy HFC-23 using a thermal oxidizer connected to the HCFC-22

production equipment, you would be required to report the mass of HFC-23 emitted from the thermal oxidizer, the mass of HFC-23 emitted from process vents, and the mass of HFC-23 emitted from equipment leaks, in metric tons.

In addition, if you produce HCFC-22 you would also be required to submit the following supplemental data, as applicable, for QA purposes: annual HCFC-22 production, annual consumption of reactants (including factors to account for quantities that typically remain unreacted), by reactant, annual mass of materials other than HCFC-22 and HFC-23 (i.e., unreacted reactants, HCl and other byproducts) that are permanently removed from the process, and the method for tracking startups, shutdowns, and malfunctions and HFC-23 generation/emissions during these events. You would also be required to report the names and addresses of facilities to which any HFC-23 was sent for destruction, and the quantities sent to each.

Where HCFC-22 production facilities have estimated missing data, you would be required to report the reason the data were missing, the length of time the data were missing, the method used to estimate the missing data, and the estimates of those data. Where the missing data was estimated by a method other than one of those specified, the owner or operator would be required to report why the

specified method would lead to a significant under- or overestimate of the parameter(s) and the rationale for the methods used to estimate the missing data.

If you destroy HFC-23, you would be required to report the mass of HFC-23 fed into the thermal oxidizer, the mass of HFC-23 destroyed, and the mass of HFC-23 emitted from the thermal oxidizer. You would also be required to submit the results of your annual HFC-23 concentration measurements at the outlet of the oxidizer. In addition, you would be required to submit a one-time report similar to that required under EPA's stratospheric protection regulations at 40 CFR 82.13(j).

We propose that facilities report these data either because the data are necessary to verify facilities' calculations of HFC-23 generation, emissions, or destruction or because the data allow us to implement other QA checks (e.g., calculation of an HFC-23/HCFC-22 generation factor that can be compared across facilities and over time). We request comment on these proposed reporting requirements.

#### 6. Selection of Records That Must Be Retained

If you produce HCFC-22, you would be required to keep records of the data used to estimate emissions and records documenting the initial and periodic calibration of the gas

chromatographs, scales, and flowmeters used to measure the quantities reported under this rule.

If you destroy HFC-23, you would be required to keep records of information documenting your one-time and annual reports.

These records are necessary to enable verification that the GHG emissions monitoring and calculations were performed correctly.

#### P. Hydrogen Production

##### 1. Definition of the Source Category

Approximately nine million metric tons of hydrogen are produced in the U.S. annually. Hydrogen is used for industrial applications such as petrochemical production, metallurgy, and food processing. Some of the largest users of hydrogen are ammonia production facilities, petroleum refineries, and methanol production facilities.

About 95 percent of all hydrogen produced in the U.S. today is made from natural gas via steam methane reforming. This process consists of two basic chemical reactions: (1) Reformation of the  $\text{CH}_4$  feedstock with high temperature steam supplied by burning natural gas to obtain a synthesis gas ( $\text{CH}_4 + \text{H}_2\text{O} = \text{CO} + 3\text{H}_2$ ); and (2) Using a water-gas shift reaction to form hydrogen and  $\text{CO}_2$  from the carbon monoxide produced in the first step ( $\text{CO} + \text{H}_2\text{O} = \text{CO}_2 + \text{H}_2$ ).



Other processes used for hydrogen production include steam naphtha reforming, coal or biomass gasification, partial oxidation of coal or hydrocarbons, autothermal reforming, electrolysis of water, recovery of byproduct hydrogen from electrolytic cells used to produce chlorine and other products, and dissociation of ammonia.

Hydrogen is produced in large quantities at approximately 77 merchant hydrogen production facilities (which produce hydrogen to sell) and 145 captive hydrogen production facilities (which consume hydrogen at the site where it is produced, e.g. petroleum refineries, ammonia, and methanol facilities). Hydrogen is also produced in small quantities at numerous other locations.

National emissions from hydrogen production were estimated to be approximately 60 million metric tons CO<sub>2</sub> (<1 percent of U.S. GHG emissions) annually.

The source category covered by the hydrogen production subpart of the proposed rule is merchant hydrogen production. CO<sub>2</sub> emissions from captive hydrogen production facilities at ammonia facilities, petrochemical facilities, and petroleum refineries are covered in proposed 40 CFR part 98, subparts G, X, and Y, respectively.

For additional background information on hydrogen production, please refer to the Hydrogen Production TSD (EPA-HQ-OAR-2008-0508-016).

## 2. Selection of Reporting Threshold

In developing the threshold for hydrogen production, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e. This threshold is based on combined combustion and process CO<sub>2</sub> emissions at the hydrogen production facility.

In selecting a threshold, we considered emissions data from merchant hydrogen facilities only, which together account for an estimated 15.2 million metric tons CO<sub>2</sub>e in 2006.

Table P-1 of this preamble illustrates the emissions and facilities that would be covered under these various thresholds.

**Table P-1. Threshold Analysis for Hydrogen Production**

CO <sub>2</sub> Threshold Level (Metric Tons CO <sub>2</sub> e/year)	H <sub>2</sub> Production Capacity (Tons H <sub>2</sub> /year)	Emissions Covered		Facilities Covered	
		Tons CO <sub>2</sub> e/year	Percent	Number	Percent
No threshold	0	15,226,620	100.0%	77	100%
1,000	116	15,225,220	100.0%	73	95%
10,000	1,160	15,130,255	99.4%	51	66%
25,000	2,900	14,984,365	98.4%	41	53%
100,000	11,600	14,251,265	93.6%	30	39%

The hydrogen production industry is heterogeneous in terms of the types of facilities. There are some

relatively large, emissions intensive facilities, but small facilities are common as well. At a 25,000 ton threshold, although 98.4 percent of emissions would be covered, only 53 percent of facilities would be required to report.

The proposed threshold for reporting emissions from hydrogen production is 25,000 metric tons CO<sub>2</sub>e. We are proposing a 25,000 metric tons CO<sub>2</sub>e threshold to reduce the compliance burden on small businesses, while still including a majority of GHG emissions from the industry.

For a full discussion of the threshold analysis, please refer to the Hydrogen Production TSD (EPA-HQ-OAR-2008-0508-016). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Several domestic and international GHG monitoring guidelines and protocols include methodologies for estimating process-related emissions from hydrogen production (e.g., the American Petroleum Institute Compendium, the DOE 1605(b), and the CARB Mandatory GHG Emissions Reporting Program). These methods coalesce around variants of two methods for merchant hydrogen

production facilities: direct measurement of CO<sub>2</sub> emissions by CEMS, and the feedstock material balance method.

Option 1. Direct measurement. The CEMS would capture both combustion and process-related CO<sub>2</sub> emissions from a hydrogen facility. Facilities that do not currently employ a CEMS could voluntarily elect to install CEMS for reporting under this subpart. This approach is consistent with DOE's 1605(b) "A" rated method and the CARB Mandatory GHG Emissions Reporting Program.

Option 2. Feedstock material balance method. This method accounts for the difference between the quantity and carbon content of all feedstock delivered to the facility and of all products leaving the facility. This approach is consistent with IPCC Tier 3 methods for similar processes (i.e., steam reformation in ammonia production), the DOE 1605(b) "A" rated method, and the CARB Mandatory GHG Emissions Reporting Program.

Based on our review of the above approaches, we propose both methods for quantifying GHG emissions from hydrogen production, to be implemented depending on current circumstances at your facility. If you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS

capture combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions from the industrial source. Also, refer to proposed 40 CFR part 98, subpart C to estimate combustion-related emissions from fuels not captured in the CEMS, as well as CH<sub>4</sub> and N<sub>2</sub>O.

For facilities that do not currently have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, or where the CEMS does not measure process emissions, the proposed monitoring method is Option 2. You would be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate combustion-related emissions from each hydrogen production unit and any other stationary combustion units. This section of the preamble provides only those procedures for calculating and reporting process-related CO<sub>2</sub> emissions. For CO<sub>2</sub> collected and used onsite or transferred offsite, you must follow the methodology provided in proposed 40 CFR part 98, subpart PP of this part (Suppliers of CO<sub>2</sub>).

The feedstock material balance method entails measurements of the quantity and carbon content of all feedstock delivered to the facility and of all products leaving the facility, with the assumption that all the carbon entering the facility in the feedstock that is not captured and sold outside the facility is converted to CO<sub>2</sub> and emitted. The quantity of feedstock consumed must be measured continuously using a flow meter. The carbon fraction in the feedstock may be provided as part of an ultimate analysis performed by the supplier (e.g., the local gas utility in the case of natural gas feedstock). If the feedstock supplier does not provide the gas composition or ultimate analysis data, the facility would be required to analyze the carbon content of the feedstock on a monthly basis using the appropriate test method in proposed 40 CFR 98.7.

We also considered three other methods for quantifying process-related emissions. The first method requires direct measurement of emissions by CEMS from all reporting facilities. The second method applies a constant proportionality factor, based on the facility's historical data on natural gas consumption, to the facility's hydrogen production rate. The third method we considered applies a

national default emission factor to the natural gas consumption rate at a facility.

The first method would generally increase accuracy of reported data. We invite comment on the practicality of adopting the first method. In general, the latter two methods are less certain, as they involve multiplying production and feedstock consumption data by default emission factors based on purity assumptions.

In contrast, the feedstock material balance method is more certain as it involves measuring the consumption and carbon content of the feedstock input. Because 95 percent of hydrogen is produced using steam methane reforming, and the carbon content of natural gas is always within 1 percent of the ratio: one mole of carbon per mole of natural gas, the local utility QA/QC requirements should be more than adequate.

Given the increase in accuracy of the direct measurement and feedstock material balance methods coupled with the minimal additional burden for facilities that already employ CEMS, we propose that facilities utilize the direct measurement method where currently employed, and the feedstock material balance method for all facilities that do not employ CEMS. We have concluded that this requirement does not add additional burden to current

practices at the facilities, thereby minimizing costs. The primary additional burden for facilities associated with this method would be in conducting a gas composition analysis of the feedstock on a monthly basis, in cases where this information is not provided by the supplier.

The various approaches to monitoring GHG emissions are elaborated in the Hydrogen Production TSD (EPA-HQ-OAR-2008-0508-016).

#### 4. Selection of Procedures for Estimating Missing Data

Sources using CEMS to comply with this rule would be required to comply with the missing data requirements of proposed 40 CFR part 98, subpart C.

In the event that a facility lacks feedstock supply rates for a certain time period, we propose that facilities use the lesser of the maximum supply rate that the unit is capable of processing or the maximum supply rate that the meter can measure. In the event that a monthly value for carbon content is determined to be invalid, an additional sample must be collected and tested. The likelihood for missing data is small, since the fuel meter and carbon content data are needed for financial accounting purposes.

#### 5. Selection of Data Reporting Requirements

We propose that facilities submit their annual CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions data. Facilities that use CEMS must



comply with the procedures specified in proposed 40 CFR 98.36(d)(iv). In addition, we propose that facilities submit the following data on an annual basis for each process unit. These data are needed for us to understand the emissions data and verify the reasonableness of the reported emissions, and are the basis of the feedstock material balance calculation.

The data should include the total quantity of feedstock consumed for hydrogen production, the quantity of CO<sub>2</sub> captured for use and the end use, if known, the monthly analyses of carbon content for each feedstock used in hydrogen production, the annual quantity of hydrogen produced, and the annual ammonia produced, if applicable.

A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and P.

#### 6. Selection of Records That Must Be Retained

We propose that each hydrogen production facility comply with the applicable recordkeeping requirements for stationary combustion units in proposed 40 CFR part 98, subpart C, which are also discussed in Section V.C of this preamble.

Also, we propose that each hydrogen production facility maintain records of feedstock consumption and the method used to determine the quantity of feedstock

consumption, QA/QC records (including calibration records and any records required by the QAPP), monthly carbon content analyses, and the method used to determine the carbon content. A full list of records that must be retained onsite is included in proposed 40 CFR part 98, subparts A and P. These records consist of values that are directly used to calculate the emissions that are reported and are necessary to enable verification that the GHG emissions monitoring and calculations were done correctly.

#### Q. Iron and Steel Production

##### 1. Definition of the Source Category

The iron and steel industry in the U.S. is the third largest in the world, accounting for about 8 percent of the world's raw iron and steel production and supplying several industrial sectors, such as construction (building and bridge skeletons and supports), vehicle bodies, appliances, tools, and heavy equipment. In this proposed rule, we are defining the iron and steel production source category to be taconite iron ore processing facilities, integrated iron and steelmaking facilities, electric arc furnace steelmaking facilities that are not located at integrated iron and steel facilities, and cokemaking facilities that are not located at integrated iron and steel facilities. Coke, sinter, and electric arc furnace steel production

operations at integrated iron and steel facilities are part of integrated iron and steel facilities. Direct reduced iron furnaces are located at and are part of electric arc furnace steelmaking facilities.

Currently, there are 18 integrated iron and steel steelmaking facilities that make iron from iron ore and coke in a blast furnace and refine the molten iron (and some ferrous scrap) in a basic oxygen furnace to make steel. In addition, there are over 90 electric arc furnace steelmaking facilities that produce steel primarily from recycled ferrous scrap. There are also eight taconite iron ore (pellet) processing facilities, 18 cokemaking facilities, seven of which are co-located at integrated iron and steel facilities, and one direct reduced iron furnace located at an electric arc furnace steelmaking facility.

The primary operation units that emit GHG emissions are blast furnace stoves (24 million metric tons CO<sub>2</sub>e/yr), taconite indurating furnaces, basic oxygen furnaces, electric arc furnaces (about 5 million metric tons CO<sub>2</sub>e/yr each), coke oven battery combustion stacks (6 million metric tons CO<sub>2</sub>e/yr), and sinter plants (3 million metric tons CO<sub>2</sub>e/yr). Smaller amounts of GHG emissions are

produced by coke pushing (160,000 metric tons CO<sub>2</sub>e/yr) and direct reduced iron furnaces (140,000 metric tons CO<sub>2</sub>e/yr).

Based on production in 2007, GHG emissions from the source category are estimated at about 85 million metric tons CO<sub>2</sub>e/yr or just over 1 percent of total U.S. GHG emissions. Emissions from both process units (47 million metric tons CO<sub>2</sub>e/yr) and miscellaneous combustion units (38 million metric tons CO<sub>2</sub>e/yr) are significant. Small amounts of N<sub>2</sub>O and CH<sub>4</sub> are also emitted during the combustion of different types of fuels.

Although by-product recovery coke batteries and blast furnaces operations produce coke and pig iron, respectively, we are proposing that their emissions be reported as required for combustion units in proposed 40 CFR part 98, subpart C because the majority of their GHG emissions originate from fuel combustion. Emissions from the blast furnace operation occur primarily from the combustion of blast furnace gas and natural gas in the blast furnace stoves. Emissions from by-product recovery coke batteries are generated from the combustion of coke oven gas in the coke battery's underfiring system. In addition to the blast furnace stoves and by-product coke battery underfiring systems, the other combustion units where fuel is the only source of GHG emissions include

boilers, process heaters, reheat and annealing furnaces, flares, flame suppression systems, ladle reheaters, and other miscellaneous sources. Emissions from these other combustion sources in 2007 are estimated at 16.8 million metric tons CO<sub>2</sub>e/yr for integrated iron and steel facilities, 18.6 million metric tons CO<sub>2</sub>e/yr for electric arc furnace steelmaking facilities, and 2.7 million metric tons CO<sub>2</sub>e/yr for coke facilities not located at integrated iron and steel facilities. As noted, the proposed requirements for combustion units in proposed 40 CFR part 98, subpart C would apply for estimating the CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions from the following combustion units:

- X By-product recovery coke oven battery combustion stacks
- X Blast furnace stoves
- X Boilers
- X Process heaters
- X Reheat furnaces
- X Annealing furnaces
- X Flares
- X Ladle reheaters
- X Other miscellaneous combustion sources.

Emissions from the remaining operation units are generated from the carbon in process inputs and in some cases, from fuel combustion in the process. The process-related CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from the operation units

listed below except for coke pushing would be reported according to the proposed requirements in this section:

- X Taconite indurating furnaces
- X Nonrecovery coke oven battery combustion stacks
- X Coke pushing
- X Basic oxygen furnaces
- X Electric arc furnaces
- X Direct reduced iron furnaces
- X Sinter plants

Emissions from nonrecovery coke batteries do not result from the combustion of a fuel input. In the nonrecovery battery, the volatiles that evolve as the coal is heated are ignited in the crown above the coal mass and in flues used to heat the oven. All of the combustible compounds distilled from the coal are burned, and the exhaust gases containing CO<sub>2</sub> are emitted through the battery's combustion stack. For all types of coke batteries, a small amount of CO<sub>2</sub> is formed when the incandescent coke is pushed from the oven, and prior to quenching with water, some of the coke burns. The CO<sub>2</sub> emissions from taconite plants come primarily from the indurating furnaces where coal and/or natural gas are burned in the pelletizing process, and carbon in the process feed materials (iron ore, limestone, bentonite) is converted to CO<sub>2</sub>. The CO<sub>2</sub> emissions from direct reduced iron furnaces result from the combustion of natural gas in

the furnace and from the process inputs, primarily from the carbonaceous materials (such as coal or coke) that is mixed with iron ore. During steelmaking in the basic oxygen furnace, most of the GHGs result from blowing oxygen into the molten iron to produce steel by removing carbon, primarily as CO<sub>2</sub>. CO<sub>2</sub> emissions also result from the addition of fluxing materials and other process inputs that may contain carbon. Emissions from electric arc furnaces are produced by the same mechanisms as for basic oxygen furnaces, and in addition, the consumption of carbon electrodes during the melting and refining stages contribute to CO<sub>2</sub> emissions.

Emissions of CH<sub>4</sub> and N<sub>2</sub>O occur from the combustion of fuels in both combustion units and process units. For fuels that contain CH<sub>4</sub>, combustion of CH<sub>4</sub> is not complete, and a small amount of CH<sub>4</sub> is not burned and is emitted. In addition, a small amount of N<sub>2</sub>O can be formed as a by-product of combustion from the air (nitrogen and oxygen) that is required for combustion.

Additional background information about GHG emissions from the iron and steel production source category is available in the Iron and Steel Production TSD (EPA-HQ-OAR-2008-0508-017).

## 2. Selection of Reporting Threshold

In evaluating potential thresholds for iron and steel production, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e per year. This threshold is based on combined combustion and process CO<sub>2</sub> emissions at an iron and steel production facility.

Table Q-1 of this preamble illustrates that the various thresholds do not have a significant effect on the amount of emissions that would be covered. To avoid placing a reporting burden on the smaller specialty stainless steel producers which may operate as small businesses while still requiring the reporting of GHG emissions from those facilities releasing most of the GHG emissions in this source category, we are proposing a threshold of 25,000 metric tons CO<sub>2</sub>e per year for reporting of emissions. This threshold level is consistent with the threshold level being proposed for other source categories with similar facility size characteristics. We are proposing that facilities emitting greater than 25,000 in the iron and steel production source category would be subject to the proposed rule because of the magnitude of their emissions. All integrated iron and steel facilities and taconite facilities exceed the highest emissions threshold considered. Most electric arc furnace facilities



(with the possible exception of about 9 facilities) exceed the 25,000 metric tons CO<sub>2</sub>e emissions threshold. Requiring facilities that emit 25,000 metric tons CO<sub>2</sub>e a year or more to report would capture nearly 100 percent of the emissions without significantly increasing the number of affected facilities.

For a full discussion of the threshold analysis, refer to the Iron and Steel Production TSD (EPA-HQ-OAR-2008-0508-017). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

**Table Q-1. Threshold Analysis for Iron and Steel Production**

Threshold level metric tons CO <sub>2</sub> e	Total national emissions (metric tons CO <sub>2</sub> e)	Total number of facilities	Emissions covered		Facilities covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
all in	85,150,877	130	85,150,877	100	130	100
1,000	85,150,877	130	85,150,877	100	130	100
10,000	85,150,877	130	85,141,500	~100	128	98
25,000	85,150,877	130	85,013,059	~100	121	93
100,000	85,150,877	130	84,468,696	99.2	111	85

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating emissions from process and combustion sources (e.g. 2006 IPCC Guidelines, U.S. Inventory, the WBCSD/WRI GHG protocol, DOE 1605(b), TCR, EU Emissions Trading System, the American Iron and Steel Institute protocol,

International Iron and Steel Institute Protocol, and Environment Canada's mandatory reporting guidelines). We considered these methodologies for measuring or estimating GHG emissions from the iron and steel source category. The following five options were considered for reporting process-related CO<sub>2</sub> emissions from these sources.

Option 1. Apply a default emission factor based on the type of process and an annual activity rate (e.g. quantity of raw steel, sinter, or direct reduced iron produced). This option is the same as the IPCC Tier 1 approach.

Option 2. Perform a carbon balance of all inputs and outputs using default or typical values for the carbon content of the inputs and outputs. Facility production and other records would be used to determine the annual quantity of process inputs and outputs. CO<sub>2</sub> emissions from the difference of carbon-in minus carbon-out, assuming all is converted to CO<sub>2</sub>, would be calculated. This option is the same as the IPCC Tier 2 approach, the WRI default approach, and the DOE 1605(b) approach that is rated "B." It is similar to the approach recommended by American Iron and Steel Institute except that the carbon balance for Option 2 is based on the individual processes rather than the entire plant.

Option 3. Perform a monthly carbon balance of all inputs and outputs using measurements of the carbon content of specific process inputs and process outputs and measure the mass rate of process inputs and process outputs. Calculate CO<sub>2</sub> emissions from the difference of carbon-in minus carbon-out assuming all is converted to CO<sub>2</sub>. This is consistent with an IPCC Tier 3 approach (if direct measurements are not available), the WRI/WBCSD preferred approach, the approach used in the EU Emissions Trading System, and the DOE 1605(b) approach that is rated "A."

Option 4. Develop a site-specific emission factor based on simultaneous and accurate measurements of CO<sub>2</sub> emissions and production rate or process input rate during representative operating conditions. Multiply the site-specific factor by the annual production rate or appropriate periodic production rate (or process input rate, as appropriate). This approach is included in Environment Canada's methodologies and might be considered a form of direct measurement consistent with the IPCC's Tier 3 approach.

Option 5. Direct and continuous measurement of CO<sub>2</sub> emissions using CEMS for CO<sub>2</sub> concentration and stack gas volumetric flow rate based on the requirements in 40 CFR

part 75. This is the IPCC Tier 3 approach (direct measurement).

Proposed option. Under this proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions from the industrial source. Also, you would use proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O.

If you do not currently have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, or where the CEMS would not adequately account for process emissions, we propose that Options 3, 4 or 5 could be implemented. You would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from stationary combustion. This section of the preamble provides procedures only for calculating and reporting process-related emissions.

We identified Options 3, 4, and 5 as the approaches that have acceptable uncertainty for facility-specific

estimates. All of these options would provide insight into different levels of emissions caused by facility-specific differences in feedstock or process operation. Options 3, 4, and 5 are forms of the IPCC's highest tier methodology (Tier 3), therefore, we propose these options as equal options. After consideration of public comments, we may promulgate one or more of the options or a combination based on the additional information that is provided.

We considered but decided against Options 1 and 2 because the use of default values and lack of direct measurements results in a very high level of uncertainty in the emission estimates. These default approaches would not provide site-specific estimates of emissions that would reflect differences in feedstocks, operating conditions, fuel combustion efficiency, variability in fuels and other differences among facilities. In general, we decided against proposing existing methodologies that relied on default emission factors or default values for carbon content of materials because the differences among facilities described above could not be discerned, and such default approaches are inherently inaccurate for site-specific determinations. The use of default values is more appropriate for sector wide or national total estimates from aggregated activity data than for determining

emissions from a specific facility. According to the IPCC's 2006 guidelines, the uncertainty associated with default emission factors for Options 1 and 2 is  $\pm 25$  percent, and the uncertainty in the production data used with the default emission factor is  $\pm 10$  percent, which results in a combined overall uncertainty greater than  $\pm 25$  percent. If process-specific carbon contents and actual mass rate data for the process inputs and outputs are used (i.e., Option 3) or if direct measurements are used (i.e., Options 4 and 5), the guidelines state that the uncertainty associated with the emission estimates would be reduced.

For Option 3, we are proposing that facilities may estimate process emissions based on a carbon balance that uses facility-specific information on the carbon content of process inputs and outputs and measurements of the mass rate of process inputs and outputs. Monthly determinations of the mass of process inputs and outputs other than fuels would be required. These data are readily available for almost all process inputs and outputs on a monthly basis from purchasing, accounting, and production records that are routinely maintained by each facility. The mass rates of fuels would be measured according to the procedures for fuels in combustion units in proposed 40 CFR part 98, subpart C. The carbon content of each process input and

output other than fuels would also be measured each month. A sample would be taken each week, composited for the monthly analysis, and sent to an independent laboratory for analysis of carbon content using the test methods in proposed 40 CFR part 98, subpart A. The carbon content of fuels would be determined using the procedures for fuels in combustion units in proposed 40 CFR part 98, subpart C. The CO<sub>2</sub> emissions would be estimated each month using the carbon balance equations in the proposed rule and then summed to provide the totals for the quarter and for the year.

While this proposed approach is consistent with how iron and steel production facilities are currently developing facility level GHG inventories, there are three components of this approach for which the Agency is requesting comment and supporting information. One issue is the ability to obtain accurate measurements of the process inputs and outputs, especially materials that are bulk solids and molten metal and slag. A second issue is the ability to obtain representative samples of the process inputs and outputs to determine the carbon content, especially for non-homogenous materials such as iron and steel scrap. The third issue is the level of uncertainty in the emission estimates for processes where there is a

significant amount of carbon leaving the process with product (such as coke plants). These and other factors may result in an unacceptable level of uncertainty, especially for certain processes, when using the carbon balance approach to estimate emissions.

While we are proposing that emissions from blast furnace stoves and coke battery combustion stacks be reported as would be required for combustion sources under proposed 40 CFR part 98, subpart C, we are also requesting comment on how the carbon balance approach (Option 3) could be implemented as an alternative monitoring option for the entire blast furnace operation and the entire coke plant operation at integrated iron and steel facilities. Comments should address the advantages, disadvantages, types and frequency of measurements that should be required, and whether (and if so, how) the emissions can be determined with reasonable certainty. Comments must demonstrate that the procedures produce results that are reproducible and clearly specify the sampling methods and QA procedures that would ensure accurate results.

For the site-specific emission factor approach (Option 4), the owner or operator may conduct a performance test and determine CO<sub>2</sub> emissions from all exhaust stacks for the process using EPA reference methods to continuously measure



the CO<sub>2</sub> concentration and stack gas volumetric flow rate during the test. In addition, either the feed rate of materials into the process or the production rate during the test would be measured. The performance test would be conducted under normal process operating conditions and at a production rate no less than 90 percent of the process rated capacity. For continuous processes (taconite indurating furnaces, non-recovery coke batteries, and sinter plants), the testing would cover at least nine hours of continuous operation. For batch or cyclic processes (basic oxygen furnaces, electric arc furnaces, and direct reduction furnaces), the testing would cover at least nine complete production cycles that start when the furnace is being charged and end after steel or iron and slag have been tapped. We are proposing testing for nine hours or nine production cycles, as applicable, because nine tests should provide a reasonable measure of variability (i.e., the standard deviation for nine production cycles or nine 1-hour runs). If an electric arc furnace is used to produce both carbon steel and low carbon steel (including stainless or specialty steel), separate emission factors would be developed for carbon steel and low carbon steel.

The site-specific emission factor for the process would be calculated in metric tons CO<sub>2</sub> per metric ton of

feed or production, as applicable, by dividing the CO<sub>2</sub> emission rate by the feed or production rate. The CO<sub>2</sub> emissions for the process would be calculated by multiplying the emission factor by the total amount of feed or production, as applicable. A new performance test would be required each year to develop a new site-specific emission factor. Whenever there is a significant change in fuel type or mix, change in the process in a manner that affects energy efficiency by more than 10 percent, or a change in the process feed materials in a manner that changes the carbon content of the feed or fuel by more than 10 percent, a new performance test would be conducted and a new site-specific emission factor calculated.

We are also requesting comment on the advantages and disadvantages of Option 4, along with supporting documentation. We have concluded that there may be situations in which the site-specific emission factor approach may result in an uncertainty lower than that associated with the carbon balance approach and provide more reasonable emission estimates. An example is nonrecovery coke plants, where a carbon balance approach may result in an unacceptably high level of uncertainty from subtracting two very large numbers (carbon in with coal and carbon out with coke) to estimate emissions that

could instead be accurately and directly measured at the combustion stack.

The primary sources of variability that affect CO<sub>2</sub> emissions from process sources in general are the carbon content of the process inputs and fuel and any changes to the process that alter energy efficiency. For most processes, the carbon content of process inputs and fuels is consistent and stable, and if a process change alters energy efficiency, a re-test could be performed to develop a new emission factor that reflected the change. We are requesting comment and supporting information on the minimum time or number of production cycles needed for testing to develop a representative emission factor, and how often periodic re-testing should be required (e.g., annually, quarterly, or only when there is a process change). We are also requesting that any comments on Option 4 address how changes in process inputs, fuels, or process energy efficiency should be accounted for, such as requiring a re-test if the carbon content of inputs change by more than some specified percent, if the type or mix of fuel is changed, or if there is a significant change in fuel consumption due to a process change.

We are also proposing that you may use direct measurements, noting that CEMS (Option 5) provide the

lowest uncertainty of the three options. This approach overcomes many of the limitations associated with other options considered such as accounting for the variability in emissions due to changes in the process, feed materials, or fuel over time. It would be applied to stacks that are already equipped with sampling ports and access platforms; consequently, it is technically feasible and cost effective. For those emission sources already equipped with CEMS, we are proposing that they be modified (if necessary) and used to determine CO<sub>2</sub> emissions for that emission source. We are proposing this requirement because it provides direct emission measurements that have low uncertainty with only a minimal additional cost burden. We also request comment, along with supporting documentation, on the advantages and disadvantages of Option 5.

We are also proposing that CH<sub>4</sub> and N<sub>2</sub>O emissions from the combustion of fuels in both combustion units and process units be determined and reported. All of the fuels used at iron and steel production processes are included in the methodologies in proposed 40 CFR part 98, subpart C for N<sub>2</sub>O and CH<sub>4</sub>. Consequently, EPA is proposing to use the same methodology as in proposed 40 CFR part 98, subpart C for determining and reporting emissions of N<sub>2</sub>O and CH<sub>4</sub> from both stationary combustion units and process units.

Miscellaneous Emissions Sources. Emissions may also occur when the incandescent coke is pushed from the coke oven and transported to the quench tower where it is cooled (quenched) with water. A small portion of the coke burns during this process prior to quenching. We updated the coke oven section of the AP-42<sup>79</sup> compilation of emission factors in May 2008, and the update included an emission factor for CO<sub>2</sub> emissions developed from 26 tests for particulate matter from pushing operations. The emissions factor (0.008 metric tons CO<sub>2</sub>e per metric ton of coal charged) was derived to account for emissions from the pushing emission control device and those escaping the capture system. We are proposing that coke facilities use the AP-42 emission factor to estimate CO<sub>2</sub> emissions from coke pushing operations.

There are dozens of emission points and various types of fugitive emissions, not collected for emission through a stack, from the production processes and materials handling and transfer activities at integrated iron and steel facilities. These emissions from iron and steel plants have been of environmental interest primarily because of the particulate matter in the emissions. Examples include

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<sup>79</sup> See *Compilation of Air Pollutant Emission Factors*, Fifth Edition: [http://www.epa.gov/ttn/chief/ap42/ch12/final/c12s02\\_may08.pdf](http://www.epa.gov/ttn/chief/ap42/ch12/final/c12s02_may08.pdf).

ladle metallurgy operations, desulfurization, hot metal transfer, sinter coolers, and the charging and tapping of furnaces. The information we have examined to date indicates that these emissions contribute very little to the overall GHG emissions from the iron and steel sector (probably on the order of one percent or less). For example, emissions of blast furnace gas may be emitted during infrequent process upsets (called "slips") when gas is vented for a short period or from leaks in the ductwork that handles the gas. However, the mass of GHG emissions is expected to be small because most of the carbon in blast furnace gas is from carbon monoxide, which is not a GHG. Fugitive emissions and emissions from control device stacks may also occur from blast furnace tapping, the charging and tapping of basic oxygen furnaces and electric arc furnaces, ladle metallurgy, desulfurization, etc. However, we have no information that indicates CO<sub>2</sub> is generated from these operations, and a review of test reports from systems that capture these emissions show that CO<sub>2</sub> concentrations are very low (at ambient air levels). Fugitive emissions containing CH<sub>4</sub> may occur from leaks of raw coke oven gas from the coke oven battery during the coking cycle. However, the mass of these emissions is expected to be small based on the small number of leaks that are now

allowed under existing Federal and State standards that regulate these emissions. In addition, since these emissions are not captured in a conveyance, there is no practical way to measure them. Consequently, we are not proposing that fugitive emissions be reported because we believe their GHG content is negligible and because there is no practical way of measuring them. However, we welcome public comment, along with supporting data and documentation, on whether fugitive emissions should be included, and if so, how these emissions can be estimated.

#### 4. Selection of Procedures for Estimating Missing Data

For process sources that use Option 3 (carbon balance) or Option 4 (site-specific emission factor), no missing data procedures would apply because 100 percent data availability would be required. For process sources that use Option 5 (direct measurement by CEMS), the missing data procedures would be the same as for units using Tier 4 in the general stationary fuel combustion source category in proposed 40 CFR part 98, subpart C.

#### 5. Selection of Data Reporting Requirements

We are proposing that facilities submit annual emission estimates for CO<sub>2</sub> presented by calendar quarters for coke oven battery combustion stacks, coke pushing, blast furnace stoves, taconite indurating furnaces,

electric arc furnaces, argon-oxygen decarburization vessel, direct reduced iron furnaces, and sinter plants.

In addition we propose that facilities submit the following data to assist in checks for reasonableness and for other data quality considerations: total mass for all process inputs and outputs when the carbon balance is used for specific processes by calendar quarters, site-specific emission factor for all processes for which the site-specific emission factor approach is used, annual production quantity for taconite pellets, coke, sinter, iron, raw steel by calendar quarters, annual production capacity for taconite pellets, coke, sinter, iron, raw steel, annual operating hours for taconite furnaces, coke oven batteries, sinter production, blast furnaces, direct reduced iron furnaces, and electric arc furnaces, and the quantity of CO<sub>2</sub> captured for use and the end use, if known.

A full list of data that would be reported is included in proposed 40 CFR part 98, subparts A and Q.

#### 6. Selection of Records That Must Be Retained

In addition to the recordkeeping requirements for general stationary fuel combustion sources, we propose that the following additional records be kept to assist in QA/QC and verification purposes: GHG emission estimates from the iron and steel production process by calendar quarter,



monthly total for all process inputs and outputs when the carbon balance is used for specific processes, documentation of calculation of site-specific emission factor for all processes for which the site-specific emission factor approach is used, monthly analyses of carbon content, and monthly production quantity for taconite pellets, coke, sinter, iron, and raw steel.

#### R. Lead Production

##### 1. Definition of the Source Category

Lead is a metal used to produce various products such as batteries, ammunition, construction materials, electrical components and accessories, and vehicle parts. For this proposed rule, we are defining the lead production source category to consist of primary lead smelters and secondary lead smelters. A primary lead smelter produces lead metal from lead sulfide ore concentrates through the use of pyrometallurgical processes. A secondary lead smelter produces lead and lead alloys from lead-bearing scrap metal.

For the primary lead smelting process used in the U.S., lead sulfide ore concentrate is first fed to a sintering process to burn sulfur from the lead ore. The sinter is smelted with a carbonaceous reducing agent in a blast furnace to produce molten lead bullion. From the

furnace, the bullion is transferred to dross kettle furnaces to remove primarily copper and other metal impurities. Following further refining steps, the lead is cast into ingots or alloy products.

The predominate feed materials processed at U.S. secondary lead smelters are used automobile batteries, but these smelters can also process other lead-bearing scrap materials including wheel balance weights, pipe, solder, drosses, and lead sheathing. These incoming lead scrap materials are first pre-treated to partially remove metal and nonmetal contaminants. The resulting lead scrap is smelted (U.S. secondary lead smelters typically use either a blast furnace or reverberatory furnace). The molten lead from the smelting furnace is refined in kettle furnaces, and then cast into ingots or alloy products

Lead production results in both combustion and process-related GHG emissions. Combustion-related CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions are generated from metallurgical process equipment used at primary and secondary lead smelters when natural gas or another fuel is burned in the unit to produce heat for drying, roasting, sintering, calcining, melting, or casting operations. Process-related CO<sub>2</sub> emissions are released from the lead smelting process due to the addition of a carbonaceous reducing agent such as

metallurgical coke or coal to the smelting furnace. The reduction of lead oxide to lead metal during the process produces the CO<sub>2</sub> emissions.

Currently there is one primary lead smelter operating in the U.S. There are 26 secondary lead smelters in the U.S. with widely varying annual lead production capacities ranging from approximately 1,000 metric tons to more than 100,000 metric tons. Total national GHG emissions from lead production in the U.S. were estimated to be approximately 0.9 million metric tons CO<sub>2</sub>e in 2006. These emissions include both on-site stationary combustion emissions (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) and process-related emissions (CO<sub>2</sub>). The majority of these emissions were from the combustion of carbon-based fuels. Combustion GHG emissions were 0.6 million metric tons CO<sub>2</sub>e emissions (69 percent of the total emissions). The remaining 0.3 million metric tons CO<sub>2</sub>e (31 percent of the total emissions) were process-related GHG emissions.

Additional background information about GHG emissions from the lead production source category is available in the Lead Production TSD (EPA-HQ-OAR-2008-0508-018).

## 2. Selection of Reporting Threshold

In developing the threshold for lead production facilities, we considered using annual GHG emissions-based

threshold levels of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e. This threshold is based on combined combustion and process CO<sub>2</sub> emissions at the lead production facility.

Table R-1 of this preamble presents the estimated emissions and number of facilities that would be subject to GHG emissions reporting, based on existing facility lead production capacities, under these various threshold levels.

**Table R-1. Threshold Analysis for Lead Smelters**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total Nationwide Emissions	Nationwide Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/ yr	Percent	Facility Number	Percent
1,000	866,000	27	859,000	99%	17	63%
10,000	866,000	27	853,000	98%	16	59%
25,000	866,000	27	798,000	92%	13	48%
100,000	866,000	27	0	0	0	0%

Secondary lead smelters in the U.S. vary greatly in production capacity and include 10 small facilities with production capacities less than 4,000 tons per year. Table R-1 of this preamble shows approximately 92 percent of the GHG emissions that result from lead production are released from the one primary smelter and 12 secondary smelters that emit more than 25,000 metric tons CO<sub>2</sub>e annually. Of the facilities with annual GHG emissions below 25,000 metric tons CO<sub>2</sub>e, 10 secondary smelters are estimated to emit less than 1,000 metric tons CO<sub>2</sub>e annually.

To avoid placing a reporting burden on the smaller secondary lead smelters which may operate as small businesses while still requiring the reporting of GHG emissions from those facilities releasing most of the GHG emissions in this source category, we are proposing a threshold of 25,000 metric tons CO<sub>2</sub>e per year for reporting of emissions. This threshold level is consistent with the threshold level being proposed for other source categories with similar facility size characteristics. More discussion of the threshold selection analysis is available in the Lead Production TSD (EPA-HQ-OAR-2008-0508-018). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

We reviewed existing domestic and international GHG monitoring guidelines and protocols including the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, U.S. GHG Inventory, the EU Emissions Trading System, the Canadian Mandatory Greenhouse Gas Reporting Program, and the Australian National Greenhouse Gas Reporting Program. These methods coalesce around the following four options for estimating process-related CO<sub>2</sub> emissions from lead production facilities. A full summary of methods reviewed

is available in the Lead Production TSD (EPA-HQ-OAR-2008-0508-018).

Option 1. Apply a default emission factor for the process-related emissions to the facility's lead production rate. This is a simplified emission calculation method using only default emission factors to estimate process-related CO<sub>2</sub> emissions. The method requires multiplying the amount of lead produced by the appropriate default emission factors from the 2006 IPCC Guidelines. This method is consistent with the IPCC Tier 1 method.

Option 2. Perform monthly measurements of the carbon content of specific process inputs and measure the mass rate of these inputs. This is the IPCC Tier 3 approach and the higher order methods in the Canadian and Australian reporting programs. Implementation of this method requires owners and operators of affected lead smelters to determine the carbon contents of materials added to the smelting furnace by analysis of representative samples collected of the material or from information provided by the material suppliers. In addition, you must measure and record the quantities of these input materials consumed during production. To obtain the process-related CO<sub>2</sub> emission estimate, the material carbon content would be multiplied by the corresponding mass of the carbon-containing input

material consumed and a conversion factor of carbon to CO<sub>2</sub>. This method assumes that all of the carbon is converted to CO<sub>2</sub> during the reduction process. The facility owner or operator would determine the average carbon content of the material for each calendar month using information provided by the material supplier or by collecting a composite sample of material and sending it to an independent laboratory for chemical analysis.

Option 3. Use CO<sub>2</sub> emissions data from a stack test performed using EPA reference test methods to develop a site-specific process emissions factor which is then applied to quantity measurement data of feed material or product for the specified reporting period. This monitoring method is applicable to furnace configurations for which the GHG emissions are contained within a stack or vent. Using site-specific emissions factors based on short-term stack testing is appropriate for those facilities where process inputs (e.g., feed materials, carbonaceous reducing agents) and process operating parameters remain relatively consistent over time.

Option 4. Use direct emission measurement of CO<sub>2</sub> emissions. For furnace configurations in which the process off-gases are contained within a stack or vent, direct measurement of the CO<sub>2</sub> emissions can be made by continuously

measuring the off-gas stream CO<sub>2</sub> concentration and flow rate using a CEMS. For a smelting furnace used for lead production where both combustion and process-related emissions are released by a source (e.g. blast furnace) emissions reported by using a CEMS would be total CO<sub>2</sub> emissions including both combustion and process-related CO<sub>2</sub> emissions.

Proposed Option. Under this proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions. Also, refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O.

For facilities that do not currently have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, or where CEMS would not adequately account for combustion and process related CO<sub>2</sub> emissions, the proposed monitoring method for process-related CO<sub>2</sub> from lead production is Option 2. You would be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and



recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from stationary combustion. This section of the preamble provides procedures only for calculating and reporting process-related emissions.

We propose Option 2, due to the operating variations between the individual U.S. lead production facilities, including differences in equipment configurations, mix of lead feedstocks charged, and types of carbon materials used. Further, Option 2 would result in lower uncertainty as compared to applying a default emissions factor based approach to these units.

Although we are not proposing to require you to directly measure process emissions, unless you meet the requirements of proposed 40 CFR part 98, subpart C and the CEMS account for both combustion and process-related emissions, you could opt to use direct measurement of CO<sub>2</sub> emissions as an alternative GHG emissions estimation method because it would best reflect actual operating practices at your facility, and therefore, reduce uncertainty. While we recognize that the costs for conducting direct measurements may be higher than other methods, we are proposing to include this alternative because it provides GHG emissions data that have low uncertainty. The additional cost burden

may be acceptable to owners and operators with site-specific reasons for choosing this alternative.

We decided not to propose the use of the default CO<sub>2</sub> emission factors (Option 1) because their application is more appropriate for GHG estimates from aggregated process information on a sector-wide or nationwide basis than for determining GHG emissions from specific facilities. We considered the additional burden of the material measurements required for the carbon calculations under Option 2 small in relation to the increased accuracy expected from using this site-specific information to calculate the process-related CO<sub>2</sub> emissions.

We also decided not to propose Option 3 because of the potential for significant variations at lead smelters in the characteristics and quantities of the furnace inputs (e.g., lead scrap materials, carbonaceous reducing agents) and process operating parameters. A method using periodic, short-term stack testing would not be practical or appropriate for those lead smelters where the furnace inputs and operating parameters do not remain relatively consistent over the reporting period.

Further details about the selection of the monitoring methods for GHG emissions is available in the Lead Production TSD (EPA-HQ-OAR-2008-0508-018).

#### 4. Selection of Procedures for Estimating Missing Data

For smelting furnaces for which the owner or operator calculates process GHG emissions using site-specific carbonaceous input material data, the proposed rule requires the use of substitute data whenever a quality-assured value of a parameter that is used to calculate GHG emissions is unavailable, or "missing." If the carbon content analysis of carbon inputs is missing or lost the substitute data value would be the average of the quality-assured values of the parameter immediately before and immediately after the missing data period. In those cases when an owner or operator uses direct measurement by a CO<sub>2</sub> CEMS, the missing data procedures would be the same as the Tier 4 requirements described for general stationary fuel combustion sources in proposed 40 CFR part 98, subpart C. The likelihood for missing data is low, as businesses closely track their purchase of production inputs.

#### 5. Selection of Data Reporting Requirements

The proposed rule would require annual reporting of the total annual CO<sub>2</sub> process-related emissions from each smelting furnace at lead production facilities, as well as any stationary fuel combustion emissions. In addition, we are proposing that additional information that forms the basis of the emissions estimates also be reported so that

we can understand and verify the reported emissions. This addition information includes the total number of smelting furnaces operated at the facility, the facility lead product production capacity, the annual facility production quantity, annual quantity and type of carbon-containing input materials consumed or used, annual weighted average carbon contents by material type, and the number of facility operating hours in the calendar year. A complete list of data to be reported is included in proposed 40 CFR part 98, subparts A and R.

#### 6. Selection of Records That Must Be Retained

Maintaining records of the information used to determine the reported GHG emissions is necessary to enable us to verify that the GHG emissions monitoring and calculations were done correctly. In addition to the information reported as described in Section V.R.5 of this preamble, we propose that all facilities estimating emissions according to the carbon input method maintain records of each carbon-containing input material consumed or used (other than fuel) the monthly material quantity, monthly average carbon content determined for material, and records of the supplier provided information or analyses used for the determination. If you use the CEMS procedure, you would maintain the CEMS measurement records according

to the procedures in proposed 40 CFR part 98, subpart C. These records would be required to be maintained onsite for 5 years. A complete list of records to be retained is included in the proposed rule.

#### S. Lime Manufacturing

##### 1. Definition of the Source Category

Lime is an important manufactured product with many industrial, chemical, and environmental applications. Its major uses are in steel making, flue gas desulfurization systems at coal-fired electric power plants, construction, and water purification. Lime is used for the following purposes: metallurgical uses (36 percent), environmental uses (29 percent), chemical and industrial uses (21 percent), construction uses (13 percent), and to make dolomite refractories (1 percent).

For U.S. operations, the term "lime" actually refers to a variety of chemical compounds. These compounds include calcium oxide ( $\text{CaO}$ ), or high-calcium quicklime; calcium hydroxide ( $\text{Ca(OH)}_2$ ), or hydrated lime; dolomitic quicklime ( $(\text{CaO}\cdot\text{MgO})$ ); and dolomitic hydrate ( $(\text{Ca(OH)}_2\cdot\text{MgO})$  or  $(\text{Ca(OH)}_2\cdot\text{Mg(OH)}_2)$ ). Lime manufacturing involves three main processes: stone preparation, calcination, and hydration. During the calcination process, the carbonate in limestone is sufficiently heated and reduced to  $\text{CO}_2$  gas.

In certain applications, lime reabsorbs CO<sub>2</sub> during use thereby reducing onsite GHG emissions.

National emissions from the lime industry were estimated to be 25.4 million metric tons CO<sub>2</sub>e in 2004 (or <0.4 percent of national emissions). These emissions include both process-related emissions and on-site stationary combustion emissions from 89 lime manufacturing facilities across the U.S. and Puerto Rico. Process-related emissions account for 14.3 million metric tons CO<sub>2</sub>e, or 56 percent of the total, while on-site stationary combustion emissions account for the remaining 11.1 million metric tons CO<sub>2</sub>e.

For additional background information on lime manufacturing, please refer to the Lime Manufacturing TSD (EPA-HQ-OAR-2008-0508-019).

## 2. Selection of Reporting Threshold

In developing the proposed reporting threshold for the lime manufacturing source category, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e. This threshold is based on combined combustion and process CO<sub>2</sub> emissions at a lime production facility. Table S-1 of this preamble illustrates the emissions and facilities that would be covered under various thresholds.

**Table S-1. Threshold Analysis for Lime Manufacturing**

Threshold level metric tons CO <sub>2</sub> e/yr	Total national emissions metric tons CO <sub>2</sub> e/yr	Total number of facilities	Emissions covered		Facilities covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	25,421,043	89	25,421,043	100%	89	100%
10,000	25,421,043	89	25,396,036	99.9%	86	97%
25,000	25,421,043	89	25,371,254	99.8%	85	96%
100,000	25,421,043	89	23,833,273	94%	52	58%

The lime manufacturing sector consists primarily of large facilities and a few smaller facilities. All facilities, except four, exceed the 25,000 metric tons CO<sub>2</sub>e threshold.

Consistent with National Lime Association recommendations, and in order to simplify the proposed rule and avoid the need to calculate and report whether the threshold value has been exceeded, we are proposing that all lime manufacturing facilities report GHG emissions. This captures 100 percent of emissions without significantly increasing the number of facilities that would have reported at 1,000, 10,000, or 25,000 metric ton thresholds. For a full discussion of the threshold analysis, please refer to the Lime Manufacturing TSD (EPA-HQ-OAR-2008-0508-019). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating process-related emissions from lime manufacturing (e.g., the 2006 IPCC Guidelines, U.S. Inventory, DOE 1605(b), National Lime Association CO<sub>2</sub> Protocol, and the EU Emissions Trading System). These methodologies can be summarized by the following two overall approaches to estimating emissions, based on measuring either the carbonate inputs to the kiln or production outputs of the lime manufacturing process.

Input-based Options. We considered the IPCC Tier 3 method which requires facilities to estimate process emissions by measuring the quantity of carbonate inputs to the kiln(s) and applying the appropriate emission factors and calcination fractions to the carbonates consumed. In order to assess the composition of carbonate inputs, facilities would send samples of their inputs and lime kiln dust produced to an off-site laboratory for analysis on a monthly basis using ASTM C25-06, "Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime" (incorporated by reference, see proposed 40 CFR 98.7). For greater accuracy, facilities would also estimate the calcination fraction of each carbonate consumed on a monthly basis. However, it is generally



accepted that the calcination fraction of carbonates during lime production is 100 percent or very close to it.

Output-based Options. We also considered three output-based methods for quantifying process-related emissions based on the quantity of lime produced. IPCC's Tier 1 method applies default emission factors to each of the three types of lime produced (high calcium lime, dolomitic lime, or hydraulic lime). The IPCC Tier 2 method applies a default emissions factor based on lime type to the corresponding quantity of all lime produced (by type), correcting for the amount of calcined byproduct/waste product (such as lime kiln dust) produced in the process.

The third output method, developed by the National Lime Association, improves upon the IPCC Tier 2 procedure. In this method, facilities multiply the amount of lime produced at each kiln and the amount of calcined byproducts/wastes at the kiln by an emission factor. The emission factor is derived based on facility specific chemical analysis of the CaO and magnesium oxide (MgO) content of the lime produced at the kiln. To assess the composition of the lime and calcined byproduct/waste product, facilities would send samples to an off-site laboratory for analysis on a monthly basis following the procedures described in the National Lime Association's

method protocol, along with the procedures in ASTM C25-06, "Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime" (incorporated by reference, see proposed 40 CFR 98.7). This third output approach is also consistent with 1605(b)'s "A" rated approach and EU Emission Trading System's calculation B method.

We compared the various methods for estimating process-related CO<sub>2</sub> emissions. In general, the IPCC output methods are less certain, as they involve multiplying production data by emission and correction factors for lime kiln dust that are likely default values based on purity assumptions (i.e. the total CaO and MgO content of the lime products). In contrast, the input method is more certain as it involves measuring the consumption of each carbonate input and calculating purity fractions. According to the 2006 IPCC Guidelines, the uncertainty involved in the carbonate input approach for the IPCC Tier 3 method is 1 to 3 percent and the uncertainty involved in using the default emission factor and lime kiln dust correction factor for the Tier 1 and Tier 2 production-based approaches is 15 percent. However, IPCC states that the major source of uncertainty in the above approaches is the CaO content of the lime produced.

Proposed Option. Under this proposed rule, if you are using an existing CEMS that meets the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate both combustion and process CO<sub>2</sub> emissions. Also, you would refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

Under this proposed rule, if you do not have CEMS that meet the conditions outlined in proposed 40 CFR part 98, subpart C, you would use the National Lime Association method in this section of the preamble to calculate process-related CO<sub>2</sub> emissions. Refer to proposed 40 CFR part 98, subpart C specifically for procedures to estimate combustion-related CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions.

We are proposing the National Lime Association's output-based procedure because this method is already in use by U.S. facilities and the improvement in accuracy compared to default approaches can be achieved at minimal additional cost. The measurement of production quantities is common practice in the industry and is usually measured through the use of scales or weigh belts so additional

costs to the industry are not anticipated. The primary additional burden for facilities would include conducting a CaO and MgO analysis of each lime product on a monthly basis (to be averaged on an annual basis). However, approximately two thirds of the lime manufacturing facilities in the U.S. are already undertaking sampling efforts to meet reporting goals set forth by the National Lime Association.

We request comment on the advantages and disadvantages of the IPCC Tier 3 method and supporting documentation. After consideration of public comments, we may promulgate the IPCC Tier 3 input-based procedure, the National Lime Association output-based procedure, or a combination based on additional information that is provided.

The various approaches to monitoring GHG emissions are elaborated in the Lime Manufacturing TSD (EPA-HQ-OAR-2008-0508-019).

#### 4. Selection of Procedures for Estimating Missing Data

It is assumed that a facility would be able to supply facility-specific production data. Since the likelihood for missing data is low because businesses closely track production, 100 percent data availability is required for lime production (by type) in the proposed rule. If analysis for the CaO and MgO content of the lime product

are unavailable or "missing", facility owners or operators would substitute a data value that is the average of the quality-assured values of the parameter immediately before and immediately after the missing data period.

#### 5. Selection of Data Reporting Requirements

We propose that in addition to stationary fuel combustion GHG emissions, you report annual CO<sub>2</sub> emissions for each kiln. In addition, for each kiln we are proposing that facilities report the following data used as the basis of the calculations to assist in verification of estimates, checks for reasonableness, and other data quality considerations for process emissions: annual lime production and production capacity, emission factor by lime type, and number of operating hours in the calendar year. A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and S.

#### 6. Selection of Records That Must Be Retained

Maintaining records of the information used to determine the reported GHG emissions are necessary to enable us to verify that the GHG emissions monitoring and calculations were done correctly. In addition to the data to be reported, we are proposing that the facilities maintain records of the calculation of emission factors, results of the monthly chemical composition analyses, total

lime production for each kiln by month and type, total annual calcined byproducts/wastes produced by each kiln averaged from monthly data, and correction factor for byproducts/waste products for each kiln. A full list of records that must be retained onsite is included in proposed 40 CFR part 98, subparts A and S.

#### T. Magnesium Production

##### 1. Definition of the Source Category

Magnesium is a high-strength and light-weight metal that is important for the manufacture of a wide range of products and materials, such as portable electronics, automobiles, and other machinery. The U.S. accounts for less than 10 percent of world primary magnesium production but is a significant importer of magnesium and producer of cast parts. The production and processing of magnesium metal under common practice results in emissions of SF<sub>6</sub>. For further information, see the Magnesium Production TSD (EPA-HQ-OAR-2008-0508-020).

The magnesium metal production (primary and secondary) and casting industry typically uses SF<sub>6</sub> as a cover gas to prevent the rapid oxidation and burning of molten magnesium in the presence of air. A dilute gaseous mixture of SF<sub>6</sub> with dry air and/or CO<sub>2</sub> is blown over molten magnesium metal to induce and stabilize the formation of a protective

crust. A small portion of the SF<sub>6</sub> reacts with the magnesium to form a thin molecular film of mostly magnesium oxide and magnesium fluoride. The amount of SF<sub>6</sub> reacting in magnesium production and processing is under study but is presently assumed to be negligible. Thus, all SF<sub>6</sub> used is presently assumed to be emitted into the atmosphere.

Cover gas systems are typically used to protect the surface of a crucible of molten magnesium that is the source for a casting operation and to protect the casting operation itself (e.g., ingot casting). SF<sub>6</sub> has been used in this application in most parts of the world for the last twenty years. Due to increasing awareness of the GWP of SF<sub>6</sub>, the magnesium industry has begun exploring climate-friendly alternative melt protection technologies. At this time the leading alternatives include HFC-134a, a fluorinated ketone (FK 5-1-12, C<sub>3</sub>F<sub>7</sub>C(O)C<sub>2</sub>F<sub>5</sub>), and dilute sulfur dioxide (SO<sub>2</sub>). The application of the fluorinated alternatives mentioned here may generate byproduct emissions of concern including PFCs. We are proposing that magnesium production and processing facilities report process emissions of SF<sub>6</sub>, HFC-134a, FK 5-1-12, and CO<sub>2</sub>.

Total U.S. emissions of SF<sub>6</sub> from magnesium production and processing in the U.S. were estimated to be 3.2 metric tons CO<sub>2</sub>e in 2006. Primary and secondary production

activities at 3 facilities accounted for about 64 percent of total emissions, or 2 metric tons CO<sub>2</sub>e. Approximately 20 magnesium die casting facilities in the U.S. accounted for more than 30 percent, or more than 0.9 metric tons CO<sub>2</sub>e of total magnesium-related SF<sub>6</sub> emissions. Other smaller casting activities such as sand and permanent mold casting accounted for the remaining magnesium-related emissions of SF<sub>6</sub>. The term "metal processed" used here is defined as the mass of magnesium melted to cast or create parts. This should not be confused with the mass of finished magnesium parts because varying amounts of the metal may be lost as scrap when performing casting operations.

## 2. Selection of Reporting Threshold

We considered emissions thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e as well as capacity based thresholds as shown in Tables T-1 and T-2 of this preamble.

**Table T-1. Threshold Analysis for Mg Production Based On Emissions**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total Nationwide Emissions metric tons CO <sub>2</sub> e/Yr	Nationwide Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Facilities	Percent
1,000	3,200,000	13	2,954,559	92%	13	100%
10,000	3,200,000	13	2,939,741	92%	11	85%
25,000	3,200,000	13	2,939,741	92%	11	85%
100,000	3,200,000	13	2,872,982	90%	9	69%

We believe that there are additional facilities than the 13 listed above, however, we do not have sufficient information to estimate emissions or production levels.



**Table T-2. Threshold Analysis for Mg Production Based On Mg Production Capacity**

Capacity Threshold Level Mg/yr	Total Nationwide Emissions metric tons CO <sub>2</sub> e/Yr	Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Facilities	Percent
26	3,200,000	13	2,954,559	92%	13	100%
262	3,200,000	13	2,949,732	92%	12	92%
656	3,200,000	13	2,949,732	92%	12	92%
2,622	3,200,000	13	2,780,717	87%	9	69%

We believe that there are additional facilities than the 13 listed above, however, we do not have sufficient information to estimate emissions or production levels.

Under the proposed rule, magnesium metal production and parts casting facilities would have to report their total GHG emissions if those emissions exceeded 25,000 metric tons CO<sub>2</sub>e. This threshold covers all currently identified operating U.S. primary and secondary magnesium producers and most die casters, accounting for over 99 percent of emissions from these source categories.

The proposed emissions threshold of 25,000 metric tons CO<sub>2</sub>e is equal to emissions of 1,046 kg of SF<sub>6</sub>; 19,231 kg of HFC-134a; or 25,000,000 kg of CO<sub>2</sub> or FK 5-1-12. Other emission threshold options that we considered were 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e. The 10,000 metric tons CO<sub>2</sub>e emission threshold yielded results identical to those of the proposed option.

We also considered capacity-based thresholds of 26, 262, 656, and 2,622 metric tons, based on 100 percent

capacity utilization and an SF<sub>6</sub> emission rate of 1.6 kg SF<sub>6</sub> per metric ton of magnesium produced or processed. This emission factor represents the sum of (1) the average of the emission factors reported for secondary production and die casting through our magnesium Partnership (excluding outliers), and (2) the standard deviation of those emission factors. The 1.6 kg-per-ton factor is higher than most, though not all, of the emission factors reported, which ranged from 0.7 to 7 kg/ton Mg in 2006. The resulting capacity thresholds yielded results very similar to those of the emission-based thresholds.

The emissions based threshold was selected over the capacity based threshold for several reasons. The emissions based threshold is simple to evaluate because magnesium production and processing facilities can use readily available data regarding consumption of SF<sub>6</sub> and would also possess similar data for alternatives such as HFC-134a as these are phased-in over time. To determine whether they exceeded the thresholds, magnesium facilities would multiply the total consumption of each of these gases by a GWP-unit conversion factor that could be compared to the 25,000 metric ton threshold. The equation for this calculation is provided in the proposed regulatory text.

The emissions-based threshold of 25,000 metric tons CO<sub>2</sub>e also takes into account the variability in cover gas identities, usage rates, and process conditions. Alternatives to SF<sub>6</sub> have considerably lower GWPs than SF<sub>6</sub>. In facilities where SF<sub>6</sub> is used, the usage rate can vary by an order of magnitude depending on the casting process and operating conditions. Therefore, cover gas emissions are not well predicted by production capacity. Because emissions of each cover gas are assumed to equal use, and facilities are expected to track gas use in the ordinary course of business, facilities should have little difficulty determining whether or not they must report under this rule. For a full discussion of the threshold analysis, please refer to the Magnesium Production TSD (EPA-HQ-OAR-2008-0508-020). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

We reviewed a wide range of protocols and guidance in developing this proposal, including the 2006 IPCC Guidelines, EPA's SF<sub>6</sub> Emission Reduction Partnership for the Magnesium Industry, the U.S. GHG Inventory, DOE 1605(b), EPA's Climate Leaders Program, and TCR.

The methods described in these protocols and guidance were similar to the methods described by the IPCC Guidelines and the U.S. GHG Inventory methodology. These methods range from a Tier 1 approach, based on default consumption factors per unit Mg produced or processed, to a Tier 3 approach based on facility-specific measured emissions data.

Under this proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions. Also, refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

For facilities that do not currently have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, or where the CEMS would not adequately account for process emissions, you would be required to follow the proposed monitoring method discussed below. The proposed method outlined below accounts for process-related SF<sub>6</sub>, HFC-

134a, FK 5-1-12, and CO<sub>2</sub> emissions. Refer to proposed 40 CFR part 98, subpart C specifically for procedures to estimate combustion-related CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions.

The proposed method for monitoring SF<sub>6</sub>, HFC-134a, FK 5-1-12, and CO<sub>2</sub> cover gas emissions from magnesium production and processing is similar to the Tier 2 approach in the 2006 IPCC Guidelines for magnesium production. This approach is based on facility-specific information on cover gas consumption and assumes that all gases consumed are emitted. This methodology applies to any cover gas that is a GHG, including SF<sub>6</sub>, CO<sub>2</sub>, HFC-134a and FK 5-1-12.

We propose three options for measuring gas consumption:

1. Weighing gas cylinders as they are brought into and out of service allowing a facility to accurately track the actual mass of gas used.
2. Using a mass flow meter to continuously measure the mass of global warming gases used.
3. Performing a facility level mass balance for all global warming gases used at least once annually. Using this approach, a facility would review its gas purchase records and inventory to determine actual mass of gas used and subtract a 10 percent default heel factor to account

for residual gas in cylinders returned to the gas suppliers.

When weighing cylinders to determine cover gas consumption, facilities would weigh all gas cylinders that are returned to the gas supplier, or have the gas supplier weigh the cylinders, to determine the residual gas still in the cylinder. The weight of residual gas would be subtracted from the weight of gas delivered to determine gas consumption. Gas suppliers can provide detailed monthly spreadsheets with exact residual gas amounts returned.

Facilities would be required to follow several procedures to ensure the quality of the consumption data. These procedures could be readily adopted, or would be based on information that is already collected for other reasons. Facilities would be required to track specific cylinders leaving and entering storage with check-out and weigh-in sheets and procedures. Scales used for weighing cylinders and mass flow meters would need to be accurate to within 1 percent of true mass, and would be periodically calibrated. Facilities would calculate the facility usage rate, compare it to known default emission rates and historical data for the facility, and investigate any anomalies in the facility usage rate. Finally, facilities

would need to have procedures to ensure that all production lines have provided information to the manager compiling the emissions report, if this is not already handled through an electronic inventory system.

We are not proposing IPCC's Tier 1 or 3 methodologies for calculating emissions. Although the Tier 1 methodology is straightforward, the default consumption factor for the SF<sub>6</sub> usage rate is significantly uncertain due to the variability in production processes and operating conditions. The Tier 3 methodology of conducting facility-specific measurements of emissions to account for potential cover gas destruction and byproduct formation is the most accurate, but also poses significant economic challenges for implementation because of the cost of direct emission measurements.

#### 4. Selection of Procedures for Estimating Missing Data

In general, it is unlikely that cover gas consumption data would be missing. Facilities are expected to know the quantities of cover gas that they consume because facility operations rely on accurate monitoring and tracking of costs. Facilities would possess invoices from gas suppliers during a given year and many facilities currently track the weight of SF<sub>6</sub> consumed by weighing individual cylinders prior to replacement.

However, where cover gas consumption information is missing, we propose that facilities estimate emissions by multiplying production by the average cover gas usage rate (kg gas per ton of magnesium produced or processed) from the most recent period when operating conditions were similar to those for the period for which the data are missing, i.e., using the same cover gas concentrations and flow rates and, if applicable, casting parts of a similar size.

#### 5. Selection of Data Reporting Requirements

Facilities would be required to report total facility GHG emissions and emissions by process type: primary production, secondary production, die casting, or other type of casting. For total facility and process emissions, emissions would be reported in metric tons of SF<sub>6</sub>, HFC-134a, FK 5-1-12, and CO<sub>2</sub> (used as a carrier gas).

Along with their total emissions from cover gas use, facilities would be required to submit supplemental data (as well as the supplemental data required in the combustion and calcination sections) including the type of production processes (e.g., primary, secondary, die casting), mass of magnesium produced or processed in metric tons for each process type, cover gas flow rate and



composition, and mass of any CO<sub>2</sub> used as a carrier gas during reporting period.

If data were missing, facilities would be required to report the length of time the data were missing, the method used to estimate emissions in their absence, and the quantity of emissions thereby estimated. Facilities would also submit an explanation for any significant change in emission rate. Examples could include installation of new melt protection technology that would account for reduced emissions in any given year, or occurrence or repair of leaks in the cover gas delivery system.

These non-emissions data need to be reported because they are needed to understand the nature of the facilities for which data are being reported and for verifying the reasonableness of the reported data.

#### 6. Selection of Records That Must Be Retained

We are proposing that magnesium producers and processors be required to keep records documenting adherence to the QA/QC requirements specified in the proposed rule. These records would include: check-out and weigh-in sheets and procedures for cylinders; accuracy certifications and calibration records for scales; residual gas amounts in cylinders sent back to suppliers; and invoices for gas purchases and sales.

These records are being specified because they are the values that are used to calculate the GHG emissions that are reported. They are necessary to verify that the GHG emissions monitoring and calculations were done correctly and accurately.

#### U. Miscellaneous Uses of Carbonates

##### 1. Definition of the Source Category

Limestone ( $\text{CaCO}_3$ ), dolomite ( $\text{CaMg}(\text{CO}_3)_2$ ) and other carbonates are inputs used in a number of industries. The most common applications of limestone are use as a construction aggregate (78 percent of specified national consumption in 2006), the chemical and metallurgy industries (18 percent), and other specialized applications (three percent). The breakdown of reported specified dolomite national consumption was similar to that of limestone, with the majority being used as a construction aggregate, and a lesser but still significant percent used in chemical and metallurgical applications.

For some of these applications, the carbonates undergo a calcination process in which the carbonate is sufficiently heated, generating  $\text{CO}_2$  as a by-product. Examples of such emissive applications include limestone used as a flux or purifier in metallurgical furnaces, as a sorbent in flue gas desulfurization systems for utility and

industrial plants, and as a raw material in the production of mineral wool or magnesium. Non-emissive applications include limestone used in producing poultry grit and asphalt filler.

The use of limestone, dolomite and other carbonates is purely an industrial process source of emissions.

Emissions from the use of carbonates in the manufacture of cement, ferroalloys, glass, iron and steel, lead, lime, pulp and paper, and zinc are elaborated in proposed 40 CFR part 98, subparts H, K, N, Q, R, S, AA and GG, since they are relatively significant emitters. Facilities that include only these source categories would not need to follow the methods presented in this section to estimate emissions from the miscellaneous use of carbonates. The methods presented in this section should be used by facilities that use carbonates in source categories other than those listed above, but which are covered by the proposed rule.

As estimated in the U.S. GHG Inventory, national process emissions from other limestone and dolomite uses (i.e. excluding cement, lime, and glass manufacturing) were 7.9 million metric tons CO<sub>2</sub>e in 2006 (0.1 percent of U.S. emissions). CH<sub>4</sub> and N<sub>2</sub>O are not released from the calcination of carbonates.

For additional background information on the use of limestone, dolomite and other carbonates, please refer to the Miscellaneous Uses of Carbonates TSD (EPA-HQ-OAR-2008-0508-021).

## 2. Selection of Reporting Threshold

A separate threshold analysis is not proposed for uses of limestone, dolomite and other carbonates as these emissions occur in a large number of facilities across a range of industries. We propose that facilities with source categories identified in proposed 40 CFR 98.2(a)(1) or (a)(2) consuming limestone, dolomite and other carbonates calculate the relevant emissions from their facility, including emissions from calcination of carbonates, to determine whether they surpass the proposed threshold for that industry. Data were not available to quantify emissions from the calcination of carbonates across all industries; therefore, these emissions were considered where appropriate in the thresholds analysis for the respective industries.

## 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating process-related emissions from the use of limestone, dolomite and other carbonates (e.g., the 2006

IPCC Guidelines, U.S. Inventory, DOE 1605(b), the EU Emissions Trading System, and the Australian National Greenhouse Gas Reporting Program). These methodologies all rely on measuring the consumption of carbonate inputs, but differ in their use of default values. The range of default values reflect differing assumptions of the carbonate weight fraction in process inputs; for example, the 2006 IPCC Guidelines Tier 1 and 2 assume that carbonate inputs are 95 percent pure (i.e., 95 percent of the mass consumed is carbonate), whereas the Australian Program assumes a default purity of 90 percent for limestone, 95 percent for dolomite, and 100 percent for magnesium carbonate.

We propose that facilities estimate process emissions by measuring the type and quantity of carbonate input to a kiln or furnace and applying the appropriate emissions factors for the carbonates consumed. In order to assess the composition of the carbonate input, we propose that facilities send samples of each carbonate consumed to an off-site laboratory for a chemical analysis of the carbonate weight fraction on an annual basis. Emission factors are based on stoichiometry and are presented in Table U-1 of this preamble. You would also be required to determine the calcination fraction for each of the

carbonate-based minerals consumed, using an appropriate test method. The calcination fraction is the fraction of carbonate that is volatilized in the process. A calcination fraction of 1.0 could over estimate CO<sub>2</sub> emissions. You would refer to proposed 40 CFR part 98, subpart C specifically for procedures to estimate combustion-related CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions.

**Table U-1. CO<sub>2</sub> Emission Factors for Common Carbonates**

<b>Mineral Name - Carbonate</b>	<b>CO<sub>2</sub> Emission Factor (metric tons CO<sub>2</sub>/metric tons on carbonate)</b>
Limestone - CaCO <sub>3</sub>	0.43971
Magnesite - MgCO <sub>3</sub>	0.52197
Dolomite - CaMg(CO <sub>3</sub> ) <sub>2</sub>	0.47732
Siderite - FeCO <sub>3</sub>	0.37987
Ankerite - Ca(Fe,Mg,Mn)(CO <sub>3</sub> ) <sub>2</sub>	0.44197*
Rhodochrosite - MnCO <sub>3</sub>	0.38286
Sodium Carbonate/Soda Ash - Na <sub>2</sub> CO <sub>3</sub>	0.41492

\* This is an average of the range provided by the 2006 IPCC Guidelines.

We also considered but decided not to propose simplified methods (similar to IPCC Tier 1 and 2) for quantifying process-related emissions from this source, which assumes that limestone and dolomite are the only carbonates consumed, and allow for the use of default fractions of the two carbonates (85 percent for limestone and 15 percent for dolomite). Default factors do not account for variability in relative carbonate consumption by other sources and therefore inaccurately estimate emissions.

The various approaches to monitoring GHG emissions are elaborated in the Miscellaneous Uses of Carbonates TSD (EPA-HQ-OAR-2008-0508-021).

#### 4. Selection of Procedures for Estimating Missing Data

We propose that 100 percent data availability is required. If chemical analysis on the fraction calcination of carbonates consumed were lost or missing, the analysis would have to be repeated. It is assumed that a facility would be able to supply facility-specific carbonate consumption data. The likelihood for missing data is low, as businesses closely track production inputs.

#### 5. Selection of Data Reporting Requirements

We propose that facilities report annual CO<sub>2</sub> emissions from carbonate consumption. In addition, we are proposing that facilities submit the following data which are the basis of the emission calculation and are needed for us to understand the emissions data and assess the reasonableness of the reported emissions: annual carbonate consumption (in metric tons, by carbonate) and the total fraction of calcination achieved (for each carbonate). A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and U.

#### 6. Selection of Records That Must Be Retained

We propose that facilities retain records on monthly carbonate consumption (by type), annual records on the fraction of calcination achieved (by carbonate type), and results of the annual chemical analysis. These records provide values that are directly used to calculate the emissions that are reported and are necessary to allow determination of whether the GHG emissions monitoring and calculations were done correctly. A full list of records that must be retained onsite is included in proposed 40 CFR part 98, subparts A and U.

#### V. Nitric Acid Production

##### 1. Definition of the Source Category

Nitric acid is an inorganic chemical that is used in the manufacture of nitrogen-based fertilizers, adipic acid, and explosives. Nitric acid is also used for metal etching and processing of ferrous metals. A nitric acid production facility uses oxidation, condensation, and absorption to produce a weak nitric acid (30 to 70 percent in strength). The production process begins with the stepwise catalytic oxidation of ammonia ( $\text{NH}_3$ ) through nitric oxide ( $\text{NO}$ ) to nitrogen dioxide ( $\text{NO}_2$ ) at high temperatures. Then the  $\text{NO}_2$  is absorbed in and reacted with water ( $\text{H}_2\text{O}$ ) to form nitric acid ( $\text{HNO}_3$ ).



According to a facility-level inventory for 2006, there are 45 nitric acid production facilities operating in 25 States with a total of 65 process lines. These facilities represent the best available data at the time of this rulemaking. Using the facility-level inventory, production levels for 2006 have been estimated at 6.6 million metric tons of nitric acid and indicate an estimated 17.7 million metric tons CO<sub>2</sub>e of process-related emissions (this represents the CO<sub>2</sub> equivalent of N<sub>2</sub>O emissions, which is the primary process-related GHG). Nitric Acid process emissions were estimated in the U.S. GHG Inventory at 15.4 million metric tons CO<sub>2</sub>e in 2006 or 0.2 percent of total U.S. GHG emissions. The main reason for the difference in estimates is that the methodology of the U.S. Inventory assumed 20 percent of the nitric acid facilities were using nonselective catalytic reduction as an N<sub>2</sub>O abatement technology. The facility-level analysis showed that only five percent of the nitric acid facilities are using nonselective catalytic reduction.

Stationary combustion emissions were not estimated at the source category level in the U.S. GHG Inventory. Stationary combustion emissions at nitric acid facilities may be associated with other chemical production processes

as well (such as adipic acid production, phosphoric acid production, or ammonia manufacturing).

For additional background information on nitric acid production, please refer to the Nitric Acid Production TSD (EPA-HQ-OAR-2008-0508-022).

## 2. Selection of Reporting Threshold

In developing the proposed threshold for nitric acid production, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e. Table V-1 of this preamble illustrates the emissions and facilities that would be covered under these various thresholds.

**Table V-1. Threshold Analysis for Nitric Acid Production**

N <sub>2</sub> O emission threshold (metric tons CO <sub>2</sub> e)	Process N <sub>2</sub> O emissions covered (metric tons CO <sub>2</sub> e/yr)		Facilities covered	
	Number	Percent	Number	Percent
1,000	17,731,650	100	45	100
10,000	17,723,576	99.9	44	97.8
25,000	17,706,259	99.9	43	95.6
100,000	17,511,444	98.8	40	88.9

We are proposing all nitric acid facilities report in order to simplify the rule and avoid the need for each facility to calculate and report whether it exceeds the threshold value. Facility-level emissions estimates based on plant production suggests that all known facilities, except two, exceed the 25,000 metric tons CO<sub>2</sub>e threshold. When facility-level production data were not known,

capacity data were used along with a utilization factor of 70 percent. The utilization factor is based on total 2006 nitric acid production from the U.S. Census Bureau and capacity estimates from publicly available sources.

This analysis, however, only took into account process-related emissions, as combustion-related emissions were not available. Had combustion-related emissions been included, it is probable that additional facilities would have been covered at each threshold. An "all in" threshold captures 100 percent of emissions without significantly increasing the number of facilities required to report. Finally, the cost of reporting using the proposed monitoring method does not vary significantly between the four different emissions based thresholds.

For a full discussion of the threshold analysis, please refer to the Nitric Acid Production TSD (EPA-HQ-OAR-2008-0508-022). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating these emissions (e.g. 2006 IPCC Guidelines, U.S.

GHG Inventory, DOE 1605(b), TCR, and EPA NSPS). These methodologies coalesce around the five options discussed below.

Option 1. Apply default emission factors to total facility production of nitric acid using the Tier 1 approach established by the IPCC. The emissions are calculated using the total production of nitric acid and the highest international default emission factor available in the 2006 IPCC Guidelines, based on technology type. It also assumes no abatement of N<sub>2</sub>O emissions.

Option 2. Apply default emission factors on a site-specific basis using the Tier 2 approach established by the IPCC. This approach is also consistent with the DOE 1605(b) "B" rated approach. These emission factors are dependent on the type of nitric acid process used, the type of abatement technology used, and the production activity. The process-related N<sub>2</sub>O emissions are then estimated by multiplying the emission factor by the production level of nitric acid (on a 100 percent acid basis).

Option 3. Follow the Tier 3 approach established by IPCC using periodic direct monitoring of N<sub>2</sub>O emissions to determine the relationship between nitric acid production and the amount of N<sub>2</sub>O emissions; i.e., develop a site-specific emissions factor. The site-specific emission

factor would be determined from an annual measurement or a single annual stack test. The site-specific emissions factor developed from this test and production rate (activity level) is used to calculate N<sub>2</sub>O emissions. After the initial test, annual testing of N<sub>2</sub>O emissions would be required each year to estimate the emission factor and applied to production to estimate emissions. The yearly testing would assist in verifying the emission factor. Testing would also be required whenever the production rate is changed by more than 10 percent from the production rate measured during the most recent performance test.

Option 4. Follow the approach used by the Nitric Acid NSPS (40 CFR part 60, subpart G). This option would require monitoring NO<sub>x</sub> emissions on a continuous basis and measuring N<sub>2</sub>O emissions to establish a site-specific emission factor that relates NO<sub>x</sub> emissions to N<sub>2</sub>O emissions. The emission factor would then be used to estimate N<sub>2</sub>O emissions based on continuous reading of NO<sub>x</sub> emissions. Periodic measurement would also be required to verify the emission factor over time. Testing would also be required whenever the production rate is changed by more than 10 percent from the production rate measured during the most recent performance test.

Option 5. Follow the Tier 3 approach established by IPCC using continuous monitoring. Use CEMS to directly measure N<sub>2</sub>O concentration and flow rate to directly determine N<sub>2</sub>O emissions. CEMS that measure N<sub>2</sub>O emissions directly are available, but the nitric acid industry is currently using only NO<sub>x</sub> CEMS.

Proposed Option. We are proposing Option 3 to quantify N<sub>2</sub>O process emissions from all nitric acid facilities. You would be required to follow the requirements in proposed 40 CFR part 98, subpart C to estimate emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O from stationary combustion. We identified Options 3, 4, and 5 as the approaches providing the highest certainty and the best site-specific estimates. These three options span the range of types of methodologies currently used that do not apply default values. These options all use site-specific approaches that would provide insight into different levels of emissions caused by site-specific differences in process operation and abatement technologies. Option 3 requires an annual test of N<sub>2</sub>O emissions and the establishment of a site-specific emissions factor that relates N<sub>2</sub>O emissions with the nitric acid production rate.

Options 4 and 5 are similar in that both use continuous monitoring to calculate N<sub>2</sub>O emissions. Option 5

directly measures the N<sub>2</sub>O emissions. Option 4 uses continuous measurement of NO<sub>x</sub> emissions to estimate a site-specific emission factor that relates NO<sub>x</sub> emissions to N<sub>2</sub>O emissions. The emission factor is then used to estimate N<sub>2</sub>O emissions based on continuous readings of NO<sub>x</sub> emissions.

Option 5 would provide the highest certainty of the three options and capture the smallest changes in N<sub>2</sub>O emissions over time, but N<sub>2</sub>O CEMS are not currently in use in the industry and there is no existing EPA method for certifying N<sub>2</sub>O CEMS. Option 3 and Option 4 use site-specific emission factors so the margin of error is much lower than using default emission factors. Option 4 would require the use of NO<sub>x</sub> CEMS that are already in use by many nitric acid facilities to automatically capture and record any changes in NO<sub>x</sub> emissions over time. However, NO<sub>x</sub> CEMS only capture emissions of NO and NO<sub>2</sub> and not N<sub>2</sub>O. Therefore they would not be useful in the estimation of N<sub>2</sub>O emissions from nitric acid production facilities. Although the amount of NO<sub>x</sub> and N<sub>2</sub>O emissions from nitric acid production may be directly related, direct measurement of NO<sub>x</sub> does not automatically correlate to the amount of N<sub>2</sub>O in the same exhaust stream. Periodic testing of N<sub>2</sub>O emissions (Option 3) would not indicate changes in emissions over short

periods of time, but does offer direct measurement of the GHG.

We request comment, along with supporting documentation, on the advantages and disadvantages of using Options 3, 4 and 5. After consideration of public comments, EPA may promulgate one or more of these options or a combination based on the additional information that is provided.

We decided not to propose Options 1 and 2 because the use of default values and lack of direct measurements results in a high level of uncertainty. Although different default emissions factors have been developed for different processes (e.g., low pressure, high pressure) and abatement techniques, the use of these default values is more appropriate for sector wide or national total estimates than for determining emissions from a specific facility. Site-specific emission factors are more appropriate for reflecting differences in process design and operation.

The various approaches to monitoring GHG emissions are elaborated in the Nitric Acid Production TSD (EPA-HQ-OAR-2008-0508-022).

#### 4. Selection of Procedures for Estimating Missing Data

For process sources that use a site-specific emission factor, no missing data procedures would apply because the



site-specific emission factor is derived from an annual performance test and used in each calculation. The emission factor would be multiplied by the production rate, which is readily available. If the test data is missing or lost, the test would have to be repeated. Therefore, 100 percent data availability would be required.

#### 5. Selection of Data Reporting Requirements

We propose that facilities report annual N<sub>2</sub>O emissions (in metric tons) from each nitric acid production line. In addition, we propose that facilities submit the following data to understand the emissions data and verify the reasonableness of the reported emissions. The data should include annual nitric acid production capacity, annual nitric acid production, type of nitric acid production process used, number of operating hours in the calendar year, the emission rate factor used, abatement technology used (if applicable), abatement technology efficiency, and abatement utilization factor.

Capacity, actual production, and operating hours would be helpful in determining the potential for growth in the nitric acid industry. The production rate can be determined through sales records or by direct measurement using flow meters or weigh scales. This industry generally

measures the production rate as part of normal operating procedures.

A list of abatement technologies would be helpful in assessing how widespread the use of abatement is in the nitric acid source category, cataloging any new technologies that are being used, and documenting the amount of time that the abatement technologies are being used.

A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and V.

#### 6. Selection of Records That Must Be Retained

We propose that facilities maintain records of significant changes to process, N<sub>2</sub>O abatement technology used, abatement technology efficiency, abatement utilization factor (percent of time that abatement system is operating), annual testing of N<sub>2</sub>O emissions, calculation of the site-specific emission rate factor, and annual production of nitric acid.

A full list of records that must be retained onsite is included in proposed 40 CFR part 98, subparts A and V.

#### W. Oil and Natural Gas Systems

##### 1. Definition of the Source Category

The U.S. petroleum and natural gas industry encompasses hundreds of thousands of wells, hundreds of

processing facilities, and over a million miles of transmission and distribution pipelines. This section of the preamble identifies relevant facilities and outlines methods and procedures for calculating and reporting fugitive emissions (as defined in this section) of CH<sub>4</sub> and CO<sub>2</sub> from the petroleum and natural gas industry. Methods and reporting procedures for emissions resulting from natural gas or crude oil combustion in prime movers such as compressors are covered under Section V.C of this preamble.

The natural gas segment involves production, processing, transmission and storage, and distribution of natural gas. The U.S. also receives, stores, and processes imported liquefied natural gas (LNG) at LNG import terminals. The petroleum segment involves crude oil production, transportation and refining.

The relevant facilities covered in this section are offshore petroleum and natural gas production facilities, onshore natural gas processing facilities (including gathering/boosting stations), onshore natural gas transmission compression facilities, onshore natural gas storage facilities, LNG storage facilities, and LNG import facilities. Fugitive emissions from petroleum refineries are proposed for inclusion in the rulemaking, but these emissions are addressed in the petroleum refinery section

(Section V.Y) of this preamble. Under this section of the preamble, we seek comment on methods for reporting fugitive emissions data from: on-shore petroleum and natural gas production and natural gas distribution facilities.

For this rulemaking, fugitive emissions from the petroleum and natural gas industry are defined as unintentional equipment emissions and intentional or designed releases of CH<sub>4</sub>- and/or CO<sub>2</sub>-containing natural gas or hydrocarbon gas (not including combustion flue gas) from emissions sources including, but not limited to, open ended lines, equipment connections or seals to the atmosphere. In the context of this rule, fugitive emissions also mean CO<sub>2</sub> emissions resulting from combustion of natural gas in flares. These emissions are hereafter collectively referred to as "fugitive emissions" or "emissions". We seek comment on the proposed definition of fugitives, which is derived from the definition of fugitive emissions outlined in the 2006 IPCC Guidelines for National GHG Inventories, and is often used in the development of GHG inventories. We acknowledge that there are multiple definitions for fugitives, for example, defining the term fugitives to include "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening". According to the 2008 U.S.

Inventory, total fugitive emissions of CH<sub>4</sub> and CO<sub>2</sub> from the natural gas and petroleum industry were 160 metric tons CO<sub>2</sub>e in 2006. The breakdown of these fugitive emissions is shown in Table W-1 of this preamble.

**Table W-1. Fugitive Emissions from Petroleum and Natural Gas Systems (2006)**

Sector	Fugitive CH <sub>4</sub> (MMTCO <sub>2</sub> e)	Fugitive CO <sub>2</sub> (MMTCO <sub>2</sub> e)
Natural Gas Systems <sup>1</sup>	102.4	28.5
Petroleum Systems	28.4	0.3

<sup>1</sup> Emissions account for Natural Gas STAR Partner Reported Reductions

Natural gas system fugitive CH<sub>4</sub> emissions resulted from onshore and offshore natural gas production facilities (27 percent); onshore natural gas processing facilities (12 percent); natural gas transmission and underground natural gas storage, including LNG import and LNG storage facilities (37 percent); and natural gas distribution facilities (24 percent). Natural gas segment fugitive CO<sub>2</sub> emissions were primarily from onshore natural gas processing facilities (74 percent), followed by onshore and offshore natural gas production facilities (25 percent), and less than 1 percent each from natural gas transmission and underground natural gas storage and distribution facilities<sup>80</sup>.

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<sup>80</sup> The distribution of CO<sub>2</sub> emissions is slightly misleading due to current U.S. Inventory convention which assumes that all CO<sub>2</sub> from natural gas processing facilities is emitted. In fact, approximately 7,000 metric tons CO<sub>2</sub>e is captured and used for EOR.

Petroleum segment fugitive CH<sub>4</sub> emissions are primarily associated with onshore and offshore crude oil production facilities (>97 percent of emissions) and petroleum refineries (2 percent) and are negligible in crude oil transportation facilities (<0.5 percent). Petroleum segment fugitive CO<sub>2</sub> emissions are only estimated for onshore and offshore production facilities.

With over 160 different sources of fugitive CH<sub>4</sub> and CO<sub>2</sub> emissions in the petroleum and natural gas industry, identifying those sources most relevant for a reporting program was a challenge. We developed a decision tree analysis and undertook a systematic review of each emissions source category included in the Inventory of U.S. GHG Emissions and Sinks. In determining the most relevant fugitive emissions sources for inclusion in this reporting program, we applied the following criteria: the coverage of fugitive emissions for the source category as a whole, the coverage of fugitive emissions per unit of the source category, feasibility of a viable monitoring method, including direct measurement and engineering estimations, and an administratively manageable number of reporting facilities.

Another factor we considered in assessing the applicability of certain petroleum and natural gas industry

fugitive emissions in a mandatory reporting program is the definition of a facility. In other words, what physically constitutes a facility? This definition is important to determine who the reporting entity would be, and to ensure that delineation is clear and double counting of fugitive emissions is minimized. For some segments of the industry, identifying the facility is clear since there are physical boundaries and ownership structures that lend themselves to identifying scope of reporting and responsible reporting entities (e.g., onshore natural gas processing facilities, natural gas transmission compression facilities, and offshore petroleum and natural gas facilities). In other segments of the industry, such as the pipelines between compressor stations, and more particularly onshore petroleum and natural gas production, such distinctions are not straightforward. In defining a facility, we reviewed current definitions used in the CAA and ISO definitions, consulted with industry, and reviewed current regulations relevant to the industry. The full results of our assessment can be found in the Oil and Natural Gas Systems TSD (EPA-HQ-OAR-2008-0508-023).

Following is a brief discussion of the proposed selected and excluded sources based on our analysis. Additional information can be found in the Oil and Natural

Gas Systems TSD (EPA-HQ-OAR-2008-0508-023). This section of the preamble addresses only fugitive emissions. Combustion-related emissions are discussed in Section V.C of this preamble.

Offshore Petroleum and Natural Gas Production Facilities. Offshore petroleum and natural gas production includes both shallow and deep water wells in both U.S. State and Federal waters. These offshore facilities house equipment to extract hydrocarbons from the ocean floor and transport it to storage or transport vessels or onshore. Fugitive emissions result from sources housed on the platforms.

In 2006, offshore petroleum and natural gas production fugitive CO<sub>2</sub> and CH<sub>4</sub> emissions accounted for 5.6 million metric tons CO<sub>2</sub>e. The primary sources of fugitive emissions from offshore petroleum and natural gas production are from valves, flanges, open-ended lines, compressor seals, platform vent stacks, and other source components. Flare stacks account for the majority of fugitive CO<sub>2</sub> emissions.

Offshore petroleum and natural gas production facilities are proposed for inclusion due to the fact that this represents approximately 4 percent of emissions from the petroleum and natural gas industry, "facilities" are clearly defined, and major fugitive emissions sources can



be characterized by direct measurement or engineering estimation.

Onshore Natural Gas Processing Facilities. Natural gas processing includes gathering/ boosting stations that dehydrate and compress natural gas to be sent to natural gas processing facilities, and natural gas processing facilities that remove NGLs and various other constituents from the raw natural gas. The resulting "pipeline quality" natural gas is injected into transmission pipelines. Compressors are used within gathering/ boosting stations and also natural gas processing facilities to adequately pressurize the natural gas so that it can pass through all of the processes into the transmission pipeline.

Fugitive CH<sub>4</sub> emissions from reciprocating and centrifugal compressors, including centrifugal compressor wet and dry seals, reciprocating compressor rod packing, and all other compressor fugitive emissions, are the primary CH<sub>4</sub> emission source from this segment. The majority of fugitive CO<sub>2</sub> emissions come from acid gas removal vent stacks, which are designed to remove CO<sub>2</sub> and hydrogen sulfide, when present, from natural gas. While these are the major fugitive emissions sources in natural gas processing facilities, if other potential fugitive sources such as flanges, open-ended lines and threaded fittings are

present at your facility you would need to account for them if reporting under proposed 40 CFR part 98, subpart W. For this subpart you would assume no capture of CO<sub>2</sub> because capture and transfer of CO<sub>2</sub> offsite would be calculated in accordance with Section V.PP of this preamble and reported separately.

Onshore natural gas processing facilities are proposed for inclusion due to the fact that these operations represent a significant emissions source, approximately 25 percent of emissions from the natural gas segment. "Facilities" are easily defined and major fugitive emissions sources can be characterized by direct measurement or engineering estimation.

Onshore Natural Gas Transmission Compression Facilities and Underground Natural Gas Storage Facilities.

Natural gas transmission compression facilities move natural gas throughout the U.S. natural gas transmission system. Natural gas is also injected and stored in underground formations during periods of low demand (e.g., spring or fall) and withdrawn, processed, and distributed during periods of high demand (e.g., winter or summer). Storage compressor stations are dedicated to gas injection and extraction at underground natural gas storage facilities.

Fugitive CH<sub>4</sub> emissions from reciprocating and centrifugal compressors, including centrifugal compressor wet and dry seals, reciprocating compressor rod packing, and all other compressor fugitive emissions, are the primary CH<sub>4</sub> emission source from natural gas transmission compression stations and underground natural gas storage facilities. Dehydrators are also a significant source of fugitive CH<sub>4</sub> emissions from underground natural gas storage facilities. While these are the major fugitive emissions sources in natural gas transmission, other potential fugitive sources include, but are not limited to, condensate tanks, open-ended lines and valve seals.

Transmission compression facilities and underground natural gas storage facilities are proposed for inclusion due to the fact that these operations represent a significant emissions source, approximately 24 percent of emissions from the natural gas segment; "facilities" are easily defined, and major fugitive sources can be characterized by direct measurement or engineering estimation.

LNG Import and LNG Storage Facilities. The U.S. imports natural gas in the form of LNG, which is received, stored, and, when needed, processed and compressed at LNG import terminals. LNG storage facilities liquefy and store

natural gas from transmission pipelines during periods of low demand (e.g., spring or fall) and vaporize for send out during periods of high demand (e.g., summer and winter)

Fugitive CH<sub>4</sub> and CO<sub>2</sub> emissions from reciprocating and centrifugal compressors, including centrifugal compressor wet and dry seals, reciprocating compressor rod packing, and all other compressor fugitive emissions, are the primary CH<sub>4</sub> and CO<sub>2</sub> emission source from LNG storage facilities and LNG import facilities. Process units at these facilities can include compressors to liquefy natural gas (at LNG storage facilities), re-condensers, vaporization units, tanker unloading equipment (at LNG import terminals), transportation pipelines, and/or pumps.

LNG storage facilities and LNG import facilities are proposed for inclusion due to the fact that fugitive emissions from these operations represent approximately 1 percent of emissions from natural gas systems. LNG storage "facilities" are defined as facilities that store liquefied natural gas in above ground storage tanks. LNG import terminal "facilities" are defined as facilities that receive imported LNG, store it in storage tanks, and release re-gasified natural gas for transportation.

Onshore Petroleum and Natural Gas Production. Similar to offshore petroleum and natural gas production, the

onshore petroleum and natural gas production segment uses wells to draw raw natural gas, crude oil, and associated gas from underground formations. The most dominant sources of fugitive CH<sub>4</sub> and CO<sub>2</sub> emissions include, but are not limited to, natural gas driven pneumatic valve and pump devices, field crude oil and condensate storage tanks, chemical injection pumps, releases and flaring during well completion and workovers, and releases and flaring of associated gas.

We considered proposing the reporting of fugitive CH<sub>4</sub> and CO<sub>2</sub> emissions from onshore petroleum and natural gas production in the rule. Onshore petroleum and natural gas production is responsible for the largest share of fugitive CH<sub>4</sub> and CO<sub>2</sub> emissions from petroleum and natural gas industry (27 percent of total emissions). However, this segment is not proposed for inclusion primarily due to the unique difficulty in defining a "facility" in this sector and correspondingly determining who would be responsible for reporting.

Given the significance of fugitive emissions from the onshore petroleum and natural gas production, we would like to take comment on whether we should consider inclusion of this source category in the future. Specifically, we would like to take comment on viable ways to define a facility

for onshore oil and gas production and to determine the responsible reporter. In addition, the Agency also requests comment on the merits and/or concerns with the corporate basin level reporting approach under consideration for onshore oil and gas production, as outlined below.

One approach we are considering for including onshore petroleum and natural gas production fugitive emissions in this reporting rule is to require corporations to report emissions from all onshore petroleum and natural gas production assets at the basin level. In such a case, all operators in a basin would have to report their fugitive emissions from their operations at the basin-level. For such a basin-level facility definition, we may propose reporting of only the major fugitive emissions sources; i.e., natural gas driven pneumatic valve and pump devices, well completion releases and flaring, well blowdowns, well workovers, crude oil and condensate storage tanks, dehydrator vent stacks, and reciprocating compressor rod packing. Under this scenario, we might suggest that all operators would be subject to reporting, perhaps exempting small businesses, as defined by the Small Business Administration.

This approach could substantially reduce the reporting complexity and require individual companies that produce

crude oil and/or natural gas in each basin to be responsible for reporting emissions from all of their onshore petroleum and natural production operations in that basin, including from rented sources, such as compressors. In cases where hydrocarbons or emissions sources are jointly owned by more than one company, each company would report emissions equivalent to its portion of ownership.

We considered other options in defining a facility such as individual wellheads or aggregating all emissions sources prior to compression as a facility. However, such definitions result in complex reporting requirements and are difficult to implement.

We are seeking comments on reporting of the major fugitive emissions sources by corporations at the basin level for onshore petroleum and natural gas production.

Petroleum and Natural Gas Pipeline Segments. Natural gas transmission involves high pressure, large diameter pipelines that transport gas long distances from field production and natural gas processing facilities to natural gas distribution pipelines or large volume customers such as power plants or chemical plants. Crude oil transportation involves pump stations to move crude oil through pipelines and loading and unloading crude oil tanks, marine vessels, and rails.

The majority of fugitive emissions from the transportation of natural gas occur at the compressor stations, which are already proposed for inclusion in the rule and discussed above. We do not propose to include reporting of fugitive emissions from natural gas pipeline segments between compressor stations, or crude oil pipelines in the rulemaking due to the dispersed nature of the fugitive emissions, the difficulty in defining pipelines as a facility, and the fact that once fugitives are found, they are generally fixed quickly, not allowing time for monitoring and direct measurement of the fugitives.

Natural Gas Distribution. In the natural gas distribution segment, high-pressure gas from natural gas transmission pipelines enter "city gate" stations, which reduce the pressure and distribute the gas through primarily underground mains and service lines to individual end users. Distribution system CH<sub>4</sub> and CO<sub>2</sub> emissions result mainly from fugitive emissions from gate stations (metering and regulating stations) and vaults (regulator stations), and fugitive emissions from underground pipelines. At gate stations and vaults, fugitive CH<sub>4</sub> emissions primarily come from valves, open-ended lines, connectors, and natural gas driven pneumatic valve devices.



Although fugitive emissions from a single vault, gate station or segment of pipeline in the natural gas distribution segment may not be significant, collectively these fugitive emissions sources contribute a significant share of fugitive emissions from natural gas systems.

We do not propose to include the natural gas distribution segment of the natural gas industry in this rulemaking due to the dispersed nature of the fugitive emissions and difficulty in defining a facility such that there would be an administratively manageable number of reporters.

One approach to address the concern with defining a facility for distribution would be to require corporate-level reporting of fugitive emissions from major sources by distribution companies. We seek comment on this and other ways of reporting fugitive emissions from the distribution sector.

Crude Oil Transportation. Crude oil is commonly transported by barge, tanker, rail, truck, and pipeline from production operations and import terminals to petroleum refineries or export terminals. Typical equipment associated with these operations are storage tanks and pumping stations. The major sources of CH<sub>4</sub> and

CO<sub>2</sub> fugitive emissions include releases from tanks and marine vessel loading operations.

We do not propose to include the crude oil transportation segment of the petroleum and natural gas industry in this rulemaking due to its small contribution to total petroleum and natural gas fugitive emissions, accounting for much less than 1 percent, and the difficulty in defining a facility.

## 2. Selection of Reporting Threshold

We propose that facilities with emissions greater than 25,000 metric tons CO<sub>2</sub>e per year be subject to reporting. This threshold is applicable to all oil and natural gas system facilities covered by this subpart: offshore petroleum and natural gas production facilities, onshore natural gas processing facilities, including gathering/boosting stations; natural gas transmission compression facilities, underground natural gas storage facilities; LNG storage facilities; and LNG import facilities.

To identify the most appropriate threshold level for reporting of fugitive emissions, we conducted analyses to determine fugitive emissions reporting coverage and facility reporting coverage at four different levels of threshold; 1,000 metric tons CO<sub>2</sub>e per year, 10,000 metric tons CO<sub>2</sub>e per year, 25,000 metric tons CO<sub>2</sub>e per year, and

100,000 metric tons CO<sub>2</sub>e per year. Table W-2 of this preamble provides coverage of emissions and number of facilities reporting at each threshold level for all the industry segments under consideration for this rule.

**Table W-2. Threshold Analysis for Fugitive Emissions from the Petroleum and Natural Gas Industry**

Source Category	Total National Emissions <sup>#a</sup> (metric tons CO <sub>2</sub> e per year)	Total Number of Facilities	Threshold Level	Total Emissions Covered by Threshold <sup>b</sup>		Facilities Covered	
				(metric tons CO <sub>2</sub> e per year)	Per-cent	Number	Per-cent
Offshore Petroleum & Gas Production Facilities	10,162,179	2,525	1,000	9,783,496	96%	1,021	40%
			10,000	6,773,885	67%	156	6%
			25,000	5,138,076	51%	50	2%
			100,000	3,136,185	31%	4	0.5%
Natural Gas Processing Facilities	50,211,548	566	1,000	50,211,548	100%	566	100%
			10,000	49,207,852	98%	394	70%
			25,000	47,499,976	95%	287	51%
			100,000	39,041,555	78%	125	22%
Natural Gas Transmission Compression Facilities	73,198,355	1,944	1,000	73,177,039	100%	1,659	85%
			10,000	71,359,167	97%	1311	67%
			25,000	63,835,288	87%	874	45%
			100,000	30,200,243	41%	216	11%
Underground Natural Gas Storage Facilities	11,719,044	398	1,000	11,702,256	100%	346	87%
			10,000	10,975,728	94%	197	49%
			25,000	9,879,247	84%	131	33%
			100,000	5,265,948	45%	35	9%
LNG Storage Facilities	1,956,435	157	1,000	1,940,203	99%	54	34%
			10,000	1,860,314	95%	39	25%
			25,000	1,670,427	85%	29	18%
			100,000	637,477	33%	3	2%
LNG Import Facilities	1,896,626	5	1,000	1,896,626	100%	5	100%
			10,000	1,895,153	99.9%	4	80%
			25,000	1,895,153	99.9%	4	80%
			100,000	1,895,153	99.9%	4	80%

<sup>a</sup> The emissions include fugitive CH<sub>4</sub> and CO<sub>2</sub> and combusted CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub> gases. The emissions for each industry segment do not match the 2008 U.S. Inventory either because of added details in the estimation methodology or use of a different methodology than the U.S. Inventory. For additional discussion, refer to the Oil and Natural Gas Systems TSD (EPA-HQ-OAR-2008-0508-023).

A proposed threshold of 25,000 metric tons CO<sub>2</sub>e applied to only those emissions sources listed in Table W-2 of this preamble captures approximately 81 percent of fugitive CH<sub>4</sub> and CO<sub>2</sub> emissions from the entire oil and natural gas

industry, while capturing only a small fraction of total facilities. For additional information, please refer to the Oil and Natural Gas Systems TSD (EPA-HQ-OAR-2008-0508-023). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating fugitive emissions from oil and natural gas operations, including the 2006 IPCC Guidelines, U.S. GHG Inventory, DOE 1605(b), and corporate industry protocols developed by the American Petroleum Institute, the Interstate Natural Gas Association of America, and the American Gas Association. The methodologies proposed vary by the emissions source, for example fugitive emissions versus vented emissions, versus emissions from flares (all of which are considered "fugitive" emissions in this rulemaking). Generally, approaches range from direct measurement (e.g., high volume samplers), to engineering equations (where applicable), to simple emission factor approaches based on national default factors.

Proposed Option. We propose that facilities would be required to detect fugitive emissions from the identified

emissions sources proposed in this rulemaking, and then quantify emissions using either engineering equations or direct measurement.

Fugitive emissions from all affected emissions sources at the facility, whether in operating condition or on standby, would have to be monitored on an annual basis. The proposed monitoring method would depend on the fugitive emissions sources in the facility to be monitored. Each fugitive emissions source would be required to be monitored using one of the two monitoring methods: (1) direct measurement or (2) engineering estimation. Table W-3 of this preamble provides the proposed fugitive emissions source and corresponding monitoring methods. General guidance on the monitoring methods is given below.

**Table W-3. Source Specific Monitoring Methods and Emissions Quantification**

<b>Emission Source</b>	<b>Monitoring Method Type</b>	<b>Emissions Quantification Methods</b>
Acid Gas Removal Vent Stacks	Engineering estimation	Simulation software
Blowdown Vent Stacks	Engineering estimation	Gas law and temperature, pressure, and volume between isolation valves
Centrifugal Compressor Dry Seals	Direct measurement	1) High volume sampler, or 2) Calibrated bag, or 3) Meter
Centrifugal Compressor Wet Seals	Direct measurement	1) High volume sampler, or 2) Calibrated bag, or 3) Meter
Compressor Fugitive Emissions	Direct measurement	1) High volume sampler, or 2) Calibrated bag, or 3) Meter
Dehydrator Vent Stacks	Engineering estimation	Simulation software

**Table W-3. Source Specific Monitoring Methods and Emissions Quantification**

<b>Emission Source</b>	<b>Monitoring Method Type</b>	<b>Emissions Quantification Methods</b>
Flare Stacks	Engineering estimation and direct measurement	Velocity meter and mass/volume equations
Natural Gas Driven Pneumatic Pumps	1) Engineering estimation, or 2) Direct measurement	1) Manufacturer data, equipment counts, and amount of chemical pumped, or 2) Calibrated bag
Natural Gas Driven Pneumatic Manual Valve Actuator Devices	1) Engineering estimation, or 2) Direct measurement	1) Manufacturer data and actuation logs, or 2) Calibrated bag
Natural Gas Driven Pneumatic Valve Bleed Devices	1) Engineering estimation, or 2) Direct measurement	1) Manufacturer data and equipment counts, or 2) High volume sampler, or 3) Calibrated bag, or 4) Meter
Non-pneumatic Pumps	Direct measurement	High volume sampler
Offshore Platform Pipeline Fugitive Emissions	Direct measurement	High volume sampler
Open-ended Lines	Direct measurement	1) High volume sampler, or 2) Calibrated bag, or 3) Meter
Pump Seals	Direct measurement	1) High volume sampler, or 2) Calibrated bag, or 3) Meter
Facility Fugitive Emissions	Direct measurement	High volume sampler
Reciprocating Compressor Rod Packing	Direct measurement	1) High volume sampler, or 2) Calibrated bag, or 3) Meter
Storage Tanks	1) Engineering estimation and direct measurement, or 2) Engineering estimation	1) Meter, or 2) Simulation software, or 3) Vasquez-Beggs Equation

a. Direct Measurement

Fugitive emissions detection and measurement are both required in cases where direct measurement is being proposed. Infrared fugitive emissions detection instruments are capable of detecting fugitive CH<sub>4</sub> emissions, or Toxic

Vapor Analyzers or Organic Vapor Analyzers can be used by the operator to detect fugitive natural gas emissions. These instruments detect the presence of hydrocarbons in the natural gas fugitive emissions stream. They do not detect any pure CO<sub>2</sub> fugitive emissions. However, because all the sources proposed for monitoring have natural gas fugitive emissions that have CH<sub>4</sub> as one of its constituents, there is no need for a separate detection instrument for separately detecting CO<sub>2</sub> fugitive emissions. The only exception to this is fugitive emissions from acid gas removal vent stacks where the predominant constituent of the fugitive emissions is CO<sub>2</sub>. Engineering estimation is proposed for this source, and therefore there is no need for detection of fugitive emissions from acid gas removal vent stacks.

In the Oil and Natural Gas Systems TSD (EPA-HQ-OAR-2008-0508-023), we describe a particular method based on practicality of application. For example, using Toxic Vapor Analyzers or Organic Vapor Analyzers on very large facilities is not as cost effective as infrared fugitive emissions detection instruments. We propose that irrespective of the method used for fugitive natural gas emissions detection, the survey for detection must be comprehensive. This means that, on an annual basis, the

entire population of emissions sources proposed for fugitive emissions reporting has to be surveyed at least once. When selecting the appropriate emissions detection instrument, it is important to note that certain instruments are best suited for particular applications and circumstances. For example, some optical infrared fugitive emissions detection instruments may not perform well in certain weather conditions or with certain colored backgrounds.

Infrared fugitive emissions detection instruments are able to scan hundreds of source components at once, allowing for efficient detection of emissions at large facilities; however, infrared fugitive emissions detection instruments are typically much more expensive than other options. Organic Vapor Analyzers and Toxic Vapor Analyzers are not able to detect fugitive emissions from many components as quickly; however, for small facilities this may provide a less costly alternative to infrared fugitive emissions detection without requiring overly burdensome labor to perform a comprehensive fugitive emissions survey. We propose that operators choose the instrument from the choices provided in the proposed rule that is best suited for their circumstance. Further information is contained



in the Oil and Natural Gas Systems TSD (EPA-HQ-OAR-2008-0508-023).

For direct measurement, we have proposed that high volume samplers, meters (such as rotameters, turbine meters, hot wire anemometers, and others), and/or calibrated bags be designated for use. However, if fugitive emissions exceed the maximum range of the proposed monitoring instrument, you would be required to use a different instrument option that can measure larger magnitude emissions levels. For example, if a high volume sampler is pegged by a fugitive emissions source, then fugitive emissions would be required to be directly measured using either calibrated bagging or a meter. In the Oil and Natural Gas Systems TSD (EPA-HQ-OAR-2008-0508-023), we discuss multiple options for measurement where the range of emissions measurement instruments is seen as an issue. CH<sub>4</sub> and CO<sub>2</sub> fugitive emissions from the natural gas fugitive emissions stream can be calculated using the composition of natural gas.

b. Engineering Estimation

Engineering estimation has been proposed for calculating CH<sub>4</sub> and CO<sub>2</sub> fugitive emissions from sources where the variable in the emissions magnitude on an annual basis is the number of times the source releases fugitive

CH<sub>4</sub> and CO<sub>2</sub> emissions to the atmosphere. For example, when a compressor is taken offline for maintenance, the volume of fugitive CH<sub>4</sub> and CO<sub>2</sub> emissions that are released is the same during each release and the only variable is the number of times the compressor is taken offline. Also, engineering estimates have been proposed where safety concerns prohibit the use of direct measurement methods. For example, sometimes the temperature of the fugitive emissions stream for glycol dehydrator vent stacks is too high for operators to safely measure fugitive emissions. Based on these principles, we propose that direct measurement is mandatory unless there is a demonstrated and documented safety concern or frequency of fugitive emission releases is the only variable in emissions, at which time engineering estimates can be applied.

c. Alternative Monitoring Methods Considered

Before proposing the monitoring methods discussed above, we considered four additional measurement methods. The use of Method 21 or the use of activity and emission factors were considered for fugitive emissions detection and measurement. Although Toxic Vapor Analyzers and Organic Vapor Analyzers were considered but not proposed for fugitive emissions direct measurement they are acceptable for fugitive emissions detection.

Method 21. This is the reference method for equipment leak detection and repair regulations for volatile organic carbon (VOC) emissions under several 40 CFR part 60 emission standards. Method 21 of 40 CFR part 60 Appendix A-7 determines a concentration at a point or points of emissions expressed in parts per million concentration of combustible hydrocarbon in the air stream of the instrument probe. This concentration is then compared to the "action level" in the referenced 40 CFR part 60 regulation to determine if a leak is present. Although Method 21 was not developed for this purpose, it may allow for better emission estimation than the overall average emission factors that have been published for equipment leaks. Quantification of air emissions from equipment leaks is generally done using EPA published guidelines which correlate the measured concentration to a VOC mass emission rate based on extensive measurements of air emissions from leaking equipment. The correlations are statistically determined for a very large population of similar components, but not very accurate for single leaks or small populations. Therefore, Method 21 was not found suitable for fugitive emissions measurement under this reporting rule. However, we are seeking comments on this conclusion, and whether Method 21 should be permitted as a viable

alternative method to estimate emissions for sources where it is currently required for VOC emissions.

Activity Factor and Emissions Factor for All Sources.

Fugitive CH<sub>4</sub> emissions factors for all of the fugitive emissions sources proposed for inclusion in the rule are available in a study that was conducted in 1992.<sup>81 82</sup> There have been no subsequent comparable studies published to replace or revise the fugitive emissions estimates available from this study. However, some petroleum and natural gas industry operations have changed significantly with the introduction of new technologies and improved operating and maintenance practices to mitigate fugitive emissions. These are not reflected in the fugitive emissions factors available. Also, in many cases the fugitive emissions factors are not representative of emission levels for individual sources or are not relevant to certain operations because the estimates were based on limited or no field data. Hence, they are not representative of the entire country or specific petroleum

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<sup>81</sup> EPA/GRI (1996) *Methane Emissions from the Natural Gas Industry*. Harrison, M., T. Shires, J. Wessels, and R. Cowgill, (eds.). Radian International LLC for National Risk Management Research Laboratory, Air Pollution Prevention and Control Division, Research Triangle Park, NC. EPA-600/R-96-080a.

<sup>82</sup> EPA (1999) *Estimates of Methane Emissions from the U.S. Oil Industry (Draft Report)*. Prepared by ICF International. Office of Air and Radiation, U.S. Environmental Protection Agency. October 1999

and natural gas facilities and fugitive emissions sources such as tanks and wells. Therefore, we did not propose this method for estimation of the fugitive emissions for reporting.

Default fugitive CO<sub>2</sub> emissions factors are available only for whole segments of the industry (e.g., natural gas processing), and are not available for individual sources. Further, these are international default factors, which have a high uncertainty associated with them and are not appropriate for facility-level reporting.

Mass Balance for Quantification. We considered, but decided not to propose, the use of a mass balance approach for quantifying emissions. This approach would take into account the volume of gas entering a facility and the amount exiting the facility, with the difference assumed to be emitted to the atmosphere. This is most often discussed for emissions estimation from the transportation segment of the industry. For transportation, the mass balance is often not recommended because of the uncertainties surrounding meter readings and the large volumes of throughput relative to fugitive emissions. We are seeking feedback on the use of a mass balance approach and the applicability to each sector of the oil and gas industry (production, processing, transmission, and distribution) as

a potential alternative to component level leak detection and quantification.

Toxic Vapor Analyzers and Organic Vapor Analyzers for Emissions Measurement. Toxic Vapor Analyzer and Organic Vapor Analyzer instruments quantify the concentration of combustible hydrocarbon from the fugitive emission in the air stream, but do not directly quantify the volumetric or mass emissions. The instrument probe rarely ingests all of the natural gas from a fugitive emissions source. Therefore, these instruments are used primarily for fugitive emissions leak detection. For the proposed rule, fugitive CH<sub>4</sub> emissions detection by more cost-effective detection technologies such as infrared fugitive emissions detection instruments in conjunction with direct measurement methodologies such as the high volume sampler, meters and calibrated bags is deemed a better overall approach to fugitive emissions quantification than the labor intensive Organic Vapor Analyzers and Toxic Vapor Analyzers, which do not quantify volumetric or mass fugitive emissions.

d. Outstanding Issues on Which We Seek Comments

The proposed rule does not indicate a particular threshold for detection above which emissions measurement is required. This is because the different emissions

detection instruments proposed have different levels and types of detection capabilities. Hence the magnitude of actual emissions can only be determined after measurement. This, however, does not serve the purpose of this rule in limiting burden on emissions reporting. A facility can have hundreds of small emissions (as low as 3 grams per hour) and it might not be practical to measure all such small emissions for reporting.

To address this issue we intend to incorporate one of the following two approaches in the final rule.

The first approach would provide performance standards for fugitive emissions detection instruments and usage such that all instruments follow a common minimum detection threshold. We may propose the use of the Alternate Work Practice to Detect Leaks from Equipment standards for infrared fugitive emissions detection instruments being developed by EPA. In such a case all detected emissions from components subject to this rule would require measurement and reporting.

The second approach would provide an emissions threshold above which the source would be identified as an "emitter" for emissions detection using Organic Vapor Analyzers or Toxic Vapor Analyzers. When using infrared fugitive emissions detection instruments all sources

subject to this rule that have emissions detected would require emissions quantification. Alternatively, the operator would be given a choice of first detecting emissions sources using the infrared detection instrument and then verifying for measurement status using the emissions definition for Organic Vapor Analyzers or Toxic Vapor Analyzers.

We are seeking comments on using the two options discussed above for determining emission sources requiring measurement of emissions.

Some fugitive emissions by nature occur randomly within the facility. Therefore, there is no way of knowing when a particular source started emitting. This proposed rule requires annual fugitive emissions detection and measurement. The emissions detected and measured would be assumed to continue throughout the reporting year, unless no emissions detection is recorded at an earlier and/or later point in the reporting period. We recognize that this may not necessarily be true in all cases and that emissions reported would be higher than actual. Therefore, we are seeking comments on how this issue can be resolved without resulting in additional reporting burden to the facilities.



The petroleum and natural gas industry is already implementing voluntary fugitive emissions detection and repair programs. Such voluntary programs are useful, but pose an accounting challenge with respect to emissions reporting for this rule. The proposed rule requires annual detection and measurement of fugitive emissions. This approach does not preclude any facility from performing emissions detection and repair prior to the official detection, measurement, and reporting of emissions for this rule. We are seeking comments on how to avoid under-reporting of emissions as a result of a preliminary, "unofficial" emissions survey and repair exercise ahead of the "official" annual survey.

Fugitive emissions from a compressor are a function of the mode in which the compressor is operating. Typically, a compressor station consists of several compressors with one (or more) of them on standby based on system redundancy requirements and peak delivery capacity. Fugitive emissions at compressors in standby mode are significantly different than those from compressors that are operating. The rule proposes annual direct measurement of fugitive emissions. This may not adequately account for the different modes in which a particular compressor is operating through the reporting period. We are soliciting

input on a method to measure emissions from each mode in which the compressor is operating, and the period of time operated in that mode, that would minimize reporting burden. Specifically, given the variability of these measured emissions, EPA requests comment on whether engineering estimates or other alternative methods that account for total emissions from compressors, including open ended lines, could address this issue of operating versus standby mode.

The fugitive emissions measurement instruments (i.e. high volume sampler, calibrated bags, and meters) proposed for this rule measure natural gas emissions. CH<sub>4</sub> and CO<sub>2</sub> emissions are required to be estimated from the natural gas mass emissions using natural gas composition appropriate for each facility. For this purpose, the proposed rule requires that facilities use existing gas composition estimates to determine CH<sub>4</sub> and CO<sub>2</sub> components of the natural gas emissions (flare stack and storage tank fugitive emissions are an exception to this general rule). We have determined that these gas composition estimates are available from facilities reporting to this rule. We are seeking comments on whether this is a practical assumption. In the absence of gas composition, an alternative proposal would be to require the periodic measurement of the

required gas composition for speciation of the natural gas mass emissions into CH<sub>4</sub> and CO<sub>2</sub> mass emissions.

#### 4. Selection of Procedures for Estimating Missing Data

The proposal requires data collection for a single source a minimum of once a year. If data are lost or an error occurs during fugitive emissions direct measurement, the operator should carry out the direct measurement a second time to obtain the relevant data point(s).

Similarly, engineering estimates must account for relevant source counts and frequency of fugitive emissions releases throughout the year. There should not be any missing data for estimating fugitive emissions from petroleum and natural gas systems.

#### 5. Selection of Data Reporting Requirements

We propose that fugitive emissions from the petroleum and natural gas industry be reported on an annual basis. The reporting should be at a facility level with fugitive emissions being reported at the source type level. Fugitive emissions from each source type could be reported at an aggregated level. In other words, process unit-level reporting would not be required. For example, a facility with multiple reciprocating compressors could report fugitive emissions from all reciprocating compressors as an aggregate number. Since the proposed monitoring method is

fugitive emissions detection and measurement at the source level, we determined that reporting at an aggregate source type level is feasible.

Fugitive emissions from all sources proposed for monitoring, whether in operating condition or on standby, would have to be reported. Any fugitive emissions resulting from standby sources would be separately identified from the aggregate fugitive emissions.

The reporting facility would be required to report the following information to us as a part of the annual fugitive emissions reporting: fugitive emissions monitored at an aggregate source level for each reporting facility, assuming no carbon capture and transfer offsite; the quantity of CO<sub>2</sub> captured for use and the end use, if known; fugitive emissions from standby sources; and activity data for each aggregate source type level.

Additional data are proposed to be reported to support verification: engineering estimate of total component count; total number of compressors and average operating hours per year for compressors, if applicable; minimum, maximum and average throughput per year; specification of the type of any control device used, including flares; and detection and measurement instruments used. For offshore petroleum and natural gas production facilities, the number

of connected wells, and whether they are producing oil, gas, or both is proposed to be reported. For compressors specifically, we proposed that the total number of compressors and average operating hours per year be reported.

A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and W.

#### 6. Selection of Records That Must Be Retained

The reporting facility shall retain relevant information associated with the monitoring and reporting of fugitive emissions to us, as follows; throughput of the facility when the fugitive emissions direct measurement was conducted, date(s) of measurement, detection and measurement instruments used, if any, results of the leak detection survey, and inputs and outputs to calculations or simulation software runs where the proposed monitoring method requires engineering estimation.

A full list of records to be retained is included in proposed 40 CFR part 98, subparts A and W.

### X. Petrochemical Production

#### 1. Definition of the Source Category

The petrochemical industry consists of numerous processes that use fossil fuel or petroleum refinery products as feedstocks. For this proposed GHG reporting

rule, the reporting of process-related emissions in the petrochemical industry is limited to the production of acrylonitrile, carbon black, ethylene, ethylene dichloride, ethylene oxide, and methanol. The petrochemicals source category includes production of all forms of carbon black (e.g., furnace black, thermal black, acetylene black, and lamp black) because these processes use petrochemical feedstocks; bone black is not considered to be a form of carbon black because it is not produced from petrochemical feedstocks. The rule focuses on these six processes because production of GHGs from these processes has been recognized by the IPCC to be significant compared to other petrochemical processes. Facilities producing other types of petrochemicals are not subject to proposed 40 CFR part 98, subpart X of this reporting rule but may be subject to 40 CFR part 98, subpart C, General Stationary Fuel Combustion Sources, or other subparts.

There are 88 facilities operating petrochemical processes in the U.S., and 9 of these operate either two or three types of petrochemical processes (e.g., ethylene and ethylene oxide). We estimate petrochemical production accounts for approximately 55 million metric tons CO<sub>2</sub>e.

Total GHG emissions relevant to the petrochemical industry primarily include process-based emissions and

emissions from combustion sources. Process-based emissions may be released to the atmosphere from process vents, equipment leaks, aerobic biological treatment systems, and in some cases, combustion source vents. CH<sub>4</sub> may also be a process-based emission from processes where CH<sub>4</sub> is a feedstock (e.g., when methanol is produced from synthesis gas that is derived from reforming natural gas, some CH<sub>4</sub> passes through the process without being converted and is emitted).

Emissions from the burning of process off-gas to supply energy to the process are also process-based emissions because the organic compounds being burned are derived from the feedstock chemical. These emissions are included with other process-based emissions if the mass balance monitoring method (described in Section V.X.3 of this preamble) is used to estimate process-based emissions, but they are included with combustion source emissions if CEMS are used to measure emissions from all stacks. Combustion source emissions include CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions from combustion of either supplemental fuel alone (under the mass balance option) or combustion of both supplemental fuels and process off-gas (under the CEMS option). This difference in approach for emissions from the combustion of off-gas is necessary to avoid either

double counting or not counting these emissions, particularly if off-gas and supplemental fuel are mixed in a fuel gas system.

CH<sub>4</sub> emissions from onsite wastewater treatment systems (if anaerobic) are another possible source of GHG emissions from the petrochemical industry, but these emissions are expected to be small because anaerobic wastewater treatment is not common at petrochemical facilities. CH<sub>4</sub> emissions from onsite wastewater treatment systems would be estimated and reported according to the proposed procedures in proposed 40 CFR part 98, subpart II.

The ratio of process-based emissions to supplemental fuel combustion emissions varies among the various petrochemical processes. For example, process-based emissions dominate for acrylonitrile, ethylene, and ethylene oxide processes. Both process-based and supplemental fuel combustion emissions are important for carbon black and methanol processes. Emissions from supplemental fuel combustion predominate for ethylene dichloride processes. Equipment leak and wastewater emissions are both estimated to be less than 1 percent of the total emissions from petrochemical production.

For further discussion see the Petrochemical Production TSD (EPA-HQ-OAR-2008-0508-024).



## 2. Selection of Reporting Threshold

We propose that every facility which includes within its boundaries methanol, acrylonitrile, ethylene, ethylene oxide, ethylene dichloride, or carbon black production be subject to the requirements of this proposed rule.

In developing the proposed threshold for petrochemical facilities, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e. Table X-1 of this preamble illustrates the emissions and number of facilities that would be covered under the four threshold options.

**Table X-1. Threshold Analysis for Petrochemical Production**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions, metric tons CO <sub>2</sub> e/yr	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number of facilities	Percent
1,000	54,830,000	88	54,830,000	100%	88	100%
10,000	54,830,000	88	54,820,000	99.98%	87	98.9%
25,000	54,830,000	88	54,820,000	99.98%	87	98.9%
100,000	54,830,000	88	54,440,000	99.7%	84	95.5%

The emissions presented in Table X-1 of this preamble are the total emissions associated solely with the production of methanol, acrylonitrile, ethylene, ethylene oxide, ethylene dichloride, or carbon black, not the total emissions from petrochemical facilities. An estimate of the total emissions was difficult to develop because many of these facilities contain multiple source categories.

For example, some petrochemical operations occur at petroleum refineries. Other petrochemical manufacturing facilities produce chemicals such as ammonia or hydrogen that are also subject to reporting. In addition, numerous chemical manufacturing facilities produce other chemicals in addition to one or more of the petrochemicals; these facilities may have combustion sources associated with these other chemical manufacturing processes that are separate from the combustion sources for petrochemical processes.

Based on this analysis, 87 of the 88 petrochemical facilities have estimated combustion and process-based GHG emissions that exceed the 25,000 metric tons CO<sub>2</sub>e/yr threshold, and 1 facility has estimated GHG emissions less than 10,000 metric tons CO<sub>2</sub>e/yr. The facility with estimated GHG emissions less than 10,000 metric tons CO<sub>2</sub>e/yr is a carbon black facility. Considering that the threshold analysis did not include all types of emissions occurring at petrochemical facilities, and the large percentage of facilities that were above the various thresholds even when these emissions were excluded, EPA proposes that all facilities producing at least one of the petrochemicals report. This would simplify the rule and likely achieve

the same result as having a 25,000 metric tons CO<sub>2</sub>e threshold.

For a full discussion of the threshold analysis, please refer to the Petrochemical Production TSD (EPA-HQ-OAR-2008-0508-024). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

We reviewed existing domestic and international GHG monitoring guidelines and protocols including the 2006 IPCC Guidelines and DOE 1605(b). Protocols included methods for both CO<sub>2</sub> and CH<sub>4</sub>. From this review, we developed the following three options that share a number of features with the three Tiers presented by IPCC:

Option 1. Apply default emission factors based on the type of process and site-specific activity data (e.g., measured or estimated annual production rate). This option is the same as the IPCC Tier 1 approach.

Option 2. Perform a carbon balance to estimate CO<sub>2</sub> emissions derived from carbon in feedstocks. Inputs to the carbon balance would be the flow and carbon content of each feedstock, and outputs would be the flow and carbon content of each product/byproduct. Organic liquid wastes that are

collected for shipment offsite would also be considered an output in the carbon balance. The difference between carbon inputs and outputs is assumed to be CO<sub>2</sub> emissions. This includes all unconverted CH<sub>4</sub> feedstock that is emitted. In addition, all CO<sub>2</sub> that is recovered for sale or other use is considered an emission for the purposes of reporting for petrochemical processes. However, the volume of CO<sub>2</sub> would be accounted for separately using the procedures in proposed 40 CFR part 98, subpart PP.

This option would require continuous monitoring of liquid and gaseous flows using flow meters, measurement of solid feedstock and product flows using scales or other weighing devices, and determination of the carbon content of each feedstock and product/byproduct at least once per week. Supplemental fuel is not considered to be a feedstock because these fuels do not mix with process fluids (except in the furnace of a carbon black process) and would be calculated consistent with the monitoring methods in proposed 40 CFR part 98, subpart C.

In addition to using the carbon balance to estimate process-based CO<sub>2</sub> emissions, this option would require the petrochemical facility owner to estimate CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions from the combustion of supplemental fuels using the monitoring methods in proposed 40 CFR part 98, subpart

C, and to estimate CH<sub>4</sub> emissions from onsite wastewater treatment using the monitoring methods in proposed 40 CFR part 98, subpart II.

Option 3. Direct and continuous measurement of CO<sub>2</sub> emissions from each stack (process vent or combustion source) using a CEMS for CO<sub>2</sub> concentration and a stack gas volumetric flow rate monitor.

This option also would require the petrochemical facility owner to use engineering analyses to estimate flow and carbon content of gases discharged to flares using the same procedures described in Section V.Y.3 of this preamble for petroleum refineries. Just as at petroleum refineries, flares at petrochemical facilities are used to control a variety of emissions releases. In addition, the flow and composition of gas flared can change significantly. Therefore, the Agency is proposing the same methodology for petrochemical flares as for flares at petroleum refineries. Please refer to the petroleum refineries section (Section V.Y.3 of this preamble) for a discussion of the rationale for these procedures.

We request comment on this approach as well as on descriptions of differences in operating conditions for flares at petrochemical facilities and refineries that

would warrant specification of different methodologies for estimating emissions.

In addition to measuring CO<sub>2</sub> emissions from process vents and estimating CO<sub>2</sub> emissions from flares, this option would require the petrochemical facility owner to calculate CH<sub>4</sub> and N<sub>2</sub>O emissions from combustion sources using the monitoring methods in proposed 40 CFR part 98, subpart C, and to calculate CH<sub>4</sub> emissions from onsite wastewater treatment systems using the monitoring methods in proposed 40 CFR part 98, subpart II.

Proposed Options. Under this proposed rule, if you operate and maintain an existing CEMS that measures total CO<sub>2</sub> from process vents and combustion sources, you would be required to follow requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions from your facility. In such a circumstance, you also would be required to estimate CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from flares.

If you do not operate and maintain an existing CEMS that measures total CO<sub>2</sub> from process vents and combustion sources for your facility, the proposed rule permits the use of either Options 2 or 3 since they account for process-based emissions, combustion source emissions, and wastewater treatment system emissions. Process-based CO<sub>2</sub> emissions are estimated using procedures in proposed 40 CFR

part 98, subpart X; combustion emissions (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) and wastewater emissions (CH<sub>4</sub>) are calculated using methods in proposed 40 CFR part 98, subparts C and II, respectively. As discussed earlier, emissions from combustion of process off-gas are calculated with other process-based emissions (only CO<sub>2</sub> emissions) under Option 2, but they are estimated using methods for combustion sources under Option 3 (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions). Option 2 offers greater flexibility and a lower cost of compliance than Option 3. However it also has a higher measurement uncertainty.

Option 3 is expected to have the lowest measurement uncertainty. However, using CEMS to monitor all emissions at petrochemical facilities would be relatively costly. For emissions estimates produced using Option 2, the uncertainty in these estimates is expected to be relatively low for most petrochemical processes. For ethylene dichloride and ethylene processes, the uncertainty of the carbon balance approach may be higher since it is influenced by the measurements of inputs and outputs at the facility and the percentage of carbon in the final product. Uncertainty may be high where the percentage of carbon in the product is close to 100 percent (since subtracting one large number for process output from another large number

for process input results in relatively large uncertainty in the difference, even if the uncertainty in the two large numbers is low). For the petrochemical processes, we have decided that Option 2 is reasonable for purposes of this proposed rulemaking. However, direct measurement may provide improved emissions estimates.

Option 1 was not proposed because the use of default values and lack of direct measurement results in a high level of uncertainty. These default approaches would not provide site-specific estimates of emissions that would reflect differences in feedstocks, operating conditions, catalyst selectivity, thermal/energy efficiencies, and other differences among plants. The use of default values is more appropriate for sector wide or national total estimates from aggregated activity data than for determining emissions from a specific facility.

We request comment on how to improve the emission estimates developed using the carbon balance approach (Option 2), including whether the uncertainty in the estimated emissions can be reduced (and if so, by how much), the advantages, disadvantages, types and frequency of other measurements that could be required, costs of alternatives, how the uncertainty of alternatives is estimated, and the QA procedures that should be followed to



assure accurate measurement. For further discussion of our assumptions on the uncertainty of emissions estimates see the Petrochemical Production TSD (EPA-HQ-OAR-2008-0508-024).

Additional Issues and Requests for Comments. EPA is interested in public comment on four additional issues.

Fugitive emissions from petrochemical production facilities have been of environmental interest primarily because of the VOC emissions. As noted above, we have concluded that fugitive CO<sub>2</sub> and CH<sub>4</sub> emissions contribute very little to the overall GHG emissions from the petrochemical production sector, and non-CH<sub>4</sub> hydrocarbon losses assumed to be CO<sub>2</sub> emissions overstate the emissions only slightly. Consequently, the Agency is not proposing that fugitive emissions be reported.

Second, Option 2 assumes all carbon entering the process is released as CO<sub>2</sub> and does not account for potential CH<sub>4</sub> emissions, nor are N<sub>2</sub>O emissions estimated in this approach. EPA believes CH<sub>4</sub> and N<sub>2</sub>O emissions are small.

Third, EPA is aware that a limited number of petrochemical facilities may produce petrochemicals as well as one or more other chemicals that are part of another source category (e.g. production of hydrogen for sale and

the petrochemical methanol from synthesis gas created by steam reforming of CH<sub>4</sub>). We consider these "integrated processes" and request comment on whether the procedures for the affected source categories are clear and adequate for addressing emissions from integrated facilities.

Fourth, we are proposing several methods for measuring the volume, carbon content and composition of feedstocks and products. There may be additional peer-reviewed and published measurement methodologies.

Public comment on each of these four issues is welcomed. Where applicable, supporting data and documentation on how emissions should be included, and if so, how these emissions can be estimated, including the advantages, disadvantages, types and frequency of measurements that could be required, costs of alternatives, how the uncertainty of alternatives is estimated, and the QA procedures that should be followed to assure accurate measurement.

#### 4. Selection of Procedures for Estimating Missing Data

The missing data procedures in proposed 40 CFR part 98, subpart C for combustion units are proposed for facilities that use CEMS to estimate emissions from both combustion sources and process vents. Similarly, if the mass balance option is used, the same procedures that apply

to missing data for fuel measurements in proposed 40 CFR part 98, subpart C would also apply to missing flow and carbon content measurements of feedstocks and products. Specifically, the substitute data value for missing carbon content, CO<sub>2</sub> concentration, or stack gas moisture content values would be the average of the quality-assured values of the parameter immediately before and immediately after the missing data period. The substitute data value for missing feedstock, product, or stack gas flows would be the best available estimate based on all available process data.

#### 5. Selection of Data Reporting Requirements

Where CEMS are used, the reporting requirements specified in proposed 40 CFR part 98, subpart C would apply. Where the carbon balance method is used, we propose that the following information be reported: identification of the process, annual CO<sub>2</sub> emissions for each type of petrochemical produced and each process unit, the methods used to determine flows and carbon contents, the emissions calculation methodology, quantity of feedstocks consumed, quantity of each product and byproduct produced, carbon contents of each feedstock and product, information on the number of actual versus substitute data points, and the quantity of CO<sub>2</sub> captured for use. In addition, owners and

operators would report information related to all equipment calibrations; measurements, calculations, and other data; certifications; and any other QA procedures used to assess the uncertainty in emissions estimates.

The data to be reported under the proposed rule form the basis of the emissions calculations and are needed for us to understand the emissions data and verify reasonableness of the reported emissions. The Agency requests comment on the types of QA procedures that are most commonly conducted or recommended and the information that would be most useful in assessing uncertainty of the emissions estimates.

#### 6. Selection of Records that must be Retained

Petrochemical production facilities would be required to keep records of the information specified in proposed 40 CFR 98.3, as applicable. Under the carbon balance option, a facility also would be required to keep records of all feedstock and product flows and carbon content determinations. If a petrochemical production facility complies with the CEMS option, the additional records for CEMS listed in proposed 40 CFR 98.37 would also be required for all CEMS, including CEMS on process stacks that are not associated with combustion sources. These records document values that are directly used to calculate the emissions

that are reported and are necessary to enable verification that the GHG emissions monitoring and calculations were done correctly.

#### Y. Petroleum Refineries

##### 1. Definition of the Source Category

Petroleum refineries are facilities engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, asphalt (bitumen), or other products through distillation of petroleum or through redistillation, cracking, or reforming of unfinished petroleum derivatives. There are 150 operating petroleum refineries in the U.S. and its territories. Emissions from petroleum refineries account for approximately 205 million metric tons CO<sub>2</sub>e, representing approximately 3 percent of the U.S. nationwide GHG emissions. Most of these emissions are CO<sub>2</sub> emissions from fossil fuel combustion. While the U.S. GHG Inventory does not separately report onsite fuel consumption at petroleum refineries, it estimates that approximately 0.6 million metric tons CO<sub>2</sub>e of CH<sub>4</sub> are emitted as fugitives per year from petroleum refineries in the U.S. Most CO<sub>2</sub> emissions at a refinery are combustion-related, accounting for approximately 67 percent of CO<sub>2</sub> emissions at a refinery.

The combustion of catalyst coke in catalyst cracking units is also a significant contributor to the CO<sub>2</sub> emissions (approximately 25 percent) from petroleum refineries. Combustion of excess or waste fuel gas in flares contributes approximately 2 percent of the refinery's overall CO<sub>2</sub> emissions. As such, the Agency proposes that the emissions from these sources must be reported.

Process emissions of CO<sub>2</sub> also occur from the sulfur recovery plant, because the amine solutions used to remove hydrogen sulfide (H<sub>2</sub>S) from the refinery's fuel gas adsorb CO<sub>2</sub>. The stripped sour gas from the amine adsorbers is fed to the sulfur recovery plant; the CO<sub>2</sub> contained in this stream is subsequently released to the atmosphere. Most refineries have on-site sulfur recovery plants; however, a few refineries send their sour gas to neighboring sulfur recovery or sulfuric acid production facilities. The quantity of CO<sub>2</sub> contained in the sour gas sent for off-site sulfur recovery operations is considered an emission under this regulation.

There are a variety of GHG emission sources at the refinery, which include: asphalt blowing, delayed coking unit depressurization and coke cutting, coke calcining, blowdown systems, process vents, process equipment leaks, storage tanks, loading operations, land disposal,

wastewater treatment, and waste disposal. To fully account for the refinery's GHG emissions, we propose that the emissions from these sources must also be reported.

Based on the emission sources at petroleum refineries, GHGs to report under proposed 40 CFR part 98, subpart Y are limited to CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. Table Y-1 of this preamble summarizes the GHGs to be reported by emission source at the refinery.

**Table Y-1. GHGs to Report Under 40 CFR Part 98, Subpart Y**

<b>Emission Source</b>	<b>GHGs to report</b>	<b>Subpart of proposed 40 CFR part 98 where emissions reporting methodologies addressed</b>
Stationary combustion sources	CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O	Subpart C
Coke burn-off emissions from catalytic cracking units, fluid coking units, catalytic reforming units, and coke calcining units.	CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O	Subpart Y
Flares	CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O	Subpart Y
Hydrogen plant vent	CO <sub>2</sub> and CH <sub>4</sub>	Subpart P
Petrochemical processes	CO <sub>2</sub> and CH <sub>4</sub>	Subpart X
Sulfur recovery plant, on-site and off-site	CO <sub>2</sub>	Subpart Y
On-site wastewater treatment system	CO <sub>2</sub> and CH <sub>4</sub>	Subpart II
On-site land disposal unit	CH <sub>4</sub>	Subpart HH
Fugitive Emissions	CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O	Subpart Y
Delayed coking units	CH <sub>4</sub>	Subpart Y

## 2. Selection of Reporting Threshold

Four options were considered as reporting thresholds for petroleum refineries. Table Y-2 of this preamble illustrates the emissions and number of facilities that would be covered under the four options.

**Table Y-2. Threshold Analysis for Petroleum Refining**

<b>Option/threshold level</b>	<b>Emissions covered</b>	<b>Facilities covered</b>
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	<b>Million metric tons CO<sub>2</sub>e/year</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
1,000 metric tons CO <sub>2</sub> e	204.75	100	150	100
10,000 metric tons CO <sub>2</sub> e	204.74	99.995	149	99.3
25,000 metric tons CO <sub>2</sub> e	204.69	99.97	146	97.3
100,000 metric tons CO <sub>2</sub> e	203.75	99.51	128	85.3

We are proposing that all petroleum refineries should report. This approach would ensure full reporting of emissions, affect an insignificant number of additional sources compared to the 25,000 metric tons CO<sub>2</sub>e threshold, and would add minimal additional burden to the reporting facilities. All U.S. refineries must report their fuel consumption to the EIA, so there is limited additional burden to estimate their GHG emissions. Furthermore, due to the importance of the petroleum refining industry to our nation's energy needs as well as the overall U.S. GHG inventory, it is important to obtain the best information available for this source category. We estimate that 4 refineries did not exceed a reporting threshold of 25,000 metric tons CO<sub>2</sub>e in 2006 and invite public comment on this matter.

For a full discussion of the threshold analysis, please refer to the Petroleum Refineries TSD (EPA-HQ-OAR-2008-0508-025). For specific information on costs, including unamortized first year capital expenditures,



please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

We considered monitoring methods that are used or recommended for use from several sources including international groups, U.S. agencies, State agencies, and petroleum refinery trade organizations. For most emission sources, three general levels of monitoring options were evaluated: (1) use of engineering calculations and/or default factors; (2) monitoring of process parameters (such as fuel consumption quantities and carbon content); and (3) direct emission measurement using CEMS for all emissions sources at a refinery.

Under this proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions. Also, refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

For facilities that do not currently have CEMS that meet the requirements outlined in proposed 40 CFR part 98, subpart C, or where the CEMS would not adequately account for process emissions, the proposed monitoring method is Option 2. Option 2 accounts for process-related CO<sub>2</sub> emissions. Simplified methods for estimating fugitive CH<sub>4</sub> emissions are provided below. Refer to proposed 40 CFR part 98, subpart C specifically for procedures to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

You would be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart HH to estimate emissions from landfills, proposed 40 CFR part 98, subpart II to estimate emissions from wastewater and proposed 40 CFR part 98, subpart P to estimate emissions from hydrogen production (non-merchant hydrogen plants only).

Specifically, for fluid catalytic cracking units and fluid coking units that already have CEMS in place, we propose to require refineries to report CO<sub>2</sub> emissions using these CEMS. For the sources that contribute significantly to the overall GHG emissions from the refinery, as defined below, we propose monitoring of process parameters (Option

2). The Agency requests comment on the feasibility of allowing smaller emission sources at the refinery to employ less certain (Option 1) methods as a way to reduce the costs and burden of measurement and verification under this proposed rule. Providing this flexibility would result in lower costs but greater uncertainty around some portions of a facility's emissions estimates.

The selected monitoring methods for this proposed rule generally follow those used in other reporting rules as well as those recommended in the American Petroleum Institute's *Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Gas Industry* (hereafter referred to as "the API Compendium"). More detail regarding the selection of the proposed monitoring options for specific emission sources follows.

Coke burn-off. The proposed methods for estimating GHG emissions from coke burn-off in the catalytic cracking unit, fluid coking unit, and catalytic reforming unit generally follow the methods presented in the API Compendium for coke burn-off. Fluid catalytic cracking units and fluid coking units are large CO<sub>2</sub> emission sources, accounting for over 25 percent of the GHG emissions from petroleum refineries. Most of these units are expected to monitor gas composition for process control or for

compliance with applicable monitoring provisions under 40 CFR part 60, subparts J and Ja and under 40 CFR part 63, subpart UUU. Given the magnitude of the GHG emissions from catalytic cracking units and fluid coking units, direct monitoring for CO<sub>2</sub> emissions (i.e., continuous monitoring of CO<sub>2</sub> concentration and flow rate at the final exhaust stack) is believed to provide greater certainty in the emission estimate. However, compositional analysis monitoring in the regenerator or fluid coking burner exhaust vent prior to the combustion of other fuels (such as auxiliary fuel fired to a CO boiler) may be used when direct monitoring for CO<sub>2</sub> emissions is not already employed. An equation is provided in the rule for calculating the vent stream flow rate based on the compositional analysis data rather than requiring a continuous flow monitor; this equation is allowed in other petroleum refinery rules (40 CFR part 60, subparts J and Ja; 40 CFR part 63, subpart UUU) as an alternative to continuous flow monitoring.

An engineering approach for estimating coke burn-off rates and calculating CO<sub>2</sub> emissions using default carbon content for petroleum coke was considered. However, as most catalytic cracking units already must have the compositional monitors in-place due to other petroleum refinery rules and because catalytic cracking unit coke

burn-off is a significant contributor to the overall GHG emissions from petroleum refineries, we are not proposing an engineering calculation for the catalytic cracking units. However, comment is requested on the engineering methods available to estimate coke burn-off rates, the uncertainty of the methods, and the measurements or parameters and enhanced QA that can be used to verify the engineering emission estimates and their certainty.

The amount of coke burned in catalytic reforming units is estimated to be about 1 percent of the amount of coke burned in catalytic cracking units or fluid coking units; therefore, a simplified method is provided for estimating coke burn-off emissions for catalytic reforming units that do not monitor gas composition in the coke burn-off exhaust vent.

Flares. Specific monitoring provisions are provided for flares. As the composition of gas flared can change significantly, we considered proposing continuous flow and composition monitors (or heating value monitors) on all flares. For example, in California, both the South Coast and Bay Area Air Quality Management Districts require these monitors for refineries located in their districts. However, a significant fraction of flares is not expected to have these monitoring systems installed. Further, since

flares are projected to contribute only about 2 percent of a typical refinery's CO<sub>2</sub> emissions, it would be costly to improve the monitoring systems for flare emission estimates. The use of the default CO<sub>2</sub> emission factor for refinery fuel gas was also considered. The default emission factor is expected to be reasonable during normal refinery operations, but is highly uncertain during periods of start-up, shutdown, or malfunction. Consequently, a hybrid method is proposed that allows the use of a default CO<sub>2</sub> emission factor for refinery fuel gas during periods of normal refinery operations and specific engineering analysis of GHG emissions during periods of high flare volumes associated with start-up, shutdown, or malfunction. As with stationary combustion sources, default emission factors for refinery gas are proposed to calculate CH<sub>4</sub> and N<sub>2</sub>O emissions from flares.

Sulfur Recovery Plants. For sulfur recovery plants at the petroleum refinery and for instances where sour gas is sent off-site for sulfur recovery, direct carbon content measurement in the sour gas feed to the sulfur recovery plant is the preferred monitoring approach. However, a site-specific or default carbon content method is also provided. It is anticipated that monitoring systems would be in place at most refineries, as monitoring of the sour

gas feed is important in the operation of the sulfur recovery plant. The monitoring data for carbon content and flow rate must be used if they are available. The alternative default carbon content method is provided because the emissions from this source are relatively small, 1 to 2 percent for a given facility, and because only small, non-Claus sulfur recovery plants are not expected to monitor the flow and composition of the sour gas. We are proposing that only CO<sub>2</sub> emissions would need to be reported for the sulfur recovery plant process-related emissions.

Coke Calcining. For coke calcining units at the petroleum refinery, direct CO<sub>2</sub> measurement is the preferred monitoring approach. However, a carbon balance approach is proposed similar to the approach included in *The Aluminum Sector Greenhouse Gas Protocol*<sup>83</sup> for units that do not have CEMS. This is because coke calcining is a small source of GHG emissions, less than 1 percent for a given facility. CH<sub>4</sub> and N<sub>2</sub>O emissions are calculated from the coke calcining CO<sub>2</sub> process emissions using the default emission factors for

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<sup>83</sup> International Aluminum Institute. 2006. *The Aluminum Sector Greenhouse Gas Protocol* (Addendum to the WRI/WBCSD Greenhouse Gas Protocol). pp. 31-32. Available at:<http://www.world-aluminium.org/Downloads/Publications/Download>.

petroleum coke combustion (the same equations as proposed for calculating CH<sub>4</sub> and N<sub>2</sub>O emissions from coke burn-off).

Process Vents not Otherwise Specified. For process vents other than those discussed elsewhere in this section of the preamble, either process knowledge or measurement data can be used to calculate the GHG emissions. Due to other regulations affecting petroleum refineries, only a few, small process vents are expected to be present at most refineries. As such, these small vents do not warrant requiring the use of CEMS to quantify emissions. Process vent emissions are expected to be predominately CO<sub>2</sub> or CH<sub>4</sub>, but N<sub>2</sub>O emissions, if present, are also to be reported.

Other Sources. Due to the small (less than 1 percent) contribution of other emissions sources at the refinery that make up the total GHG emissions from the facility, very simple methods are proposed to estimate these other emissions sources. Alternative methods are provided so that facilities can provide more detailed estimates if desired. For example, a refinery may estimate CH<sub>4</sub> emissions from individual tanks using EPA's TANKS model, if desired, or apply a default emission factor to the facility's overall throughput. Simple emission factor approaches are provided for asphalt blowing, delayed coking unit depressurization and coke cutting, blowdown systems,



process equipment leaks, storage tanks, and loading operations.

For further discussion of this source category and monitoring of its emissions, see the Petroleum Refineries TSD (EPA-HQ-OAR-2008-0508-025).

#### 4. Selection of Procedures for Estimating Missing Data

In those cases where you use direct measurement by a CO<sub>2</sub> CEMS, the missing data procedures would be the same as the Tier 4 requirements described for general stationary fuel combustion sources in proposed 40 CFR part 98, subpart C. Missing data procedures are also specified, consistent with proposed 40 CFR part 98, subpart C, for heat content, carbon content, fuel molecular weight, gas and liquid fuel flow rates, stack gas flow rates, and compositional analysis data (CO<sub>2</sub>, CO, O<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, and stack gas moisture content, as applicable). Generally, the average of the data measurements before and after the missing data period would be used to calculate the emissions during the missing data period.

#### 5. Selection of Data Reporting Requirements

The reporting requirements for combustion sources other than those associated with coke burn-off directly refer to those in proposed 40 CFR part 98, subpart C, General Stationary Fuel Combustion Sources. For other

sources, we propose to report the identification of the source, throughput of the source (if applicable), the calculation methodology used, the total GHG emissions for the source, and the quantity of CO<sub>2</sub> captured for use and the end use, if known. A list of the specific GHG emissions reportable for each emission source is provided in Table Y-1 of this preamble.

The reporting requirements consist of actual GHG emission values as well as values that are directly used to calculate the emissions and are necessary in order to verify that the GHG emissions monitoring and calculations were done correctly. As there are high uncertainties associated with many of the ancillary emission sources at the refinery, separate reporting of the emissions for these separate sources is needed to fully understand the importance and variability of these ancillary emission sources. A complete list of information to report is contained in proposed 40 CFR §98.256.

#### 6. Selection of Records That Must Be Retained

The recordkeeping requirements in the general provisions of proposed 40 CFR part 98 apply for petroleum refineries. Specifically, refineries would be required to keep all records specified in proposed 40 CFR part 98, subpart A and summarized in Section III.E of this preamble.

In addition, records of the data required to be monitored and reported under proposed 40 CFR part 98, subpart Y would be retained. If CEMS are used to quantify the GHG emissions, you would be required to keep additional records specified in proposed 40 CFR part 98, subparts A and Y. These records consist of values that are directly used to calculate the emissions and are necessary to enable verification that the GHG emissions monitoring and calculations were done correctly.

## Z. Phosphoric Acid Production

### 1. Definition of the Source Category

Phosphoric acid is a common industrial product used to manufacture phosphate fertilizers. Phosphoric acid is a product of the reaction between phosphate rock and, typically, sulfuric acid ( $\text{H}_2\text{SO}_4$ ). A byproduct called calcium sulfate ( $\text{CaSO}_4$ ), or gypsum, is formed when calcium from the phosphate rock reacts with sulfate. Most companies in the U.S. use a dihydrate process in which two molecules of water ( $\text{H}_2\text{O}$ ) are produced per molecule of gypsum ( $\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$  or calcium sulfate dihydrate).

Additionally, a second reaction occurs in which the limestone ( $\text{CaCO}_3$ ) present in the phosphate rock reacts with sulfuric acid ( $\text{H}_2\text{SO}_4$ ) releasing  $\text{CO}_2$ . The amount of carbon

in the phosphate rock feedstock varies depending on the region in which it was mined.

National emissions from phosphoric acid production facilities were estimated to be 3.8 million metric tons CO<sub>2</sub>e in 2006. These emissions include both process-related emissions (CO<sub>2</sub>) and on-site stationary combustion emissions (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O) from 14 phosphoric acid production facilities across the U.S. Process-related emissions account for 1.2 million metric tons CO<sub>2</sub>e, or 30 percent of the total, while on-site stationary combustion emissions account for the remaining 2.7 million metric tons CO<sub>2</sub>e emissions.

The phosphoric acid production industry has many production sites that are integrated with mines; notably, three facilities import phosphate rock from Morocco.

For additional background information on phosphoric acid production, please refer to the Phosphoric Acid Production TSD (EPA-HQ-OAR-2008-0508-026).

## 2. Selection of Reporting Threshold

In developing the threshold for phosphoric acid production, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e per year. Table Z-1 of this preamble illustrates the emissions and

number of facilities would not be impacted under these various applicability thresholds.

**Table Z-1. Threshold Analysis for Phosphoric Acid Production**

Threshold level metric tons CO <sub>2</sub> e/yr	Total National Emissions metric tons CO <sub>2</sub> e/yr	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	3,838,036	14	3,838,036	100%	14	100%
10,000	3,838,036	14	3,838,036	100%	14	100%
25,000	3,838,036	14	3,838,036	100%	14	100%
100,000	3,838,036	14	3,838,036	100%	14	100%

There is no proposed threshold for reporting emissions from phosphoric acid production. Even at a 100,000 metric tons CO<sub>2</sub>e threshold, all emissions would be covered, and all facilities would be required to report. Having no threshold would simplify the rule and avoid any burden for unnecessary calculations to determine if a threshold is exceeded. Therefore, we propose that all phosphoric acid production facilities report.

For a full discussion of the threshold analysis, please refer to the Phosphoric Acid Production TSD (EPA-HQ-OAR-2008-0508-026). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

The methodology for estimating process-related emissions from phosphoric acid production is based on the U.S. GHG Inventory method discussed further in the Phosphoric Acid Production TSD (EPA-HQ-OAR-2008-0508-026). Most domestic and international GHG monitoring guidelines and protocols, such as the 2006 IPCC Guidelines do not provide estimation methodologies for process-related emissions from phosphoric acid production.

Proposed Option. Under this proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions. Also, refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

If you do not have CEMS that meet the conditions outlined in proposed 40 CFR part 98, subpart C, we propose that facilities estimate process-related CO<sub>2</sub> emissions by determining the amount of inorganic carbon input to the process through measurement of the inorganic carbon content of the phosphate rock and multiplying by the amount (mass) of phosphate rock used to manufacture phosphoric acid.

Refer to proposed 40 CFR part 98, subpart C specifically for procedures to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

In order to assess the composition of the inorganic carbon input, we assume that vertically integrated phosphoric acid production facilities already have the necessary equipment on-site for conducting chemical analyses of the inorganic carbon weight fraction of the phosphate rock and that this analysis is conducted on a routine basis at facilities. Facilities importing rock from Morocco would send rock samples off-site for composition analysis. The inorganic carbon content would be determined on a per-batch basis. Multiplying the inorganic carbon content by the amount (mass) of phosphate rock processed and by the molecular weight ratio of CO<sub>2</sub> to inorganic carbon (44/12) yields the estimate of CO<sub>2</sub> emissions. This calculated value should be recorded monthly based on the most recent batch of phosphate rock received. The monthly emissions for each phosphoric acid process line are then summed to obtain the annual emissions to be included in the report.

The various approaches to monitoring GHG emissions are elaborated in the Phosphoric Acid Production TSD (EPA-HQ-OAR-2008-0508-026).

#### 4. Selection of Procedures for Estimating Missing Data

The likelihood for missing data is low, as businesses closely track their purchase of production inputs. The Phosphoric Acid NSPS (40 CFR part 60, subpart T) requires continuous monitoring of phosphorus-bearing material (rock) to process. This requirement, along with the fact that the facility would closely monitor production inputs, results in low likelihood of missing data. Additionally, only 3 facilities within the U.S. are not vertically integrated with mines and may lack the necessary equipment to measure the inorganic carbon weight percent of the rock.

Therefore, no missing data procedures would apply to CO<sub>2</sub> emission estimates from wet-process phosphoric acid production facilities because inorganic carbon test results and monthly production data should be readily available. Therefore, 100 percent data availability would be required.

#### 5. Selection of Data Reporting Requirements

We propose that facilities report total annual CO<sub>2</sub> emissions from each wet-process phosphoric acid productionline, as well as any stationary fuel combustion emissions. In addition, we propose that facilities report their annual average phosphate rock consumption, percent of inorganic carbon in the phosphate rock consumed, annual phosphoric acid production and concentration and annual



phosphoric acid capacity. These data are used to calculate emissions. They are needed for us to understand the emissions data and assess the reasonableness of the reported emissions. A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and Z.

#### 6. Selection of Records That Must Be Retained

In addition to the data reported, we propose that facilities maintain records of inorganic carbon content chemical analyses on each batch of phosphate rock and monthly phosphate rock consumption (by the origin of the phosphate rock). These records provide values that are directly used to calculate the emissions that are reported and are necessary to allow determination of whether the GHG emissions monitoring and calculations were done correctly.

A full list of records that must be retained on-site is included in proposed 40 CFR part 98, subparts A and Z.

#### AA. Pulp and Paper Manufacturing

##### 1. Definition of the Source Category

The pulp and paper source category consists of over 5,000 facilities engaged in the manufacture of pulp, paper, and/or paperboard products primarily from wood material. However, less than 10 percent of these facilities are expected to meet the applicability thresholds of this proposed rule. The approximately 425 facilities that the

proposed rule is expected to cover mainly consist of facilities that include pulp, paper and paperboard facilities that operate fossil fuel-fired boilers in addition to operating other sources of GHG emissions (e.g., biomass boilers, lime kilns, onsite landfills, and onsite wastewater treatment systems)<sup>84</sup>.

Greenhouse gas emissions from the pulp and paper source category are predominantly CO<sub>2</sub> with smaller amounts of CH<sub>4</sub> and N<sub>2</sub>O. The pulp and paper GHG emissions include biomass-derived CO<sub>2</sub> emissions from using the biomass generated on site as a byproduct (e.g., bark, other wood waste, spent pulping liquor). For example, kraft pulp and paper facilities are likely to generate byproduct biomass fuel while the majority of the onsite energy for non-integrated paper facilities and 100 percent recycled paper facilities is likely to be generated from fossil fuel-fired boilers because these facilities do not generate byproduct biomass fuel.

Table AA-1 of this preamble lists the GHG emission sources that may be found at pulp and paper facilities, the type of GHG emissions that are required to be reported, and

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<sup>84</sup> This estimate is based on a survey of pulp and paper mills conducted by the National Council for Air and Stream Improvement that operated stationary combustion units in 2005. See: National Council of Air and Stream Improvement Special Report No. 06-07. December 2006.

where the reporting methodologies are found in proposed 40 CFR part 98.

**Table AA-1. GHG Emission Sources at Pulp, Paper, and Paperboard Facilities**

<b>Emissions Source</b>	<b>GHG emissions</b>	<b>Subpart of 40 CFR part 98 where emissions reporting methodologies addressed</b>
General Stationary Fuel Combustion	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, biomass-CO <sub>2</sub>	Subpart C
Makeup Chemicals (CaCO <sub>3</sub> , Na <sub>2</sub> CO <sub>3</sub> )	CO <sub>2</sub>	Subpart AA
Onsite industrial landfills	CH <sub>4</sub>	Subpart HH
Wastewater treatment	CH <sub>4</sub>	Subpart II

The method presented in this section of the preamble is to account for the use of make-up chemicals (e.g., sodium sulfate, calcium carbonate, sodium carbonate) that are added into the recovery loop (e.g., with the spent pulping liquor) at a pulp and paper facility to replace the small amounts of sodium and calcium that are lost from the recovery cycle at kraft and soda facilities. When carbonates are added, the carbon in these make-up chemicals, which can be derived from biomass or mineral sources, is emitted as CO<sub>2</sub> from recovery furnaces and lime kilns. In cases where the carbon is mineral-based, emissions of CO<sub>2</sub> would contribute to GHG emissions.

Affected facilities would be required to report total GHG emissions on a facility-wide basis for all source categories for which methods are presented in proposed 40 CFR part 98.

## 2. Selection of Reporting Threshold

For the pulp and paper source category, the Agency proposes a GHG reporting threshold of 25,000 metric tons CO<sub>2</sub>e, which would include the vast majority of GHG emissions from the pulp and paper source category<sup>85</sup>.

As described in proposed 40 CFR part 98, subpart A, biomass-derived CO<sub>2</sub> emissions should not be taken into consideration when determining whether a facility exceeds the 25,000 metric tons CO<sub>2</sub>e threshold.

In evaluating potential thresholds for the pulp and paper source category, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e. The threshold analysis focuses on the most significant sources of GHG emissions in the pulp and paper industry, specifically facilities that make pulp, paper and paperboard and operate fossil fuel-fired boilers. Therefore, of the 5,000 facilities associated with this industry, only 425 were included in the analysis. Table AA-2 of this preamble illustrates that the various thresholds do not have a significant effect on the amount of emissions that would be covered.

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<sup>85</sup> The American Forest and Paper Association estimates that the 25,000 metric tons CO<sub>2</sub>e would include approximately 99 percent of GHG emissions from the pulp and paper source category.

For a full discussion of the threshold analysis, please refer to the Pulp and Paper Manufacturing TSD (EPA-HQ-OAR-2008-0508-027). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

**Table AA-2. Reporting Thresholds for Pulp and Paper Sector**

Threshold Level metric tons CO <sub>2</sub> e	Total National Emissions (metric tons CO <sub>2</sub> e)	Total Number of U.S. Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	57,700,000	425	57,700,000	100%	425	100%
10,000	57,700,000	425	57,700,000	100%	425	100%
25,000	57,700,000	425	57,700,000	100%	425	100%
100,000	57,700,000	425	57,527,000	99.7%	410	96%

### 3. Selection of Proposed Monitoring Methods

#### a. Calculation Methods Selected

Refer to proposed 40 CFR part 98, subparts C, HH, and II for monitoring methods for general stationary fuel combustion sources, landfills, and industrial wastewater treatment occurring on-site at pulp and paper facilities. This section of the preamble includes monitoring methods for calculating and reporting makeup chemicals at pulp and paper facilities. Additional details on the proposed monitoring options are elaborated in the Pulp and Paper Manufacturing TSD (EPA-HQ-OAR-2008-0508-027).

The proposed method for monitoring emissions from carbonate-based make-up chemicals used at chemical pulp

facilities includes calculating the CO<sub>2</sub> emissions from the added CaCO<sub>3</sub> and Na<sub>2</sub>CO<sub>3</sub> using emissions factors provided in the rule. The calculation assumes that the carbonate based make-up chemicals added (e.g., limestone) are pure carbonate minerals, and that all of the carbon is released to the atmosphere. If you believe that these assumptions do not represent circumstances at your facility, you may send samples of each carbonate consumed to an off-site laboratory for a chemical analysis of the carbonate weight fraction on a quarterly basis, consistent with proposed 40 CFR part 98, subpart U. You could also determine the calcination fraction for each of the carbonate-based minerals consumed, using an appropriate test method. Make-up chemical usage would be required to be determined by direct measurement of the quantity of chemical added. The chemical usage should be quantified separately for each chemical used, and the estimate should be in terms of pure CaCO<sub>3</sub> and/or Na<sub>2</sub>CO<sub>3</sub>. We have proposed direct measurement for quantifying the amount of makeup chemicals, consistent with the estimation of emissions from carbonates in the rest of proposed 40 CFR part 98.

For the monitoring methods detailed in proposed 40 CFR part 98, subpart C for general stationary combustion, it should be noted that biogenic CO<sub>2</sub> emissions from the

combustion of biomass fuels are to be reported separately. Furthermore, in referring to proposed 40 CFR part 98, subpart C on general stationary combustion, we would expand upon particular details unique to a pulp and paper facility, because of the unique uses of biomass fuels. For the pulp and paper source category, biomass fuels include, but may not be limited to: (1) unadulterated wood, wood residue, and wood products (e.g., trees, tree stumps, tree limbs, bark, lumber, sawdust, sanderdust, chips, scraps, slabs, millings, wood shavings, paper pellets, and corrugated container rejects); (2) pulp and paper facility wastewater treatment system sludge; (3) vegetative agricultural and silvicultural materials, such as logging residues and bagasse; and (4) liquid biomass-based fuels such as biomass-based turpentine and tall oil. Such fuels could be combusted at a pulp and paper facility in stationary combustion units including, but not limited to, boilers, chemical recovery furnaces, and lime kilns. Proposed 40 CFR part 98, subpart C provides details on the separate reporting of the biogenic CO<sub>2</sub> emissions from these biomass-based fuels, and the calculation methodologies for any fossil fuels combusted, including when co-fired with biomass.

Where biomass is co-fired with fossil fuel, the appropriate methodology as required in proposed 40 CFR part 98, subpart C should be used. However, to minimize the burden on owners and operators of biomass-fired stationary combustion equipment, this proposed rule allows biogenic CO<sub>2</sub> emissions to be calculated using default emission factors and default HHVs used in the Tier 1 methodology.

Where available, like in the case of spent pulping liquor, we would require direct analysis of the HHV, rather than allowing the use of a default HHV. This is due to the variability in the HHV of spent pulping liquor across the industry and because a number of facilities already perform this analysis on a monthly basis. However, the proposed rule does not propose the use of default GHG emissions factors for spent pulping liquor at kraft pulp facilities. For sulfite and semichemical chemical recovery combustion units, we propose that sources conduct a monthly carbon content analysis of the spent pulping liquor for use in calculating the biomass CO<sub>2</sub> emissions because no default emissions factors are known to exist for these sources.

We are requesting comment on the appropriateness of today's proposed requirements for monthly measurement of spent pulping liquor HHV (kraft recovery furnaces) and monthly carbon content analysis of spent pulping liquor



(sulfite and semichemical chemical recovery combustion units). We welcome data and documentation regarding the use of potential alternative methods or default emissions factors.

In addition, regarding the monitoring methods in proposed 40 CFR part 98, subpart C for general stationary combustion, the majority of biomass fuel consumed at pulp and paper mills is generated onsite, and thus, as required in proposed 40 CFR part 98, subpart C, the use of purchasing records might not be an option for these mills. As such, we are taking comment on appropriate details to be reported on volume or mass of biogenic fuel fed into stationary combustion units.

b. Other monitoring methods considered

Lime kilns and calciners used in the pulp and paper source category are unique and are defined separately from lime kilns used in the commercial lime manufacturing industry because the source of the carbon in the calcium carbonate entering the kraft lime kiln is biogenic. The CO<sub>2</sub> emitted from lime kilns at kraft pulp facilities originates from two sources: (1) fossil fuels burned in the kiln, and (2) conversion of calcium carbonate (or "lime mud") to calcium oxide during the chemical recovery process.

Although CO<sub>2</sub> is also liberated from the CaCO<sub>3</sub> burned in the kiln or calciner, the carbon released from CaCO<sub>3</sub> is biomass carbon that originates in wood and is included in the biogenic CO<sub>2</sub> emissions factor for the recovery furnace as discussed previously. The reporting of the CO<sub>2</sub> emissions associated with the conversion of the calcium carbonate to lime as biogenic CO<sub>2</sub> is consistent with the reporting requirements in other accepted protocols such as DOE 1605(b) and guidance developed for the International Council of the Forest and Paper Association. This approach has been widely accepted by the domestic and international community, including WRI/WBCSD. The IPCC does not directly state how CO<sub>2</sub> emissions from kraft facility lime kilns should be addressed. As biogenic process CO<sub>2</sub> emissions (i.e., any biogenic CO<sub>2</sub> emissions not associated with the combustion of biomass fuels) are not being reported in this rule, we are taking comment on whether an exception should be made for this unique case, consistent with other existing protocols as noted above.

#### 4. Selection of Procedures for Estimating Missing Data

Refer to proposed 40 CFR part 98, subparts C, HH, and II for procedures for estimating missing data for stationary combustion, landfills, and industrial wastewater treatment occurring on-site at pulp and paper facilities.

Proposed 40 CFR part 98, subpart AA contains missing data procedures for process emissions. There are no missing data procedures for measurements of heat content and carbon content of spent pulping liquor. A re-test must be performed if the data from any monthly measurements are determined to be invalid. For missing spent pulping liquor flow rates, the lesser value of either the maximum fuel flow rate for the combustion unit, or the maximum flow rate that the fuel flow meter can measure would be used. For the use of makeup chemicals (carbonates), the substitute data value shall be the best available estimate of makeup chemical consumption, based on available data (e.g., past accounting records, production rates).

#### 5. Selection of Data Reporting Requirements

Refer to proposed 40 CFR part 98, subparts C, HH, and II for reporting requirements for stationary combustion, landfills, and industrial wastewater treatment occurring on-site at pulp and paper facilities.

We propose that some additional data be reported to assist in verification of estimates, checks for reasonableness, and other data quality considerations, including: annual emission estimates presented by calendar quarters (including biogenic CO<sub>2</sub>), total consumption of all biomass fuels and spent pulping liquor by calendar

quarters, and total annual quantities of makeup chemicals (carbonates) used and by carbonate.

#### 6. Selection of Records That Must Be Retained

Refer to proposed 40 CFR part 98, subparts C, HH, and II for recordkeeping requirements for stationary combustion, landfills, and industrial wastewater treatment occurring on-site at pulp and paper facilities.

In addition to the recordkeeping requirements for general stationary fuel combustion sources in proposed 40 CFR part 98, subpart C, we propose that the following additional records be kept to assist in QA/QC, including: GHG emission estimates by calendar quarter by unit and facility, monthly consumption total of all biomass fuels and spent pulping liquor by unit and facility, monthly analyses of spent pulping liquor HHV or carbon content, monthly and annual steam production for each biomass unit, and monthly quantities of makeup chemicals (carbonates) used.

#### BB. Silicon Carbide Production

##### 1. Definition of the Source Category

Silicon carbide (SiC) is primarily an industrial abrasive manufactured from silica sand or quartz and petroleum coke. Other uses of silicon carbide include semiconductors, body armor, and the manufacture of

Moissanite, a diamond substitute. The silicon carbide source category is limited to the production of silicon carbide for abrasive purposes.

CO<sub>2</sub> and CH<sub>4</sub> are emitted during the production of silicon carbide. Petroleum coke is utilized as a carbon source during silicon carbide production and approximately 35 percent of the carbon is retained within the silicon carbide product; the remaining carbon is converted to CO<sub>2</sub> and CH<sub>4</sub>.

Silicon carbide process emissions totaled 109,271 metric tons CO<sub>2</sub>e in 2006 (less than 0.002 percent of the total national GHG emissions). Of the total, process-related CO<sub>2</sub> emissions accounted for 91 percent (91,700 metric tons CO<sub>2</sub>e), CH<sub>4</sub> emissions accounted for 9 percent (8,526 metric tons CO<sub>2</sub>e), and on-site stationary combustion emissions accounted for less than 1 percent (9,045 metric tons CO<sub>2</sub>e).

For additional background information on silicon carbide production, please refer to the Silicon Carbide Production TSD (EPA-HQ-OAR-2008-0508-028).

## 2. Selection of Reporting Threshold

In developing the reporting threshold for silicon carbide production, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons

CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e. Requiring all facilities to report (no threshold) was also considered. Table BB-1 of this preamble illustrates the emissions and facilities that would be covered under these various thresholds.

**Table BB-1. Threshold Analysis for Silicon Carbide Production**

Threshold level metric tons CO <sub>2</sub> e/yr	Total national emissions (metric tons CO <sub>2</sub> e/yr)	Total number of facilities	Emissions covered		Facilities covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	109,271	1	109,271	100%	1	100%
10,000	109,271	1	109,271	100%	1	100%
25,000	109,271	1	109,271	100%	1	100%
100,000	109,271	1	109,271	100%	1	100%

There is no proposed threshold reporting level for GHG emissions from silicon carbide production facilities. The current estimate of emissions from the known facility just exceeds the highest threshold considered. Therefore, in order to simplify the rule and avoid the need for the facility to calculate and report whether the facility exceeds the threshold value, we propose that all facilities report in this source category. Requiring all facilities to report captures 100 percent of emissions, and small temporary changes to the facility would not affect reporting requirements.

For a full discussion of the threshold analysis, please refer to the Silicon Carbide Production TSD (EPA-HQ-

OAR-2008-0508-028). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Monitoring of process emissions from silicon carbide production is addressed in both domestic and international GHG monitoring guidelines and protocols (the 2006 IPCC Guidelines and U.S. GHG Inventory). These methodologies can be summarized in two different options based on measuring either inputs or output of the production process. In general, the output or production-based method is less certain, as it involves multiplying production data by emission and correction factors that are likely default values based on carbon content (i.e., percentage of petroleum coke input that is carbon) assumptions. In contrast, the input method is more certain as it generally involves measuring the consumption of reducing agents and calculating the carbon contents of those reducing agents, specifically petroleum coke inputs.

Proposed Option. Under this proposed rule, if you are required to use an existing CEMS that meets the requirements outlined in proposed 40 CFR part 98, subpart C, then you would be required to use CEMS to estimate CO<sub>2</sub>

emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions from the industrial source. Also, refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

Under this proposed rule, if you do not have CEMS that meet the conditions outlined in proposed 40 CFR part 98, subpart C or where the CEMS would not adequately account for process emissions, we propose that facilities use an input based method to estimate process-related CO<sub>2</sub> emissions by measuring the facility-level petroleum coke consumed and applying a facility-specific emission factor derived from analysis of the carbon content in the coke. In addition, we propose that facilities use default emission factors to estimate process-related CH<sub>4</sub> emissions. Refer to proposed 40 CFR part 98, subpart C for procedures to estimate combustion-related CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions.

We propose that facilities use an input-based method to estimate process-related CO<sub>2</sub> emissions by measuring the facility-level petroleum coke consumed and applying a facility-specific emission factor derived from analysis of the carbon content in the coke. Using the emission factor, facilities would calculate CO<sub>2</sub> emissions quarterly and



aggregate for an annual estimate. In order to estimate carbon content, we propose that facilities request reports of the carbon content of the petroleum coke directly from the supplier or send petroleum coke samples out to a certified laboratory for chemical analysis on a quarterly basis. Any changes in the measured values would be reflected in a revised emission factor.

We assume that data on petroleum coke consumption is readily available to facilities. The measurement of production quantities is common practice in the industry and is usually measured through the use of scales or weigh belts so additional costs to the industry are not anticipated. The primary additional burden for facilities associated with this method is modifying their petroleum coke supplier contract to include an analysis of the carbon content of each delivery of petroleum coke. Alternatively, a facility can send the coke to an off-site laboratory for analysis of the carbon content by the applicable method incorporated by reference in proposed 40 CFR 98.7. We consider the additional burden of determining the carbon content of the coke raw material minimal compared to the increases in accuracy expected from the site specific emission factors.

We also considered a second method of estimating process-related CO<sub>2</sub> emissions that involves application of default emission factors based on the quantity of coke consumed or total silicon carbide produced. According to the 2006 IPCC Guidelines, the default CO<sub>2</sub> emission factors for silicon carbide production are relatively uncertain because industry scale carbide production processes differ from the stoichiometry of theoretical chemical reactions. Given the relative uncertainty of defaults, we decided not to propose existing methodologies that relied on default emission factors or default values for carbon content of materials because default approaches are inherently inaccurate for site-specific determinations. The use of default values is more appropriate for sector wide or national total estimates from aggregated activity data than for determining emissions from specific facilities.

We propose that facilities estimate process-related CH<sub>4</sub> emissions by using a default emission factor of 10.2 kg CH<sub>4</sub> per metric ton of petroleum coke consumed during silicon carbide production. This method coincides with the IPCC Tier 1 method. Direct measurement of a CH<sub>4</sub> emission factor was considered, but the cost of performing testing to determine this factor is too burdensome, considering that the amount of CH<sub>4</sub> emissions originating from silicon carbide

production is less than 0.5 percent of the overall GHG emissions from this source category.

The various approaches to monitoring GHG emissions are elaborated in the Silicon Carbide Production TSD (EPA-HQ-OAR-2008-0508-028).

#### 4. Selection of Procedures for Estimating Missing Data

It is assumed that a facility would be readily able to supply data on annual petroleum coke consumption and its carbon contents. Therefore, 100 percent data availability is required.

#### 5. Selection of Data Reporting Requirements

We propose that facilities report the combined annual CO<sub>2</sub> and CH<sub>4</sub> emissions from the silicon carbide production processes. In addition, we propose that the following data be reported to assist in verification of calculations and estimates, checks for reasonableness, and other data quality considerations: annual silicon carbide production, annual silicon carbide production capacity, facility-specific CO<sub>2</sub> emission factor, and annual operating hours. A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and BB.

#### 6. Selection of Records That Must Be Retained

In addition to the data reported, we propose that facilities maintain records of quarterly analyses of carbon

content for consumed coke (averaged to an annual basis), annual consumption of petroleum coke, and calculations of emission factors. These records hold values directly used to calculate reported emissions and are necessary for future verification that GHG emissions monitoring and calculations were done correctly. A full list of records that must be maintained onsite is included in proposed 40 CFR part 98, subparts A and BB.

#### CC. Soda Ash Manufacturing

##### 1. Definition of the Source Category

Soda ash (sodium carbonate,  $\text{Na}_2\text{CO}_3$ ) is a raw material utilized in numerous industries including glass production, pulp and paper production, and soap production. According to the USGS, the majority of the 11 million metric tons of soda ash produced is used for glass production. In the U.S., trona (the raw material from which most American soda ash is produced) is mined exclusively in Wyoming, where five of the seven U.S. soda ash manufacturing facilities are located. Total soda ash production in 2006 was 11 million metric tons, an amount consistent with 2005 and 500,000 metric tons more than was produced in 2002. Due to a surplus of soda ash in the market, approximately 17 percent of the soda ash industry's nameplate capacity was idled in 2006.

Trona-based production methods are collectively referred to as "natural production" methods. "Natural production" emits CO<sub>2</sub> by calcining trona. Calcining involves placing crushed trona into a kiln to convert sodium bicarbonate into crude sodium carbonate that would later be filtered into pure soda ash.

National emissions from natural soda ash manufacturing were estimated to be 3.1 million metric tons CO<sub>2</sub>e in 2006 or less than 0.04 percent of total emissions. These emissions include both process-related emissions (CO<sub>2</sub>) and on-site stationary combustion emissions (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O) from six production facilities across the U.S. and Puerto Rico. Process-related emissions account for 1.6 million metric tons CO<sub>2</sub>e, or 52 percent of the total, while on-site stationary combustion emissions account for the remaining 1.5 million metric tons CO<sub>2</sub>e emissions. Soda ash consumption in the U.S. generated 2.5 million metric tons CO<sub>2</sub>e in 2006.

Emissions from consumption of soda ash are not addressed in this proposed rule as they do not occur at the soda ash manufacturing source. Emissions from the use of soda ash would be reported by the glass manufacturing industry, which consumes the soda ash.

For additional background information on soda ash manufacturing, please refer to the Soda Ash Manufacturing TSD (EPA-HQ-OAR-2008-0508-029).

## 2. Selection of Reporting Threshold

In developing the threshold for soda ash manufacturing, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e per year. Table CC-1 of this preamble illustrates the emissions and facilities that would be covered under these various thresholds.

**Table CC-1. Threshold Analysis for Soda Ash Manufacturing**

Threshold level metric tons CO <sub>2</sub> e/yr	Total National Emissions metric tons CO <sub>2</sub> e/yr	Total Number of facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	3,121,438	5	3,121,438	100%	5	100%
10,000	3,121,438	5	3,121,438	100%	5	100%
25,000	3,121,438	5	3,121,438	100%	5	100%
100,000	3,121,438	5	3,121,438	100%	5	100%

Facility-level emissions estimates based on known plant capacities suggest that all known facilities exceed the highest (100,000 metric tons CO<sub>2</sub>e) threshold examined. Two facilities were excluded from this analysis based on available information (one has not been operating since 2004 and the second recycles or utilizes CO<sub>2</sub> emissions as part of the process, resulting in limited fugitive emissions). Even if sources are not operating at full

capacity, all or most of them would still be expected to exceed the 25,000 metric ton threshold. We propose that all facilities report. Requiring all facilities to report would simplify the proposed rule, and ensure that 100 percent of the emissions from this industry are reported.

For a full discussion of the threshold analysis, please refer to the Soda Ash Manufacturing TSD (EPA-HQ-OAR-2008-0508-029). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating process-related emissions from soda ash manufacturing (e.g., the 2006 IPCC Guidelines, DOE 1605(b)). These methodologies coalesce around three different options:

Option 1: Default emission factors would be applied to the amount of trona consumed or soda ash produced. This method would also involve applying an adjustment factor to the default emission factor to account for fractional purity of the trona consumed or soda ash produced. A

default adjustment factor of 0.9 could be applied if country specific or plant specific information is not available. This option is consistent with IPCC Tier 2 methods and 1605(b)'s "A" rated approach.

Option 2: Develop a site-specific emission factor (determined by an annual stack test). This method would account for the fractional purity of the trona consumed or soda ash produced. This approach is consistent with IPCC's Tier 2 method and consistent with the DOE 1605(b) "A" rated approach.

Option 3: Direct measurement of emissions using CEMS.

Proposed Option. Under this proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions, you would be required to follow requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions. Also, refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

Under this proposed rule, if you do not have CEMS that meet the conditions outlined in proposed 40 CFR part 98, subpart C, or where the CEMS would not adequately account for process emissions, we propose that facilities estimate



process-related CO<sub>2</sub> emissions using a modified Option 1. Refer to proposed 40 CFR part 98, subpart C for procedures to estimate combustion-related CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions.

The proposed monitoring method requires facilities to use default stoichiometric emission factors (either 0.097 for trona consumed (ratio of ton of CO<sub>2</sub> emitted for each ton of trona) or 0.138 for soda ash produced (ratio of ton of CO<sub>2</sub> emitted for each ton of natural soda ash produced)) and to measure the fractional purity of the trona or soda ash. These factors are then applied to the estimated quantity of raw material input or the amount of soda ash output. Raw material input and output quantities are assumed to be readily available to facilities. In order to assess the fractional purity of trona or soda ash (as determined by the level of the inorganic carbon present), we propose that facilities test samples of trona using in-house TOC analyzers or test samples of soda ash for inorganic carbon expressed as total alkalinity using applicable test methods. We are assuming that soda ash facilities are conducting daily tests of fractional purity and can develop monthly averages from daily tests. This methodology was chosen because it would be more accurate than methods using default factors for fractional purity.

We decided against applying a default emission factor and a default adjustment factor of 0.9 to either the total amount of trona consumed or soda ash produced. According to IPCC, the stoichiometric ratio used in the default emission factor equation is an exact number and assumes 100 percent purity of the input or output and the uncertainty of the default emission factor is negligible. However, simple application of default emission and adjustment factors would not take into account the actual fractional purities of either the trona input or soda ash output.

We also decided against proposing the second option to determine an annual site-specific emission factor. The stack from the calciner (kiln) emits CO<sub>2</sub> emissions from both combustion- and process-related sources. An annual stack test would not capture the variability in stationary combustion emissions associated with consumption of various types of fuels, so would not significantly reduce the uncertainty for developing annual estimates of CO<sub>2</sub> emissions. While not improving emissions estimates significantly, annual stack testing would be burdensome to industry. We have concluded that measuring fractional purity, as described in the proposed modified Option 1 approach, would improve emissions estimates, with a minimal cost burden.

The third option we considered, but did not select as the proposed option, was continuous direct measurement of emissions from soda ash manufacturing. This option is consistent with the 2006 IPCC Guidelines Tier 3 method. Use of a CO<sub>2</sub> CEMS would eliminate the need for further periodic review because this method would account for the variability in GHG emissions due to changes in the process or operation over time. While this method does tend to provide the most accurate CO<sub>2</sub> emissions measurements and can measure both the combustion- and process-related CO<sub>2</sub> emissions, it is likely the costliest of all the monitoring methods. Installation of CEMS would require significant additional burden to facilities given that few soda ash facilities currently have CO<sub>2</sub> CEMS.

The various options of monitoring GHG emissions, as well as the domestic and international GHG monitoring guidelines and protocols researched, are elaborated in the Soda Ash Manufacturing TSD (EPA-HQ-OAR-2008-0508-029).

#### 4. Selection of Procedures for Estimating Missing Data

We propose that no missing data procedures would apply to estimating CO<sub>2</sub> process emissions because the calculations are based on production, or trona consumption, which are closely tracked production inputs and outputs. Given that the fractional purity would have to be tested on a daily

basis, if a value is missing the test should be repeated. Therefore, 100 percent data availability would be required.

#### 5. Selection of Data Reporting Requirements

We propose that reported data include annual CO<sub>2</sub> process emissions from each soda ash manufacturing line, and the number of soda ash manufacturing lines, as well as any stationary fuel combustion emissions. In addition, we propose that facilities report the following data for each soda ash manufacturing line: annual soda ash production, annual soda ash production capacity, annual trona quantity consumed, fractional purity (i.e., inorganic carbon content) of the trona or soda ash, and number of operating hours in the calendar year. These additional data, most of which are used as a basis for calculating emissions, are needed to understand the emissions data, verify the reasonableness of the reported emissions, and identify outliers. A full list of data that would be reported is included in proposed 40 CFR part 98, subparts A and CC.

#### 6. Selection of Records That Must Be Retained

We propose that facilities keep information on monthly production of soda ash (metric tons), monthly consumption of trona (metric tons), and daily fractional purity (i.e., inorganic carbon content) of the trona or soda ash. A full

list of records that must be retained onsite is included in the proposed rule.

DD. Sulfur Hexafluoride (SF<sub>6</sub>) from Electrical Equipment

1. Definition of the Source Category

The largest use of SF<sub>6</sub>, both in the U.S. and internationally, is as an electrical insulator and interrupter in equipment that transmits and distributes electricity. The gas has been employed by the electric power industry in the U.S. since the 1950s because of its dielectric strength and arc-quenching characteristics. It is used in gas-insulated substations, circuit breakers, other switchgear, and gas-insulated lines. SF<sub>6</sub> has replaced flammable insulating oils in many applications and allows for more compact substations in dense urban areas. Currently, there are no available substitutes for SF<sub>6</sub> in this application. For further information, see the SF<sub>6</sub> from Electrical Equipment TSD (EPA-HQ-OAR-2008-0508-030).

Fugitive emissions of SF<sub>6</sub> can escape from gas-insulated substations and switch gear through seals, especially from older equipment. The gas can also be released during equipment manufacturing, installation, servicing, and disposal.

PFCs are sometimes used as dielectrics and heat transfer fluids in power transformers. PFCs are also used

for retrofitting CFC-113 cooled transformers. One PFC used in this application is perfluorohexane ( $C_6F_{14}$ ). In terms of both absolute and carbon-weighted emissions, PFC emissions from electrical equipment are generally believed to be much smaller than  $SF_6$  emissions from electrical equipment; however, there may be some exceptions to this pattern, according to the 2006 IPCC Guidelines.

According to the 2008 U.S. Inventory, total U.S. estimated emissions of  $SF_6$  from an estimated 1,364 electric power system utilities<sup>86</sup> were 12.4 million metric tons  $CO_2e$  in 2006. We do not have an estimate of PFC emissions.

This source category comprises electric power transmission and distribution systems that operate gas-insulated substations, circuit breakers, and other switchgear, or power transformers containing sulfur-hexafluoride ( $SF_6$ ) or PFCs.

## 2. Selection of Reporting Threshold

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<sup>86</sup> The estimated total number of electric power system (EPS) utilities includes all companies participating in the  $SF_6$  Emission Reduction Partnership for Electric Power Systems and the number includes non-partner utilities with non-zero transmission miles. The estimated total number of EPS utilities that emit  $SF_6$  likely underestimates the population, as some utilities may own high-voltage equipment yet not own transmission miles. However, the estimated number is consistent with the U.S. inventory methodology, in which only non-partner utilities with non-zero transmission miles and partner utilities are assumed to emit  $SF_6$ .

We propose to require electric power systems to report their SF<sub>6</sub> and PFC emissions if the total nameplate capacity of their SF<sub>6</sub>-containing equipment exceeds 17,820 lbs of SF<sub>6</sub>. This threshold is equivalent to an emissions threshold of 25,000 metric tons CO<sub>2</sub>e, and was developed using historical (1999) data from utilities that participate in EPA's SF<sub>6</sub> Emission Reduction Partnership for Electric Power Systems (Partnership).

In addition, we considered emission-based threshold options of 1,000 metric tons CO<sub>2</sub>e; 10,000 metric tons CO<sub>2</sub>e; and 100,000 metric tons CO<sub>2</sub>e. Nameplate capacity thresholds of 713; 7,128; and 71,280 lbs of SF<sub>6</sub> for all utilities were also considered, corresponding to the emission threshold options of 1,000; 10,000; and 100,000 metric tons CO<sub>2</sub>e, respectively. Summaries of the threshold options (capacity-based and emissions-based) and the number of utilities and emissions falling above each threshold are presented in Tables DD-1 and DD-2 of this preamble.

**Table DD-1. Options for Capacity-Based Thresholds for Electric Power Systems**

Nameplate Capacity Threshold For All Utilities (lbs SF <sub>6</sub> )	Total national emissions MMTCO <sub>2</sub> e/yr	Total number of facilities	Emissions covered		Facilities covered	
			MMTCO <sub>2</sub> e/yr	Percent	Number	Percent
713	12.4	1,364	12.19	98%	578	42%
7,128	12.4	1,364	10.96	88%	183	13%
17,820	12.4	1,364	10.32	83%	141	10%
71,280	12.4	1,364	5.95	48%	35	3%

**Table DD-2. Options for Emissions-Based Thresholds for Electric Power Systems**

Threshold level metric tons CO <sub>2</sub> e/yr	Total national emissions MMTCO <sub>2</sub> e/yr	Total number of facilities	Emissions covered		Facilities covered	
			MMTCO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	12.4	1,364	12.20	98%	564	41%
10,000	12.4	1,364	10.87	88%	158	12%
25,000	12.4	1,364	10.11	82%	111	8%
100,000	12.4	1,364	5.84	47%	27	2%

We selected a nameplate capacity threshold equivalent to the 25,000 metric tons CO<sub>2</sub>e emissions threshold level. A capacity-based threshold was selected because it permits utilities to quickly determine whether they are covered. There have been many mergers and acquisitions in the electric power industry and nameplate capacity is generally a known variable as a result of these transactions.

The proposed threshold is consistent with the threshold for other source categories. Based on information from the Partnership and from the Universal Database Interface Directory of Electric Power Producers and Distributors, we estimate that the nameplate capacity threshold covers only a small percentage of total utilities (10 percent or 141 utilities), while covering the majority of annual emissions (approximately 83 percent).

Other Options Considered. We considered setting a threshold based on the length of the transmission lines, defined as the miles of lines carrying voltages above 34.5 kV, owned by electric power systems. The transmission-mile



threshold equivalent to 25,000 metric tons CO<sub>2</sub>e is 1,186 miles. The fractions of utilities and emissions covered by this threshold would be almost identical to those covered by the nameplate-capacity threshold.

We decided not to propose the transmission-mile threshold because the relationship between emissions and transmission miles, while strong, is not as strong as that between emissions and nameplate capacity. On the one hand, some utilities have far larger nameplate capacities and emissions than would be expected based on their transmission miles. This is the case for some urban utilities that have large volumes of SF<sub>6</sub> in gas-insulated switchgear. On the other hand, some utilities have lower nameplate capacities and emissions than would be expected based on their transmission miles, because most of their transmission lines use lower voltages than average and therefore typically use less SF<sub>6</sub> than average as well.

Additional information supporting the selection of the threshold can be found in the SF<sub>6</sub> from Electrical Equipment TSD (EPA-HQ-OAR-2008-0508-030). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

In developing the proposed approach, we reviewed the 2006 IPCC Guidelines, the SF<sub>6</sub> Emissions Reduction Partnership for Electric Power Systems, the U.S. GHG Inventory, DOE 1605(b), EPA's Climate Leaders Program, and TCR. In the IPCC Guidelines, Tiers 1 and 2 are based on default SF<sub>6</sub> and PFC emission factors, but Tier 3 is based on using utility-specific information to estimate emissions of both SF<sub>6</sub> and PFC using a mass-balance analysis.

The proposed monitoring methods for calculating SF<sub>6</sub> and PFC emissions from electric power systems are similar to the methodologies described in EPA's SF<sub>6</sub> Emission Reduction Partnership for Electric Power Systems (Partnership) Inventory Reporting Protocol and Form and the 2006 IPCC Guidelines Tier 3 methods for emissions from electrical equipment. In general, these protocols and guidance all support using a mass-balance approach as the most accurate alternative to estimate emissions.

We propose that you report all SF<sub>6</sub> and PFC emissions, including those from equipment installation, equipment use, and equipment decommissioning and disposal. This requirement would apply only to systems where the total nameplate capacity of their SF<sub>6</sub>-containing equipment exceeds 17,820 lbs of SF<sub>6</sub>. The Tier 3 approach is being proposed because it is the most accurate and it is feasible for all

systems to conduct the mass balance analysis for SF<sub>6</sub> and PFC using readily available information.

The mass-balance approach works by tracking and systematically accounting for all facility uses of SF<sub>6</sub> and PFC during the reporting year. The quantities of SF<sub>6</sub> and PFC that cannot be accounted for are assumed to have been emitted to the atmosphere. The emissions of SF<sub>6</sub> and PFC would be estimated and reported separately.

The following equation describes the proposed utility-level mass-balance approach:

$$\begin{aligned} \text{User Emissions} = & \text{Decrease in SF}_6 \text{ Inventory} + \\ & \text{Acquisitions of SF}_6 - \text{Disbursements of SF}_6 - \text{Net Increase in} \\ & \text{Total Nameplate Capacity of Equipment} \end{aligned}$$

Where:

*Decrease in SF<sub>6</sub> Inventory* is SF<sub>6</sub> stored in containers (but not in equipment) at the beginning of the year minus SF<sub>6</sub> stored in containers (but not in equipment) at the end of the year.

*Acquisitions of SF<sub>6</sub>* is SF<sub>6</sub> purchased from chemical producers or distributors in bulk + SF<sub>6</sub> purchased from equipment manufacturers or distributors with or inside of equipment + SF<sub>6</sub> returned to site after off-site recycling.

*Disbursements of SF<sub>6</sub>* is SF<sub>6</sub> in bulk and contained in equipment that is sold to other entities + SF<sub>6</sub> returned to

suppliers + SF<sub>6</sub> sent off-site for recycling + SF<sub>6</sub> sent to destruction facilities.

*Net Increase in Total Nameplate Capacity of Equipment* is the Nameplate capacity of new equipment minus Nameplate capacity of retiring equipment. (Note that Nameplate capacity refers to the full and proper charge of equipment rather than to the actual charge, which may reflect leakage.)

The same method is being proposed to estimate emissions of PFCs from power transformers.

Other Options Considered. We also considered the IPCC Tier 1 and the IPCC Tier 2 methods for calculating and reporting SF<sub>6</sub> and PFC emissions, but did not choose them for several reasons. Although the IPCC Tier 1 method is simpler, the default emission factors have large uncertainty due to variability associated with handling and management practices, age of equipment, mix of equipment, and other similar factors. Utilities participating in EPA's Partnership have reduced their emission factors to less than Tier 1 default values. Less than 10 percent of U.S. utilities participate in this program; however, these utilities represent close to 40 percent of the U.S. grid, so the IPCC Tier 1 emission factors are not accurate for a large percentage of the U.S. source category.

IPCC Tier 2 methods use country-specific emission factors, but the Partner utilities have demonstrated by calculating their own utility-level emission rates that large variability exists in utility-level emission rates across the nation (i.e., emission rates range from less than one percent of a utility's SF<sub>6</sub> inventory to greater than 35 percent). As a result, we are not proposing the IPCC Tier 2 method.

#### 4. Selection of Procedures for Estimating Missing Data

It is expected that utilities should have 100 percent of the data needed to perform the mass balance calculations for both SF<sub>6</sub> and PFCs. Partner utilities missing inputs to the mass-balance approach have estimated emissions using other methods, such as assuming that all purchased SF<sub>6</sub> is emitted. However, this method over-estimates emissions, and we do not recommend this method of estimation in the absence of more complete data. The use of the mass-balance approach requires correct records for all inputs.

#### 5. Selection of Data Reporting Requirements

We propose annual reporting for facilities in the electric power systems industry. Each facility would report all SF<sub>6</sub> and PFC emissions, including those from equipment installation, equipment use, and equipment decommissioning and disposal. However, the emissions would

not need to be broken down and reported separately for installation, use or disposal. Along with their emissions, utilities would be required to submit the following supplemental data, nameplate capacity (existing as of the beginning of the year, new during the year, and retired during the year), transmission miles, SF<sub>6</sub> and PFC sales and purchases, SF<sub>6</sub> and PFC sent off-site for destruction or to be recycled, SF<sub>6</sub> and PFC returned from offsite after recycling, SF<sub>6</sub> and PFC stored in containers at the beginning and end of the year, SF<sub>6</sub> and PFC with or inside new equipment purchased in the year, SF<sub>6</sub> and PFC with or inside equipment sold to other entities and SF<sub>6</sub> and PFC returned to suppliers.

These data would be submitted because they are the minimum data that are needed to understand and reproduce the emission calculations that are the basis of the reported emissions. Transmission miles would be included in the reported data so that the reasonableness of the reported emissions could be quickly checked using default emission factors.

#### 6. Selection of Records That Must Be Retained

We propose that electric power systems be required to keep records documenting (1) their adherence to the QA/QC requirements specified in the proposed rule, and (2) the

data that would be included in their emission reports, as specified above. The QA/QC requirements records include check-out sheets and weigh-in procedures for cylinders, residual gas amounts in cylinders sent back to suppliers, invoices for gas and equipment purchases or sales, and records of equipment nameplate capacity. The records that are being proposed are the minimum needed to reproduce and confirm emission calculations.

#### EE. Titanium Dioxide Production

##### 1. Definition of the Source Category

Titanium dioxide is a metal oxide commonly used as a white pigment in paint manufacturing, paper, plastics, rubber, ceramics, fabrics, floor covering, printing ink, and other applications. The majority of  $\text{TiO}_2$  production is for the manufacturing of white paint. National production of  $\text{TiO}_2$  in 2006 was approximately 1,400,000 metric tons.

Titanium dioxide is produced through two processes: the chloride process and the sulfate process. According to USGS, most facilities in the U.S. employ the chloride process. Total U.S. production of titanium dioxide pigment through the chloride process was approximately 1.4 metric tons in 2006, a 7 percent increase compared to 2005. The chloride process emits process-related  $\text{CO}_2$  through the use of petroleum coke and chlorine as raw materials, while the

sulfate process does not emit any significant process-related GHGs.

The chloride process is based on two chemical reactions. Petroleum coke (C) is oxidized as the reducing agent in the first reaction in the presence of chlorine and crystallized iron titanium oxide ( $\text{FeTiO}_3$ ) to form and emit  $\text{CO}_2$ . A special grade of petroleum coke, known as calcined petroleum coke, is a highly electrically conductive carbon (fixed carbon content >98 percent) and is used in several manufacturing processes including titanium dioxide (in the chloride process), aluminum, graphite, steel, and other carbon consuming industries. For the purposes of this rulemaking effort EPA is assuming the carbon content factor for calcined petroleum coke is 100 percent or a multiplier of 1. Therefore, no site-specific factor needs to be determined. The titanium tetrachloride ( $\text{TiCl}_4$ ) produced through this first reaction is oxidized with oxygen at about  $1,000^\circ\text{C}$ , and calcinated in a second reaction to remove residual chlorine and any hydrochloric acid that may have formed in the reaction producing titanium dioxide ( $\text{TiO}_2$ ).

National emissions from titanium dioxide production were estimated to be 3.6 million metric tons  $\text{CO}_2\text{e}$  in 2006. These emissions include process-related ( $\text{CO}_2$ ) and on-site



stationary combustion emissions (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) from eight production facilities. Process-related emissions from titanium dioxide production were 1.87 million metric tons CO<sub>2</sub>e or 47 percent of the total, while on-site combustion emissions account for the remaining 1.8 million metric tons CO<sub>2</sub>e emissions in 2006.

For additional background information on titanium dioxide production, please refer to the Titanium Dioxide Production TSD (EPA-HQ-OAR-2008-0508-031).

## 2. Selection of Reporting Threshold

In developing the threshold for titanium dioxide production, we considered an emissions-based threshold of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e. Table EE-1 of this preamble illustrates the emissions and facilities that would be covered under these various thresholds.

**Table EE-1. Threshold Analysis for Titanium Dioxide Production**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/ yr	Percent	Number	Percent
1,000	3,685,777	8	3,685,777	100%	8	100%
10,000	3,685,777	8	3,685,777	100%	8	100%
25,000	3,685,777	8	3,685,777	100%	8	100%
100,000	3,685,777	8	3,628,054	98%	7	88%

At the threshold levels of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, and 25,000 metric tons CO<sub>2</sub>e, all facilities exceed the threshold, therefore covering 100

percent of total emissions. At the 100,000 metric tons CO<sub>2</sub>e level, one facility would not exceed the threshold and 98 percent of emissions would be covered. In order to simplify the rule, and avoid the need for the source to calculate and report whether the facility exceeds threshold value, we are proposing that all titanium dioxide production facilities report. Including all facilities simplifies the rule and ensures 100 percent coverage without significantly increasing the number of affected facilities expected to report relative to the 25,000 metric ton threshold.

For a full discussion of the threshold analysis, please refer to the Titanium Dioxide Production TSD (EPA-HQ-OAR-2008-0508-031). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating process-related emissions from titanium dioxide production (e.g. the 2006 IPCC Guidelines, U.S. GHG Inventory, Australian Government's National Greenhouse and

Energy Reporting System). These methods coalesce around two different options.

Option 1. CO<sub>2</sub> emissions are estimated by applying a default emission factor to annual facility level titanium dioxide production.

Option 2. CO<sub>2</sub> emissions are estimated based on the facility-specific quantity of reducing agents or calcined petroleum coke consumed.

Option 3. Direct measurement of emissions using CEMS.

Proposed Option. Under this proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Where the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions you would be required to follow the calculation procedures, monitoring and QA/QC methods, missing data procedures, reporting requirements, and recordkeeping requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions. Also, refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

Under this proposed rule, if you do not have CEMS that meet the conditions outlined in proposed 40 CFR part 98, subpart C, we propose that facilities use the second option

discussed above to estimate process-related CO<sub>2</sub> emissions. Refer to proposed 40 CFR part 98, subpart C specifically for procedures to estimate combustion-related CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions.

Under this approach the total amount of calcined petroleum coke consumed would be assumed to be directly converted into CO<sub>2</sub> emissions. The amount of calcined petroleum coke can be obtained from facility records, as that data would be readily available. The carbon oxidation factor for the calcined petroleum coke is assumed to be 100 percent, because any amount that is not oxidized is an insignificant amount. For the purposes of this rulemaking effort EPA is assuming the carbon oxidation factor for calcined petroleum coke, is equal to 100/100 or 1. Therefore, no site-specific factor needs to be determined.

We decided not to propose the option to use continuous direct measurement because it would not lead to significantly reduced uncertainty in the emissions estimate over the proposed option. Furthermore, the cost impact of requiring the installation of CEMS is high in comparison to the relatively low amount of emissions that would be quantified from the titanium production sector.

We decided not to propose the option to apply default emission factors to titanium dioxide production to quantify

process-related emissions. Although default emissions factors have been developed for quantifying process-related emissions from titanium dioxide production, the use of these default values is more appropriate for sector wide or national total estimates than for determining emissions from a specific plant. Estimates based on site-specific consumption of reducing agents are more appropriate for reflecting differences in process design and operation. According to the 2006 IPCC Guidelines, the uncertainty associated with the proposed approach is much lower given that facilities closely track consumption of the calcined petroleum coke (accurate within 2 percent), whereas the uncertainty associated with the default emission factor is approximately 15 percent.

The various approaches to monitoring GHG emissions are elaborated in the Titanium Dioxide Production TSD (EPA-HQ-OAR-2008-0508-031).

#### 4. Selection of Procedures for Estimating Missing Data

It is assumed that a facility would be able to supply data on annual calcined petroleum coke consumption data. Therefore, 100 percent data availability is required for all parameters.

#### 5. Selection of Data Reporting Requirements

We propose that facilities submit process-related CO<sub>2</sub> emissions on an annual basis, as well as any stationary fuel combustion emissions. In addition we propose that facilities report the following additional data used as the basis of the calculations to assist in verification of estimates, checks for reasonableness, and other data quality considerations. The data includes: annual production of titanium dioxide, annual amount of calcined petroleum coke consumed, and number of operating hours in the calendar year. Facilities are not required to submit carbon oxidation factor for calcined petroleum coke; this value is assumed to be 100 percent, as any amount that is not oxidized is assumed to be an insignificant amount. A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and EE.

#### 6. Selection of Records That Must Be Retained

In addition to the data reported, we propose that facilities maintain records of monthly production of titanium dioxide and monthly amounts of calcined petroleum coke consumed. These records hold values that are directly used to calculate the emissions that are reported and are necessary to allow determination of whether GHG emissions monitoring and calculations were done correctly. They also are needed to understand the emissions data and verify the

reasonableness of the reported emissions and identify potential outliers.

A full list of records that must be retained onsite is included in proposed 40 CFR part 98, subparts A and EE.

#### FF. Underground Coal Mines

##### 1. Definition of the Source Category

Coal mining can produce significant amounts of CH<sub>4</sub> from the following areas and activities: active underground coal mines, surface coal mines, post-coal mining activities and abandoned underground coal mines.

An active underground coal mine is a mine at which coal is produced by tunneling into the earth to a subsurface coal seam, which is then mined with equipment such as cutting machines, extracted and transported to the surface. In underground mines, CH<sub>4</sub> is released from the coal and surrounding rock strata due to mining activities, and can create an explosive hazard. Ventilation systems dilute in-mine concentrations to within safe limits, and exhaust CH<sub>4</sub> to the atmosphere.

Mines that produce large amounts of CH<sub>4</sub> also rely on degasification (or "drainage") systems to remove CH<sub>4</sub> from the coal seam in advance of, during, or after mining, producing high-concentration CH<sub>4</sub> gas.

CH<sub>4</sub> from degasification and ventilation systems can be liberated to the atmosphere or destroyed. Destroyed CH<sub>4</sub> includes, but is not limited to, CH<sub>4</sub> combusted by flaring, CH<sub>4</sub> destroyed by thermal oxidation, CH<sub>4</sub> combusted for use in onsite energy or heat production technologies, CH<sub>4</sub> that is conveyed through pipelines (including natural gas pipelines) for offsite combustion, and CH<sub>4</sub> that is collected for any other onsite or offsite use as a fuel.

At surface mines, CH<sub>4</sub> in the coal seams is directly exposed to the atmosphere.

Post coal mining activities release emissions as coal continues to emit CH<sub>4</sub> as it is stored in piles, processed, and transported.

At abandoned (closed) underground coal mines, CH<sub>4</sub> from the coal seam and mined-out area may vent to the atmosphere through fissures in rock strata or through incompletely sealed boreholes. It is possible to recover and use the CH<sub>4</sub> stored in abandoned coal mines.

Total U.S. CH<sub>4</sub> emissions from active mining operations in 2006 were estimated to be 58.5 million metric tons CO<sub>2</sub>e from these sources. Of this, active underground mines accounted for 61 percent of emissions, or 35.9 million metric tons CO<sub>2</sub>e, surface mines accounted for 24 percent of emissions, or 14.0 million metric tons CO<sub>2</sub>e, and post-mining



emissions accounted for 15 percent, or 8.6 million metric tons CO<sub>2</sub>e. CH<sub>4</sub> emissions from abandoned (closed) underground coal mines were estimated to contribute another 5.4 million metric tons CO<sub>2</sub>e. On-site stationary fuel combustion emissions at coal mining operations accounted for an estimated 9.0 million metric tons CO<sub>2</sub>e emissions in 2006. Proposed requirements for stationary fuel combustion emissions are set forth in proposed 40 CFR part 98, subpart C.

We propose to require reporting of emissions from ventilation and degasification systems at active underground mines in this rule. This includes the fugitive CH<sub>4</sub> from these systems and also CO<sub>2</sub> emissions from destruction of coal mine gas CH<sub>4</sub>, where the gas is not a fuel input for energy generation or use. Due to difficulties associated with obtaining accurate measurements from surface mines, post-mining activities, and abandoned (closed) mines, and in some cases, difficulties in identifying owners of these sources, we propose to exclude fugitive CH<sub>4</sub> emissions from these sources from this rule. These sources could still surpass the threshold for stationary fuel combustion activities and therefore be required to report stationary fuel combustion-related emissions.

Although fugitive CO<sub>2</sub> may be emitted from coal seams, it is not typically a significant source of emissions from U.S. coal seams compared to CH<sub>4</sub>. Furthermore, methodologies are not widely available to measure these emissions, and therefore they are not proposed for inclusion in this rule.

For additional background information on coal mining, please refer to the Underground Coal Mines TSD (EPA-HQ-OAR-2008-0508-032).

## 2. Selection of Reporting Threshold

In developing the threshold for active underground coal mines, we considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e for total onsite emissions from stationary fuel combustion, ventilation, and degasification. We also considered requiring all coal mines for which CH<sub>4</sub> emissions from the ventilation system are sampled quarterly by the MSHA to report under this proposal. Table FF-1 of this preamble illustrates the emissions and facilities that would be covered under these various thresholds.

**Table FF-1. Threshold Analysis for Coal Mining at Active Underground Coal Mines**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions (metric tons CO <sub>2</sub> e)	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Facilities	Percent

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions (metric tons CO <sub>2</sub> e)	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Facilities	Percent
MSHA reporting	39,520,000	612	33,945,956	86%	128	21%
1,000	39,520,000	612	33,945,446	86%	125	20%
10,000	39,520,000	612	33,926,526	86%	122	20%
25,000	39,520,000	612	33,536,385	85%	100	16%
100,000	39,520,000	612	31,054,856	79%	53	9%

We propose that all active underground coal mines for which CH<sub>4</sub> from the ventilation system is sampled quarterly by MSHA (or on a more frequent basis), are required to report under this rule. MSHA conducts quarterly testing of CH<sub>4</sub> concentration and flow at mines emitting more than 100,000 cf CH<sub>4</sub> per day. We selected this threshold because subjecting underground mine operators to a new emissions-based threshold is unnecessarily burdensome, as many of these mines are already subject to MSHA regulations. The MSHA threshold for reporting of 100,000 cf CH<sub>4</sub> per day covers approximately 94 percent of the CH<sub>4</sub> emitted from underground coal mine ventilation systems and about 86 percent of total emissions from underground mining (including stationary fuel combustion emissions at mine sites, as shown in Table FF-1 of this preamble).

For additional background information on the thresholds for coal mining, please refer to the Underground Coal Mines TSD (EPA-HQ-OAR-2008-0508-032). For specific

information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating CH<sub>4</sub> emissions from coal mining (e.g., the 2006 IPCC Guidelines, U.S. GHG Inventory, DOE 1605(b), and Australia's National Greenhouse Gas and Energy Reporting System). These methodologies coalesce into three different approaches.

Option 1. Engineering approaches, whereby default emission factors would be applied to total annual coal production (for ventilation systems), or emission factors associated with the system type (for degasification systems) to estimate fugitive emissions.

Option 2. Periodic sampling of CH<sub>4</sub>. Quarterly or more frequent samples could be taken in order to develop a site-specific emission factor.

Option 3. Use of CEMS.

Proposed Option for Liberated Ventilation CH<sub>4</sub>. We propose Option 2, quarterly sampling of ventilation air for monitoring ventilation CH<sub>4</sub> liberated from coal mines.

Under this option, coal mine operators are required to either (a) independently collect quarterly samples of CH<sub>4</sub> released from the ventilation system(s), using MSHA procedures, have these samples analyzed for CH<sub>4</sub> composition, and report the results to us, or (b) to obtain the results from the quarterly testing that MSHA already conducts, and report those to EPA.

MSHA inspectors currently perform quarterly mine safety inspections on mines emitting 100,000 cf CH<sub>4</sub> or more per day, and as part of these inspections, the inspectors test CH<sub>4</sub> emissions rates and ventilation shaft flow, using MSHA-approved sampling procedures and devices. The sample bottles are sent to the MSHA lab for analysis and the results are provided back to the MSHA district offices for inclusion in the inspection report. Currently, the results of these quarterly measurements are generally not provided back to the mine.

We would like to take comment on whether relying on MSHA sampling procedures,<sup>87</sup> which were developed to ensure adherence to safety standards, is appropriate and sufficiently accurate for a GHG emissions reporting program. Further, we are interested in viewpoints on

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<sup>87</sup> NIOSH, *Handbook for Methane Control in Mining*, CDC Information Circular 9486, June 2006.

whether quarterly sampling is sufficient to account for potential fluctuations in emissions over smaller time increments (e.g., daily) from the mine. For more information on the MSHA sampling procedures, please refer to the Underground Coal Mines TSD (EPA-HQ-OAR-2008-0508-032).

For all ventilation systems with CH<sub>4</sub> destruction, CH<sub>4</sub> destruction would be monitored through direct measurement of CH<sub>4</sub> flow to combustion devices with continuous flow monitoring systems. The resulting CO<sub>2</sub> emissions would be calculated from these monitored values. If CH<sub>4</sub> from ventilation systems is destroyed, such a system would have sufficient continuous monitoring devices associated with it that such required monitoring would not propose any additional burden.

We considered requiring mines to monitor ventilation CH<sub>4</sub> concentrations by daily sampling, in place of quarterly sampling, for this rule. Many mines sample CH<sub>4</sub> daily from ventilation systems using handheld CH<sub>4</sub> analyzers. The primary advantages of this option are that many mines already take these measurements and this would therefore not impose an additional monitoring burden, and that daily measurements of CH<sub>4</sub> concentration and ventilation shaft flowrates could allow for more accurate annual estimates

than quarterly measurements. The primary disadvantages of this option relative to the other options that were considered are that it is not as accurate as continuous emissions measurements, and that, if required, it would impose a cost burden for those mines that do not already have a daily sampling and monitoring program in place.

We also decided against requiring mines with CEMS installed at ventilation systems to use the continuous monitoring devices to monitor ventilation system CH<sub>4</sub> emissions. Mines without CEMS would follow the quarterly option proposed above. In many underground mines, CEMS devices are already in operation. In such cases, this option may involve only placing such devices at or near the mine vent outflows where the air samples are taken by MSHA inspectors. The primary advantage of continuous monitoring is that it could increase the accuracy of annual CH<sub>4</sub> emissions calculations because it takes into consideration any variability in emissions from mining operations that may not be represented in the quarterly sampling. Moreover, since such devices are already used within the mine to assess safety conditions, mine operator personnel are familiar with their operation. The disadvantage in requiring CEMS installation would be the larger costs associated with purchasing and maintaining these devices.

We seek comment on the accuracy and cost of monitoring ventilation emissions with CEMS.

Finally, we decided not to propose Option 1, which applies default emission factors to coal production. We decided against the use of the default CH<sub>4</sub> emission factors because their application is more appropriate for GHG estimates from aggregated process information on a sector-wide or national basis than for determining GHG emissions from specific mines.

Proposed Option for Degasification. We propose that all coal mine operators subject to this rule that deploy degasification systems in underground mines install continuous monitors for CH<sub>4</sub> content and flowrates on all degasification wells or degasification vent holes, and that all CH<sub>4</sub> liberated and CH<sub>4</sub> destroyed from these systems be reported (Option 3). For all systems with CH<sub>4</sub> destruction, CH<sub>4</sub> destruction would be monitored through direct measurement of CH<sub>4</sub> flow to combustion devices with continuous monitoring systems. The resulting CO<sub>2</sub> emissions would be calculated from these monitored values. Option 3 is consistent with current practices for CH<sub>4</sub> that is destroyed, where the produced gas volume is presumably already being measured with continuous monitors. For gas that is simply vented to the atmosphere from degasification



wells, this requirement would ensure that this gas is accurately measured.

We considered, but are not proposing, Option 1, which would estimate CH<sub>4</sub> emissions based on the type of degasification system employed. For example, in developing the U.S. GHG Inventory, we currently assume for selected mines that degasification emissions account for 40 percent of total CH<sub>4</sub> liberated from the mine. This method is very simplistic and least costly, but there is relatively larger uncertainty associated with the emissions estimated. Considering that emissions from many degasification wells are currently monitored, and the need to characterize the quantity of these vented emissions more accurately, we do not believe this option is appropriate.

We also considered, but are not proposing, Option 2, which would require mine operators to conduct periodic sampling of gob gas vent holes and any other degasification boreholes, rather than installing continuous monitoring. While such an approach would involve lower capital costs than CEMS, greater labor costs would be involved with traveling to each (often remote) well site to take samples. Moreover, this method would not accurately reflect fluctuations in gas quantity and CH<sub>4</sub> concentration. Pre-mining degasification and gob wells are generally

characterized by large variations in emissions over time, as emissions can decline rapidly in each individual well, while new wells/vents come on line as mining advances.

The various approaches to monitoring GHG emissions are elaborated in the Underground Coal Mines TSD (EPA-HQ-OAR-2008-0508-032).

#### 4. Selection of Procedures for Estimating Missing Data

A complete record of all measured parameters used in the GHG emissions calculations is required. Therefore, whenever a quality-assured value of a required parameter is unavailable (e.g., if a meter malfunctions during unit operation) a substitute data value for the missing parameter shall be used in the calculations.

For each missing value of CH<sub>4</sub> concentration, flow rate, temperature, and pressure for ventilation and degassification systems, the substitute data value shall be the arithmetic average of the quality-assured values of that parameter immediately preceding and immediately following the missing data incident. If, for a particular parameter, no quality-assured data are available prior to the missing data incident, the substitute data value shall be the first quality-assured value obtained after the missing data period.

#### 5. Selection of Data Reporting Requirements

We propose that coal mines report, for all ventilation shafts and degasification systems (e.g., all boreholes), the following parameters: CH<sub>4</sub> liberated from the shaft or borehole, the quantity of CH<sub>4</sub> destroyed (if applicable), and net CH<sub>4</sub> emissions on an annual basis. In addition to reporting emissions, all input data needed to calculate liberation and emissions are to be reported, as well as mine days of operation (for the ventilation and degasification systems). A full list of data to be reported is included proposed 40 CFR part 98, subparts A and FF.

#### 6. Selection of Records That Must Be Retained

Reporters are to retain all data listed in Section V.FF.5 of this preamble. A full list of records to be retained onsite is included in proposed 40 CFR part 98, subparts A and FF.

### GG. Zinc Production

#### 1. Definition of the Source Category

Zinc is a metal used as corrosion-protection coatings on steel (galvanized metal), as die castings, as an alloying metal with copper to make brass, and as chemical compounds in rubber, ceramics, paints, and agriculture. For this proposed rule, we are defining the zinc production source category to consist of zinc smelters using

pyrometallurgical processes and secondary zinc recycling facilities. Zinc smelters can process zinc sulfide ore concentrates (primary zinc smelters) or zinc-bearing recycled and scrap materials (secondary zinc smelters). A secondary zinc recycling facility recovers zinc from zinc-bearing recycled and scrap materials to produce crude zinc oxide for use as a feed material to zinc smelters. Many of these secondary zinc recycling facilities have been built specifically to process dust collected from electric arc furnace operations at steel mini-mills across the country.

There are no primary zinc smelters in the U.S. that use pyrometallurgical processes. The one operating U.S. pyrometallurgical zinc smelter processes crude zinc oxide and calcine produced from recycled zinc materials. These feed materials are first processed through a sintering machine. The sinter is mixed with metallurgical coke and fed directly into the top of an electrothermic furnace. Metallic zinc vapor is drawn from the furnaces into a vacuum condenser, which is then tapped to produce molten zinc metal. The molten metal is then transferred directly to a zinc refinery or cast into zinc slabs.

Secondary zinc recycling facilities operating in the U.S. use either of two thermal processes to recover zinc from recycled electric arc furnace dust and other scrap

materials. For the Waelz kiln process, the feed material is charged to an inclined rotary kiln together with petroleum coke, metallurgical coke, or anthracite coal. The zinc oxides in the gases from the kiln are then collected in a baghouse or electrostatic precipitator. The second recovery process used for electric arc furnace dust uses a water-cooled, flash-smelting furnace to form vaporized zinc that is subsequently captured in a vacuum condenser. The crude zinc oxide produced at secondary zinc recycling facilities is shipped to a zinc smelter for further processing.

Zinc production results in both combustion and process-related GHG emissions. The major sources of GHG emissions from a zinc production facility are the process-related emissions from the operation of electrothermic furnaces at zinc smelters and Waelz kilns at secondary zinc recycling facilities. In an electrothermic furnace, reduction of zinc oxide using carbon provided by the charging of coke to the furnace produces CO<sub>2</sub>. In the Waelz kiln, the zinc feed materials are heated to approximately 1200°C in the presence of carbon producing zinc vapor and carbon monoxide (CO). When combined with the surplus of air in the kiln, the zinc vapors are oxidized to form crude

zinc oxide, and the CO oxidized to form process-related CO<sub>2</sub> emissions.

Total nationwide GHG emissions from zinc production facilities operating in the U.S. were estimated to be approximately 851,708 metric tons CO<sub>2</sub>e for the year 2006. This total GHG emissions estimate includes both process-related emissions (CO<sub>2</sub> and CH<sub>4</sub>) and the additional combustion emissions (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O). Process-related GHG emissions were approximately 528,777 metric tons CO<sub>2</sub>e emissions (62 percent of the total emissions). The remaining 38 percent or 322,931 metric tons CO<sub>2</sub>e are from onsite stationary combustion.

Additional background information about GHG emissions from the zinc production source category is available in the Zinc Production TSD (EPA-HQ-OAR-2008-0508-033).

## 2. Selection of Reporting Threshold

Zinc smelters and secondary zinc recycling facilities in the U.S. vary in types and sizes of the metallurgical processes used and mix of zinc-containing feedstocks processed to produce zinc products. In developing the threshold for zinc production facilities, we considered using annual GHG emissions-based threshold levels of 1,000, 10,000, 25,000 and 100,000 metric tons CO<sub>2</sub>e. Table GG-1 of

this preamble illustrates the emissions and facilities that would be covered under these various thresholds.

**Table GG-1. Threshold Analysis for Zinc Production Facilities**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total Nationwide Emissions metric tons CO <sub>2</sub> e/yr	National Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Facilities	Percent
1,000	851,708	9	851,708	100%	9	100%
10,000	851,708	9	843,154	99%	8	89%
25,000	851,708	9	801,893	94%	5	56%
100,000	851,708	9	712,181	84%	4	44%

We have concluded, based on emissions estimates using production capacity, that the one primary zinc facility exceeds all thresholds considered (Table GG-1 of this preamble). For the eight secondary zinc production facilities, just half are over a 25,000 metric tons CO<sub>2</sub>e threshold. We decided it is appropriate to propose a threshold of 25,000 metric tons CO<sub>2</sub>e for reporting emissions from zinc production facilities that is consistent with the threshold level being proposed for other source categories. This threshold level would avoid placing a reporting burden on a zinc production facility with inherently low GHG emissions because of the type of metallurgical processes used and type of zinc product produced while still requiring the reporting of GHG emissions from the zinc production facilities releasing most of the GHG emissions in the source category. More discussion of the threshold selection analysis is available in the Zinc Production TSD

(EPA-HQ-OAR-2008-0508-033). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

EPA reviewed existing domestic and international GHG monitoring guidelines and protocols including the 2006 IPCC Guidelines, U.S. GHG Inventory, the EU Emissions Trading System, the Canadian Mandatory GHG Reporting Program, and the Australian National GHG Reporting Program. These methods coalesce around the following four options for estimating process-related GHG emissions from zinc production facilities. Zinc smelters using hydrometallurgical processes (e.g., electrolysis) would not be subject to the estimating and reporting requirements in proposed 40 CFR part 98, subpart GG for zinc production because the processes used at these smelters do not release process-related GHG emissions. However, combustion GHG emissions from the process equipment at these smelters burning natural gas or other carbon-based fuels could be subject to the estimating and reporting requirements for general stationary fuel combustion units in proposed 40 CFR part 98, subpart C, depending on the level of total GHG



emissions from the facility with respect to the reporting thresholds specified in proposed 40 CFR part 98, subpart A.

Option 1. Apply a default emission factor for the process-related emissions to the facility zinc production rate. This is a simplified emission calculation method using only default emission factors to estimate CO<sub>2</sub> emissions. The method requires multiplying the amount of zinc produced by the appropriate default emission factors from the 2006 IPCC Guidelines.

Option 2. Perform a carbon balance of all inputs and outputs using monthly measurements of the carbon content of specific process inputs and measure the mass rate of these inputs. This method is the same as the IPCC Tier 3 approach and the higher order methods in the Canadian and Australian reporting programs. Implementation of this method requires owners and operators of affected zinc smelters to determine the carbon contents of materials added to the electrothermic furnace or Waelz kiln by analysis of representative samples collected of the material or from information provided by the material suppliers. In addition, the quantities of these materials consumed during production are measured and recorded. To obtain the process-related CO<sub>2</sub> emission estimate, the material carbon content would be multiplied by the

corresponding mass of material consumed and a factor for conversion of carbon to CO<sub>2</sub>. This method assumes that all of the carbon is converted during the reduction process. The facility owner or operator would determine the average carbon content of the material for each calendar month using information provided by the material supplier or by collecting a composite sample of material and sending it to an independent laboratory for chemical analysis.

Option 3. Use CO<sub>2</sub> emissions data from a stack test performed using U.S. EPA reference test methods to develop a site-specific process emissions factor which is then applied to quantity measurement data of feed material or product for the specified reporting period. This monitoring method is applicable to furnace or Waelz kiln configurations for which the GHG emissions are contained within a stack or vent. Using site-specific emissions factors based on short-term stack testing is appropriate for those facilities where process inputs (e.g., feed materials, carbonaceous reducing agents) and process operating parameters remain relatively consistent over time.

Option 4. Use direct emissions measurement of CO<sub>2</sub> emissions. For furnace and kiln configurations in which the process off-gases are contained within a stack or vent,

direct measurement of the CO<sub>2</sub> emissions can be made by either continuously measuring the off-gas stream CO<sub>2</sub> concentration and flow rate using a CEMS, or periodically measuring the off-gas stream CO<sub>2</sub> concentration and flow rate using standard stack testing methods. Using a CEMS, the recorded emissions measurement data would be reported annually. An annual emissions test could be used to develop a site-specific process emissions factor which would then be applied to quantity measurement data of feed material or product for the specified reporting period.

Proposed Option. Under this proposed rule, if you are required to use an existing CEMS to meet the requirements outlined in proposed 40 CFR part 98, subpart C, you would be required to use CEMS to estimate CO<sub>2</sub> emissions. Provided that the CEMS capture all combustion- and process-related CO<sub>2</sub> emissions, you would be required to follow the requirements of proposed 40 CFR part 98, subpart C to estimate CO<sub>2</sub> emissions from the industrial source. You **would also** refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions.

If you do not have CEMS that meet the conditions outlined in proposed 40 CFR part 98, subpart C, or where the CEMS would not adequately account for process emissions, we propose that you follow Option 2, a carbon

balance. You would still need to refer to proposed 40 CFR part 98, subpart C to estimate combustion-related CH<sub>4</sub> and N<sub>2</sub>O emissions. Given the operating variations between the individual U.S. zinc production facilities (including differences in equipment configurations, mix of zinc feedstocks charged, and types of carbon materials used) we are proposing Option 2 to estimate CO<sub>2</sub> emissions from an electrothermic furnace or Waelz kiln at zinc production facilities because of the lower uncertainties indicated by the IPCC Guidelines for these types of emissions estimates, as compared to applying exclusively a default emissions factor based approach to these units on a nationwide basis.

We decided not to propose the use of default CO<sub>2</sub> emission factors (Option 1) because their application is more appropriate for GHG estimates from aggregated process information on a sector-wide or nationwide basis than for determining GHG emissions from specific facilities. According to the 2006 IPCC Guidelines, the uncertainty associated with default emission factors could be as high as 50 percent, while the uncertainty associated with facility specific estimates of process inputs and carbon contents would be within 5 to 10 percent. We considered the additional burden of the material measurements required for the carbon calculations small in relation to the

increased accuracy expected from using this site-specific information to calculate the process-related CO<sub>2</sub> emissions.

We also decided against proposing Option 3 because of the potential for significant variations at zinc production facilities in the characteristics and quantities of the furnace or Waelz kiln inputs (e.g., zinc scrap materials, carbonaceous reducing agents) and process operating parameters. A method using periodic, short-term stack testing would not be practical or appropriate for those zinc production facilities where the furnace or Waelz kiln inputs and operating parameters do not remain relatively consistent over the reporting period.

Further details about the selection of the monitoring methods for GHG emissions are available in the Zinc Production TSD (EPA-HQ-OAR-2008-0508-033).

#### 4. Selection of Procedures for Estimating Missing Data

For electrothermic furnaces or Waelz kilns for which the owner or operator calculates process GHG emissions using site-specific carbonaceous input material data, the proposed rule requires the use of substitute data whenever a quality-assured value of a parameter that is used to calculate GHG emissions is unavailable, or "missing." If the carbon content analysis of carbon inputs is missing or lost the substitute data value would be the average of the

quality-assured values of the parameter immediately before and immediately after the missing data period. In those cases when an owner or operator uses direct measurement by a CO<sub>2</sub> CEMS, the missing data procedures would be the same as the Tier 4 requirements described for general stationary fuel combustion sources in proposed 40 CFR part 98, subpart C.

#### 5. Selection of Data Reporting Requirements

The proposed rule would require annual reporting of the total annual CO<sub>2</sub> process-related emissions from the electrothermic furnaces and Waelz kilns at a zinc production facilities, as well as any stationary fuel combustion emissions. In addition we propose that additional information which forms the basis of the emissions estimates also be reported so that we can understand and verify the reported emissions. This addition information includes the total number of Waelz kilns and electrothermic furnaces operated at the facility, the facility zinc product production capacity, and the number of facility operating hours in calendar year, carbon inputs by type, and carbon contents of inputs by type.

A complete list of data to be reported is included in proposed 40 CFR part 98, subparts A and GG.

#### 6. Selection of Records That Must Be Retained

Maintaining records of the information used to determine the reported GHG emissions is necessary to enable us to verify that the GHG emissions monitoring and calculations were done correctly. We propose that all affected facilities maintain records of monthly facility production quantities for each zinc product, number of facility operating hours each month, and the annual facility production quantity for each zinc product (in tons). If you use the carbon input procedure, you would record for each carbon-containing input material consumed or used (other than fuel) the monthly material quantity, monthly average carbon content determined for material, and records of the supplier provided information or analyses used for the determination. If you use the CEMS procedure, you would maintain the CEMS measurement records.

A complete list of records to be retained is included in proposed 40 CFR part 98, subparts A and GG.

#### HH. Landfills

##### 1. Definition of the Source Category

After being placed in a landfill, waste is initially decomposed by aerobic bacteria, and then by anaerobic bacteria, which break down organic matter into substances such as cellulose, amino acids, and sugars. These substances are further broken down through fermentation

into gases and short-chain organic compounds that form the substrates for the growth of methanogenic bacteria, which convert the fermentation products into stabilized organic materials and biogas.

CH<sub>4</sub> generation from a given landfill is a function of several factors, including the total amount of waste disposed in the landfill, the characteristics of the waste, and the climatic conditions. The amount of CH<sub>4</sub> emitted is the amount of CH<sub>4</sub> generated minus the amount of CH<sub>4</sub> that is destroyed and minus the amount of CH<sub>4</sub> oxidized by aerobic microorganisms in the landfill cover material prior to being released into the atmosphere.

Waste decaying in landfills also produces CO<sub>2</sub>; however, this CO<sub>2</sub> is not counted in GHG totals as it is not considered an anthropogenic emission. Likewise, CO<sub>2</sub> resulting from the combustion of landfill CH<sub>4</sub> is not accounted as an anthropogenic emission under international accounting guidance.

According to the 2008 U.S. Inventory, MSW landfills emitted 111.2 million metric tons CO<sub>2</sub>e of CH<sub>4</sub> in 2006. Generation of CH<sub>4</sub> at these landfills was 246.8 million metric tons CO<sub>2</sub>e; however, 65.3 million metric tons CO<sub>2</sub>e was recovered and used (destroyed) in energy projects, 59.8 million metric tons CO<sub>2</sub>e was destroyed by flaring, and 12.4



million metric tons CO<sub>2</sub>e was oxidized in cover soils. The majority of the CH<sub>4</sub> emissions from on-site industrial landfills occur at pulp and paper facilities and food processing facilities. In 2006, these landfills emitted 14.6 million metric tons CO<sub>2</sub>e CH<sub>4</sub>: 7.3 million metric tons CO<sub>2</sub>e from pulp and paper facilities, and 7.2 million metric tons CO<sub>2</sub>e from food processing facilities.

We propose to require reporting from open and closed<sup>88</sup>, MSW landfills meeting or exceeding the thresholds described below. We also propose to require reporting of industrial landfills (e.g., landfills at food processing, pulp and paper, and ethanol production facilities) meeting or exceeding the applicable thresholds in the relevant subparts. Hazardous waste landfills and construction and demolition landfills are not included in the landfills source category as they are not considered significant sources of GHG emissions.

The definition of landfills in this rule does not include land application units. Several refineries have land application units (also known as land treatment units) in which oily waste is tilled into the soil. We are

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<sup>88</sup> For the purposes this rule, an open landfill is one that has accepted waste during the reporting year.

seeking comment on the exclusion of land application units from this rule.

For additional background information on landfills, please refer to the Landfills TSD (EPA-HQ-OAR-2008-0508-034).

## 2. Selection of Reporting Threshold

In developing the threshold for landfills, we considered thresholds of 1,000, 10,000, 25,000, and 100,000 metric tons CO<sub>2</sub>e of CH<sub>4</sub> generation at a landfill minus soil oxidation ("generation threshold") or of CH<sub>4</sub> emissions from a landfill, minus oxidation, after any destruction of landfill gas at a combustion device ("emissions threshold").

Table HH-1 of this preamble illustrates the emissions and facilities that would be covered under these various thresholds for MSW landfills. For landfills located at industrial facilities<sup>89</sup>, please refer to the threshold analyses for those sectors, (e.g., food processing, ethanol, pulp and paper).

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<sup>89</sup> As explained in sections III and IV of this preamble, many facilities reporting to the proposed rule will have more than one source category. In order to determine applicability, facilities must add the emissions from all source categories for which there are methods proposed in the proposed rule.

**Table HH-1. Threshold Analysis for MSW Landfills (open and closed)**

Threshold Level	Total National Emissions (metric tons CO <sub>2</sub> e)	Total National Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e /year	Percent	Number	Percent
1,000 metric tons CO <sub>2</sub> e (generation)	111,100,000	7800	110,800,000	99.7	6,830	88
1,000 metric tons CO <sub>2</sub> e (emissions)	111,100,000	7800	110,800,000	99.7	6,827	88
10,000 metric tons CO <sub>2</sub> e (generation)	111,100,000	7800	104,400,000	94	3,484	45
10,000 metric tons CO <sub>2</sub> e (emissions)	111,100,000	7800	102,800,000	93	3,060	39
25,000 metric tons CO <sub>2</sub> e (generation)	111,100,000	7800	91,100,000	82	2,551	33
25,000 metric tons CO <sub>2</sub> e (emissions)	111,100,000	7800	82,400,000	74	1,926	25
100,000 metric tons CO <sub>2</sub> e (generation)	111,100,000	7800	65,600,000	59	1,038	13
100,000 metric tons CO <sub>2</sub> e (emissions)	111,100,000	7800	39,300,000	35	441	6

The proposed threshold for reporting emissions from MSW landfills is a generation threshold of 25,000 metric tons CO<sub>2</sub>e (i.e., CH<sub>4</sub> generated at the landfill, minus oxidation in landfill cover soils). This threshold is consistent with thresholds for other source categories and covers over 70 percent of emissions from the source category. It strikes a balance between the goal of

covering the majority of the emissions while avoiding a reporting burden for small MSW landfills and, especially, small, closed MSW landfills.

For a full discussion of the threshold analysis, please refer to the Landfills TSD (EPA-HQ-OAR-2008-0508-034). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

This section of the preamble describes the proposed methods for estimating CH<sub>4</sub> generation and emissions from landfills and for determining the quantity of landfill CH<sub>4</sub> destroyed.

Many domestic and international GHG monitoring guidelines and protocols include methodologies for estimating emissions from landfills (e.g., 2006 IPCC Guidelines, U.S. GHG Inventory, CCAR, EPA Climate Leaders, EU Emissions Trading System, TCR, EPA's Landfill Methane Outreach Program, DOE 1605(b), Australia's National Mandatory GHG Reporting Program (draft), NSPS/NESHAP, WRI/WBCSD GHG Protocol and, National Council of Air and Stream Improvement). In general, these methodologies include three methods for monitoring emissions: the

modeling method, the engineering method, and the direct measurement method.

Option 1. Modeling Method. The IPCC First Order Decay Model<sup>90</sup> in the 2006 IPCC Guidelines produces emissions estimates that reflect the degradation rate of wastes in a landfill. This method uses waste disposal quantities, degradable organic carbon, dissimilated degradable organic carbon, a decay rate, time lag before CH<sub>4</sub> generation, fraction of CH<sub>4</sub> in landfill gas, and an oxidation factor.

Option 2. Engineering Method. Direct measurement of collected landfill gas to determine CH<sub>4</sub> generation from landfills depends on two measurable parameters: the rate of gas flow to the destruction device; and the CH<sub>4</sub> content of the gas. These are quantified by directly measuring the flow rate and CH<sub>4</sub> concentration of the gas stream to the destruction device(s).

Option 3. Direct Measurement. Direct measurement methods for calculating CH<sub>4</sub> emissions from landfills include flux chambers and optical remote sensing.

Proposed Option. As part of this proposed rule, stationary fuel combustion emissions unrelated to the flaring of recovered landfill CH<sub>4</sub>, and emissions from the

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<sup>90</sup> The IPCC First Order Decay Model is available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html>.

use of auxiliary fuel to maintain effective operation of the flare (e.g., for pilot gas, or fuel used to supplement the heating value of the landfill gas occurring at the landfill), would be estimated and reported according to the proposed procedures in proposed 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources), which are discussed in Section V.C of this preamble.

In order to estimate CH<sub>4</sub> emissions from the landfill we propose a combination of Option 1 and Option 2.

Modeling method. In the proposed rule, all landfills would be required to calculate CH<sub>4</sub> generation and emissions using the IPCC First Order Decay Model. The IPCC First Order Decay Model has two calculation options: a bulk waste option and a waste material-specific option. The proposed rule would require the use of the material-specific option for all industrial landfills, and for MSW landfills when material-specific waste quantity data are available, as this option is expected to provide more accurate emission estimates. However, the accuracy improvement is limited and at MSW landfills, material-specific waste quantity data are expected to be sparse, so use of the waste material-specific approach would not be mandated for all MSW landfills. Where landfills do not

have waste material-specific data, the bulk waste option would be used.

We propose that the landfills use site-specific data to determine waste disposal quantities (by type of waste material disposed when material-specific waste quantity data are available) and use appropriate EPA and IPCC default values for all other factors used in the emissions calculation. To accurately estimate emissions using this method, waste disposal data are needed for the 50 year period prior to the year of the emissions estimate. Annual waste disposal data are estimated using receipts for disposal where available, and where unavailable, estimates based on national waste disposal rates and population served by the landfill.

Engineering method. For landfills with gas collection systems, it is also possible to estimate CH<sub>4</sub> generation and emissions using gas flow and composition metering along with an estimate of the landfill gas collection efficiency. We propose to require landfills that have gas collection systems to calculate their CH<sub>4</sub> generation (adjusted for oxidation) and emissions using both the IPCC First Order Decay Model (as described above), and the measured CH<sub>4</sub> collection rates and estimated gas collection efficiency. This proposal provides a means by which all landfills would

report emissions and generation consistently using the same (IPCC First Order Decay Model) methodology, while also providing reporting of site-specific emissions and generation estimates based on gas collection data.

We propose that landfills with gas collection systems continuously measure the CH<sub>4</sub> flow and concentration at the flare or energy device. This monitoring option is more accurate than a monthly sample given variability in gas flow and concentration over time, and many landfills with gas collection systems already have such equipment in place.

We are seeking comment on monthly sampling of landfill gas CH<sub>4</sub> flow and concentration as an alternative to a continuous composition analyzer. For the monthly sampling alternative, a continuous gas flow meter would still be required.

To estimate CH<sub>4</sub> emissions remaining in the landfill gas combustion exhaust of a destruction device, apply the DE of the equipment to the quantity of CH<sub>4</sub> collected as measured by the monitoring systems described above.

Calculating generation and emissions. CH<sub>4</sub> generation (adjusted for oxidation) is calculated by applying an oxidation factor to generated CH<sub>4</sub>. For landfills without gas collection systems, the calculated value for CH<sub>4</sub>



generation (adjusted for oxidation) is equal to CH<sub>4</sub> emissions. For landfills with collection systems, CH<sub>4</sub> generation is also calculated using both the IPCC First Order Decay model method and the gas collection data measurement method with a collection efficiency as explained above.) CH<sub>4</sub> emissions are calculated by deducting destroyed CH<sub>4</sub> and applying an oxidation factor to the fraction of generated CH<sub>4</sub> that is not destroyed.

Direct Measurement Method. We also considered direct measurement at landfills as an option. The direct measurement methods available (e.g., flux chambers and optical remote sensing) are currently being used for research purposes, but are complex and costly, their application to landfills is still under investigation, and they may not produce accurate results if the measuring system has incomplete coverage.

We are considering developing a tool to assist reporters in calculating generation and emissions from this source category. We have reviewed tools for calculating emissions and emissions reductions from these sources, including IPCC's Waste Model, and National Council of Air and Stream Improvement's GHG Calculation Tools for Pulp and Paper Mills, and EPA's LandGEM, and are seeking comment on the advantages and disadvantages of using these tools as a

model for tool development and on the utility of providing such a tool.

#### 4. Selection of Procedures for Estimating Missing Data

Missing data procedures for landfills are proposed based on the monitoring methodology. In the case where a monitoring system is used, the substitute value would be calculated as the average of the values immediately proceeding and succeeding the missing data period. For prolonged periods of missing data when a monitoring system is used, or for other non-monitored data, the substitute data would be determined from the average value for the missing parameter from the previous year, or from equations specified in the rule (for waste disposal quantities). The proposed rule would require a complete record of all parameters determined from company records that are used in the GHG emissions calculations (e.g. disposal data, gas recovery data).

For purposes of the emissions calculation, we considered not deducting CH<sub>4</sub> destruction that was not recorded. However, not including CH<sub>4</sub> recovery could greatly overestimate a facility's emissions. On the other hand, allowing extended periods of missing data provides a disincentive to repairing the monitoring system.

#### 5. Selection of Data Reporting Requirements

We propose that landfills over the threshold report CH<sub>4</sub> generation, CH<sub>4</sub> oxidation, CH<sub>4</sub> destruction (if applicable), and net CH<sub>4</sub> emissions on an annual basis, as calculated above using both the First Order Decay Model and, if applicable, gas flow data for landfills with gas collection systems. In addition to reporting emissions, input data needed to calculate CH<sub>4</sub> generation and emissions would be required to be reported. These data form the basis of the GHG emission calculations and are needed for EPA to understand the emissions data and verify the reasonableness of the reported data. A full list of data to be reported is included in proposed 40 CFR part 98, subaprts A and HH.

#### 6. Selection of Records That Must Be Retained

Records to be retained include information on waste disposal quantities, waste composition if available, and biogas measurements. These records are needed to allow verification that the GHG emission monitoring and calculations were done correctly. A full list of records to be retained onsite is included in proposed 40 CFR part 98, subparts A and HH.

## II. Wastewater Treatment

### 1. Definition of the Source Category

An industrial wastewater treatment system is a system located at an industrial facility which includes the

collection of processes that treat or remove pollutants and contaminants, such as soluble organic matter, suspended solids, pathogenic organisms, and chemicals from waters released from industrial processes. Industrial wastewater treatment systems may include a variety of processes, ranging from primary treatment for solids removal to secondary biological treatment (e.g., activated sludge, lagoons) for organics reduction to tertiary treatment for nutrient removal, disinfection, and more discrete filtration. In some systems, the biogas (primarily  $\text{CH}_4$ ) generated by anaerobic digestion of organic matter is captured and destroyed by flaring and/or energy recovery. The components and configuration of an industrial wastewater treatment system are determined by the type of pollutants and contaminants targeted for removal or treatment. Industrial wastewater systems that rely on microbial activity to degrade organic compounds under anaerobic conditions are sources of  $\text{CH}_4$ .

$\text{CH}_4$  emissions from wastewater treatment systems are primarily a function of how much organic content is present in the wastewater system and how the wastewater is treated. Industries that have the potential to produce significant  $\text{CH}_4$  emissions from wastewater treatment – those with high volumes of wastewater generated and a high organic

wastewater load – include pulp and paper manufacturing, food processing, ethanol production, and petroleum refining.

Wastewater treatment also produces CO<sub>2</sub>; however, with the exception of CO<sub>2</sub> from oil/water separators at petroleum refineries, this CO<sub>2</sub> is not counted in GHG totals as it is not considered an anthropogenic emission. Likewise, CO<sub>2</sub> resulting from the combustion of digester CH<sub>4</sub> is not accounted as an anthropogenic emission under international accounting guidance.

In 2006, CH<sub>4</sub> emissions from industrial wastewater treatment were estimated to be 7.9 million metric tons CO<sub>2</sub>e.

The only wastewater treatment process emissions to be reported in this rule are those from onsite wastewater treatment located at industrial facilities, such as at pulp and paper, food processing, ethanol production, petrochemical, and petroleum refining facilities. POTWs are not included in this proposal because, as described in the Wastewater Treatment TSD (EPA-HQ-OAR-2008-0508-035), emissions from POTWs do not exceed the thresholds considered under this rule.

## 2. Selection of Reporting Threshold

A separate threshold is not proposed for emissions from industrial wastewater treatment system as these

emissions occur in a number of facilities across a range of industries (e.g., pulp and paper, food processing, ethanol production, petrochemical, and petroleum refining). As described in Sections III and IV of this preamble, a facility may have more than one source category and emissions from all source categories for which there are methods (e.g., emissions from industrial wastewater treatment systems) must be included in the facility's applicability determination. Please see the preamble sections for the relevant sectors for more information on the applicability determination for your facility.

Despite the fact that we are not proposing a separate threshold for industrial wastewater systems, there is analysis in the Wastewater Treatment TSD on the types of industrial facilities that would meet thresholds at the 1,000, 10,000, 25,000 and 100,000 million metric tons CO<sub>2</sub>e level based on emissions from wastewater alone. There is also a separate threshold analysis on POTWs.

For a full discussion of those threshold analyses, please refer to Wastewater Treatment TSD (EPA-HQ-OAR-2008-0508-035). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

For this proposal, we reviewed several protocols and programs for monitoring and/or estimating GHG emissions including the 2006 IPCC Guidelines, the U.S. GHG Inventory, CARB Mandatory GHG Emissions Reporting System, CCAR, National Council of Air and Stream Improvement, DOE 1605 (b), EPA Climate Leaders, TCR, UNFCCC Clean Development Mechanism, the EU Emissions Trading System, and the New Mexico Mandatory GHG Reporting Program. These methodologies are all primarily based on the IPCC Guidelines.

Based on this review, we considered the following options.

Option 1. Modeling Method. This method involves the use of certain site-specific measured activity data and emission factors. The IPCC method, for example, uses wastewater flow, COD, and wastewater treatment system type to calculate CH<sub>4</sub> emissions from wastewater treatment.

Option 2. Direct Measurement. This method allows for site-specific measurements, but the methods available (e.g., flux chambers and open path methods) are currently being used only for research purposes, are complex and costly, and might not be accurate if the measuring system has incomplete coverage.

Proposed Methods. We propose that facilities use activity data, such as measured COD concentration, and operational characteristics (e.g., type of system), and the IPCC Tier 1 method to calculate CH<sub>4</sub> generation. To determine CH<sub>4</sub> destruction, we propose direct measurement of CH<sub>4</sub> flow to combustion devices. The proposed monitoring method uses a separate equation to estimate CO<sub>2</sub> from oil/water separators at petroleum refineries, based on California's AB32 mandatory reporting rule. This approach allows the use of default factors, such as a system emission factor, for certain elements of the calculation, and the use of site-specific data where possible.

CH<sub>4</sub> emissions from industrial wastewater treatment system components other than digesters. To estimate the amount of CH<sub>4</sub> emissions from industrial wastewater treatment, plant-specific values of COD would be determined by weekly sampling. The maximum amount of CH<sub>4</sub> that could potentially be produced by the wastewater under ideal conditions is calculated by multiplying the COD by the maximum CH<sub>4</sub> producing capacity of the wastewater, per the 2006 IPCC Guidelines. This value is then multiplied by a system-specific CH<sub>4</sub> conversion factor reflecting the capability of a system to produce the maximum achievable CH<sub>4</sub> based on the organic matter present in the wastewater.



CH<sub>4</sub> Generation from Anaerobic Digesters. If the wastewater treatment system includes an anaerobic digester, we propose that the CH<sub>4</sub> generation of the digester be measured continuously. Direct measurement to determine CH<sub>4</sub> generation from digesters depends on two measurable parameters: the rate of gas flow to the combustion device and the CH<sub>4</sub> content of the gas. These are quantified by direct measurement of the gas stream to the destruction device(s). The gas stream is measured by continuous metering of both flow and gas concentration. This continuous monitoring option is more accurate than a monthly sample given variability in gas flow and concentration over time, and many digesters already have such equipment in place.

We are also seeking comment on monthly sampling of digester gas CH<sub>4</sub> content as an alternative to a continuous composition analyzer. For the monthly CH<sub>4</sub> content sampling alternative, a continuous gas flow meter would still be required.

CH<sub>4</sub> Destruction. To estimate CH<sub>4</sub> destroyed at a digester, you would apply the DE of the combustion equipment (lesser of manufacturer's specified DE and 0.99) to the value of CH<sub>4</sub> generated from anaerobic digestion estimated above.

CO<sub>2</sub> emissions from oil/water separators at petroleum refineries. To calculate CO<sub>2</sub> emissions from degradation of petroleum or impurities at oil/water separators at petroleum refineries, the volume of wastewater treated would be measured weekly and multiplied by the non-methane volatile organic carbon emission factor for the type of separator used, and an emission factor for CO<sub>2</sub> (mass of CO<sub>2</sub> / mass of non-methane volatile organic carbon).

Total emissions. Total emissions from wastewater treatment are the sum of the CH<sub>4</sub> emissions (including undestroyed CH<sub>4</sub> from digesters), and CO<sub>2</sub> emissions.

Other Options Considered. Direct measurement is another option we considered but are not proposing in this rule. This method allows for site-specific measurements, but it is costly and might not be accurate if the measuring system has incomplete coverage. To be accurate, a direct measurement system would need to be complete both spatially (in that all emissions pathways are covered, not just individual pathways as is the case with anaerobic digesters, at which gas is commonly directly metered) and temporally (as emissions can vary greatly due to changes in influent and conditions at the facility).

We are considering developing a tool to assist reporters in calculating emissions from this source

category. EPA has reviewed tools for calculating emissions from these sources, such as National Council of Air and Stream Improvement's GHG Calculation Tools for Pulp and Paper Mills, and is seeking comment on the advantages and disadvantages of using these tools as a model for tool development, and the utility of providing such a tool.

For additional information on the proposed method, please see the 2006 IPCC Guidelines,<sup>91</sup> the 2008 U.S. Inventory,<sup>92</sup> and the Wastewater Treatment TSD (EPA-HQ-OAR-2008-0508-035).

#### 4. Selection of Procedures for Estimating Missing Data

On the occasion that a facility lacks data needed to determine the emissions from wastewater treatment over a period of time, we propose that the facility apply an average facility-level value for the missing parameter from measurements of the parameter preceding and following the missing data incident, as specified in the proposed rule. The proposed rule would require a complete record of all parameters determined from company records that are used in the GHG emissions calculations (e.g., production data, biogas combustion data).

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<sup>91</sup> 2006 IPCC Guidelines. Chapter 6: Wastewater Treatment and Discharge. (Volume 5 Waste). Available at [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_6\\_Ch6\\_Wastewater.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_6_Ch6_Wastewater.pdf).

<sup>92</sup> 2008 U.S. Inventory. Chapter 8: Waste. Available at <http://www.epa.gov/climatechange/emissions/usinventoryreport.html>

For purposes of the emissions calculations, we considered not deducting CH<sub>4</sub> destruction that was not recorded. However, not including CH<sub>4</sub> destruction could greatly overestimate a facility's actual CH<sub>4</sub> emissions.

#### 5. Selection of Data Reporting Requirements

EPA proposes that industrial wastewater treatment plants over the threshold report annually both CH<sub>4</sub> and CO<sub>2</sub> emissions from wastewater treatment system components other than digesters, and CH<sub>4</sub> generation and destruction at digesters. In addition to reporting emissions, generation, and destruction, input data used to calculate emissions from the wastewater treatment process would be required to be reported. These data form the basis of the GHG emission calculations and are needed for EPA to understand the emissions data and verify the reasonableness of the reported data.

A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and II.

#### 6. Selection of Records That Must Be Retained

Records to be retained include information on influent flow rate, COD concentration, wastewater treatment system types, and digester biogas measurements. These records are needed to allow verification that the GHG emission monitoring and calculations were done correctly. A full

list of records to be retained onsite is included in proposed 40 CFR part 98, subparts A and II.

#### JJ. Manure Management

##### 1. Definition of the Source Category

A manure management system is a system that stabilizes or stores livestock manure, or does both. Anaerobic manure management systems include liquid/slurry handling in uncovered anaerobic lagoons, ponds, tanks, pits, or digesters. At some digesters, material other than manure is treated along with the manure. Manure management systems in which treatment is primarily aerobic include daily spread, solid storage, drylot, and manure composting. For the purposes of this rule, a manure management facility consists of uncovered anaerobic lagoons, liquid/slurry systems, pits, digesters, and drylots (including systems that combine drylot with solid storage) onsite manure composting, other poultry manure systems, and cattle and swine deep bedding systems. The manure management system does not include other onsite units and processes at a livestock operation unrelated to the stabilization and/or storage of manure.

When livestock manure are stored or treated, the anaerobic decomposition of materials in the manure management system produces  $\text{CH}_4$ , while  $\text{N}_2\text{O}$  is produced as

part of the nitrogen cycle through the nitrification and denitrification of the organic nitrogen in livestock manure and urine. The amount and type of emissions produced are related to the specific types of manure management systems used at the farm and are driven by retention time, temperature, and treatment conditions.

Manure management also produces CO<sub>2</sub>; however, this CO<sub>2</sub> is not counted in GHG totals as it is not considered an anthropogenic emission. Likewise, CO<sub>2</sub> resulting from the combustion of digester CH<sub>4</sub> is not accounted as an anthropogenic emission under international accounting guidance.

According to the 2008 U.S. Inventory, CH<sub>4</sub> emissions from manure management systems totaled 41.4 million metric tons CO<sub>2</sub>e, and N<sub>2</sub>O emissions were 14.3 million metric tons CO<sub>2</sub>e in 2006; manure management systems account for 8 percent of total anthropogenic CH<sub>4</sub> emissions and 3 percent of N<sub>2</sub>O emissions in the U.S.

Manure management systems which include one or more of the following components are to report emissions under this rule: manure handling in uncovered anaerobic lagoons, liquid/slurry systems, pits, digesters, and drylots, including systems that combine drylot with solid storage. Emissions to be reported include those from the systems

listed above, and also emissions from any high rise houses for caged laying hens, broiler and turkey production on litter, deep bedding systems for cattle and swine, and manure composting occurring onsite as part of the manure management system.

This source category does not include systems which consist of only components classified as daily spread, solid storage, pasture/range/paddock, or manure composting. For detailed descriptions of system types, please refer to the Manure Management TSD (EPA-HQ-OAR-2008-0508-036).

A facility that is subject to the proposed rule only because of emissions from manure management would also report CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions from the combustion of supplemental fuel in flares using the methods in proposed 40 CFR part 98, subpart C, but would not be required to report any other combustion emissions.

## 2. Selection of Reporting Threshold

In developing the threshold for manure management, we considered thresholds of 1,000, 10,000, 25,000, and 100,000 metric tons CO<sub>2</sub>e of CH<sub>4</sub> generation and N<sub>2</sub>O emissions at a manure management system ("generation threshold"), and CH<sub>4</sub> and N<sub>2</sub>O emissions at manure management systems ("emissions threshold"). The "generation threshold" is the amount of CH<sub>4</sub> and N<sub>2</sub>O that would be emitted from the facility if no

CH<sub>4</sub> destruction takes place. This includes all CH<sub>4</sub> generation from all manure management system types, including digesters, and N<sub>2</sub>O emissions. The "emissions threshold" includes the CH<sub>4</sub> and N<sub>2</sub>O that is emitted to the atmosphere from these facilities. In the emissions threshold, CH<sub>4</sub> that is destroyed at digesters is taken into account and deducted from the total CH<sub>4</sub> generation calculated.

To estimate the number of farms at each threshold, EPA first developed a number of model farms to represent the manure management systems that are most common on large farms and have the greatest potential to exceed the GHG thresholds. Next, we used EPA's GHG inventory methodology for manure management, to estimate the numbers of livestock that would need to be present to exceed the threshold for each model farm type. Finally, we combined the numbers of livestock required on each model farm to meet the thresholds with U.S. Department of Agriculture (USDA) data on farm sizes to determine how many farms in the United States have the livestock populations required to meet the GHG thresholds for each model farm.

Table JJ-1 of this preamble presents the estimated head of livestock that would meet the thresholds evaluated for the highest GHG-emitting common manure management



systems for beef (steers and heifers at a feedlot), dairy (cows at an uncovered anaerobic lagoon, heifers on dry lot without solids separation), swine (farrow to finish at an uncovered anaerobic lagoon), and poultry (layers and pullets at an uncovered anaerobic lagoon).

Other types of farms and manure management systems could require significantly higher head counts to meet the thresholds considered: Meeting the 25,000 tCO<sub>2</sub>e threshold could require 978,000 head for beef on pasture, 13,000 head for some dairy liquid slurry systems, 171,000 head of farrow to finish swine using a deep pit for manure, and 47,028,300 broilers on litter. For more information on estimated head of livestock that would meet these thresholds for other manure management system types, please see the Manure Management TSD (EPA-HQ-OAR-2008-0508-036).

**Table JJ-1. Estimated head of livestock to meet thresholds.**

	Threshold Levels (metric tons CO <sub>2</sub> e)			
	1,000	10,000	25,000	100,000
	Total number of head to meet threshold			
Beef	3,500	35,500	89,000	356,000
Dairy	200	2,000	5,000	20,000
Swine	3,000	29,000	73,000	291,500
Poultry	39,500	358,000	895,000	3,580,000

Although data are available at the national level on the number of farms of certain sizes, most of the population sizes needed to meet these thresholds occur in the largest farm size categories, in which data are not

sufficiently disaggregated to determine how many farms of such sizes exist. For example, the largest dairy farm size category for which data is available is "1,000 head or more." The number of dairy farms with populations large enough to meet thresholds for 10,000 metric tons CO<sub>2</sub>e (2,000 animals) and above therefore had to be estimated using expert judgment. It is estimated that at the proposed threshold, fewer than 50 manure management systems at beef, dairy, and swine operations would be required to report. Table JJ does not determine applicability alone, but rather serves as a "screening" guide in determining the approximate facility size that meets the applicability requirements. We are also seeking comment on the advantages and disadvantages of using additional screening tools such as a look-up table or computerized calculator to help owners or operators determine if they meet the reporting threshold. A table could be developed that indicated whether a facility had a sufficient number of animals to warrant further screening. If the initial screening through use of the table indicated that the facility may meet the reporting threshold a simple computerized calculator (e.g., web-based model) utilizing site-specific data such as the type of manure management system and the average number of head, along with some

other default data provided in look-up tables could be used to determine if a facility met the reporting threshold. Screening devices, if utilized, could assist owners or operators in determining if they are near the threshold for reporting and therefore potentially avoid costs incurred from monthly manure analysis proposed in the calculation method of the rule. More information and estimates based on existing farm size data are presented in the Manure Management TSD (EPA-HQ-OAR-2008-0508-036).

The proposed threshold for reporting emissions from manure management systems is the emission threshold of 25,000 metric tons CO<sub>2</sub>e. More specifically, the CH<sub>4</sub> and N<sub>2</sub>O emissions from manure management are summed to determine if a manure management system meets or exceeds the threshold. Facilities exceeding the threshold would report both of these GHG emissions. This threshold includes the largest emitters of GHG from this source category, while avoiding reporting from many small farms with less significant emissions. For a full discussion of the threshold analysis, please refer to Manure Management TSD (EPA-HQ-OAR-2008-0508-036). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

We are seeking comment on the option of using a generation threshold instead of the proposed emissions threshold. In the generation threshold option, the CH<sub>4</sub> generation (including CH<sub>4</sub> generated and later combusted) and the N<sub>2</sub>O emissions from manure management are summed to determine if a manure management system meets or exceeds the threshold. Facilities exceeding the threshold would report both GHG generation and emissions. We estimated that this option would cover several farms with digesters that would not be covered in the emissions threshold option.

### 3. Selection of Proposed Monitoring Methods

Many domestic and international GHG programs provide monitoring guidelines and protocols for estimating emissions from manure management (e.g., the 2006 IPCC Guidelines, the U.S. GHG Inventory, DOE 1605(b), CARB Mandatory GHG Emissions Reporting System, CCAR, EPA Climate Leaders, TCR, UNFCCC Clean Development Mechanism, EPA AgSTAR, and Chicago Climate Exchange). These methodologies are all based on the IPCC Guidelines.

Based on the review of these methods, we considered the following options.

Option 1. Modeling Method. This method involves the use of certain site-specific measured activity data and

emission factors. The IPCC method, for example, uses volatile solids, nitrogen excretion, climate data, and manure management system type to calculate CH<sub>4</sub> and N<sub>2</sub>O emissions from manure management systems.

Option 2. Direct Measurement. This method allows for site-specific measurements, but the methods available (e.g., flux chambers and open path methods) are currently being used only for research purposes, are complex and costly, and might not be accurate if the measuring system has incomplete coverage.

Proposed option. We propose that facilities use activity data, such as the number of head of livestock, operational characteristics (e.g., physical and chemical characteristics of the manure, including measured volatile solids and nitrogen values, type of management system(s)), and climate data, with the IPCC method to calculate CH<sub>4</sub> and N<sub>2</sub>O emissions, and measured values for gas destruction.

CH<sub>4</sub> emitted at manure management system types other than digesters. We propose that CH<sub>4</sub> emissions at manure management system components other than digesters be calculated using the IPCC methodology and measured volatile solids values.

We propose that the amount of volatile solids excreted be calculated using (1) calculation of manure quantity

entering the system using livestock population data and default values for average animal mass and manure generation, and (2) monthly sampling and testing of excreted manure for total volatile solids content.

We are seeking comment on the option of using facility-specific livestock population and mass, and default values for volatile solids rate to estimate total volatile solids, instead of measured values. We are also seeking comment on whether a different sampling and testing frequency, such as quarterly, would be more appropriate than monthly.

The maximum amount of CH<sub>4</sub> that could potentially be produced by the manure under ideal conditions would be calculated by multiplying the volatile solids by the maximum CH<sub>4</sub>-producing capacity of the manure (B0), a default value included in the GHG Inventory. A system-specific CH<sub>4</sub> conversion factor would then be applied to determine the amount of CH<sub>4</sub> produced by the specific system type.

CH<sub>4</sub> Generation at Digesters. If the manure management system includes a digester, we propose that the CH<sub>4</sub> generation of the digester be measured continuously. Direct measurement to determine CH<sub>4</sub> generation from digesters depends on two measurable parameters: the rate of gas flow to the combustion device, and the CH<sub>4</sub> content of

the gas. These would be quantified by direct measurement of the total gas stream. We propose that the gas stream be measured by continuous metering of both flow and gas concentration. This continuous monitoring option is more accurate than a monthly sample given variability in gas flow and concentration over time, and many digesters already have such equipment in place.

We are also seeking comment on monthly sampling of digester gas CH<sub>4</sub> content as an alternative to a continuous composition analyzer. For the monthly CH<sub>4</sub> content sampling alternative, a continuous gas flow meter would still be required.

CH<sub>4</sub> Destruction at Digesters. To estimate CH<sub>4</sub> destruction at a digester, you would apply the DE of the destruction equipment (lesser of manufacturer's specified DE and 0.99) and the ratio of operating hours to reporting hours to the value of CH<sub>4</sub> generated from anaerobic digestion estimated above.

CH<sub>4</sub> Leakage at Digesters. To estimate CH<sub>4</sub> leakage from digesters, we propose that a default value for collection efficiency is applied to the measured quantity of CH<sub>4</sub> flow to a destruction device. We are seeking comment on the proposed method and on the proposed default collection efficiency values for estimating leakage from digesters.

CH<sub>4</sub> Emissions from Digesters. We propose that emissions from digesters be calculated as the sum of CH<sub>4</sub> that is not destroyed at the destruction device, and CH<sub>4</sub> that leaks from the digester.

N<sub>2</sub>O Emissions. We propose that N<sub>2</sub>O emissions be calculated using the IPCC methodology and measured nitrogen (N) values.

We propose that the amount of nitrogen entering the manure management system be measured through (1) calculation of manure quantity entering the system using livestock population data and default values for average animal mass and manure generation, and (2) monthly sampling and testing of excreted manure for total nitrogen content.

We are seeking comment on the option of using facility-specific livestock population and mass, and default values for nitrogen excretion rate to estimate total N, instead of measured values.

Each manure management system type has an associated default N<sub>2</sub>O emission factor which would be applied to the amount of nitrogen managed by the system.

GHG Emissions. Reporters would be required to complete the following to calculate the emissions for reporting.



Estimate and report GHG emissions by adding the CH<sub>4</sub> emissions from manure management systems other than digesters, the N<sub>2</sub>O emissions from manure management systems, and, for manure management systems which include digesters, the CH<sub>4</sub> emissions (monitored CH<sub>4</sub> generation at the digester minus CH<sub>4</sub> destruction at the digester) from the anaerobic digester.

Direct measurement is another option we considered but are not proposing in this rule. A direct measurement system must be complete both spatially (in that all emissions pathways are covered) and temporally (as emissions can vary greatly due to changes in population, diet, and conditions at the facility) and would hence be difficult and expensive to implement accurately.

We are considering developing a tool to assist reporters in calculating emissions from this source category. There are several existing tools for calculating emissions and emissions reductions from manure management systems, including EPA's FarmWare and CCAR's Livestock Project Reporting Protocol. We are seeking comment on the advantages and disadvantages of using such tools as a model for tool development and on the utility of providing such a tool.

The various approaches to monitoring GHG emissions, as well as specific cost information, are elaborated in the Manure Management TSD (EPA-HQ-OAR-2008-0508-036).

#### 4. Selection of Procedures for Estimating Missing Data

On the occasion that a facility lacks sufficient data to determine the emissions from manure management over a period of time, we propose that the facility apply an average facility-level value for the missing parameter from measurements of the parameter preceding and following the missing data incident, as specified in the proposed rule. The proposed rule would require a complete record of all parameters determined from company records that are used in the GHG emissions calculations (e.g., historical livestock population data, biogas destruction data).

For emissions calculation purposes, EPA considered not deducting CH<sub>4</sub> recovery and destruction that was not recorded, but not including CH<sub>4</sub> destruction could greatly overestimate an entity's actual CH<sub>4</sub> emissions.

#### 5. Selection of Data Reporting Requirements

EPA proposes that facilities report CH<sub>4</sub> and N<sub>2</sub>O emissions, along with the input data to calculate these values. These data form the basis of the GHG emission calculations and are needed for EPA to understand the emissions data and verify the reasonableness of the

reported data. A full list of data to be reported is included in proposed 40 CFR part 98, subparts A and JJ.

#### 6. Selection of Records That Must be Retained

Records to be retained include information on animal population, manure management system types, animal waste characteristics, and digester biogas measurements. These records are needed to allow verification that the GHG emission monitoring and calculations were done correctly. A full list of records to be retained onsite is included in proposed 40 CFR part 98, subparts A and JJ.

#### KK. Suppliers of Coal

##### 1. Definition of the Source Category

Proposed 40 CFR part 98, subpart KK would require reporting by facilities or companies that introduce or supply coal into the economy (e.g., coal mines, coal importers, and waste coal reclaimers). These facilities or companies (in the case of coal importers and exporters) would report on the CO<sub>2</sub> emissions that would result from complete combustion or oxidation of the quantities of coal supplied. For completeness, this source category also includes coal exporters.

Facilities that use coal for energy purposes should refer to proposed 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources). Facilities that use

coal for non-energy uses (e.g., as a reducing agent in metal production such as ferroalloys, zinc, etc.) should refer to the relevant subparts of the proposed rule. Underground coal mine operators who are included in this subpart should also refer to proposed 40 CFR part 98, subpart FF (Underground Coal Mines) in order to account for any combustion and fugitive emissions separately, as described in Sections III and IV of this preamble. A description of the requirements related to the conversion of coal to liquid fuel is covered in Section V.LL of this preamble.

Coal is a combustible black or brownish-black sedimentary rock composed mostly of carbon and hydrocarbons. It is the most abundant fossil fuel produced in the U.S. Over 90 percent of the coal used in the U.S. is used to generate electricity. Coal is also used as a basic energy source in many industries, including cement and paper. In 2006, the combustion of coal for useful heat and work resulted in emissions of 2,065.3 million metric tons CO<sub>2</sub>, or 29 percent of total U.S. GHG emissions.

The supply chain for delivering coal to consumers is relatively straightforward. It includes coal mines or importers, in some cases coal washing or preparation onsite or at dedicated offsite plants, and transport (usually by

rail) to consumers. The U.S. typically produces nearly all of its domestic coal needs; in 2007, domestic coal production accounted for 97 percent of domestic coal consumption. A relatively small share of coal consumed in the U.S. (3 percent in 2007) is imported from other countries, and a small share of U.S. production is exported for use abroad (5 percent in 2007).

In determining the most appropriate point in the supply chain of coal for reporting potential CO<sub>2</sub> emissions, we considered the following criteria: an administratively manageable number of reporting facilities; complete coverage of coal supply as a group of facilities or in combination with facilities reporting under other subparts of the proposed rule; minimal irreconcilable double-counting of coal supply; and feasibility of monitoring or calculation methods.

We are proposing to include all active coal mines, coal importers, coal exporters, and reclaimers of waste coal as reporters under this subpart.

We are proposing to require all owners or operators of active underground and surface coal mines to report under proposed 40 CFR part 98, subpart KK. There were 1,365 active coal mines (both underground and surface mines) operating in the U.S. in 2007, according to the MSHA.

Currently, coal mines routinely monitor coal quantity and coal quality data for use in coal sale contracts as well as for reporting requirements to various State and Federal agencies.

We are proposing that importers of coal into the U.S. report under proposed 40 CFR part 98, subpart KK. Reporting for coal importers is proposed at the company level, as opposed to the facility level, because the importers of record are typically companies, and these companies currently track and report imports. Most of the 36 million tons of coal that were imported to the U.S. in 2007 were used for power generation. A small number of electric utility companies were responsible for the large majority of coal imports in 2006.<sup>93</sup> In many cases, the importing companies also own and operate electricity generating or industrial facilities that would be included as covered facilities under other subparts of the proposed rule. Because these entities already collect much of this information, EPA believes that the reporting requirements for importers would impose a minimal additional burden.

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<sup>93</sup> In 2006, the eight largest coal-importing power generating companies accounted for 87 percent of total imported coal by electric utilities (FERC Form 423 and EIA 906). Approximately 80 percent of coal imports were used in the electricity sector in 2006.

We are proposing that exporters of coal report under proposed 40 CFR part 98, subpart KK. In 2007, 59.2 million tons of coal produced (mined) in the U.S. were exported. Coal exporters may include coal mining companies who directly sell their coal to entities outside the U.S., or other retailers who export the coal (typically via barge from one of several U.S. ports). Coal exports are included in proposed 40 CFR part 98, subpart KK so that the total supply of coal (and associated GHG emissions) into the U.S. economy is balanced against the coal that leaves the country. Typically, coal exporters characterize the quantity (tons) and heat value of the coal. Thus, this reporting requirement would impose a minimal additional burden on coal exporters.

We are proposing that reclaimers of waste coal report under proposed 40 CFR part 98, subpart KK. In some parts of the U.S., waste coal that was mined decades ago and placed in waste piles is now being actively recovered and sold to end users. Because this coal is technically not being "mined" but is nonetheless entering the U.S. economy for the first time, facilities that reclaim or recover such waste coal from waste coal piles and sell or deliver it to end-users are being included for reporting under proposed 40 CFR part 98, subpart KK as waste coal reclaimers.

Because these facilities would need to collect data on the quantity and quality (e.g., heat value) of their product, this reporting requirement should impose a minimal additional burden on coal reclaimers.

We considered but are not proposing that facilities that convert coking coal into industrial coke and importers of coke report under proposed 40 CFR part 98, subpart KK. U.S. coke imports in 2007 constituted only 2.5 million tons (about 0.2 percent of total U.S. coal production) and can therefore be considered negligible. Most domestically consumed coal-based coke (87 percent) is derived from domestically-mined coal or imported coal, and therefore the inclusion of coal mines and coal importers in this subpart already provide for coverage of carbon contained in the coke (and the potential CO<sub>2</sub> emissions from oxidizing or combusting the coke). Only 14 percent of coal-based coke consumed domestically is imported directly as coke. Furthermore, coke production is an energy- and emissions-intensive process, and these facilities are likely to be above thresholds for the general stationary fuel combustion sources (proposed 40 CFR part 98, subpart C) and industrial process categories such as iron and steel, and ferroalloys. Therefore, GHG emissions associated with the combustion or oxidation of coke imports and domestically



produced coke would already be included in the actual GHG emissions reported under those subparts.

We considered but are not proposing that coal preparation plants located offsite from coal mines report the potential CO<sub>2</sub> emissions associated with their processed coal. Some of these facilities may be included as reporting facilities under proposed 40 CFR part 98, subpart C for direct emissions from combustion. An unknown but likely very small share of coal production annually requires additional preparation or washing at an offsite preparation plant. Typically, only the smaller mines do not do their preparation onsite. We are not requiring offsite coal preparation plants to report under this subpart because the potential CO<sub>2</sub> emissions from coal supplied by these facilities is already accounted for by reported data from coal mines, coal importers, and waste coal reclaimers.

Instead of requiring coal mines to report as coal suppliers, we also considered, but are not proposing, that rail operators report the quantity of coal they transport. We have determined that requiring reporting on coal transport would add complexity without increasing the accuracy of information on potential CO<sub>2</sub> emissions associated with the supply of coal to the U.S. economy. It

is our understanding that, unlike coal mines or coal importers, coal transporters do not routinely collect information about the carbon content or heating value of the coal they are transporting, so such reporting requirements would add to the reporting burden.

Furthermore, in the case of mine mouth power plants for which the coal does not travel via rail, rail transporters would miss this coal production entirely.

We request comment on the inclusion of active underground and surface coal mines, coal importers, coal exporters, and waste coal reclaimers, and the exclusion of offsite preparation plants, coke importers and coke manufacturing facilities, and coal rail transporters from reporting requirements under proposed 40 CFR part 98, subpart KK. For additional background information on suppliers of coal, please refer to the Suppliers of Coal TSD (EPA-HQ-OAR-2008-0508-037).

## 2. Selection of Reporting Threshold

In considering a threshold for coal suppliers, we considered the application of the following emissions-based thresholds for each affected company or facility under proposed 40 CFR part 98, subpart KK (e.g., coal mine, coal importer, coal exporter, or waste coal reclaimer): 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric

tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e per year. For coal suppliers, these thresholds would be applied to the CO<sub>2</sub> emissions that would result from complete combustion or oxidation of the coal produced or supplied into the U.S. economy, rather than the actual GHG emissions for the individual facilities or companies. To provide general information on how the thresholds would affect the coal industry, we used a weighted average carbon content of 1,130 lbs/short ton<sup>94</sup>. These thresholds translate into annual coal production for a single mine of 532 short tons, 5,321 short tons, 13,303 short tons, and 53,211 short tons, respectively.

Coal Mines. Table KK-1 of this preamble illustrates the coal mine emissions and facilities that would be covered under these various thresholds.

**Table KK-1. Threshold Analysis for Coal Mines**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total 2007 National Emissions (million metric tons CO <sub>2</sub> e/yr) <sup>1</sup>	Total 2007 Number of Facilities in the U.S.	Emissions Covered		Facilities Covered	
			Million metric tons CO <sub>2</sub> e/ yr <sup>2</sup>	Percent	Number of Facilities <sup>3</sup>	Percent of Facilities
1,000	2,153	1,365	2,146	99.7%	1,346	99%
10,000	2,153	1,365	2,146	99.7%	1,237	91%
25,000	2,153	1,365	2,144	99.6%	1,117	82%
100,000	2,153	1,365	2,130	98.9%	867	64%

Source: EIA Table FE4 and 2007 MSHA database.

Notes:

<sup>94</sup> Carbon content is found using the weighted average of CO<sub>2</sub> (lbs/MMbtu) from EIA Table FE4 along with the heat content (MMbtu/ton) and production (tons) from the 2007 MSHA database. The molecular mass ratio of carbon to CO<sub>2</sub> (12/44) is then used to find carbon content from the derived CO<sub>2</sub> content (4,143 lbs/short ton).

(1) 2007 National Emissions (metric tons CO<sub>2</sub>e) = 2007 Production x U.S. Weighted Average CO<sub>2</sub> content (4,143 lbs/short ton)/(2205 lbs/metric ton).

(2) Emissions covered (metric tons CO<sub>2</sub>e) = sum of coal CO<sub>2</sub> emissions for all facilities with metric tons CO<sub>2</sub>e production greater than the threshold.

(3) Facilities covered = total number of facilities with metric tons CO<sub>2</sub>e production greater than the threshold.

For this rule, we propose to include all active underground and surface coal mines, with no threshold. Of the approximately 1,365 active coal mines operating in 2007, the 25,000 metric tons CO<sub>2</sub>e threshold (corresponding to 1,140.8 million tons of coal production) would include the largest 1,117 coal mines and 99.6 percent of U.S. coal production. All active U.S. coal mines already report annual (and quarterly) coal production (based on aggregated daily production data) to MSHA. The additional reporting required under this proposal is the carbon content of the coal, which can be calculated using the coal's higher heating value (HHV) also referred to as the gross calorific value (GCV). All active U.S. coal mines already conduct daily proximate analysis to record the HHV for coal sales contracts. An alternative for coal mines with annual production lower than 100,000 short tons is offered in the proposed rule to estimate CO<sub>2</sub> emissions using HHV and default values, making this a very minimal additional reporting burden. Thus, we have determined that including all mines as reporters under proposed 40 CFR part 98, subpart KK would not significantly increase the burden on

small coal mines. We are seeking comments on this conclusion.

Coal Importers. As noted above, the majority of imported coal is imported by power plants for steam generation of electricity, with the remainder imported by other sizeable industrial facilities. We propose that all coal importers report, with no threshold. Because most of the imported coal is brought into the U.S. by companies owning facilities that would already be required to report GHG data to EPA under other subparts of the proposed 40 CFR part 98, EPA believes that there would be a minimal incremental burden associated the inclusion of all importing companies. We are seeking comments on this conclusion.

Coal Exporters. Under proposed 40 CFR part 98, subpart KK, we are proposing that all coal exporting companies report, with no threshold. Coal exporters already collect information about the quantity and quality (e.g., heating value) of coal to be exported. Reporting to us under proposed 40 CFR part 98, subpart KK would therefore impose only minimal additional burden on these companies.

Waste coal reclaimers. Under proposed 40 CFR part 98, subpart KK, we are proposing all waste coal reclaimers

report, with no threshold. Parties that recover this waste coal for sale to consumers already collect information about the quantity and quality (e.g., heating value) of coal to be sold. Reporting to us under proposed 40 CFR part 98, subpart KK would therefore impose only minimal additional burden on these facilities.

For a full discussion of the threshold analysis, please refer to the Suppliers of Coal TSD (EPA-HQ-OAR-2008-0508-037). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

We are proposing the reporting of the amount of coal produced or supplied to the economy annually, as well as the CO<sub>2</sub> emissions that would result from complete oxidation or combustion of this quantity of coal.

The only GHG required to be reported under this subpart is CO<sub>2</sub>. Combustion of coal may also lead to trace quantities of CH<sub>4</sub> and N<sub>2</sub>O emissions.<sup>95</sup> Because the quantity of CH<sub>4</sub> and N<sub>2</sub>O emissions are highly variable and dependent on technology and operating conditions in which the coal is being consumed (unlike CO<sub>2</sub>), we are not proposing that coal

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<sup>95</sup> CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from coal combustion were 2065.3, 0.8, and 10.23 million metric tons CO<sub>2</sub>e, respectively.

suppliers report on these emission. We seek comment on whether or not EPA should use the national inventory estimates of CH<sub>4</sub> and N<sub>2</sub>O emissions from coal combustion, and apportion them to individual coal suppliers based on the quantity of their products.

We are proposing that coal mines, coal importers, coal exporters, and reclaimers of waste coal use a mass-balance method to calculate CO<sub>2</sub> emissions. The mass balance approach is based on readily available information: the quantity of coal (tons), and the carbon content of the coal (as determined by the mine, importer, exporter, or waste reclaimer, according to the methodology described below). The formula is simple and can be automated. The mass-balance approach is used extensively in national GHG inventories, and in existing reporting guidelines for facilities, companies, and states, such as the WRI/WBCSD GHG Protocol.

We propose that coal suppliers be required to report both the total weight of coal produced or supplied annually (tons per year), as well as either the carbon content (carbon mass fraction) or coal HHV, which can be a proxy for carbon content. In practice, coal suppliers routinely and frequently monitor both the weight and energy content of coal for contractual purposes (e.g., daily measurements

of tonnage and analyses of the BTU, sulfur, and ash content of coal) as well as for reporting requirements to various State and Federal agencies. We propose that all coal suppliers report these routinely-collected data, and use them as a basis for estimating the CO<sub>2</sub> emissions associated with the coal.

For the purpose of this calculation, we propose that larger coal mines (i.e., coal mines that produce over 100,000 short tons of coal per year) use mine-specific, carbon content values.

Generally, the carbon content of coal can be determined through one of two procedures. The most accurate method is to determine the coal's carbon content (carbon mass fraction) directly through ultimate analysis of the coal's chemical constituents. An alternative method is to measure the coal's energy content (HHV, which is often expressed in units of MMBTU per unit weight) and use it as an indicator of the coal's carbon content. This is done by establishing a statistically significant correlation between the coal's heating value and the carbon content of the coal, and using this correlation to estimate the carbon content (carbon mass fraction) of a given batch of coal with known heating value. For instance, a linear relationship between coal heating value and coal carbon



content can be established. This alternative approach is convenient because heat value measurements of coal are taken routinely and frequently by coal mines, coal importers, coal exporters, and coal retailers.

For the purpose of proposed 40 CFR part 98, subpart KK, EPA proposes that coal mines that produce over 100,000 short tons of coal per year have two options for reporting the carbon content of their coal: (1) daily measurements of coal carbon content through ultimate analyses (daily sampling and analyses, reported as annual weighted average), or (2) a combination of daily measurements of coal HHV through proximate analyses and monthly measurements of carbon content through ultimate analyses, using an established, statistically significant correlation to estimate the daily weighted average coal carbon content (mass fraction), as described in the rule. We propose that a minimum of one year of data be used to establish such a mine-specific statistically significant correlation between the coal carbon content (as measured by ultimate analyses) and coal heating value (as measured by proximate analyses). We request comment on this approach, including the minimum number of data points necessary to establish a statistically significant mine-specific relationship between coal carbon content and coal HHV, and how often and

under what circumstances should the statistical relationship be reestablished. According to MSHA data, 706 mines produced over 100,000 short tons of coal during 2007 (52 percent of all mines), accounting for 98 percent of total production. We propose that a more stringent method for calculating carbon content be applied to these larger mines in order to reduce the uncertainty of the CO<sub>2</sub> data collected.

EPA proposes that coal mines with annual coal production less 100,000 short tons use either one of the above approaches for estimating carbon content, or use a third alternative. This alternative involves estimating the coal's carbon content based only on daily measurements of coal HHV through proximate analyses and a default CO<sub>2</sub> emissions factor provided as described in proposed 40 CFR part 98, subpart KK. EPA has concluded that this alternative is reasonable because it would reduce the sampling and analyses cost burden on these entities, yet would provide sufficient accuracy given their relatively small contribution to total U.S. coal supply. We request comments on this approach.

EPA proposes that all coal importers, coal exporters, and reclaimers of waste coal use any of three above approaches for estimating carbon content based on

measurements per shipment in place of daily measurements if preferred. We seek comment on this measurement approach.

We propose that the ASTM Method D5373 should be used as the standard for all ultimate analyses.

We considered, but are not recommending, an option to allow all coal mines to use default coal carbon content values instead of site-specific values or measurements. Existing information available on the variability of carbon content for coal from USGS, the U.S. GHG Inventory, EIA's GHG Inventory, and the IPCC indicate that default values introduce considerable uncertainty into the emissions calculation. Given the large share of total GHG emissions represented by use of coal in the U.S. economy, we view the direct measurement or estimation of site-specific carbon content values as necessary. We seek comment on an appropriate approach for reporters - such as importers - who estimate a weighted annual average GCV according to specified methodology that is not listed with a corresponding default coal carbon content value in table KK-1 of this rule. Further information on various approaches to monitoring GHG emissions is elaborated in the Suppliers of Coal TSD (EPA-HQ-OAR-2008-0508-037).

#### 4. Selection of Procedures for Estimating Missing Data

We have determined that some of the information to be reported by coal mines, coal importers, coal exporters, and waste coal reclaimers is routinely collected as part of standard operating practices (e.g., coal tonnage). For these cases, we expect no missing data would occur.

Typically, coal is weighed using automated systems on the conveyor belt or at the loadout facility. In general, the weighing and sampling of coal at coal mines are conducted at about the same time to ensure consistency between quantity and quality of coal. In this rule, EPA proposes that the most current version of NIST Handbook 44 published by Weights and Measures Division, National Institute of Standards and Technology be used as the standard practice for coal weighing. In cases where coal supply data are not available, reporters may estimate the missing quantity of coal supplied, using documentation for the quantity of coal received by end-users or other recipients. For any periods during which mine scales are not operational or records are unavailable, estimates of coal production at the mine may be estimated using an average of values of production immediately preceding and following the missing data period, or other standard industry practices, such as estimating the volume of coal transported by rail cars and coal density to estimate total

coal weight in tons. For additional background information on coal weighing, please refer to the Suppliers of Coal TSD (EPA-HQ-OAR-2008-0508-037).

In cases where carbon content or HHV measurements are missing, reporters may estimate the missing value based on an weighted average value for the previous seven days.

#### 5. Selection of Data Reporting Requirements

We propose that coal mines, coal importers, coal exporters, and waste coal reclaimers each report to us annually on the CO<sub>2</sub> emissions that would result from complete combustion or oxidation of coal produced during the previous calendar year.

Information from coal mines should be reported at the facility level, and should include mine name, mine MSHA identification number, name of operating company, coal production coal rank or classification (e.g. anthracite, bituminous, sub-bituminous, or lignite), facility-specific measured values of coal carbon content or HHV that are used to calculate CO<sub>2</sub> emissions, and the estimated CO<sub>2</sub> emissions (metric tons CO<sub>2</sub>/yr).

Coal importers, coal exporters, and waste coal reclaimers should report company name and technical contact information (name, e-mail, phone).

Coal importers should report at the corporate level. Coal importers already measure coal quantity for each shipment entering the U.S. Importers generally conduct proximate analyses on each shipment to assure that coal quality meets the coal specification under contract. Some importers may also conduct ultimate analysis. Coal importers should report the quantity of coal imported, coal rank or classification (e.g. anthracite, bituminous, sub-bituminous, or lignite,) country of origin, origin-specific measured values of coal carbon content and HHV that are used to calculate CO<sub>2</sub> emissions, and estimated CO<sub>2</sub> emissions.

Coal exporters should report, at the corporate level, the quantity of coal exported, coal rank or classification (e.g. anthracite, bituminous, sub-bituminous, or lignite), name and MSHA identification number of mine of origin, country of destination, mine-specific measured values of coal carbon content or HHV that are used to calculate CO<sub>2</sub> emissions, and estimated CO<sub>2</sub> emissions (metric tons CO<sub>2</sub>/yr).

Waste coal reclaimers should report, at the facility level, the quantity of coal recovered or reclaimed (tons/yr), coal rank or classification (e.g. anthracite, bituminous, sub-bituminous, or lignite), name of mine of origin, state of origin, mine-specific measured values of

coal carbon content or HHV that are used to calculate CO<sub>2</sub> emissions, and estimated CO<sub>2</sub> emissions.

A full list of data to be reported is contained in the rule. These data to be reported form the basis of calculating potential CO<sub>2</sub> emissions associated with the total supply of coal into the U.S. economy. Therefore, these data are necessary for us to understand the emissions data and to verify the reasonableness of the reported emissions.

We considered, but are not proposing an option in which we would obtain facility-specific data for coal production through access to existing Federal government reporting databases, such as those maintained by MSHA. We have determined that comparability and consistency in reporting processes across all facilities included in the entire rule is vital, particularly with respect to timing of submission, reporting formats, QA/QC, database management, missing data procedures, transparency and access to information, and recordkeeping. In addition, EPA's methodological approach requires information that is not currently reported to Federal agencies, such as facility-specific information on coal quality (e.g., coal carbon content or heating value).

#### 6. Selection of Records That Must Be Retained

A full list of records that must be retained onsite is included in proposed 40 CFR part 98, subparts A and KK. EPA proposes that the following records specific to suppliers of coal be kept onsite: daily production of coal, annual weighted average of coal carbon content values (if measured), annual weighted average of coal HHV, calibration records of any instruments used onsite (e.g., if coal analyses are done onsite), and calibration records of scales or other equipment used to weigh coal.

These records consist of data that are directly used to calculate the potential CO<sub>2</sub> emissions reported. We have concluded that these records are necessary to enable verification that the GHG emissions monitoring and calculation were done correctly.

#### LL. Suppliers of Coal-based Liquid Fuels

##### 1. Definition of the Source Category

We are proposing to include facilities that produce coal-based liquids as well as importers and exporters of coal-based liquids in this source category. Owners and operators of coal to-liquids facilities, or "producers", importers, and exporters would report on the CO<sub>2</sub> emissions that would result from complete combustion or oxidation of the quantities of coal-based liquids supplied to or exported from the U.S. economy. Producers would report at



the facility level; importers and exporters would report at the corporate level.

The carbon in coal-based liquids would already be captured in the reporting from domestic coal suppliers and importers, but we believe that it is important for climate policy development to have additional information on a unique and potentially growing source of liquid fuels. As discussed in Sections III and IV of this preamble, emissions resulting from the combustion and other uses of coal-based liquids, as well as emissions generated in the production of coal-based liquids, are addressed in other sections of the preamble, particularly Section V.C of this preamble (General Stationary Fuel Combustion Sources), Section V.D (Electricity Generation), and Section V.FF (Underground Coal Mines).

The output fuels from coal-to-liquids processes are compositionally similar to standard petroleum-based products e.g., gasoline, diesel fuel, jet fuel, light gases etc. The most common processes for converting coal to liquids are direct and indirect liquefaction. In the direct process, coal is processed directly to liquid. In the indirect process, coal is first gasified, and then liquefied.

Once manufactured, the supply chain for coal-based liquids to consumers is basically the same as it is for refined petroleum products. Liquid fuels are moved from the manufacturing facility to a terminal, at which point they may be blended or mixed with other products, before entering the downstream distribution chain. Imported coal-based liquids would enter the U.S. in the same way that refined and semi-refined petroleum products enter the country. In determining the most appropriate point in the supply chain of coal-based liquids, we followed the decision-making process applied to suppliers of petroleum products discussed in Section V.MM of this preamble, and selected coal-to-liquids facilities (analogous to refineries), and importers and exporters. For further information, see the Coal to Liquids TSD (EPA-HQ-OAR-2008-0508-038). We request comment on the approach of establishing a separate source category and subpart for suppliers of coal-based liquids, and the selection of coal-to-liquids facilities and corporate importers and exporters of coal-based liquids. We also request comment on whether or not importers of liquid-based fuels are likely to have the necessary information with which to distinguish coal-based liquids from conventional petroleum-based liquids.

## 2. Selection of Reporting Threshold

In developing the threshold for suppliers of coal-based liquids, EPA considered the emissions-based threshold of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e per year, but was limited by the fact that there are very few existing facilities. According to DOE, there is one facility operating in the world, one U.S. facility in the engineering phase, and thirteen facilities proposed in the U.S.<sup>96</sup> Given that conversion of coal to liquids is a highly energy intensive process that is viable only on a large scale, we propose that any coal-to-liquids facility operating in the U.S. would be required to report.

We also propose that all importers and exporters of coal-based liquids report under this rule. While the number of existing importers and exporters is very small in comparison to importers and exporters of petroleum products, importers of coal-based liquids would be required to track fuel quantities as part of routine business operations, and report to DOE and other Federal agencies.

For further information, see the Coal to Liquids TSD (EPA-HQ-OAR-2008-0508-038). For specific information on costs, including unamortized first year capital

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<sup>96</sup> Coal Conversion - Pathway to Alternate Fuels. C. Lowell Miller. 2007 EIA Energy Outlook Modeling and Data Conference. Washington, DC, March 28, 2007.

expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

We are proposing that producers, importers, and exporters of coal-based liquids calculate potential CO<sub>2</sub> emissions associated with coal-based liquids on the basis of a mass balance approach. Under this approach, CO<sub>2</sub> emissions would be determined by applying a carbon content value to the quantity of each coal-based liquid supplied. The formulae are simple and can be automated. For carbon content, reporters can either use the default CO<sub>2</sub> emission factors for standard petroleum-based fuels in proposed 40 CFR part 98, subpart MM or develop their own factors.<sup>97</sup> Reporters that choose to substitute their own batch- or facility-specific values for density and carbon share of individual coal-based liquids, and develop their own CO<sub>2</sub> emission factors, must do so according to the proposed ASTM standards and procedures discussed in proposed 40 CFR part 98, subpart MM. While carbon content of coal-based liquids may differ from petroleum products, we believe the default emission factors for petroleum products in proposed 40 CFR part 98, subpart MM can be used for estimating emissions

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<sup>97</sup> For a discussion of the benefits and disadvantages of default carbon factors versus direct measurement see Section V.MM.3 of this preamble.

from coal-based liquids. We request comment on this approach, the appropriateness of the proposed default CO<sub>2</sub> emission factors, and ways to improve these default values. We also request comment on the appropriateness of the proposed sampling and analysis standards and methods for developing batch- or facility-specific CO<sub>2</sub> emission factors, especially the methods for determining carbon share.

#### 4. Selection of Procedures for Estimating Missing Data

We have determined that the information to be reported by suppliers of coal-based liquids is routinely collected by facilities and entities as part of standard operating practices, and therefore 100 percent data availability would be required. Typically, coal-based liquids would be metered directly at multiple stages. In cases where metered data are not available, reporters may estimate the missing volumes based on contracted maximum daily quantities and known conditions of receipt and delivery during the period when data are missing.

#### 5. Selection of Data Reporting Requirements

We propose that producers, importers, and exporters report CO<sub>2</sub> emissions directly to EPA on an annual basis. Suppliers would report potential CO<sub>2</sub> emissions disaggregated by fuel types.

We considered but did not propose an option in which we would obtain facility-specific data for coal-based liquids through access to existing Federal government reporting databases, such as those maintained by EIA. EPA believes that comparability and consistency in reporting processes across all facilities included in the entire rule are vital, particularly with respect to timing of submission, reporting formats, QA/QC, database management, missing data procedures, transparency and access to information, and recordkeeping.

#### 6. Selection of Records That Must Be Retained

A full list of records that must be retained onsite is included in proposed 40 CFR part 98, subparts A and LL.

#### MM. Suppliers of Petroleum Products

##### 1. Definition of the Source Category

We are proposing that refineries as well as importers and exporters of petroleum products be included in this source category. Owners or operators of petroleum refineries, or "refiners," and importers that introduce petroleum products into the U.S. economy would be required to report on the CO<sub>2</sub> emissions associated with the complete combustion or oxidation of their petroleum products. Additionally, both refiners and importers would be required to report on biomass components of their petroleum products

as well as NGLs they supply to the economy, and refiners would be required to report on certain types of feedstock entering their facility. Refiners would report at the facility level, and importers would report at the corporate level. Exporters of petroleum products are also included in this source category in order for us to appropriately account for petroleum products that are produced but not consumed in the U.S. and therefore do not result in direct CO<sub>2</sub> emissions in the U.S. Exporters would report on the petroleum products and NGLs they export, including the biomass components of the petroleum products, at the corporate level.

End users of petroleum products are addressed in other sections of this preamble, such as Section V.C (General Stationary Fuel Combustion Sources), and direct, onsite emissions at petroleum refineries are covered in Section V.Y of this preamble.

The total estimated GHG emissions resulting from the combustion of petroleum products in the U.S. in 2006 was 2,417 million metric tons CO<sub>2</sub>e, according to the 2008 U.S. GHG Inventory. It is estimated that 75 percent of the combustion-related CO<sub>2</sub> emissions from petroleum use in the U.S. comes from the transportation sector. The next largest sector is industrial use (15 percent), and the

commercial, residential, and electricity generation sectors make up the remainder.

Petroleum products are ultimately consumed in one of two ways: either through combustion for energy use, or through a non-energy use such as petrochemical feedstocks or lubricants. Combustion of petroleum products produces CO<sub>2</sub> and lesser amounts of CH<sub>4</sub> and N<sub>2</sub>O, which are in almost all cases emitted directly into the atmosphere. Some non-energy uses of fuels, such as lubricants, also result in oxidation of carbon and CO<sub>2</sub> emissions. This process may occur immediately upon first use or, in the case of biological deterioration, over time. Carbon in other petroleum products, such as asphalts and durable plastics, may remain un-oxidized for long periods unless burned as fuel or incinerated as waste.

The following list, while not comprehensive, illustrates the types of products that EPA considers to fall under the category of petroleum products:

- X Motor vehicle and nonroad gasoline and diesel fuels
- X Jet fuel and kerosene
- X Aviation gasoline
- X Propane and other LPGs
- X Home heating oil
- X Residual fuel oil
- X Petrochemical feedstocks
- X Asphalt
- X Petroleum coke
- X Lubricants and waxes



Reporting Parties. When considering the extent of the definition of this source category and who should be required to report under this rule, our approach was first to identify all parties within the petroleum product supply chain. We considered parties that function primarily in upstream petroleum production, such as oil drillers and well owners, as well as petroleum refiners and importers of refined and semi-refined products. We also considered parties located even further downstream, such as terminal operators, oxygenate blenders of transportation fuel, blenders of blendstock, transmix processors, and retail gas station owners. In addition, we considered pipeline owners and operators.

As discussed earlier in this preamble, one of our objectives when determining which entities would fall within a source category was to identify logical data reporting points or groups of facilities that were relatively small in number but that could provide a comprehensive set of data for the particular source category. Of all the parties that make up the petroleum products supply chain, we have concluded that petroleum

refiners<sup>98</sup> and importers and exporters of semi-refined and refined petroleum products are the most appropriate parties to report to EPA under this source category and that the data they can report would be comprehensive.

There are approximately 150 operating petroleum refineries in the U.S. and its territories. Our thresholds analysis in Section V.MM.2 of this preamble, however, only reflects data on the 140 refineries that reported atmospheric distillation capacity to EIA (at DOE) in 2006. Petroleum products from these refineries account for approximately 90 percent of U.S. consumption. Given the coverage provided by a relatively small number of facilities, we propose that all refiners be subject to the reporting requirements for petroleum product suppliers and that they report to EPA on a facility-by-facility basis. For refiners that trade semi-refined and refined petroleum products between facilities, leading to a possible risk of double-counting in coverage, we are proposing a straight-forward accounting method in Section V.MM.5 of this preamble to address this possibility.

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<sup>98</sup> A petroleum refinery is any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, asphalt (bitumen) or other products through distillation of petroleum or through redistillation, cracking, or reforming of unfinished petroleum derivatives.

To account for refined and semi-refined petroleum products that are not produced at U.S. refineries, we are proposing to include importers under this source category. Importers currently report to EPA on petroleum products designated for transportation or non-road mobile end-uses. This rule would include all importers regardless of end-use designations. The number of importing companies varies from year to year, but it is typically on the order of 100 to 200.

We are also proposing to include under this source category exporters of refined and semi-refined petroleum products in order to have information on petroleum products that are produced but not consumed in the U.S. The rationale to include reporting from exporters is to be able to account for petroleum products that are consumed in other countries and that do not contribute to direct CO<sub>2</sub> emissions in the U.S.

Many refiners are also importers and exporters of petroleum products. EPA is proposing that such refiners separately report data on the petroleum products that they produce on a facility-by-facility basis and report at a corporate level the petroleum products they import or export. The rationale for this separate reporting is that we are generally proposing coverage at the facility level

where feasible (e.g., refineries) and proposing corporate reporting only where facility-level coverage may not be feasible (e.g., importers and exporters). In addition, the separation simplifies reporting in cases where a company that owns or operates multiple refineries may have a consolidated arrangement for imports of refined and semi-refined products destined for its refineries and for other consumers, or for exports.

We considered but are not proposing to include parties that are involved in upstream petroleum production. We believe the number of domestic oil drillers and well owners is prohibitively large and represents only a portion of the amount of crude petroleum that is processed into finished products to be used in the U.S.

We are not proposing to include retail gas station owners and oxygenate blenders to report to EPA as suppliers of petroleum products. Retail gas station owners and oxygenate blenders mostly handle transportation fuel and fuel used in small engines. Because we are interested in GHG emissions from all petroleum products combusted or consumed in the U.S. and can obtain information on such products on a more aggregated basis directly from refiners and importers, we are proposing to exclude retail gas

station owners and oxygenate blenders from reporting under this rule.

We are not proposing to include operators of terminals or pipelines, blenders of blendstocks, or transmix processors in this source category because we believe that refiners and importers can provide comprehensive information on petroleum products supplied in the U.S. with a lower risk of double-counting petroleum products. A given quantity of refined or semi-refined petroleum product may pass between multiple terminals and blending facilities, so asking terminal or pipeline operators, blenders of blendstock, or transmix processors to report information on incoming and outgoing products would likely result in unreliable data for estimating GHG emissions from petroleum products.<sup>99</sup>

Liquid fossil fuel products can be derived from feedstocks other than petroleum crude, such as coal and natural gas. Suppliers of coal-based products are covered under Section V.LL of this preamble, Suppliers of Coal-Based Liquid Fuels. Primary suppliers of natural gas-based products are covered in Section V.NN of this preamble, Suppliers of Natural Gas and Natural Gas Liquids. We are

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<sup>99</sup> See Section V.MM.3 of this preamble regarding a method for accounting for trade between refineries.

proposing to require all reporters in this source category to report data on the NGLs they supply to or export from the economy because these products may not currently be captured under Section V.NN of this preamble, Suppliers of Natural Gas and NGLs. The natural-gas related reporting requirements are discussed in Section V.MM.5 of this preamble.

This section of the preamble is focused on suppliers of petroleum products, so EPA is not proposing to include primary<sup>100</sup> suppliers of renewable fuels, such as fuel derived from biomass like grains, animal fats and oils, or waste, under this source category. However, as described in Section IV.B of this preamble (Reporting by fuel and industrial gas suppliers), we note that we are not proposing to require suppliers of biomass-based fuels to report on their products anywhere under this rule, except as discussed below for petroleum suppliers, due to a longstanding accounting convention adopted by the IPCC, the UNFCCC, the U.S. GHG Inventory, and many other State and regional GHG reporting programs where emissions of CO<sub>2</sub> from the combustion of renewable fuels are distinguished from emissions of CO<sub>2</sub> from combustion of petroleum or other

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<sup>100</sup> Refiners, exporters, and importers of petroleum products could, in some cases, be suppliers of renewable fuels but their supply of renewable fuels is not the focus of this subpart.

fossil-based products. Under such convention, potential emissions from the combustion of biomass-based fuels are accounted for at the time of feedstock harvest, collection, or disposal, not at the point of fuel combustion.

Nonetheless, we seek comment on this approach.

Certain petroleum products can be co-processed or blended with renewable fuels. We are proposing a method in Section V.MM.5 of this preamble whereby petroleum product suppliers report data that allows EPA to distinguish between the biomass and fossil fuel-based carbon in their products.

## 2. Selection of Reporting Threshold

In assessing the appropriateness of applying a threshold to refiners (at the facility level) and importers (at the corporate level), we calculated the volume of finished gasoline that would contain enough carbon that, when combusted or oxidized, would produce 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e. We took the volume of finished gasoline as an example of how much of a refined or semi-refined product would result in a given level of CO<sub>2</sub> emissions. These data are summarized in Table MM-1 of this preamble.

**Table MM-1. Threshold Analysis for Finished Gasoline**

Threshold Level metric tons CO <sub>2</sub> /yr	Total Volume of Gasoline Bbls/yr
1,000	2,564
10,000	25,641
25,000	64,103
100,000	256,410

Based on the calculations in Table MM-1 of this preamble and data on the annual volume of petroleum products that refiners and importers are currently reporting to the EIA, EPA estimated the number of refineries and importers that would meet each of the four selected threshold levels. The results of this analysis are summarized below.

Refineries. Data on the typical production levels for refineries<sup>101</sup> demonstrate that each of the thresholds considered would cover all domestic refineries (see Table MM-2 of this preamble). This conclusion is based on the result that all refineries would exceed the thresholds for gasoline alone, and therefore would also exceed the thresholds for all products combined. For this reason, we are proposing to cover all petroleum refineries.

**Table MM-2. Threshold Analysis for Refineries**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions <sup>1,2</sup> metric tons CO <sub>2</sub> /yr	Total Number of Facilities <sup>3</sup>	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> /yr	Percent	Number	Percent

<sup>101</sup> To simplify our reporting threshold analysis, EPA omitted roughly 10 refineries that meet our definition of a petroleum supplier but did not report any atmospheric distillation capacity to EIA.



Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions <sup>1,2</sup> metric tons CO <sub>2</sub> /yr	Total Number of Facilities <sup>3</sup>	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> /yr	Percent	Number	Percent
1,000	2,447,738,368	140	2,447,738,368	100%	140	100%
10,000	2,447,738,368	140	2,447,738,368	100%	140	100%
25,000	2,447,738,368	140	2,447,738,368	100%	140	100%
100,000	2,447,738,368	140	2,447,738,368	100%	140	100%

<sup>1</sup> These constitute total emissions from all petroleum products ex refinery gate. The total includes only CO<sub>2</sub> emissions.

<sup>2</sup> Estimated CO<sub>2</sub> emissions for all refineries are based on applying product-specific default carbon contents to production of each product.

<sup>3</sup> This number represents the total number of refineries that reported atmospheric distillation capacity to EIA in 2006.

Small Refiners. In recent EPA fuel rulemakings, we have provided temporary exemptions from our regulations for small refiners, defined as producers of transportation fuel from crude oil that employed an average of 1,500 people or fewer over a given one-year period and with a corporate-average crude oil capacity of 155,000 barrels per calendar day or less. Such small refiner exemptions were provided to allow small refiners extra time to meet standards or comply with new regulations. This exemption was based on an assumption that to require small refiners to comply with new regulations on the same schedule as larger refiners would put them at a disadvantage if required to seek the same capital and administrative resources being sought by their larger competitors. Because of the nature of this reporting rule, however, we are not proposing any temporary exemptions for small refiners. We do not believe complying with this rule will require additional resources that might

put small refiners at an unfair disadvantage. All refiners would already be reporting data to EPA, regardless of size, because all refineries meet the proposed reporting threshold in proposed 40 CFR part 98, subpart Y for direct onsite emissions.

Importers. Data on importers of petroleum products in 2006, the most recent year available, show that 78 percent of the importing companies exceeded the 25,000 metric tons CO<sub>2</sub>e/yr reporting threshold and that some importing companies did not meet the 1,000 metric tons CO<sub>2</sub>e/yr threshold (see Table MM-3 of this preamble). While 22 percent of importers supplied less than the amount of products that, when combusted or oxidized, would have resulted in 25,000 metric tons CO<sub>2</sub>/yr, data on the amount and types of petroleum products is information that all importers maintain as part of their normal business operations. Therefore we believe the burden of reporting the required information listed in Section V.MM.5 of this preamble is minimal since no additional monitoring equipment has to be installed to comply with this rule. In addition, the quantity of products imported by a company may vary greatly from year to year. Furthermore, our proposed definition for petroleum products for importers and exporters in Subpart A excludes asphalt and road oil,

lubricants, waxes, plastics, and plastic products. For these reasons, we are proposing that all importers of petroleum products be required to report to EPA, and we seek comment on our proposed definition of petroleum products as it applies to importers.

**Table MM-3. Threshold Analysis for Importers**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions <sup>1</sup> metric tons CO <sub>2</sub> /yr	Total Number of Importers-	Emissions Covered		Companies Covered	
			metric tons CO <sub>2</sub> /yr	Percent	Number	Percent
<1000	393,294,390	224	393,294,390	100%	224	100%
1,000	393,294,390	224	393,291,916	>99.9%	219	98%
10,000	393,294,390	224	393,171,144	>99.9%	193	86%
25,000	393,294,390	224	392,895,841	99.9%	175	78%
100,000	393,294,390	224	389,628,252	99%	120	54%

<sup>1</sup>These constitute total emissions from all product imports. Analysis is based on EIA's *Company Reports* for 2006.

Exporters. Due to the limited availability of export data, EPA did not conduct a threshold analysis for petroleum products exporters. However, based on the type of information that exporters must maintain as part of their normal business operations, we believe that the incremental burden of reporting this information to EPA would be minimal. Considering this information and the importance of being able to account for petroleum products produced but not combusted or oxidized in the U.S., EPA is proposing that all exporters report on their exported petroleum products. Furthermore, our proposed definition for petroleum products for importers and exporters in Subpart A excludes asphalt and road oil, lubricants, waxes,

plastics, and plastic products. We seek comment on this proposal.

De Minimis Exports and Imports. We are seeking comment on whether or not to establish a de minimis level, either in terms of total product volume or potential CO<sub>2</sub> emissions, to eliminate any reporting burden for parties that may import or export a small amount of petroleum products on an annual basis. We also note that in the proposed rule some importers and exporters may not be required to report their onsite combustion, process, and/or fugitive emissions under other sections of the proposed rule because their combined emissions do not meet the applicable thresholds.

For a full discussion of the threshold analysis, please refer to the Suppliers of Petroleum Products TSD (EPA-HQ-OAR-2008-0508-039). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Rather than directly measuring emissions from the combustion or consumption of their products, suppliers of petroleum products would need to estimate the potential emissions of their non-crude feedstocks and products based

on volume and characteristic information. Therefore product volume metering and sampling would be of utmost importance to accurately calculate potential CO<sub>2</sub> emissions.

Volume measurement. EPA is proposing to require specific industry-standard test methods for flow meters and tank gauges for measuring volumes of feedstocks and products. For ultra-sonic flow meters, we propose to require the test method described in AGA Report No. 9 (2007); for turbine meters, American National Standards Institute, ANSI/ASME MFC-4M-1986; for orifice meters, American National Standards Institute, ANSI/API 2530 (also called AGA-3) (1991); and for coriolis meters, ASME MFC-11 (2006). For tank gauges, we propose to require the following test methods: API-2550: Measurements and Calibration of Petroleum Storage Tanks (1965), API MPMS 2.2: A Manual of Petroleum Measurement Standards (1995), or API-653: Tank Inspection, Repair, Alteration and Reconstruction, 3<sup>rd</sup> edition (2008).

We propose that all flow meters and tank gauges must be calibrated prior to monitoring under this rule using a method published by a consensus standards organization (e.g., ASTM, ASME, American Petroleum Institute, or NAESB), or using calibration procedures specified by the flow meter manufacturer. Product flow meters and tank gauges would be

required to be recalibrated either annually or at the minimum frequency specified by the manufacturer.

Carbon content determination. To translate data on petroleum product, NGLs, and biomass types and quantities into estimated potential GHG emissions, it is necessary either to estimate or measure the carbon content for each product type. For this proposal, we reviewed the existing CO<sub>2</sub> emission factors developed by EIA and used in the U.S. GHG Inventory, and we researched the sampling and test methods that would be required for direct measurement of carbon content by reporters.

We also considered the benefits and disadvantages of using default carbon content factors and of using direct measurements of carbon content. Default CO<sub>2</sub> emission factors have been used extensively in the U.S. GHG Inventory, in inventories of other nations, and in corporate reporting guidance; they are simple and cost effective for evaluating GHG emissions from common classes of biomass and fossil fuel types (e.g. ethanol, motor gasoline, jet fuel, distillate fuel, etc). It is also possible to combine default CO<sub>2</sub> emission factors to develop alternative factors for fuel reformulations by averaging according to weight. Some products, however, can have multiple chemical compositions due to different feedstock,

blending components, and/or refinery processes, which can lead to variations in carbon content. Default CO<sub>2</sub> emission factors for common chemical compositions of common products cannot account for the full variability of carbon content in petroleum, natural gas, and biomass products.

Direct measurements would provide the most accurate determination of carbon content. It is relatively expensive, however, to design and implement a program for regular sampling and testing for carbon content across the variety of products produced at refineries. Many products are homogeneous because they must meet "minimum" specifications (e.g., jet fuel), and the use of direct measurements may not lead to noticeable improvements in accuracy over default CO<sub>2</sub> emission factors.

Based on this information, we are proposing that for purposes of estimating emissions, reporters could either use the default CO<sub>2</sub> emission factors for each product type published in proposed 40 CFR part 98, subpart MM or, in the case of petroleum products and NGLs, develop their own factors. Reporters that choose to substitute their own values for density and carbon share of individual petroleum products and NGLs, and develop their own CO<sub>2</sub> emission factors would be required to sample each product monthly for the reporting year and to test the composite sample at

the end of the reporting period using ASTM D1298 (2003), ASTM D1657-02(2007), ASTM D4052-96(2002)e1, ASTM D5002-99(2005), or ASTM D5004-89(2004)e1 for density, as appropriate, and ASTM D5291(2005) or ASTM D6729-(2004)e1 for carbon share, as appropriate (see Suppliers of Petroleum Products TSD (EPA-HQ-OAR-2008-0508-039)). For suppliers of seasonal gasoline, reporters would be required to take a sample each month of the season and test the composite sample at the end of the season.

We request comment on this approach. We request comment on whether reporters should be allowed to combine default CO<sub>2</sub> emission factors to develop alternative factors for fuel reformulations according to the volume percent of each fuel component, and if so using what methodology. We also request comment on the appropriateness and adequacy of the proposed default CO<sub>2</sub> emission factors - including factors for biomass products - and ways to improve these default values. For full documentation of the derivation of the proposed default factors, please refer to the Suppliers of Petroleum Products TSD (EPA-HQ-OAR-2008-0508-039).

In addition, we request comment on the appropriateness of the proposed sampling and analysis standards and methods for developing CO<sub>2</sub> emission factors for petroleum products



and NGLs, especially the methods for determining carbon share. Specifically, we seek comment on specific ASTM or other industry standards that would be more appropriate for sampling petroleum products and NGLs to determine carbon share. Finally, we request comment on potential methods to determine carbon share of biomass products.

The various approaches to monitoring GHG emissions are elaborated in the Suppliers of Petroleum Products TSD (EPA-HQ-OAR-2008-0508-039).

#### 4. Selection of Procedures for Estimating Missing Data

Under this proposal, we are suggesting methods for estimating data that may be missing from different source categories for various reasons. Petroleum product suppliers would need to estimate any missing data on the amount of petroleum products or NGLs supplied or exported, and the quantity of the crude and non-crude feedstocks, including biomass, consumed. In most cases, the source category would be missing data due to monitoring equipment malfunction or shutdown. We have determined that the information to be reported by petroleum fuel suppliers is collected as part of standard operating practices, and expect that any missing data would be negligible. Typically, products are metered directly at multiple stages, and billing systems require rigorous reconciliation

of data. In cases where metered data are not available, we are proposing that reporting parties may estimate the missing volumes based either on the last valid data point they recorded or on an average of two valid data points based on their established procedures for purposes of product tracking and billing. We seek comment on the appropriateness and adequacy of our proposed procedures for estimating missing data. Petroleum product suppliers reporting under this rule would be required to keep sufficient records to verify any volume estimates (see Section V.MM.6 of this preamble).

#### 5. Selection of Data Reporting Requirements

We are proposing that suppliers of petroleum products be required to report the type, volume, and CO<sub>2</sub> emissions associated with the complete combustion or oxidation of each individual petroleum product and NGL they supply to the economy, export, or use as a feedstock annually. We are also proposing to require reporting on the total CO<sub>2</sub> emissions of all products they supply to the economy annually, minus any emissions associated with non-crude feedstocks, including biomass, and renewable fuel blended in a petroleum product. Additionally, we are proposing to require refiners to report information on the volume, API gravity, sulfur content, and country of origin of each

crude oil batch used as feedstock at a refinery. Finally, we are proposing to require reporting on the volume of diesel fuel that is most likely to be used in the onroad mobile source sector.

The only GHG required to be reported under proposed 40 CFR part 98, subpart MM is CO<sub>2</sub>. Combustion of petroleum products may also lead to trace quantities of CH<sub>4</sub> and N<sub>2</sub>O emissions.<sup>102</sup> The amounts of CH<sub>4</sub> and N<sub>2</sub>O are dependent on factors other than fuel characteristics such as combustion temperatures, air-fuel mixes, and use of pollution control equipment. These other factors vary significantly across and within the major categories of petroleum product end-uses. EPA bases national estimates of CH<sub>4</sub> and N<sub>2</sub>O for the U.S. GHG Inventory on bottom-up data, such as penetration of control technologies and distance traveled for on-highway mobile sources<sup>103</sup>. We seek comment on whether or not EPA should use the national inventory estimates of CH<sub>4</sub> and N<sub>2</sub>O emissions from petroleum product combustion and apportion them to individual petroleum product suppliers based on the quantity of their product.

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<sup>102</sup> CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from combustion of petroleum products were 1900, 3.1, and 34.1 million metric tons CO<sub>2</sub>e, respectively.

<sup>103</sup> 2008 U.S. GHG Inventory, Annex 3 - Methodological Descriptions for Additional Source or Sink Categories. pp. A-106 to A-120.

Data related to products supplied to or exported from the economy. We are proposing that petroleum product suppliers use a mass-balance method to calculate CO<sub>2</sub> emissions, which is used extensively in national GHG inventories and in existing reporting guidelines for facilities, companies, and states, such as the WRI/WBCSD GHG Protocol.<sup>104</sup> The mass balance approach is based on readily available information: the volume of fuel, which is typically tracked by suppliers, and the carbon content of the fuel, i.e., mass of carbon per volume of fuel (the carbon content of the petroleum product is also referred to as the CO<sub>2</sub> emission factor). The formula to apply this method is simple and can be automated.<sup>105</sup> Carbon content, where not measured directly, can be estimated using other readily available data and literature values.

There is substantial trade and transfer of products between refiners, between importers and refiners, and between other parties. The products supplied by one refiner might in some cases serve as the feedstock for another refiner. To avoid double-counting of emissions, we

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<sup>104</sup> See The Greenhouse Gas Protocol (GHG Protocol) <http://www.ghgprotocol.org/>; the 2008 U.S. Inventory [http://www.epa.gov/climatechange/emissions/downloads/08\\_Energy.pdf](http://www.epa.gov/climatechange/emissions/downloads/08_Energy.pdf), and the 2006 IPCC Guidelines <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html>.

<sup>105</sup> The generic formula is  $CO_2 = \text{Fuel Quantity} * \text{Carbon Content} * 44/12$ .

are proposing an elaboration of the mass-balance approach for use by refiners. Under this elaborated approach, to account for the fact that any non-crude feedstock<sup>106</sup> entering a refiner's facility would have already been reported by the non-crude feedstock's source (such as an importer or another refiner), the refiner would measure and report the potential CO<sub>2</sub> emissions from the non-crude feedstock, but then subtract the amount from the overall CO<sub>2</sub> emissions they report.

We are proposing that suppliers report to EPA the types of products and quantities of products sold during the reporting period or otherwise transferred to another facility, in the case of refiners, or corporate entity, in the case of importers and exporters. This information underlies the proposed CO<sub>2</sub> emissions calculations. By focusing on petroleum products sold versus produced, we would avoid double-counting products, especially semi-refined products, that would either be used onsite by the facility to generate energy or that would be reused as a feedstock at some point in the facility's production process.

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<sup>106</sup> This could include both petroleum- and natural gas- based products.

We are not proposing that petroleum product suppliers collect new information on those petroleum products which may be used or converted by other entities into long-lived products that are not oxidized or combusted, or oxidized slowly over long periods of time (e.g., plastics). A comprehensive and rigorous system for tracking the fate of non-energy petroleum products and their various end-uses is beyond the scope of this rule, and would require a much more burdensome reporting obligation for petroleum product suppliers. However, at some point, we may need to address the question of non-emissive end uses of petroleum products as part of future climate policy development. We request comment on our proposal to require petroleum product suppliers to report the CO<sub>2</sub> emissions associated with products that could potentially have non-emissive end-uses. We also request comment on ways in which non-emissive end-uses could be tracked and reported.

Data related to crude feedstocks We are proposing that refiners report basic information to EPA on the crude oil feedstock type, API gravity, sulfur content and country of origin during the reporting period. This basic information on the feedstock characteristics would provide useful information to EPA to assess the lifecycle GHG emissions associated with petroleum refining.

Data related to non-crude petroleum and natural gas feedstocks. As discussed previously, in order to minimize double-counting of non-crude petroleum products and NGLs, we would require refiners to report the volume and CO<sub>2</sub> emissions of any non-crude petroleum and natural gas feedstock that was acquired from an outside facility. We are not proposing to require reporting of products produced at the facility and recycled back into processing. In the event that a reporter cannot determine whether a feedstock is petroleum- or natural gas-based, we are proposing to have the reporter assume the product is petroleum-based. We request comment on methods for distinguishing between natural gas- and petroleum-based feedstock.

Data related to co-processed biomass and blended biomass-based fuels. We are proposing to require reporters to provide information on the biogenic portion of petroleum products under two circumstances discussed below. We are proposing these reporting requirements to ensure that EPA can distinguish between potential emissions of carbon from biogenic sources (i.e., biomass) and from non-biogenic sources (i.e., fossil fuel). We believe it is important to make this distinction because CO<sub>2</sub> emissions from biogenic sources are traditionally accounted for at the time of

harvest, collection, or disposal, rather than the point of fuel combustion.

First, we are proposing to require refiners to report information related to biomass that is co-processed with a petroleum feedstock (crude or non-crude) to produce a product that would be supplied to the economy. We propose that refiners report the volume of and estimated CO<sub>2</sub> emissions associated with both the biomass and petroleum-based portions of these products. Refiners would then subtract the estimated CO<sub>2</sub> emissions from the biomass portion from their total CO<sub>2</sub> emissions calculation. We are not proposing to require refiners to report on CO<sub>2</sub> emissions from biomass they combust onsite or co-process with a petroleum feedstock to produce a product that they combust onsite; these emissions are addressed in Section V.Y of this preamble.

Second, in the case where a reporter supplies or exports a petroleum product that is blended with a biomass-based fuel, we are proposing only to require CO<sub>2</sub> emissions information on the petroleum-based portion of the product along with the volume of the biomass-based fuel. This reporting requirement would also apply to a refiner that receives a blended fuel (e.g., gasoline with ethanol) as feedstock to be further refined or otherwise used onsite.



We are also assuming that all reporters would know the percent volume of the biomass-based component of any product. We seek comment on this assumption and on any necessary methods for distinguishing between biomass- and petroleum-based components of blended fuels.

Under this proposal, we are proposing to require reporters to calculate and report CO<sub>2</sub> emissions from products derived from co-processing biomass and petroleum feedstocks outside their operations as if the products were entirely petroleum-based. We are not requiring reporters to report information on products that were derived entirely from biomass. We seek comment on this proposed approach towards biomass reporting.

Carbon Content. We are proposing that petroleum product suppliers that directly measure the batch- or facility-specific density or carbon share of their products report the density and carbon content values along with the testing and sampling standards they use for each product<sup>107</sup>. We are not proposing that reporters that choose to use the default carbon content values provided in the proposed 40 CFR part 98, subpart MM be required to report these values

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<sup>107</sup> Proposed 40 CFR part 98, subpart MM identifies the specific ASTM standards that reporters must use, but allows discretion for the reporter to select the most appropriate standard.

since they can easily be back-calculated with data on volume and CO<sub>2</sub> emissions.

Designated End-use. Although not required as a direct input to the mass-balance equation for estimating total emissions, EPA is also interested in collecting data on designated end-use (such as for use in a highway vehicle versus a stationary boiler) of petroleum products for effective policy development. EPA recognizes that petroleum product suppliers do not always have full knowledge of the ultimate end-use of their products. We evaluated the potential end-uses that petroleum product suppliers could know, including end-use designations required by EPA's transportation fuel regulations,<sup>108</sup> and determined that reporters should be able to identify diesel fuel intended for use on highway since it must contain less than 15 ppm of sulfur and should not contain dyes or markers associated with nonroad and stationary fuel. We recognize, however, that some of this fuel may ultimately be used in nonroad and stationary sectors. We request comment on this proposal, on the extent to which this and other refinery gate (ex refinery) and importer end-use designations reflect actual end-use consumption patterns,

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<sup>108</sup> Current regulations require refiners and importers to designate diesel fuel (40 CFR 80.598(a)(2)).

and other options EPA could pursue to track the combustion-related end-uses of petroleum products.

Reporting to EIA. We realize that most petroleum product suppliers report much of the relevant fuel quantity information to EIA on a monthly, quarterly, or annual basis. During development of this proposal, EPA consulted with EIA on its existing reporting programs and discussed the feasibility of sharing this information through an interagency agreement, rather than requiring reporting parties to report the same information multiple times to the Federal government.

However, we have concluded that comparability and consistency in reporting processes across all facilities included in the entire rule is vital, particularly with respect to timing of submission, reporting formats, QA/QC, database management, missing data procedures, transparency and access to information, and recordkeeping. In addition, all refineries would be reporting emissions from petroleum refining processes under proposed 40 CFR part 98, subpart Y. Finally, as noted above, we are requesting readily available information from petroleum product suppliers and do not consider reporting information to more than one Federal agency an undue burden for these industries. We thus considered but are not proposing an option in which

EPA obtains facility-specific data for suppliers of petroleum products through access to existing Federal government reporting databases, such as those maintained by EIA. However, in order to reduce the reporting burden placed on industry, we would consider information that refiners and importers already report to EIA with respect to units and frequency, for example, when crafting the reporting requirements for refiners, importers, and exporters under the final rule.

Reporting to EPA's Office of Transportation of Air Quality. EPA currently collects a variety of information associated with the production and use of most transportation fuels in the U.S. in order to ensure compliance with existing fuel regulations and standards. Over the course of many years, EPA has developed a reporting system for its transportation fuels programs that incorporates a number of compliance and enforcement mechanisms. For example, all reporting parties must register their facilities with EPA and in many cases use EPA's dedicated reporting web portal, the CDX, to submit their reports. We review reports to identify reporting errors (e.g. incorrect report formats or missing data) but also require reporting parties to self-report any errors or anomalies in their data. For some of our existing

transportation fuels reporting programs, we employ the use of annual attest engagements, audits of the reporting parties' records by an independent certified public accountant or certified internal auditor, to help ensure that the data submitted in reports to EPA reflect data maintained in the reporting parties' records.

For purposes of this rule, we are interested in minimizing the additional reporting burden on reporters by utilizing existing reporting and verification systems, such as EPA's transportation fuel programs reporting protocols, as appropriate. We request comments on ways to take advantage of existing reporting and verification programs, particularly those related to transportation fuels. Specifically, as noted in Section IV.J.3 of this preamble, we are seeking comment on requiring annual attest engagements for all reporters under proposed 40 CFR part 98, subpart MM. In addition, whereas the proposed deadline for annual report submission is March 31 following the reporting year for all reporters under this rule, we seek comment on an alternative deadline of February 28 following the reporting year for annual reports from suppliers of petroleum products. This deadline would align with the submission deadline for annual compliance reports under several existing EPA fuels programs.

## 6. Selection of Records that must be Retained

We are proposing that reporters under this source category must maintain all of the following records: copies of all reports submitted to EPA under this rule, records documenting the type and quantity of petroleum products and NGLs supplied to or exported from the economy, records documenting the type, characteristics, and quantity of purchased feedstocks, including crude oil, LPGs, biomass, and semi-refined feedstocks, records documenting the CO<sub>2</sub> emissions that would result from complete combustion or oxidation of the petroleum products, NGLs, and biomass, and sampling and analysis records related to all batch- or facility-specific carbon contents developed and used in reporting to EPA.

These records should contain data directly used to calculate the emissions that are reported and are necessary to enable verification that the CO<sub>2</sub> emissions monitoring and calculations were done correctly. These records would also consist of information used to determine the required characteristics of crude feedstocks.

### NN. Suppliers of Natural Gas and Natural Gas Liquids

#### 1. Definition of the Source Category

This subpart would require reporting by facilities and companies that introduce or supply natural gas and NGLs

into the economy (e.g., LDCs). These facilities and companies would report the CO<sub>2</sub> emissions that would result from complete combustion or oxidation of the quantities of natural gas and NGLs supplied (e.g., as a fuel).

Combustion and other uses of natural gas are addressed in other subparts, such as proposed 40 CFR part 98, subpart C (General Fuel Stationary Combustion Sources).

Natural gas is a combustible gaseous mixture of hydrocarbons, mostly CH<sub>4</sub>. It is produced from wells drilled into underground reservoirs of porous rock. Natural gas withdrawn from the well may contain liquid hydrocarbons and nonhydrocarbon gases. The natural gas separated from these components at gas processing plants is considered "dry". Dry natural gas is also known as consumer-grade natural gas. In 2006, the combustion of natural gas for useful heat and work resulted in 1,155.1 million metric tons CO<sub>2</sub>e emissions out of a total of 7,054.2 million metric tons CO<sub>2</sub>e of GHG emissions in the U.S.

In addition to being combusted for energy, natural gas is also consumed for non-energy uses in the U.S. The non-energy applications of natural gas are diverse, and include feedstocks for petrochemical production, ammonia, and other products. In 2006, emissions from non-energy uses of natural gas were 138 million metric tons CO<sub>2</sub>e.

The supply chain for delivering natural gas to consumers is complex, involving producers (i.e., wells), processing plants, storage facilities, transmission pipelines, LNG terminals, and local distribution companies. In developing the proposed rule, we concluded that inclusion of all natural gas suppliers as reporters would not be practical from an administrative perspective, nor would it be necessary for complete coverage of the supply of natural gas. In determining the most appropriate point in the supply chain of natural gas, we applied the following criteria: an administratively manageable number of reporting facilities; complete coverage of natural gas supply as a group of facilities or in combination with facilities reporting under other subparts of this rule; minimal irreconcilable double-counting of natural gas supply; and feasibility of monitoring or calculation methods.

Based on these criteria, we are proposing to include LDCs for deliveries of dry gas, and natural gas processing facilities for the supply of NGLs as reporters under this source category. LDCs receive natural gas from the large transmission pipelines and re-deliver the gas to end users on their systems, or, in some cases, re-deliver the natural gas to other LDCs or even other transmission pipelines.



Importantly, LDCs keep records on the amount of natural gas delivered to their customers. In 2006, LDCs delivered about 12.0 trillion cf or 60 percent of the total 19.9 trillion cf delivered to consumers. The balance of the natural gas is delivered directly to large end users in industry and for power generation. Most of these large end users would already be included as reporting facilities for direct GHG emissions because their emissions exceed the respective emissions threshold for their source category.

LDCs meter the amount of gas they receive and meter and bill for the deliveries they make to all end-use customers or other LDCs and pipelines. Some of the end-use customers may be large industrial or electricity generating facilities that would be included under other subparts for direct emissions related to stationary combustion. LDCs already report their total deliveries to DOE as well as to State regulators. There are approximately 1,207 LDCs in the U.S.<sup>109</sup>

Natural gas processing facilities (defined as any facility that extracts or recovers NGLs from natural gas,

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<sup>109</sup> This number includes all LDCs that report to EIA on Form 176, and includes separate operating companies owned by a single larger company, as for example Niagara Mohawk, a LDC in New York, owned by National Grid, which also owns other LDCs in New York and New England. For the purposes of this rule, LDCs are defined as those companies that distribute natural gas to ultimate end users and which are regulated as separate entities by state public utility commissions.

separates individual components of NGLs using fractionation, or converts one form of natural gas liquid into another form such as butane to isobutene using isomerization process) take raw untreated natural gas from domestic production and strip out the NGLs, and other compounds. The NGLs are then sold, and the processed gas is delivered to transmission pipelines.<sup>110</sup> According to EIA, processors generated about 638 million barrels of NGLs, in 2006, which is 69 percent of NGLs supplied in the U.S. Processors meter the NGLs they produce and deliver to pipelines. These data are reported to DOE.

We are not proposing that processing plants report supply of dry natural gas to transmission pipelines. While the processing industry in 2006 delivered an estimated 13.8 trillion cf of processed, pipeline quality gas into the pipeline system, an estimated 30 percent of dry natural gas goes directly from production fields to the transmission pipelines, completely by-passing processing plants. In the interest of increasing coverage, we considered but decided not to propose including production wells producing pipeline quality natural gas (i.e., not needing significant

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<sup>110</sup> This definition of processors does not include field gathering and boosting stations, and is therefore narrower in scope than the definition provided earlier in the preamble for the oil and gas sector.

processing) due to the large number of potential facilities affected.

We considered but are not proposing to include the approximately 448,641 (in 2006) production wells in the U.S. as covered facilities. Producers routinely monitor production to predict sales, to distribute sales revenues to working interest owners, pay royalties, and pay State severance taxes. These data are reported regularly to State agencies. At the national level, however, inclusion of producers would be administratively difficult and would include many small facilities. EIA collects reports from a subset of larger producers in key States, but relies on State data to develop comprehensive aggregated national statistics.

We considered but are not proposing to include interstate and intrastate pipelines. Pipeline operators transport almost all of the natural gas consumed in the U.S. including both domestically produced and imported natural gas. While there are a relatively modest number of transmission pipelines, approximately 160, and the operators meter flows and report these data to DOE, their inclusion as reporters would introduce significant complications. The U.S. pipeline network is characterized by interconnectivity, in which natural gas moves through

multiple pipelines on its way to the consumers. Given the hundreds of receipt and delivery points and the interconnections with a multiplicity of other pipelines, processing plants, LDCs, and end users, a substantial amount of double-counting errors would be introduced. A time- and resource-intensive administrative effort by EPA and reporting companies would be required annually in an attempt to correct this double-counting.

We are also not proposing to include importers of natural gas as reporting facilities. Natural gas is imported by land via transmission pipelines (primarily from Canada), and as LNG via a small number of port terminals (predominantly on the East and Gulf coasts). Imported natural gas ultimately is delivered to consumers by LDCs or sent directly to high volume consumers who would report under other subparts of proposed 40 CFR part 98.

EPA requests comment on the inclusion of LDCs and processing plants, and the exclusion of other parts of the natural gas supply and distribution chain. For additional background information on suppliers of natural gas, please refer to the Suppliers of Natural Gas and NGLs TSD (EPA-HQ-OAR-2008-0508-040).

## 2. Selection of Reporting Threshold

In developing the reporting threshold for LDCs and natural gas processors, EPA considered emissions-based thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e and 100,000 metric tons CO<sub>2</sub>e per year. For natural gas suppliers, these thresholds are applied on the amount of CO<sub>2</sub> emissions that would result from complete combustion or oxidation of the natural gas. These thresholds translate into 18,281 thousand cf, 182,812 thousand cf, 457,030 thousand cf, and 1,828,120 thousand cf of natural gas, respectively.

Table NN-1 of this preamble illustrates the LDC emissions and facilities that would be covered under these various thresholds.

**Table NN-1. Threshold Analysis for LDCs**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions metric tons CO <sub>2</sub> e/yr	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	632,100,851	1,207	632,004,022	99.98%	1,022	85%
10,000	632,100,851	1,207	630,106,725	99.68%	521	43%
25,000	632,100,851	1,207	627,543,971	99.28%	365	30%
100,000	632,100,851	1,207	619,456,607	98.00%	206	17%

We propose to include all LDCs as reporters in this source category. Of the approximate 1,207 LDCs, the 25,000 metric tons CO<sub>2</sub>e threshold would capture the 365 largest LDCs and 98 percent of the natural gas that flows through them. The remaining LDCs already report annual throughput to EIA in form EIA 176. Thus, inclusion of all LDC's does

not require collection of new information. Comments on this conclusion are requested.

Table NN-2 of this preamble illustrates the NGL emissions and number of processing facilities that would be covered under these various thresholds.

**Table NN-2. Threshold Analysis for NGLs from Processing Plants**

Threshold Level metric tons CO <sub>2</sub> e/yr	Total National Emissions metric tons CO <sub>2</sub> e/yr	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	164,712,077	566	164,704,346	100%	466	82%
10,000	164,712,077	566	164,404,207	100%	400	71%
25,000	164,712,077	566	163,516,733	99%	347	61%
100,000	164,712,077	566	157,341,629	96%	244	43%

We propose there be no reporting threshold for natural gas processing plants. Each natural gas processing plant is already required to report the supply (beginning stocks, receipts, and production) and disposition (input, shipments, fuel use and losses, and ending stocks) of NGLs monthly on EIA Form 816. Processing plants are also required to report the amounts of natural gas processed, NGLs produced, shrinkage of the natural gas from NGLs extraction, and the amount of natural gas used in processing on an annual basis on EIA Form 64A.

For a full discussion of the threshold analysis, please refer to the Suppliers of Natural Gas and NGLs TSD (EPA-HQ-OAR-2008-0508-040). For specific information on costs, including unamortized first year capital

expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

Under this subpart, we are proposing reporting the amount of natural gas and NGLs produced or supplied to the economy annually, as well as the CO<sub>2</sub> emissions that would result from complete oxidation or combustion of this quantity of natural gas and NGLs.

The only GHG required to be reported under this subpart is CO<sub>2</sub>. Combustion of natural gas and NGLs may also lead to trace quantities of CH<sub>4</sub> and N<sub>2</sub>O emission.<sup>111</sup> Because the quantity of CH<sub>4</sub> and N<sub>2</sub>O emissions are small, highly variable and dependent on technology and operating conditions in which the fuel is being consumed (unlike CO<sub>2</sub>), we are not proposing that natural gas suppliers report on these emissions. We seek comment on whether or not EPA should use the national inventory estimates of CH<sub>4</sub> and N<sub>2</sub>O emissions from natural gas combustion, and apportion them to individual natural gas suppliers based on the quantity of their product. We request comments on this conclusion.

We are proposing that LDCs and natural gas processing plants use a mass-balance method to calculate CO<sub>2</sub> emissions.

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<sup>111</sup>In 2006, CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from natural gas combustion were 1,155.1, 1.0, and 0.6 MMTCO<sub>2</sub>e, respectively.

The mass balance approach is based on readily available information: the quantity of fuel (e.g., thousand cf, barrels, mmBtus), and the carbon content of the fuel. The formula is simple and can be automated. The mass-balance approach is used extensively in national GHG inventories, and in existing reporting guidelines for facilities, companies, and States, such as the WRI/WBCSD GHG Protocol.

For carbon content, we have prepared two look-up tables listing default CO<sub>2</sub> emission factors of natural gas and natural gas liquid. These emission factors are drawn from published sources, including the American Petroleum Institute Compendium, EIA, and the U.S. GHG Inventory.

Where natural gas processing plants extract and separate individual components of NGLs, the facilities should report carbon content by individual component of the NGLs. In cases where raw NGLs are not separated, the processing plants should report carbon content for the raw NGLs. LDCs and natural gas processing plants can substitute their own values for carbon content provided they are developed according to nationally-accepted ASTM standards for sampling and analysis.

We considered but do not propose an option in which LDCs and natural gas processing plants would be required to sample and analyze natural gas and NGLs periodically to



determine the carbon content. Given the close correlation between carbon content and BTU value of natural gas and NGLs, and the availability of BTU information on these products, EPA believes that periodic sampling and analysis would impose a cost on facilities but would not result in improved accuracy of reported emissions values. We request comment on an approach in which natural gas suppliers would be required to develop facility- and batch-specific carbon contents through periodic sampling and analysis. The various approaches to monitoring GHG emissions are elaborated in the Suppliers of Natural Gas and NGLs TSD (EPA-HQ-OAR-2008-0508-040).

#### 4. Selection of Procedures for Estimating Missing Data

EPA has determined that the information to be reported by LDCs and gas processing plants is routinely collected by facilities as part of standard operating practices, and expects that any missing data would be negligible. Typically, natural gas amounts are metered directly at multiple stages, and billing systems require rigorous reconciliation of data. In cases where metered data are not available, reporters may estimate the missing volumes based on contracted maximum daily quantities and known conditions of receipt and delivery during the period when data are missing.

## 5. Selection of Data Reporting Requirements

We propose that LDCs and gas processing plants report CO<sub>2</sub> emissions directly to EPA on an annual basis. LDCs would also report CO<sub>2</sub> emissions disaggregated into categories that represent residential consumers, commercial consumers, industrial consumers, and electricity generating facilities. Further information would be provided on the facilities to which LDCs deliver greater than 460,000 thousand cf of natural gas during the calendar year, which would be used by EPA to check and verify information on facilities covered under other subparts of this rule because of their onsite stationary combustion or process emissions.<sup>112</sup>

Natural gas processing plants would report CO<sub>2</sub> emissions disaggregated by individual components of NGLs extracted and separated, where applicable. Where raw NGLs are not separated into individual components, plants should report CO<sub>2</sub> emissions for raw NGLs.

We considered but are not proposing an option in which EPA obtained facility-specific data for natural gas and NGLs through access to existing Federal government reporting databases, such as those maintained by EIA. We

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<sup>112</sup> 460,000 thousand cf/year is a conservative estimate of the amount of dry natural gas that when fully combusted would produce at least 25,000 metric tons of CO<sub>2</sub>.

have concluded that comparability and consistency in reporting processes across all facilities included in the entire rule is vital, particularly with respect to timing of submission, reporting formats, QA/QC, database management, missing data procedures, transparency and access to information, and recordkeeping. In addition, large natural gas processing plants would already be included as reporting facilities under proposed 40 CFR 98.2(a)(2), therefore there is minimal burden in reporting the additional information proposed under this subpart. Finally, as noted above, we are requesting readily available information from LDCs and natural gas processing facilities, and do not consider reporting information to more than one Federal agency to place an undue burden on these industries.

#### 6. Selection of Records That Must Be Retained

Records that must be kept include quantity of individual fuels supplied, BTU content, carbon content determined, flow records and/or invoice records for customers with amount of natural gas received, type of customer receiving natural gas (so the disaggregated report by category can be checked), and data for determining carbon content for natural gas processing plants. These records are necessary to enable verification that the GHG

monitoring and calculations were done correctly. Records related to the end-user (e.g., ammonia facility) are required to allow us to reconcile data reported by different facilities and entities, and to ensure that coverage of natural gas supply and end-use is comprehensive.

A full list of records that must be retained onsite is included in proposed 40 CFR part 98, subparts A and NN.

#### 00. Suppliers of Industrial GHGs

##### 1. Definition of the Source Category

The industrial gas supply category includes facilities that produce N<sub>2</sub>O or fluorinated GHGs,<sup>113</sup> importers of N<sub>2</sub>O or fluorinated GHGs, and exporters of N<sub>2</sub>O or fluorinated GHGs. These facilities and entities are collectively referred to as "suppliers of industrial GHGs".

Under the proposed 40 CFR part 98, subpart 00, if you produce fluorinated GHGs or N<sub>2</sub>O, you would be required to report the quantities of these gases that you produce, transform (use as feedstocks in the production of other chemicals), destroy, or send to another facility for transformation or destruction. Importers and exporters of bulk fluorinated GHGs and N<sub>2</sub>O would be required to report

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<sup>113</sup> Please see the proposed definition of fluorinated GHG near the end of this section.

the quantities that they imported or exported and the quantities that they imported and sold or transferred to another person for transformation or destruction. As described in Sections III and IV of this preamble, emissions from general stationary fuel combustion sources and fugitive emissions from fluorinated gas production are addressed separately (Sections V.C and V.L of this preamble).

Fluorinated GHGs. Fluorinated GHGs are man-made gases used in a wide variety of applications. They include HFCs, PFCs, SF<sub>6</sub>, NF<sub>3</sub>, fluorinated ethers, and other compounds such as perfluoropolyethers. CFCs and HCFCs also contain fluorine and are GHGs, but both the production and consumption (production plus import minus export) of these ODS are currently being phased out and otherwise regulated under the Montreal Protocol and Title VI of the CAA. We are not proposing requirements for ODS under proposed 40 CFR part 98.

Fluorinated GHGs are powerful GHGs whose ability to trap heat in the atmosphere is often thousands to tens of thousands times as great as that of CO<sub>2</sub>, on a pound-for-pound basis. Some fluorinated GHGs are also very long

lived; SF<sub>6</sub> and PFCs have lifetimes ranging from 3,200 to 50,000 years.<sup>114</sup>

HFCs are the most commonly used fluorinated GHGs, they are used primarily as a replacement for ODS in a number of applications, including air-conditioning and refrigeration, foams, fire protection, solvents, and aerosols. PFCs are used in fire fighting and to manufacture semiconductors and other electronics. SF<sub>6</sub> is used in a diverse array of applications, including electrical transmission and distribution equipment (as an electrical insulator and arc quencher) and in magnesium casting operations (as a cover gas to prevent oxidation of molten metal). NF<sub>3</sub> is used in the semiconductor industry, increasingly to reduce overall semiconductor GHG emissions through processes such as NF<sub>3</sub> remote cleaning and NF<sub>3</sub> substitution during in-situ cleaning. Fluorinated ethers (HFEs and HCFEs) are used as anesthetics (e.g., isoflurane, desflurane, and sevoflurane) and as heat transfer fluids (e.g., the H-Galdens).

In 2006, 12 U.S. facilities produced over 350 million metric tons CO<sub>2</sub>e of HFCs, PFCs, SF<sub>6</sub>, and NF<sub>3</sub>. More specifically, 2006 production of HFCs is estimated to have

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<sup>114</sup> IPCC SAR available at: <http://www.ipcc.ch/ipccreports/assessments-reports.htm>.

exceeded 250 million metric tons CO<sub>2</sub>e while production of PFCs, SF<sub>6</sub>, and NF<sub>3</sub> was estimated to be almost 100 million metric tons CO<sub>2</sub>e. We estimate that an additional 6 facilities produced approximately 1 million metric tons CO<sub>2</sub>e of fluorinated anesthetics.

Fluorinated GHGs are imported both in bulk (contained in shipping containers and cylinders) and in products. For further information, see the Bulk Imports and Exports of Fluorinated Gases TSD (EPA-HQ-OAR-2008-0508-042) and the Imports of Fluorinated GHGs in Products TSD (EPA-HQ-OAR-2008-0508-043). EPA estimates that over 110 million metric tons CO<sub>2</sub>e of bulk HFCs, PFCs, and SF<sub>6</sub> were imported into the U.S. in 2007 by over 100 importers (PIERS, 2007). In CO<sub>2</sub>e terms, SF<sub>6</sub> and NF<sub>3</sub> each made up about one third of this total, while HFCs accounted for one quarter and PFCs made up the remainder. Several other fluorinated GHGs may be imported in smaller quantities, including fluorinated ethers such as the H-Galdens and anesthetics such as desflurane (HFE-236ea2), isoflurane (HCFE-235da2), and sevoflurane.

A variety of products containing fluorinated GHGs are imported into the U.S. Imports of particular importance include pre-charged air-conditioning, refrigeration, and electrical equipment and closed-cell foams. Pre-charged

air-conditioning and refrigeration equipment contains a full or partial (holding) charge of HFC refrigerant, while pre-charged electrical equipment contains a full or partial charge of SF<sub>6</sub> insulating gas. Closed-cell foams contain HFC blowing agent.

We estimate that in 2010, approximately 18 million metric tons CO<sub>2</sub>e of fluorinated GHGs would be imported in pre-charged equipment.<sup>115</sup> In 2006, an additional 2.5 million metric tons CO<sub>2</sub>e of fluorinated GHGs were imported in closed-cell foams. Together, these imports are expected to constitute between five and ten percent of U.S. consumption of fluorinated GHGs.

Once produced or imported, fluorinated GHGs can have hundreds of millions of downstream emission points. For example, the gases are used in almost all car air conditioners and household refrigerators and in other ubiquitous products and applications. Thus, tracking emissions of these gases from all downstream uses would not be practical.

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<sup>115</sup> The number of refrigeration and AC units imported in 2010 was assumed to equal the number of units imported in 2006. The refrigeration and AC units imported in 2006 were pre-charged with both HFCs and HCFCs. (HCFCs are ozone-depleting substances that are regulated under the Montreal Protocol and are exempt from the proposed definition of fluorinated GHG.) However, by 2010, EPA expects that all imported refrigeration and AC units will be charged with HFCs, because imports pre-charged with HCFCs will not be permitted starting in that year.



Nitrous oxide. N<sub>2</sub>O is a clear, colorless, oxidizing gas with a slightly sweet odor. N<sub>2</sub>O is a strong GHG with a GWP of 310<sup>116</sup>.

N<sub>2</sub>O is primarily used in carrier gases with oxygen to administer more potent inhalation anesthetics for general anesthesia and as an anesthetic in various dental and veterinary applications. In this application, it is used to treat short-term pain, for sedation in minor elective surgeries and as an induction anesthetic. The second main use of N<sub>2</sub>O is as a propellant in pressure and aerosol products, the largest application being pressure-packaged whipped cream. In smaller quantities, N<sub>2</sub>O is also used as an oxidizing agent and etchant in semiconductor manufacturing, an oxidizing agent (with acetylene) in atomic absorption spectrometry, an oxidizing agent in blowtorches used by jewelers and others, a fuel oxidant in auto racing, and a component of the production of sodium azide, which is used to inflate airbags.

Two companies operate a total of five N<sub>2</sub>O production facilities in the U.S.. These facilities produced an estimated 4.5 million metric tons CO<sub>2</sub>e of N<sub>2</sub>O in 2006.

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<sup>116</sup> IPCC SAR.

N<sub>2</sub>O may be imported in bulk or inside products. We estimate that approximately 300,000 metric tons CO<sub>2</sub>e of bulk N<sub>2</sub>O were imported into the U.S. in 2007 by 18 importers. Products that may be imported include several of those listed above, particularly pre-blended anesthetics and aerosol products such as pressure-packaged whipped cream.

Further information on N<sub>2</sub>O supply and import can be found in the Suppliers of Industrial GHGs TSD (EPA-HQ-OAR-2008-0508-041).

Selection of Reporting Facilities and Types of Data to be Reported. Because fluorinated GHGs and N<sub>2</sub>O have an extremely large number of relatively small downstream sources, reporting of downstream emissions of these gases would be incomplete, impractical, or both. On the other hand, the number of upstream producers, importers, and exporters is comparatively small, and the quantities that would be reported by individual gas suppliers are often quite large. Thus, upstream reporting is likely to be far more complete and cost-effective than downstream reporting. For these reasons, we are proposing to require upstream reporting of the quantities required to estimate U.S. consumption of N<sub>2</sub>O and fluorinated gases. "Consumption" is defined as the sum of the quantities of chemical produced in or imported into the U.S. minus the sum of the

quantities of chemical transformed (used as a feedstock in the production of other chemicals), destroyed, or exported from the U.S.

In developing this proposed rule, we reviewed a number of protocols that track chemical consumption, its components (production, import, export, etc.), or similar quantities. These protocols included EPA's Stratospheric Ozone Protection regulations at 40 CFR part 82, the EU Regulation on Certain Fluorinated Greenhouse Gases (No. 842/2006), the Australian Commonwealth Government Ozone Protection and Synthetic Greenhouse Gas Reporting Program, EPA's Chemical Substances Inventory Update Rule at 40 CFR 710.43, EPA's Acid Rain regulations at 40 CFR part 75, the TRI Program, and the 2006 IPCC Guidelines.<sup>117</sup>

We reviewed these protocols both for their overall scope and for their specific requirements for monitoring and reporting. The monitoring requirements are discussed in Section V.00.3 of this preamble. The protocols whose scopes were most similar to the one proposed for industrial gas supply were EPA's Stratospheric Protection Program, the EU Regulation on Certain Fluorinated Greenhouse Gases, the

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<sup>117</sup> We also reviewed other programs, including the DOE's 1605(b) Program, EPA's Climate Leaders Program, and the European Commission's Article 6 reporting requirements, but we found that these programs did not monitor consumption or its components.

Australian Synthetic Greenhouse Gas Reporting Program, and EPA's Chemical Substances Inventory Update Rule. All four of these programs require reporting of production and imports, and the first three also require reporting of exports. In addition, the EU regulation and EPA's Stratospheric Ozone Protection Program require reporting of the quantities of chemicals (ODS) transformed or destroyed. In general, the proposed requirements in this rule are based closely on those in EPA's Stratospheric Ozone Protection Program. By accounting for all chemical flows into and out of the U.S., including destruction and transformation, this approach results in an estimate of consumption that is more closely related to actual U.S. emissions than are estimates of consumption that do not account for all of these flows.

Proposed Definition of Fluorinated GHGs. We propose to define "Fluorinated GHG" as SF<sub>6</sub>, NF<sub>3</sub>, and any fluorocarbon except for ODS as they are defined under EPA's stratospheric protection regulations at 40 CFR part 82, subpart A. In addition to SF<sub>6</sub> and NF<sub>3</sub>, this definition would include any hydrofluorocarbon, any perfluorocarbon, any fully fluorinated linear, branched or cyclic alkane, ether, tertiary amine or aminoether, any perfluoropolyether, and any hydrofluoropolyether.

EPA is proposing this definition because HFCs, PFCs, SF<sub>6</sub>, NF<sub>3</sub>, and many fluorinated ethers are known to have significant GWPs. (For a list of these GWPs, see Table A-1 of proposed 40 CFR part 98, subpart A.) In addition, although not all fluorocarbons have had their GWPs evaluated, any fluorocarbon with an atmospheric lifetime greater than one year is likely to have a significant GWP due to the radiative properties of the carbon-fluorine bond.

As discussed above, ODS are excluded from the proposed definition of fluorinated GHG because they are already regulated under the Montreal Protocol and Title VI of the CAA.

EPA requests comment on the proposed definition. EPA also requests comment on two other options for defining or refining the set of fluorinated GHGs to be reported. The first option would permit a fluorocarbon to be excluded from reporting if (1) the GWP for the fluorocarbon were not listed in Table A-1 of proposed 40 CFR part 98, subpart A or in any of the IPCC Assessment Reports or World Meteorological Organization (WMO) Scientific Assessments of Ozone Depletion, and (2) the producer or importer of the fluorocarbon could demonstrate, to the satisfaction of the Administrator, that the fluorocarbon had an atmospheric

lifetime of less than one year and a 100-year GWP of less than five. In general, we expect that new fluorocarbons would be used in relatively low volumes. For such chemicals, a GWP of five may be a reasonable trigger for reporting.

The second option would be to require reporting only of those fluorinated chemicals listed in Table A-1 of proposed 40 CFR part 98, subpart A. The disadvantage of this approach is that it would exclude any new (or newly important) fluorocarbons whose GWPs have not been evaluated. As discussed above, fluorocarbons in general are likely to have significant GWPs. Given the pace of technological development in this area, production (and emissions) of these gases could become significant before the chemicals were added to the table.

## 2. Selection of Reporting Threshold

In developing the proposed thresholds for producers and importers of fluorinated GHGs and N<sub>2</sub>O, we considered production, capacity, and import/export thresholds of 1,000 metric tons CO<sub>2</sub>e, 10,000 metric tons CO<sub>2</sub>e, 25,000 metric tons CO<sub>2</sub>e, and 100,000 metric tons CO<sub>2</sub>e per year. Table OO-1 of this preamble shows the emissions and facilities that would be covered under the various thresholds for

production and bulk imports of N<sub>2</sub>O and HFCs, PFCs, SF<sub>6</sub>, and NF<sub>3</sub>.

**Table OO-1: Threshold Analysis for Industrial Gas Supply**

Source Category	Emission Threshold Level (metric tons CO <sub>2</sub> e/yr)	Total National Production or Import (metric tons CO <sub>2</sub> e/yr)	Number of Facilities	Production or Imports Covered		Facilities Covered	
				metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
HFC, PFC, SF <sub>6</sub> , and NF <sub>3</sub> Producers	1,000	350,000,000	12	350,000,000	100%	12	100%
	10,000	350,000,000	12	350,000,000	100%	12	100%
	25,000	350,000,000	12	350,000,000	100%	12	100%
	100,000	350,000,000	12	350,000,000	100%	12	100%
N <sub>2</sub> O Producers	1,000	4,500,000	5	4,500,000	100%	5	100%
	10,000	4,500,000	5	4,500,000	100%	5	100%
	25,000	4,500,000	5	4,500,000	100%	5	100%
	100,000	4,500,000	5	4,500,000	100%	5	100%
N <sub>2</sub> O and Fluorinated GHG Importers (bulk)	1,000	110,024,979	116	110,024,987	100%	111	96%
	10,000	110,024,979	116	109,921,970	99.9%	81	70%
	25,000	110,024,979	116	109,580,067	99.6%	61	53%
	100,000	110,024,979	116	108,703,112	98.8%	44	38%

Producers. We are proposing to require reporting for all N<sub>2</sub>O and fluorinated GHG production facilities. As shown in Table OO-1 of this preamble, all identified N<sub>2</sub>O, HFC, PFC, SF<sub>6</sub>, and NF<sub>3</sub> production facilities would be covered at all capacity and production-based thresholds considered in this analysis. We do not have facility-specific production capacity information for the six facilities producing fluorinated anesthetics; however, if all these facilities

produced the same quantity in CO<sub>2</sub>e terms, they too would probably be covered at all capacity and production-based thresholds.

The requirement that all facilities report would simplify the rule and permit facilities to quickly determine whether or not they must report. The one potential drawback of this requirement is that small-scale production facilities (e.g., for research and development) could be inadvertently required to report their production, even though the quantities produced would be small in both absolute and CO<sub>2</sub>e terms. We are not currently aware of any small-scale deliberate production of N<sub>2</sub>O or fluorinated GHGs, but we request comment on this issue. These research and development facilities could be specifically exempt from reporting. An alternative approach that would address this concern would be to establish a capacity-based threshold of 25,000 metric tons CO<sub>2</sub>e, summed across the facility's production capacities for N<sub>2</sub>O and each fluorinated GHG. We request comment on these alternative approaches.

Importers and Exporters. We are proposing to require importers and exporters to report their imports and exports if either their total imports or their total exports, in bulk, of all relevant gases, exceed 25,000 metric tons CO<sub>2</sub>e.



We are proposing this threshold to reduce the compliance burden on small businesses while still including the vast majority of imports and exports. As is true for HFC production, HFC import and export levels are expected to increase significantly during the next several years as HFCs replace ODS, which are being phased out under the Montreal Protocol.

Because it may be relatively easy for importers and exporters to create new corporations in order to divide up their imports and exports and remain below applicable thresholds, we considered setting no threshold for importers and exporters. However, we are not proposing this option because we are concerned that it would be too burdensome to current small-scale importers. We request comment on this approach, specifically the burden on small-scale importers if they were required to report.

Further information on the threshold analysis for industrial gas suppliers can be found in the Suppliers of Industrial GHGs TSD (EPA-HQ-OAR-2008-0508-041). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

#### a. Production

If you produce N<sub>2</sub>O or fluorinated GHGs, we propose that you measure the total mass of N<sub>2</sub>O or fluorinated gases produced by chemical, including production that was later transformed or destroyed at the facility, but excluding any used GHG product that was added to the production process (e.g., HFCs returned to the production facility and added to the HFC production process for reclamation). Production would be measured wherever it is traditionally measured, e.g., at the inlet to the day tank or at the shipping dock. The quantities transformed or destroyed would be reported separately; see Sections V.00.3.c and V.00.3.d of this preamble. The quantities of used product added to the production process would be measured and subtracted from the total mass of product measured at the end of the process. This would avoid counting used GHG product as new production.

b. Imports and Exports

If you import or export bulk N<sub>2</sub>O or fluorinated GHGs, we propose that you report the total quantities of N<sub>2</sub>O or fluorinated GHGs that you import or export by chemical. Reports would include quantities imported in mixtures and the name/number of the mixture, if applicable (e.g., HFC-410A). Reporting would occur at the corporate level. You would not be required to report imports or exports of heels

(residual quantities inside returned containers) or transshipments (GHGs that originate in a foreign country and that are destined for another foreign country), but you would be required to keep records documenting the nature of these transactions.

We propose to require reporting of imports and exports in metric tons of chemical because that is the unit in which other quantities (production, emissions, etc.) are proposed to be reported under this rule. However, because the preferred unit for Customs reporting is kg rather than tons, EPA requests comment on whether it should require reporting of imports and exports in kg of chemical.

In general, these proposed requirements are consistent with those of other programs that monitor imports and exports of bulk chemical, particularly EPA's Stratospheric Ozone Protection regulations.

Existing programs vary in their treatment of products containing chemicals whose bulk import must be reported. The Australian program requires reporting of all ODS and GHGs imported in pre-charged equipment, including the identity of the refrigerant, the number of pieces of equipment, and the charge size. The Inventory Update Rule requires reporting of chemicals contained in products if the chemical is designed to be released from the product

when it is used (e.g., ink from a pen). EPA's Stratospheric Ozone Protection regulations do not currently require reporting of ODS contained in imported equipment or other imported products; however, (1) EPA has prohibited the introduction into interstate commerce, including import, of certain non-essential products typically pre-charged with these chemicals, and (2) EPA is in the process of proposing new regulations to prohibit import of equipment pre-charged with HCFCs.

We are not proposing to require that importers of products containing N<sub>2</sub>O or fluorinated GHGs report their imports. In general, we are concerned that it would be difficult for importers to identify and quantify the GHGs contained in these products and that the number of importers would be high. However, it may be easier for importers to identify and quantify the GHGs contained in a few types of products, such as pre-charged equipment and foams. For example, the identities and amounts of fluorinated GHGs contained in equipment are generally well known; this data is typically listed on the nameplate affixed to every unit. Moreover, in aggregate, the quantities of GHGs imported in equipment can be large, for example, over 7 million metric tons CO<sub>2</sub>e in imported pre-charged window air-conditioners. We request comment on

whether we should require reporting of imports or exports of pre-charged equipment and/or closed-cell foams, including the likely burden and benefits of such reporting.

c. N<sub>2</sub>O or Fluorinated GHGs Transformed

Under the proposed rule, if you chemically transform N<sub>2</sub>O or fluorinated GHGs, you would be required to estimate the mass of N<sub>2</sub>O or fluorinated GHGs transformed. This estimate would be the difference between (1) the quantity of the N<sub>2</sub>O or fluorinated GHG fed into the process for which the N<sub>2</sub>O or fluorinated GHG was used as a feedstock, and (2) the mass of any unreacted feedstock that was not returned to the process. Measuring the quantity of N<sub>2</sub>O or fluorinated GHGs actually fed into the process would account for any losses between the point where total production of the fluorinated GHG is measured and the point where the fluorinated GHG is reacted as a feedstock (transformed). The mass of any unreacted feedstock that was not returned to the process would be ascertained using mass flow measurements and (if necessary) gas chromatography.

d. Destruction

Under the proposed rule, if you produce and destroy fluorinated GHGs, you would be required to estimate the quantity of each fluorinated GHG destroyed. This estimate

would be based on (1) the quantity of the fluorinated GHG fed into the destruction device, and (2) the DE of the device. In developing the estimate, you would be required to account for any decreases in the DE of the device that occurred when the device was not operating properly (as defined in State or local permitting requirements and/or destruction device manufacturer specifications). Finally, you would be required to perform annual fluorinated GHG concentration measurements by gas chromatography to confirm that emissions from the destruction device were as low as expected based on the DE of the device. If emissions were found to be higher, then you would have the option of using the DE implied by the most recent measurements or of conducting more extensive measurements of the DE of the device.

These proposed requirements are identical to those proposed for destruction of HFC-23 that is generated as a byproduct during HCFC-22 production. They are also similar to those contained in EPA's Stratospheric Ozone Protection Regulations. Those regulations include detailed requirements for reporting and verifying transformation and destruction of chemicals.

We are proposing requirements for verifying the DE of destruction devices used to destroy fluorinated GHGs

because fluorinated GHGs, particularly PFCs and SF<sub>6</sub>, are difficult to destroy. In many cases, these chemicals have been selected for their end uses precisely because they are not flammable. For destruction to occur, temperatures must be quite high (over 2,300EF), fuel must be provided, flow rates of fuels and air (or oxygen) must be kept above certain limits, flow rates of fluorinated GHG must be kept below others, and for some particularly difficult-to-destroy chemicals such as CF<sub>4</sub>, pure oxygen must sometimes be fed into the process. If one or more of these process requirements is not met, DEs can drop sharply (in some cases, by an order of magnitude or more), and fluorinated GHGs would simply be exhausted from the device. Both construction deficiencies and operator error can lead to a failure to meet process requirements; thus, both initial testing and periodic monitoring are important for verifying destruction device performance. We request comment on the option of requiring that the annual destruction device emissions measurement be performed using a compound that is at least as difficult to destroy as the most difficult-to-destroy GHG ever fed into the device, e.g., SF<sub>6</sub> or CF<sub>4</sub>.

We believe that owners or operators of facilities that destroy fluorinated GHGs are already likely to verify the DEs of their destruction devices. Many facilities

destroying fluorinated GHGs are likely to destroy ODS as well. In this case, they are already subject to requirements to verify the DEs of their devices.

We request comment on the extent of potential overlap between the destruction reported under proposed 40 CFR part 98, Subpart OO and that reported under proposed 40 CFR part 98, Subpart L. To obtain an accurate estimate of the net supply of fluorinated industrial greenhouse gases, fluorinated GHGs that are produced and subsequently destroyed should be subtracted from the total produced or imported. However, if fluorinated GHGs are never included in the mass produced (e.g., because they are removed from the production process with or as byproducts), then including them in the mass destroyed would lead to an underestimate of supply. One possible solution to this problem would be to require facilities producing and destroying fluorinated GHGs to separately estimate and report their destruction of fluorinated GHGs that have been counted as produced in either the current year or previously.

EPA is not proposing to require reporting of N<sub>2</sub>O destruction, because EPA is not aware that such destruction occurs. However, EPA requests comment on this.

e. Precision, Accuracy, and Calibration Requirements



The protocols and guidance reviewed by EPA differ in their level of specificity regarding the measurement of production or other flows, particularly regarding their precision and accuracy requirements. Some programs, such as the Stratospheric Ozone Protection regulations, do not specify any accuracy requirements, while other programs specifically define acceptable errors and reference industry standards for calibrating and verifying monitoring equipment. One of the latter is 40 CFR part 75, Appendix D, which establishes requirements for measuring oil and gas flows as a means of estimating SO<sub>2</sub> emissions from their combustion. These requirements include a requirement that the fuel flowmeter accuracy be within 2 percent of the upper range value and a requirement that flowmeters be recalibrated at least once a year.

In today's proposed rule, we are proposing to require facilities to measure the mass of N<sub>2</sub>O or fluorinated GHGs produced, transformed, or destroyed using flowmeters, weigh scales, or a combination of volumetric and density measurements with an accuracy and precision of 0.2 percent of full scale or better. In addition, we are proposing to require that weigh scales, flowmeters, and/or other measurement devices be calibrated every year or sooner if an error is suspected based on mass-balance calculations or

other information. Facilities could perform the verification and calibration of their scales and flowmeters during routine product line maintenance. Finally, we are proposing that facilities transforming or destroying fluorinated GHGs calibrate gas chromatographs by analyzing, on a monthly basis, certified standards with known GHG concentrations that are in the same range (percent levels) as the process samples.

EPA requests comment on these proposed requirements. EPA specifically requests comment on the proposed frequency of calibration for flowmeters; the Agency understands that some types of flowmeters that are commonly employed in chemical production, such as the Coriolis type, may require less frequent calibration.

We are proposing specific accuracy, precision, and calibration requirements because the high GWPs and large volumes of fluorinated GHGs produced make such requirements worthwhile for this source category. For example, a one percent error at a typical facility producing fluorinated GHGs would equate to 300,000 metric tons CO<sub>2</sub>e. The Agency believes that these precision and accuracy requirements (0.2 percent) should not represent a significant burden to chemical producers, who already use and regularly calibrate measurement devices with similar accuracies.

EPA is not proposing precision and accuracy requirements for importers and exporters of bulk chemical; however, EPA requests comment on whether such requirements (e.g., 0.5 to 1 percent) would be appropriate.

#### 4. Selection of Procedures for Estimating Missing Data

##### a. Production

In the event that any data on the mass produced, fed into the production process (for used material being reclaimed), fed into transformation processes, fed into destruction devices, or sent to another facility for transformation or destruction, is unavailable, we propose that facilities be required to use secondary measurements of these quantities. For example, facilities that ordinarily measure production by metering the flow into the day tank could use the weight of product charged into shipping containers for sale and distribution. We understand that the types of flowmeters and scales used to measure fluorocarbon production (e.g., Coriolis meters) are generally quite reliable, and therefore it should rarely be necessary to rely on secondary production measurements. In general, production facilities rely on accurate monitoring and reporting of production and related quantities.

If concentration measurements were unavailable for some period, we propose that the facility be required to

report the average of the concentration measurements from just before and just after the period of missing data.

There is one proposed exception to these requirements: if the facility has reason to believe that either method would result in a significant under- or overestimate of the missing parameter, then the facility would be required to develop an alternative estimate of the parameter and explain why and how it developed that estimate. We would have the option of rejecting this alternative estimate and replacing it with the value developed using the usual missing data method if we did not agree with the rationale or method for the alternative estimate.

We request comment on these methods for estimating missing data. We also request comment on the option of estimating missing production data based on consumption of reactants, assuming complete stoichiometric conversion. This approach could be used in the very unlikely event that neither primary nor secondary direct measures of production were available.

b. Imports and Exports

We do not believe that missing data would be a problem for importers and exporters of GHGs due to their requirement to declare the quantities of GHGs imported or

exported for Customs purposes. However, we request comment on this assumption.

#### 5. Selection of Data Reporting Requirements

Under the proposed rule, facilities would be required to submit data, described below, in addition to the production, import, export, feedstock, and destruction data listed above. This data is intended to permit us to check the main estimates submitted. A complete list of data to be reported is included in proposed 40 CFR part 98, Subparts A and OO.

##### a. Production

Facilities producing N<sub>2</sub>O or fluorinated GHGs would be required to submit data on the total mass of reactants fed into the production process, the total mass of non-GHG reactants and byproducts permanently removed from the process, and the mass of used product added back into the production process. Facilities would also be required to provide the names and addresses of other facilities to which they sent N<sub>2</sub>O or fluorinated GHGs for transformation or destruction. All quantities would be annual totals in metric tons, by chemical.

##### b. Imports/Exports and Destroyers of Fluorinated GHG

Importers of N<sub>2</sub>O or fluorinated GHGs would be required to submit an annual report that summarized their imports,

providing the following information for each import: the quantity of GHGs imported by chemical, the date on which the GHGs were imported, the port of entry through which the GHGs passed, the country from which the imported GHGs were imported, and the importer number for the shipment.

Importers would also be required to provide the names and addresses of any persons and facilities to which the imported GHGs were sold or transferred for transformation or destruction.

Exporters of N<sub>2</sub>O and fluorinated GHGs would be required to submit an annual report that summarized their exports, similar to the report provided by importers. A complete list of data to be reported is included in the proposed rule.

These proposed requirements are very similar to those that apply to importers and exporters of ODS under EPA's Stratospheric Ozone Protection Program. We are proposing them because they would provide us with valuable information for verifying the nature and size of GHG imports and exports.

In addition to annually reporting the mass of fluorinated GHG fed into the destruction device, facilities destroying fluorinated GHGs would be required to submit a one-time report including the following: the destruction

unit's DE, the methods used to record volume destroyed and to measure and record DE, and the names of other relevant Federal or State regulations that may apply to destruction process. This one-time report is very similar to that required under EPA's Stratospheric Ozone Protection regulations.

#### 6. Selection of Records That Must Be Retained

EPA is proposing that the following records be retained because they are necessary to verify production, import, export, transformation, and destruction estimates and related quantities and calibrations.

##### a. Production

Owners or operators of facilities producing N<sub>2</sub>O or fluorinated GHGs would be required to keep records of the data used to estimate production, as well as records documenting the initial and periodic calibration of the flowmeters or scales used to measure production.

##### b. Imports and Exports

Importers of N<sub>2</sub>O or fluorinated GHGs would be required to keep the following records substantiating each of the imports that they report: a copy of the bill of lading for the import, the invoice for the import, the U.S. Customs entry form, and dated records documenting the sale or

transfer of the imported GHG for transformation or destruction (if applicable).

Every person who imported a container with a heel would be required to keep records of the amount brought into the U.S. and document that the residual amount in each shipment is less than 10 percent of the net mass of the container when full and would: remain in the container and be included in a future shipment, be recovered and transformed, or be recovered and destroyed.

Exporters of N<sub>2</sub>O, or fluorinated GHGs would be required to keep the following records substantiating each of the exports that they report: a copy of the bill of lading for the export and the invoice for the import.

c. Transformation

Owners or operators of production facilities using N<sub>2</sub>O or fluorinated GHGs as feedstocks would be required to keep records documenting: the initial and annual calibration of the flowmeters or scales used to measure the mass of GHG fed into the destruction device and the periodic calibration of gas chromatographs used to analyze the concentration of N<sub>2</sub>O fluorinated GHG in the product for which the GHG is used as a feedstock.

d. Destruction



Owners or operators of GHG production facilities that destroy fluorinated GHGs would be required to keep records documenting: the information that they send in the one-time and annual reports, the initial and annual calibration of the flowmeters or scales used to measure the mass of GHG fed into the destruction device, the method for tracking startups, shutdowns, and malfunctions and any GHG emissions during these events, and the periodic calibration of gas chromatographs used to annually analyze the concentration of fluorinated GHG in the destruction device exhaust stream, as well as the representativeness of the conditions under which the measurement took place.

PP. Suppliers of Carbon Dioxide (CO<sub>2</sub>)

1. Definition of the Source Category

CO<sub>2</sub> is used for a variety of commercial applications, including food processing, chemical production, carbonated beverage production, refrigeration, and petroleum production for EOR, which involves injecting a CO<sub>2</sub> stream into injection wells at well fields for the purposes of increasing crude oil production. Possible suppliers of CO<sub>2</sub> include industrial facilities or process units that capture a CO<sub>2</sub> stream, such as those found at electric power plants, natural gas processing plants, cement kilns, iron and steel mills, ammonia manufacturing plants, petroleum refineries,

petrochemical plants, hydrogen production plants, and other combustion and industrial process sources. These suppliers can capture and/or compress CO<sub>2</sub> for delivery to a variety of end users as discussed above.

To ensure consistent treatment of CO<sub>2</sub> suppliers and given the large percentage of CO<sub>2</sub> supplied from CO<sub>2</sub> production wells, we have also proposed inclusion of facilities producing CO<sub>2</sub> from CO<sub>2</sub> production wells in the proposal. Importers and exporters of CO<sub>2</sub> are discussed under suppliers of industrial GHGs (see Section V.00 of this preamble) because most of these facilities import or export multiple industrial gases. For a full discussion of this source category, refer to the Suppliers of CO<sub>2</sub> TSD (EPA-HQ-OAR-2008-0508-044).

According to the U.S. GHG Inventory in 2006, the total supply of CO<sub>2</sub> from industrial facilities and CO<sub>2</sub> production wells was approximately 40.6 million metric tons CO<sub>2</sub>e. Further research in support of this rulemaking identified three additional facilities capturing a CO<sub>2</sub> stream for sale. Data for two of these facilities suggest an additional 0.5 million metric tons CO<sub>2</sub>e captured. Currently, the majority of CO<sub>2</sub> (79 percent) is produced from CO<sub>2</sub> production wells. Approximately 18 percent of CO<sub>2</sub> is produced at natural gas processing facilities and less than 2 percent from ammonia

production facilities. Less than 1 percent of CO<sub>2</sub> is captured at other industrial facilities.

Fugitive Emissions from CO<sub>2</sub> Supply. Fugitive CO<sub>2</sub> emissions can occur from the production of CO<sub>2</sub> streams from CO<sub>2</sub> production wells or capture at industrial facilities or process units, as well as during transport of the CO<sub>2</sub>, and during or after use of the gas. We propose to exclude the explicit reporting of fugitive CO<sub>2</sub> emissions from CO<sub>2</sub> supply at industrial facilities or process units and CO<sub>2</sub> production wells, as well as from CO<sub>2</sub> pipelines, injection wells and storage sites. Much of the CO<sub>2</sub> that could ultimately be released as a fugitive emission during transportation, injection and storage, would be accounted for in the CO<sub>2</sub> supply calculated using the methods below. Although separate calculation and reporting of fugitive CO<sub>2</sub> emissions are not proposed for inclusion, we believe that obtaining robust data on fugitive CO<sub>2</sub> emissions from the entire carbon capture and storage chain would provide a more complete understanding of the efficacy of carbon capture and storage technologies as an option for mitigating CO<sub>2</sub> emissions.

We seek comment on the decision to exclude the reporting of fugitive CO<sub>2</sub> emissions from the carbon capture and storage chain. We have concluded that there could be merit in requiring the reporting of fugitive emissions from

geologic sequestration of CO<sub>2</sub>, in particular. This is discussed further below.

Geologic Sequestration of CO<sub>2</sub>. CO<sub>2</sub> used in most industrial applications would eventually be released to the atmosphere. For EOR applications, however, some amount of CO<sub>2</sub> could ultimately remain sequestered in deep geologic formations. The objective of EOR operations is not to maximize reservoir CO<sub>2</sub> retention rates, but to maximize oil production and the amount of CO<sub>2</sub> trapped underground would be a function of site specific and operational factors. There are several EOR operations in the Permian Basin of Texas. One study showed that retention rates for eight reservoirs ranged from 38 to 100 percent with an average of 71 percent, but many of these projects are not mature enough to predict final retention (see Suppliers of CO<sub>2</sub> TSD (EPA-HQ-OAR-2008-0508-044)).

We are not proposing the inclusion of geologic sequestration in the proposed rulemaking. However, the Agency recognizes that there may be significant stakeholder interest in reporting the amount of CO<sub>2</sub> injected and geologically sequestered at EOR operations in order to demonstrate the effectiveness of EOR projects that ultimately intend to store the CO<sub>2</sub> for long periods of time. If an EOR project intends to sequester CO<sub>2</sub> for long periods

of time, there would be additional operational factors and post-operational considerations and monitoring. Although EPA is not proposing inclusion of this source in the rulemaking, we have outlined initial thoughts about how geologic sequestration might be included in a reporting program for EOR sequestration or other types of geologic sequestration. We welcome comment on the approach outlined below or other suggestions for how to quantify and verify the amount of CO<sub>2</sub> sequestered in geologic formations.

We reviewed a number of existing and proposed methodologies for monitoring and reporting fugitive emissions from carbon capture, transport, injection and storage. A summary of these protocols can be found in the Review of Existing Programs memorandum (EPA-HQ-OAR-2008-0508-054). Based on this review, a possible approach to include geologic sequestration might be to ask EOR operators to submit a geologic sequestration report. This report could provide information on the amount of CO<sub>2</sub> sequestered (based on the amount of CO<sub>2</sub> injected minus any fugitive emissions) along with a written description of the activities undertaken to document and verify the amount sequestered at each site. This report could include the following supporting information:

- X The owner and operator of the geologic sequestration site(s). Including the business name, address, contact name, and telephone number.
- X Location of the geologic sequestration site(s) including a map showing the modeled aerial extent of the CO<sub>2</sub> plume over the lifetime of the project.
- X Permitting information. Including information on the UIC well permit(s) issued by the appropriate State or Federal agency: permit number or other unique identification, date the permit was issued and modified if applicable, permitting agency, contact name, and telephone number.
- X An overview of the site characteristics, referencing or providing information which demonstrates sufficient storage capacity for the expected operating lifetime of the plant and the presence of an effective confining system overlying the injection zone.
- X An assessment of the risks of CO<sub>2</sub> leakage, or escape of CO<sub>2</sub> from the subsurface to the atmosphere, including an evaluation of potential leakage pathways such as deep wells, faults, and fractures.
- X An overview of the methods used to model the subsurface behavior of CO<sub>2</sub> and the results.
- X Baseline conditions used to evaluate performance of the site including the amount of naturally occurring CO<sub>2</sub> emissions and/or other characteristics that would be used to demonstrate the effectiveness of the system to contain CO<sub>2</sub>.
- X Summary of the monitoring plan that would be used to determine CO<sub>2</sub> emissions from the site including a discussion of the methodology, rationale, and frequency of monitoring.

The information listed above could be submitted one time and then updated as appropriate. However, the volume of CO<sub>2</sub> injected and any emissions from the storage site, including physical leakage from the geologic formation (via natural features or wells) and/or fugitive emissions of CO<sub>2</sub> co-produced with oil/gas, would be reported on an annual

basis in order to quantify the amount of CO<sub>2</sub> geologically sequestered.

## 2. Selection of Reporting Threshold

EPA has identified at least nine industrial facilities or process units in the U.S. that currently capture CO<sub>2</sub> (three natural gas processing plants, two ammonia facilities, two electricity generation facilities, one soda ash production plant, and one coal gasification facility) (Table PP-1 of this preamble).

**Table PP-1. Threshold Analysis for CO<sub>2</sub> Supply from Industrial Facilities or Process Units**

Threshold level metric tons CO <sub>2</sub> e	Total National Emissions (metric tons CO <sub>2</sub> e)	Total Number of U.S. Facilities	Emissions covered		Facilities covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	8,184,875	9	8,186,881	100%	9	100%
10,000	8,184,875	9	8,186,881	100%	9	100%
25,000	8,184,875	9	8,186,881	100%	9	100%
100,000	8,184,875	9	8,036,472	98%	5	56%

Under the proposed rule, all industrial facilities that capture and transfer a CO<sub>2</sub> stream would be required to report the mass of CO<sub>2</sub> captured and/or transferred. All known existing facilities exceed all but the highest reporting threshold of 100,000 metric tons CO<sub>2</sub>e, taking into account solely the mass of CO<sub>2</sub> captured. At the 25,000 metric tons CO<sub>2</sub>e threshold considered by other subparts of this rule, all industrial facilities and capture sites exceed the threshold. The analysis did not account for

stationary combustion at each facility. We concluded that all facilities capturing CO<sub>2</sub> would likely already exceed the reporting thresholds under other subparts of proposed 40 CFR part 98 for their downstream emissions. Therefore, a proposed threshold of "All In" for reporting CO<sub>2</sub> supply from industrial facilities or process units would not bring in additional facilities not already triggering other subparts of the proposed rule.

Based on the volumes of CO<sub>2</sub> supplied by facilities producing a CO<sub>2</sub> stream from CO<sub>2</sub> production wells, we also propose that they be subject to reporting. Currently there are four natural formations- Jackson Dome, Bravo Dome, Sheep Mountain, and McElmo Dome. Data are not available to estimate emissions from individual owners or operators operating within the Domes, therefore emissions data are presented at the Dome level (Table PP-2 of this preamble). We propose that all CO<sub>2</sub> production wells owned by a single owner or operator in a given Dome report the mass of CO<sub>2</sub> extracted and/or transferred off site. We are seeking comment on alternative methods for defining the reporting facility (e.g., reporting at the level of an individual well).



**Table PP-2. Threshold Analysis for CO<sub>2</sub> Supply CO<sub>2</sub> Production Wells**

Threshold level metric tons CO <sub>2</sub> e	Total national emissions (metric tons CO <sub>2</sub> e)	Total number of U.S. facilities*	Emissions covered		Facilities covered	
			metric tons CO <sub>2</sub> e/yr	Percent	Number	Percent
1,000	31,358,853	4	31,358,853	100%	4	100%
10,000	31,358,853	4	31,358,853	100%	4	100%
25,000	31,358,853	4	31,358,853	100%	4	100%
100,000	31,358,853	4	31,358,853	100%	4	100%

\* Under this proposal, owners or operator would be required to report on all CO<sub>2</sub> production wells under their ownership/operation in a single Dome.

We have concluded that reporting the volume of the CO<sub>2</sub> streams from CO<sub>2</sub> production wells is important given the large fraction of CO<sub>2</sub> supplied from CO<sub>2</sub> production wells. Further, we conclude that there is minimal burden associated with these requirements, as all necessary monitoring equipment should already be installed to support current operating practice.

Importers and exporters of CO<sub>2</sub> in bulk should review the threshold language for industrial GHG suppliers found in Section OO of this preamble, which proposes a threshold of 25,000 metric tons CO<sub>2</sub>e, for applicability. We decided to have a single threshold applicable for bulk importers and exporters of all industrial gases, because many are importing and/or exporting multiple industrial gases. We decided not to include CO<sub>2</sub> imported or exported in products (e.g., fire extinguishers), because of the potentially large number of sources.

For additional information on the threshold analysis please refer to the Suppliers of CO<sub>2</sub> TSD (EPA-HQ-OAR-2008-0508-044). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4 of the RIA and the RIA cost appendix.

### 3. Selection of Proposed Monitoring Methods

The monitoring plan for CO<sub>2</sub> suppliers at industrial facilities or process units, CO<sub>2</sub> production wells, and CO<sub>2</sub> importers and exporters involves accounting for the total volume of the CO<sub>2</sub> stream captured, extracted, imported and exported. We propose that if CO<sub>2</sub> suppliers already have the flow meter installed to directly measure the CO<sub>2</sub> stream at the point of capture, extraction, import and/or export, that facilities use the existing flow meter to measure CO<sub>2</sub> supply. We propose that facilities sample the composition of the gas on at least a quarterly basis to determine CO<sub>2</sub> composition of the CO<sub>2</sub> stream. If the necessary flow meters are not currently installed, CO<sub>2</sub> suppliers would use mass flow meters to measure the volume of the CO<sub>2</sub> stream transferred offsite.

We propose to require reporting on the volume of the CO<sub>2</sub> stream at the point of capture, extraction, import and export because this would provide information on the total quantity of CO<sub>2</sub> available for sale. Measuring at this

initial point could provide additional information in the future on fugitive CO<sub>2</sub> emissions from onsite purification, processing, and compression of the gas. However, if the necessary flow meters are not currently in place, facilities may conduct measurements at the point of CO<sub>2</sub> transfer offsite.

We conclude that there is minimal incremental burden associated with this approach for CO<sub>2</sub> suppliers at industrial facilities or process units, CO<sub>2</sub> production wells, importers and exporters because these sites likely already have the necessary flow meters installed to monitor the CO<sub>2</sub> stream. In addition, facilities need to know CO<sub>2</sub> composition of the gas in order to ensure the gas meets appropriate specifications (e.g., food grade CO<sub>2</sub>).

We also considered requiring CO<sub>2</sub> suppliers to report only on CO<sub>2</sub> sales, without determining the actual CO<sub>2</sub> composition of the gas sold. This is a relatively simple method, however, facilities already routinely measure the composition of the gas, providing greater certainty in the potential emissions data.

The methods proposed are generally consistent with existing GHG reporting protocols. Although existing protocols focus on accounting for fugitive emissions, and not quantity of CO<sub>2</sub> supplied, direct measurement is commonly

the recommended approach for measuring fugitive emissions. We concluded that while direct measurement of fugitive emissions may not be common practice, and is therefore not proposed, measurement of CO<sub>2</sub> transfer is.

#### 4. Selection of Procedures for Estimating Missing Data

Facilities with missing monitoring data on the volume of the CO<sub>2</sub> stream captured, extracted, imported, and exported should use the greater of the volume of the CO<sub>2</sub> stream transferred offsite or the quarterly or average value for the parameter from the past calendar year. The owners or operators of facilities monitoring emissions at the point of transfer offsite, that have missing monitoring data on the CO<sub>2</sub> stream transferred, may use the quarterly or average value for the parameter from the past calendar year.

Facilities with missing data on the composition of the CO<sub>2</sub> stream captured, extracted, imported, and exported should use the quarterly or average value for the parameter from the past calendar year.

#### 5. Selection of Data Reporting Requirements

For CO<sub>2</sub> supply, the proposed monitoring method is based on direct measurement of the gaseous and liquid CO<sub>2</sub> streams. All CO<sub>2</sub> suppliers would report, on an annual basis, the measured volume of the CO<sub>2</sub> stream that is captured,

extracted, imported and exported if the proper flow meter is installed to carry out these measurements. Facilities monitoring emissions at the point of transfer offsite would report the annual volume of the CO<sub>2</sub> stream transferred. All suppliers also would report, on an annual basis, the CO<sub>2</sub> composition of the gas sold. The end-use application of the supplied CO<sub>2</sub> (e.g., EOR, food processing) should also be reported, if known.

EPA proposes to collect data on the measured volume of the CO<sub>2</sub> stream captured, extracted, imported and exported, as well as gas composition because these form the basis of the GHG calculations and are needed for EPA to understand the emissions data and verify reasonableness of the reported emissions. EPA also proposes to collect information on the end use of the transferred CO<sub>2</sub>, if known, because CO<sub>2</sub> can be used in emissive or non-emissive applications. Collecting data on the ultimate fate of the CO<sub>2</sub> stream can provide information on the potential emissions of CO<sub>2</sub> released to the atmosphere.

#### 6. Selection of Records That Must Be Retained

Owners or operators of all CO<sub>2</sub> suppliers would be required to retain onsite all quarterly measurements for the volume of the CO<sub>2</sub> stream captured, extracted, imported and exported, and CO<sub>2</sub> composition. Where measurements are

based on CO<sub>2</sub> transferred offsite, these quarterly measurements would be retained, along with CO<sub>2</sub> composition.

#### QQ. Mobile Sources

##### 1. Definition of the Source Category

This section of the preamble describes proposed GHG reporting requirements for manufacturers of new mobile sources, including motor vehicles and engines, nonroad vehicles and engines, and aircraft engines.<sup>118</sup> It also seeks comment on the need to collect additional in-use travel activity and other emissions-related data from States and local governments and mobile source fleet operators. These proposed requirements and the requests for comments are based on EPA's authority under CAA Sections 114 and 208.

Not discussed in this portion of the preamble are proposed GHG reporting requirements related to transportation fuels (see Section V.MM of this preamble, Suppliers of Petroleum Products) and motor vehicle and engine manufacturing facilities (see Section V.C of this preamble, General Stationary Fuel Combustion Sources).

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<sup>118</sup> The terms "manufacturers" and "manufacturing companies", as used in this section, mean companies that are subject to EPA emissions certification requirements. This primarily includes companies that manufacture vehicles and engines domestically and foreign manufacturers that import vehicles and engines into the U.S. market. In some cases, this also includes domestic companies that are required to meet EPA certification requirements when they import foreign-manufactured vehicles or engines.

Total Emissions. For the U.S. transportation sector, the 2008 U.S. Inventory includes GHGs from the operation of passenger and freight vehicles within U.S. boundaries, natural gas used to power domestic pipelines, lubricants associated with mobile sources, and international bunker fuels purchased in the U.S. for travel outside U.S. boundaries. GHG emissions from these sources in 2006 totaled 2102.6 Tg CO<sub>2</sub>e, representing 29.3 percent of total U.S. GHG emissions. Just under 79 percent of these emissions came from on-road sources, including passenger cars and light-duty trucks (58.8 percent), medium- and heavy-duty trucks (19.2 percent), buses (0.6 percent) and motorcycles (0.1 percent). Aircraft (including domestic military flights) accounted for 11.6 percent of transportation GHGs, ships and boats 5 percent, rail 2.8 percent, pipelines 1.5 percent, and lubricants 0.5 percent. These estimates primarily reflect GHGs resulting from the combustion of fuel to power U.S. transportation sources. These estimates do not include emissions from the operation of other non-transportation mobile equipment and recreational vehicles, which collectively accounted for over 2 percent of total U.S. GHG emissions.

GHGs produced by transportation sources include CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>, which result primarily from the combustion of

fuel to power these sources or from treatment of the exhaust gases, and HFCs, which are released through the operation, servicing and retirement of vehicle A/C systems. CO<sub>2</sub> is the predominant GHG from these sources, representing 95 percent of transportation GHG emissions (weighted by the GWP of each gas). HFCs account for 3.3 percent, N<sub>2</sub>O for 1.6 percent, and CH<sub>4</sub> for 0.1 percent of transportation GHG emissions. EPA is proposing reporting requirements for each of these gases, where appropriate.

## 2. Selection of Proposed GHG Measurement, Reporting, and Recordkeeping Requirements

For the new vehicle and engine manufacturer reporting requirements proposed in this Notice, EPA intends to build on our long-established programs that control vehicle and engine emissions of criteria pollutants including hydrocarbons, NO<sub>x</sub>, CO, and PM. These programs, which include emissions standards, testing procedures, and emissions certification and compliance requirements, are based on emission rates over prescribed test cycles (e.g., grams of pollutant per mile or grams per kilowatt-hour). Thus, we propose having manufacturers also report GHG emissions in terms of emission rates for this reporting program. It is important to note that this approach is somewhat different from the direct reporting of tons per



year of emissions that is appropriate for the non-mobile source categories addressed elsewhere in this preamble. However, EPA would be able to use the GHG emission rate data from manufacturers with our existing models and other information to project tons of GHG emissions for the various mobile source categories.

Although the new reporting requirements proposed here focus on emission rates from new vehicles and engines, EPA also is very interested in continually updating and improving our understanding of the in-use activity and total emissions from mobile sources. Thus, we are seeking comment on the need to collect in-use travel activity and other emissions-related data from States and local governments and mobile source fleet operators. Section V.QQ.4 of this preamble describes the existing State and local government and fleet operator data that EPA currently collects and requests public comment on the need for, and substance of, additional reporting requirements.

### 3. Mobile Source Vehicle and Engine Manufacturers

#### a. Overview

As mentioned above, EPA is proposing GHG reporting requirements that fit within the reporting framework established for EPA's long-established criteria pollutant emissions control programs and vehicle fuel economy testing

program. While the details of the programs vary widely among the vehicle and engine categories, EPA generally requires manufacturers to conduct emissions testing and report the resulting emissions data to EPA for approval on an annual basis prior to the introduction of the vehicles or engines into commerce. As a part of this process, since the early 1970s, EPA has collected criteria pollutant emissions data for all categories of vehicles and engines used in the transportation sector, including engines used in nonroad equipment (see Table QQ-1 of this preamble).

**Table QQ-1. Mobile Source Vehicle and Engine Categories**

Category
Light-duty vehicles
Highway heavy-duty vehicles (chassis-certified)
Highway heavy-duty engines
Highway motorcycles
Nonroad diesel engines
Marine diesel engines
Locomotive engines
Nonroad small spark ignition engines
Nonroad large spark ignition engines
Marine spark ignition engines/personal watercraft
Snowmobiles
Off-highway motorcycles and all terrain vehicles
Aircraft engines

For purposes of EPA certification, manufacturers typically group vehicles/engines with similar characteristics into families and perform emission tests on representative or worst-case vehicles/engines from each family. Integral to EPA's existing certification procedures are well-established methods for assuring the completeness and quality of reported emission test data.

We are proposing to require manufacturers to measure and report GHG emissions data as part of these current emissions testing and certification procedures. These procedures, appropriate here because of the long-standing history and structure of mobile source control programs, are necessarily different from the monitoring-based methods proposed for other sources elsewhere in this notice.

After a discussion of the proposed small business threshold, the following subsections describe the proposed GHG emissions measurement and reporting requirements for manufacturers. As discussed in those subsections, some manufacturers already measure and report some GHG emissions, some measure but do not have to report GHG emissions, and others would need to measure and report for the first time. We propose that the new measurement and reporting requirements apply beginning with the 2011 model year, although we encourage voluntary measurement and reporting for model year 2010.

b. Selection of a Reporting Threshold

In most of EPA's recent mobile source regulatory programs for criteria pollutants, EPA has applied special provisions to small manufacturers. EPA proposes to exempt small manufacturers from the GHG reporting requirements. We define "small business" or "small volume manufacturer"

separately for each mobile source category. These definitions were established in the regulations during the rulemaking process for each category, which included consultation with small entities and with the Small Business Administration. We're proposing to use these same definitions in each case for the reporting requirements exemption. We believe that this exemption would avoid the relatively high per-vehicle or per-engine reporting costs for small manufacturers without detracting from the goals of the reporting program, as discussed below.

It is important to note that this "threshold" would differ from the approach proposed for other source categories discussed in Section V of this preamble. That is, EPA would not have manufacturers determine their eligibility based on total tons emitted per year. As discussed above, EPA's current mobile source criteria pollutant control programs are based on emissions rates over prescribed test cycles rather than tons per year estimates. Since we are proposing to build on our existing system, we believe that a threshold based on manufacturer size is appropriate for the mobile source sector. Although the emission rates of some vehicles and engines would not be reported, we do not believe this is a concern because the technologies - and thus emission rates -- from larger

manufacturers represent the same basic technologies and emission rates of essentially all vehicles and engines. It is also worth noting that the manufacturers that meet the small manufacturer definitions represent a very small fraction of overall vehicle and engine sales. For nine out of the twelve non-aircraft mobile source categories (there are currently no small aircraft engine manufacturers), we estimate that sales from small manufacturers represent less than 10 percent of overall sales (for eight of these categories, including light-duty vehicles, small manufacturers account for less than 3 percent of sales). For the remaining three categories (highway motorcycles, all terrain vehicles/off-road motorcycles, and small spark ignition engines) we estimate that small entities account for less than 32 percent of sales.

Please see the discussion of our compliance with the RFA in Section IX.C of this preamble. We request comments on our proposed approach for the reporting threshold for mobile source categories.

c. Light-Duty Vehicles

We propose that manufacturers of passenger cars, light trucks, and medium-duty passenger vehicles measure and report emissions of CO<sub>2</sub> (including A/C-related CO<sub>2</sub>), CH<sub>4</sub>,

N<sub>2</sub>O, and refrigerant leakage.<sup>119</sup> Existing criteria pollutant emissions certification regulations, as well as fuel economy testing regulations, already require manufacturers to measure and report CO<sub>2</sub> for essentially all of their vehicle testing. Requiring manufacturers to also measure and report the other GHGs emitted by these vehicles, as proposed in this Notice and discussed below, would introduce a modest but reasonable additional testing and reporting burden.

For CH<sub>4</sub> and N<sub>2</sub>O, we propose that manufacturers begin to measure these emissions as a part of existing emissions certification and fuel economy test procedures (FTP, SFTP, HFET, et. al.), if they are not already doing so, and then to report those emissions in the same cycle-weighted format that they report other emission results under the current certification requirements. Because such testing has not generally been required, some manufacturers would need to install additional exhaust analysis equipment for the measurement of CH<sub>4</sub> and/or N<sub>2</sub>O. In most cases, both of these types of new analyzers could be added as modular units to existing test equipment.

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<sup>119</sup> See 40 CFR 1803-01 for full definitions of "light-duty vehicle".

In the case of N<sub>2</sub>O, since this pollutant has not previously been included in the certification testing process, it is necessary to introduce a new analytical procedure for the measurement of N<sub>2</sub>O over the FTP. This is not the case for CH<sub>4</sub>, however, since an analytical procedure for CH<sub>4</sub> testing already exists. We propose that manufacturers use an N<sub>2</sub>O procedure found in the regulatory language associated with this notice that would be based largely on the procedures currently used to measure CO<sub>2</sub> and CO, using nondispersive infrared measurement technology. In addition, EPA is proposing a "scrubbing" stage as a part of this procedure that would remove sulfur compounds that can contribute to N<sub>2</sub>O formation in the sample bag. (See proposed 40 CFR 1065.257 and 1065.357 for the proposed N<sub>2</sub>O measurement procedures.) EPA requests comments on all aspects of the proposed N<sub>2</sub>O measurement procedure, including potential alternate methods with equal or better analytical performance.

Measuring and Reporting A/C-Related CO<sub>2</sub>. Manufacturers of light-duty vehicles, unlike manufacturers of heavy-duty and nonroad engines, sell their products as complete engine-plus-vehicle combinations that include the vehicles' A/C systems. Thus, we believe it is appropriate that these manufacturers report A/C-related emissions as a part of

their existing vehicle certification requirements. EPA does not currently require these manufacturers to measure or report the A/C-related CO<sub>2</sub> emissions (or the leakage of refrigerants, as discussed below) under current regulations. We propose that these manufacturers begin to measure A/C-related CO<sub>2</sub> emissions (i.e., the indirect CO<sub>2</sub> emissions resulting from the additional load placed on the engine by an operating A/C system), using a proposed new test cycle, which is described below. This testing would not require new equipment, and the proposed test cycle is similar to one that exists in many State Inspection & Maintenance (I/M) programs.

The current FTP for light-duty vehicles is performed with the A/C turned on only during the SC03, or "air conditioning," test procedure. This test is used to verify emissions compliance in a "worst-case" situation when the A/C system is operating under relatively extreme conditions. The SC03 is also used in the 5-cycle fuel economy calculation for fuel economy labeling. Thus, although the SC03 test results in a value for CO<sub>2</sub> emissions (in grams per mile), the incremental increase of CO<sub>2</sub> resulting from operation of the A/C system, especially in a more typical situation, is not quantified.



In order to provide for consistent, accurate measurement of A/C-related CO<sub>2</sub> emissions, EPA proposes to introduce a specifically-designed test procedure for A/C-related CO<sub>2</sub> emissions. Manufacturers would run this proposed test, the A/C CO<sub>2</sub> Idle Test, with the engine idling, upon completion of an emissions certification test -- such as the FTP, highway fuel economy, or US06 test. The proposed A/C CO<sub>2</sub> Idle Test is similar to the "Idle CO" test, which was once a part of vehicle certification, and is still used in State I/M programs (see 40 CFR part 51, subpart S, Appendix B).

Within each vehicle model type, various configurations of engine and cooling system options can be expected to have somewhat different A/C-related CO<sub>2</sub> performance.<sup>120</sup> However, we believe that vehicles sharing certain technical characteristics would generally have similar A/C-related CO<sub>2</sub> emissions. Specifically, vehicles with the same engine, A/C system design, and interior volume would be expected in most cases to have similar A/C-related CO<sub>2</sub> performance. In order to minimize the number of new tests that manufacturers would be required to perform, EPA is proposing that manufacturers be allowed to select a subset

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<sup>120</sup> In the existing regulations covering vehicle emissions certification, under 'Definitions' in 40 CFR 600.002-85(a)(15), "model type" means a unique combination of car line, basic engine, and transmission class.

of vehicles for A/C CO<sub>2</sub> Idle Testing, each of which would represent the performance of a larger group of vehicles with common A/C-related technical characteristics. We believe that in most cases the vehicles that manufacturers currently test for fuel economy purposes (as described in 40 CFR 600.208(a)(2)) would generally also capture the key engine-A/C system-vehicle configurations that may exist within a given model type. The complete set of our proposed criteria for manufacturers to meet in selecting the representative vehicles for the A/C CO<sub>2</sub> Idle Test is found in the regulatory language in the proposed rule (see proposed 40 CFR 86.1843-01, "Air conditioning system commonality").

The A/C CO<sub>2</sub> Idle Test would compare the additional CO<sub>2</sub> generated at idle with the A/C system in operation to the CO<sub>2</sub> generated at idle with the A/C system off. Manufacturers would run the test with the vehicle's A/C system operating under complete control of the climate control system and for a sufficient length of time to stabilize the cabin conditions and tailpipe emission levels. EPA believes that this test would account for the CO<sub>2</sub> contributions from most of the key A/C system components and modes of operation.

The additional CO<sub>2</sub> generated when the A/C is operated during the Idle Test would then be normalized to account for the interior cabin volume of the vehicle. This normalization is necessary because the size and capacity of an A/C system is related to the volume of air that an A/C system must cool. Rather than simply reporting the vehicle's CO<sub>2</sub> emissions, this normalization would provide a more appropriate metric of CO<sub>2</sub> emissions to compare systems that must cool relatively larger volumes with those that cool smaller volumes. EPA proposes that the interior cabin volume be defined as the volume of air that the air conditioner cools, which includes the volume of space used by passengers and, in some vehicles, the volume used for cargo. The proposed calculation of interior cabin volume is adapted from an industry protocol, Society of Automotive Engineers (SAE) Surface Vehicle Standard J1100.

The proposed A/C CO<sub>2</sub> Idle Test would require three approximately 10-minute periods of CO<sub>2</sub> emissions measurement once the vehicle's cabin conditions and climate control system have stabilized in order to quantify the A/C related CO<sub>2</sub>. The test would be run at 75°F, the standard temperature of the FTP. As discussed below, EPA considered proposing a more complex procedure that would be performed at a higher temperature, such as the 95°F used in the SC03

test. However, we believe that A/C-related CO<sub>2</sub> can be accurately demonstrated on the Idle Test at 75°F, avoiding the significant facility and testing issues associated with higher temperature testing. In order to better simulate "real world" idling conditions, we propose that the A/C CO<sub>2</sub> Idle Test be performed with the engine compartment hood and windows closed and without operating the test site cooling fan that is usually used to simulate the motion of the vehicle on the road.

The proposed A/C CO<sub>2</sub> Idle Test procedure specifies how climate control systems, whether manual or automatic, would need to be set to appropriately simulate the maximum and minimum cooling demands on the A/C system. CO<sub>2</sub> exhaust emission measurements, in grams per minute, would be taken during both of these modes. Manufacturers would conduct the idle test following the completion of a FTP certification test, a fuel economy test, or a test over the US06 cycle. As discussed above, manufacturers would measure the change in CO<sub>2</sub> due to A/C operation in grams per minute and then would divide this value by the interior volume in cubic feet, for an A/C CO<sub>2</sub> emission value in terms of grams per minute per cubic foot. The manufacturer would report this value to EPA with other emission results.

EPA also requests comment on three different approaches that could be used alone or in combination with the proposed A/C CO<sub>2</sub> Idle Test or with each other. Each of these tests would capture a somewhat different set of aspects of A/C-related CO<sub>2</sub> emissions. First, EPA is seeking comment on basing reporting requirements on the SC03 test (or some variant of this test), which, as described above, is designed to simulate more extreme driving conditions than the standard certification tests. Using the SC03 test to determine A/C-related CO<sub>2</sub> performance would likely require manufacturers to run tests in additional modes or to repeat the test in order to capture more real-world A/C usage (i.e., a stabilized cabin temperature). Therefore such an approach could involve significant modifications to the SC03 test procedure. The rationale for considering such an adapted SC03 test would be to characterize more systemic technological features (such as thermal management and transient A/C control) that may not be captured in a 75°F idle test or a bench test (as discussed below).

Second, EPA is seeking comment on basing reporting requirements on a "bench" test procedure similar to the one being developed by the SAE and the University of Illinois, which was employed to measure A/C efficiency improvements for the industry/government Improved Mobile Air

Conditioning project. This bench test only measures the power consumption of the A/C compressor with simulated loads, and is not integrated into a vehicle (as would be the case in the proposed A/C CO<sub>2</sub> Idle Test, which is a "chassis," or whole-vehicle, test). The purpose of the bench test for characterizing A/C-related CO<sub>2</sub> emissions would be to have a relatively repeatable test that could represent a variety of temperature and humidity conditions around the country. Unlike a chassis test, there would not be a direct connection to a vehicle's interior volume, and we would need to develop assumptions about a vehicle's interior volume in order to normalize the results. This test procedure might be less expensive than a modified SC03 test.

Finally, EPA is seeking comment on basing reporting requirements on design-based criteria for characterizing A/C-related CO<sub>2</sub> emissions. Design-based criteria would be conceptually similar to the ones proposed for leakage emissions characterization as described below. A manufacturer would choose technologies from a list provided by EPA in the rule where we would specify the A/C-related CO<sub>2</sub> characteristics associated with each major component and technology, including system control strategy and systems integration. While such a design-based approach might

capture the expected CO<sub>2</sub> emissions of individual components and controls, it would not necessarily capture overall system A/C-related CO<sub>2</sub> (when the A/C components would be integrated into the vehicle and would interact with the engine, cabin conditions, and other vehicle characteristics, such as the under-hood environment).

Calculating and Reporting a "Score" for A/C-Related Refrigerant Leakage. As part of most of EPA's existing mobile source emissions testing and certification programs, where robust test procedures have been developed and are in widespread use, EPA has relied on "performance-based" approaches, where emissions are measured directly during vehicle or engine operation to determine emission levels. Examples of performance-based test procedures include the FTP and the proposed A/C CO<sub>2</sub> Idle Test discussed above. In the case of A/C refrigerant leakage, where it is known that leakage of refrigerants with high GWPs occurs, a reliable, performance-based test procedure to measure such emissions from a vehicle does not yet exist. Instead, we are proposing a "design-based" approach to establish a vehicle's expected refrigerant leakage emissions.

Under our proposal, each key A/C-related component and system would be assigned an expected rate of refrigerant leakage, in the form of a leakage "score," in terms of

grams per year. These individual scores would be added to result in an overall leakage score for the vehicle. We propose that manufacturers establish an overall leakage score for the same test vehicle(s) on which they run the A/C CO<sub>2</sub> Idle Test, as described above.

The cooperative industry and government Improved Mobile Air Conditioning Program referenced above also has developed a comprehensive set of leakage scores that EPA proposes to use to represent the significant sources of A/C refrigerant leakage from newer vehicles. The Improved Mobile Air Conditioning Program and the SAE have established a template for calculating individual leakage scores based on the quantity and type of components, fittings, seals, and hoses utilized in a specific A/C system design; this template is known as the SAE Surface Vehicle Standard J2727. EPA is proposing a set of component and system leakage scores, based closely on J2727, but expanded to place greater emphasis on characterizing leakage emissions later in the vehicle's life. Like the J2727, this proposed EPA protocol would associate each technology or system design approach with a specific leakage score. Each score would be a design-based, "leakage-equivalent" value that would take into account expected early-in-life refrigerant leakage from the



specified components and systems. Manufacturers would report this value to EPA on their application for certification.

In addition, we request comment on the whether other A/C design considerations, such as use of alternative refrigerants, monitoring refrigerant leakage (with fault storage and indicators), and minimizing refrigerant quantity, should be used in determining an A/C leakage score.

d. Highway Heavy-Duty Diesel and Gasoline Vehicles and Engines

EPA's highway heavy-duty vehicle and engine emissions testing and certification programs generally cover vehicles above 8,500 pounds Gross Vehicle Weight Rating.<sup>121</sup> For most large trucks, manufacturers are required to measure and report criteria air pollutant emissions data for engines rather than vehicles. Engine manufacturers measure and report emissions prior to the engines being sold to separate companies that build trucks or buses and install engines in them. Manufacturers of gasoline-fueled complete vehicles below 14,000 pounds Gross Vehicle Weight Rating, such as large pick-ups and SUVs, are required to measure

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<sup>121</sup> See 40 CFR 1803-01 for full definitions of "heavy-duty vehicle" and "heavy-duty engine."

and report vehicle emissions, as do manufacturers of light-duty vehicles. These vehicles are described as "complete" vehicles because the vehicles leave the primary manufacturing facility fully assembled, with the engine and associated hardware installed and the load-carrying container attached.

Manufacturers That Certify Engines. EPA proposes to require manufacturers to report CO<sub>2</sub> emissions from highway heavy-duty diesel and gasoline engines. All manufacturers currently measure CO<sub>2</sub> as an integral part of calculating emissions of criteria pollutants, and some report CO<sub>2</sub> emissions in some form. We propose that engine manufacturers report CO<sub>2</sub> to EPA with criteria pollutant emission results and, as with the criteria emissions, report the CO<sub>2</sub> emissions in terms of brake-specific emissions (i.e., in units of grams of CO<sub>2</sub> per brake-horsepower-hour).

We also propose that highway heavy-duty engine manufacturers measure and report CH<sub>4</sub> emissions. This would require most manufacturers to install CH<sub>4</sub> exhaust analytical equipment or to arrange for testing at another facility. This equipment is usually designed to be installed as a modular addition to existing analytical equipment. Procedures for analyzing CH<sub>4</sub> are currently in place.

Finally, we also propose that these manufacturers measure and report N<sub>2</sub>O. As with CH<sub>4</sub>, this would require most manufacturers to install new, usually modular, N<sub>2</sub>O exhaust analytical equipment, or to arrange for testing at another facility. Because it has not been necessary in the past to measure N<sub>2</sub>O, we are proposing a new procedure for measuring N<sub>2</sub>O (see proposed 40 CFR 1065.257 and 1065.357).

As with CO<sub>2</sub>, manufacturers would measure both CH<sub>4</sub> and N<sub>2</sub>O as a part of the existing FTP for heavy-duty engines and report the results to EPA with other criteria pollutant emission test results.

Manufacturers That Certify Complete Highway Heavy-Duty Vehicles. We propose that manufacturers certifying complete heavy-duty vehicles be subject to the same measurement and reporting requirements as manufacturers of heavy-duty engines. Thus, as described above, these manufacturers would report the CO<sub>2</sub> emissions they are currently measuring as part of criteria air pollutant emissions testing and would additionally measure and report CH<sub>4</sub> and N<sub>2</sub>O. Although vehicle emissions testing (also known as "chassis testing") is different than engine-only testing, measurement procedures are the same, and we are proposing measurement and reporting requirements for

complete heavy-duty vehicles that are essentially identical to our proposed requirements for heavy-duty engines.

However, manufacturers of complete heavy-duty vehicles, unlike heavy-duty engine manufactures, are generally responsible for installing the vehicle's A/C equipment. For this reason, we propose that these manufacturers be responsible for reporting A/C-related emissions, in exactly the same ways that we are proposing for light-duty manufacturers, as described in Section V.QQ.3.c of this preamble. Thus, we propose that these manufacturers perform the A/C CO<sub>2</sub> Idle Test and report the A/C-related CO<sub>2</sub> emissions. We also request comment on the potential applicability of the alternate A/C CO<sub>2</sub> measurement procedures discussed above to manufacturers of complete heavy-duty vehicles. In addition, we propose that these manufacturers calculate and report an overall A/C refrigerant leakage "score," using the same assigned component and system scores we have developed for the proposed light-duty scoring system.

Vehicle Manufacturers That Install Certified Engines.

We are not proposing any requirements for the heavy-duty truck and bus manufacturers that install certified engines into their vehicles. These truck manufacturers currently are not required to certify their trucks to EPA emissions

standards and do not conduct emissions testing. However, we recognize that these vehicles are generally equipped with A/C systems by the truck or bus manufacturer. We request comment on the appropriateness, feasibility, and cost of extending some form of the proposed A/C CO<sub>2</sub> Idle Test and refrigerant leakage score requirements discussed above for manufacturers of complete heavy-duty trucks to these truck and bus manufacturers as well. In addition, we request comment on how original-equipment or aftermarket auxiliary power units - if used to provide power for cabin A/C - might be incorporated into a GHG reporting program.

e. Nonroad Diesel Engines and Nonroad Large Spark-Ignition Engines

Nonroad diesel engines and nonroad large spark-ignition (generally gasoline-fueled) engines are used in a wide variety of construction, agricultural, and industrial equipment applications. However, these engines are very similar (in terms of design, technology, and certification process) to their counterparts certified for highway operation. Given these similarities, we propose that manufacturers of these engines measure and report CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O in the same manner as manufacturers of highway heavy-duty diesel and gasoline engines, as described earlier in this section of the preamble.

Like highway heavy-duty truck and bus manufacturers that use certified engines, nonroad diesel equipment manufacturers install certified engines into their equipment but do not certify their equipment. As with trucks and buses, this equipment is often equipped with A/C systems. While we are not proposing any reporting requirements for nonroad equipment manufacturers, we request comment on the appropriateness, feasibility, and cost of extending some form of the proposed A/C CO<sub>2</sub> Idle Test and refrigerant leakage score reporting requirements discussed above to nonroad equipment manufacturers. We also request comment on extending A/C-related GHG reporting requirements to transportation refrigeration units that are equipped with separate engines that are certified under EPA's nonroad engine program.

f. Nonroad Small Spark-Ignition Engines, Marine Spark-Ignition Engines, Personal Watercraft, Highway Motorcycles, and Recreational Engines and Vehicles

There is a large range of spark-ignition engines in this category including engines used in portable power equipment, snowmobiles, all terrain vehicles, off-highway motorcycles, automotive-based, inboard engines used in marine vessels. For purposes of this proposed reporting rule, we also include highway motorcycles, which are tested

as complete vehicles. We are proposing that manufacturers measure and report CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions for these engines and vehicles. As part of existing criteria pollutant emissions testing requirements, manufacturers must determine the amount of fuel consumed either through direct measurement or through chemical balances of the fuel, intake air, and exhaust. With the "chemical balance" approach, CO<sub>2</sub> levels in the intake air and exhaust are measured (along with either the intake air flow rate or exhaust flow rate), and fuel consumption is calculated based on fuel properties and the change in CO<sub>2</sub> level between the intake and exhaust flows. (CO<sub>2</sub> levels with associated flow rates can be used to calculate a CO<sub>2</sub> emission rates). Alternatively, when a "direct measurement" approach is used to determine fuel consumption, there is no need to measure CO<sub>2</sub> levels in the intake air or exhaust. For manufacturers that generally use only the direct measurement approach, new analysis equipment might be required to measure CO<sub>2</sub> levels in the intake air and exhaust. We propose that manufacturers measure and report cycle-weighted CO<sub>2</sub> emissions (in the same "grams-per-unit-of-work" format used for criteria pollutant emissions reporting) for all engines in these categories, regardless of the method used to determine fuel consumption. We also propose that highway

motorcycle manufacturers measure and report CO<sub>2</sub> in terms of grams per mile.

For CH<sub>4</sub>, many of the engines described above are subject to "total" hydrocarbon, or "hydrocarbon + NO<sub>x</sub>" standards (as opposed to "non-CH<sub>4</sub>" hydrocarbon standards applying to some other categories), and thus CH<sub>4</sub> emissions may not typically be measured. In these cases, the manufacturers would need to install CH<sub>4</sub> emissions analysis equipment. We propose that manufacturers report cycle-weighted CH<sub>4</sub> emissions for these engines and for highway motorcycles.

Finally, we are proposing that manufacturers also report the cycle-weighted N<sub>2</sub>O emissions for these engines and for highway motorcycles. As with CH<sub>4</sub>, manufacturers would likely need to install N<sub>2</sub>O emissions analysis equipment. The proposed new procedure for measuring N<sub>2</sub>O is found in the draft regulations (40 CFR 1065.257 and 1065.357).

g. Locomotive and Marine Diesel Engines

We are proposing that manufacturers of locomotive and marine diesel engines - including those who certify "remanufactured" engines - measure and report CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions for locomotive and marine diesel engines. Manufacturers of these engines already measure CO<sub>2</sub> emissions



during the course of existing criteria air pollutant emission testing requirements, but generally do not report this to EPA. For manufacturers of these engines, we propose that CO<sub>2</sub> emissions be reported in the same cycle-weighted, work-based format (i.e., g/bhp-hr) as used for criteria pollutant emissions reporting. For C3 marine diesel engines, we are requesting comment on whether indirect CO<sub>2</sub> measurement (i.e. calculating the CO<sub>2</sub> levels based on fuel flow rate and fuel composition parameters) is an appropriate method for those manufacturers that do not utilize CO<sub>2</sub> analysis equipment in the course of emission testing.

Since diesel locomotives are subject to "total" hydrocarbon standards (which include CH<sub>4</sub> in the measured and reported hydrocarbon value), as opposed to "non-CH<sub>4</sub>" hydrocarbon standards (which do not include CH<sub>4</sub>), manufacturers typically do not measure CH<sub>4</sub> emissions. With the exception of C3 marine diesel engines (which do not have any "hydrocarbon" emission standards, and are not required to measure hydrocarbon or CH<sub>4</sub> emissions), we propose that manufacturers measure and report CH<sub>4</sub> emissions as a part of certification. To do so, we expect that some manufacturers would need to install equipment for analyzing CH<sub>4</sub> emissions.

We also propose that manufacturers - except for C3 marine - measure and report N<sub>2</sub>O emissions as well. For C3 marine diesel engines, we are requesting comment on the appropriateness and feasibility of requiring N<sub>2</sub>O measurement and reporting on the small number of engines represented by this category. As with CH<sub>4</sub>, we expect that most or all manufacturers would need to install N<sub>2</sub>O emissions analysis equipment. The proposed new procedure for measuring N<sub>2</sub>O is found in the proposed regulations (40 CFR 1065.257 and 1065.357).

#### h. Aircraft Engines

This category comprises turbofan, turbojet, turboprop (turbine-driven propeller), turboshaft (turbine-driven helicopters), and piston propulsion engines for commercial, air taxi, and general aviation aircraft. In the case of turbofan and turbojet engines of rated output (or thrust) greater than 26.7 kilonewtons, manufacturers of these engines are already measuring and recording CO<sub>2</sub> emissions as part of existing criteria air pollutant emission requirements for the landing and takeoff cycle. In this notice, we propose that manufacturers measure, record and report CO<sub>2</sub> separately for each mode of the landing and takeoff (LTO) cycle used in the emission certification test, as well as for the entire landing and takeoff cycle.

(The modes of the landing and takeoff cycle are taxi/idle, takeoff, climb out, and approach.)

CH<sub>4</sub> may be emitted by gas turbine engines during idle and by relatively older technology engines, but recent data suggest that little or no CH<sub>4</sub> may be emitted by some newer engines. Manufacturers of turbofan and turbojet engines of rated output greater than 26.7 kilonewtons are currently measuring hydrocarbon emissions as part of existing criteria air pollutant emissions testing, and CH<sub>4</sub> is included in the total hydrocarbon measurement. We propose that manufacturers of these engines begin to separately measure and report CH<sub>4</sub> for all engines in this category for which they are currently required to measure and record criteria air pollutant emissions as part of the certification process. Some manufacturers may need to acquire CH<sub>4</sub> emissions analysis equipment. We ask for comment on the degree to which engine manufacturers now have the needed equipment in their certification test cells to measure CH<sub>4</sub>.

Since little or no N<sub>2</sub>O is formed in modern gas turbine engines, we are not proposing to require N<sub>2</sub>O measurement or reporting.

Within the mobile source sector, NO<sub>x</sub> is a climate change gas unique to aviation. As required in 40 CFR 87,

manufacturers of turbofan and turbojet engines of rated output greater than 26.7 kilonewtons measure and record NO<sub>x</sub> emissions in each of the four LTO test modes, and these manufacturers must comply with the LTO NO<sub>x</sub> emission standard (for the entire LTO cycle). EPA asks for comment on whether NO<sub>x</sub> emissions in the four LTO test modes and for the overall LTO cycles should be reported under the provisions of this proposal, as they are now not reported to EPA for public consideration as is the case with all other mobile sources.<sup>122</sup>

EPA does not currently require manufacturers of piston engines (used in any application) to measure, record or report criteria air pollutant or GHG emissions, and no official FTP exists for these engines.<sup>123</sup> For these reasons, we are not proposing any GHG reporting requirements for these engines. However, we request comment on the potential costs and benefits of reporting requirements for GHG emissions from these engines,

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<sup>122</sup> Currently, these engine manufacturers voluntarily report criteria air pollutant emissions for the LTO cycle to the International Civil Aviation Organization.

<sup>123</sup> EPA received an administrative petition asking the agency to determine under section 231 of the CAA whether lead emissions from general aviation (piston engine) aircraft cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, and, if so, to establish standards for such emissions. Today's proposal regarding GHG emissions from piston-engine aircraft is not intended to respond in any way to the petition regarding general aviation lead emissions.

including how an appropriate emission test cycle might be designed. We also ask for comment on whether the requirements should be applied to turbofan and turbojet engines of rated output less than or equal to 26.7 kilonewtons, turboprop engines, and turbo shaft engines which are not now regulated under 40 CFR 87 requirements for criteria air pollutant emissions.<sup>124</sup>

#### 4. Request for Comments on Travel Activity and other In-Use, Emissions-Related Data

Travel activity and other emissions-related data from State and local governments and fleet operators are critical to understanding the overall GHG contribution of the mobile source sector. These data serve the important role of reflecting real-world conditions and capturing activity levels (e.g. distance traveled and hours operated) from all vehicles and engines, which can complement data that manufacturers report on expected emissions rates from new vehicles and engines. EPA already receives some in-use data through existing reporting programs. The purpose of this section of the preamble is to describe these existing data sources and to request public comment on the need for

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<sup>124</sup> Existing regulations in 40 CFR 87 include smoke number standards for turbofan and turbojet engines of rated output less than or equal to 26.7 kilonewtons and turboprop engines of rated output greater than or equal to 1,000 kilowatts. Requirements for the term turboshaft engine are currently not specified in 40 CFR 87.

additional data. In Section V.QQ.4.a of this preamble, we describe data currently reported by State and local governments, and request comment on the potential benefits of the collection of additional data. In Section V.QQ.4.b of this preamble, we highlight the types of data reported by fleet operators as part of the SmartWay Transport Program or other Federal programs, and request comment on the value of other potential reporting requirements.

a. Travel Activity and Other Data from State and Local Governments

Travel activity is a term EPA primarily uses for on-road vehicle activity and includes the number and type of vehicles and the distance they travel. State and local governments collect many types of travel activity data, including VMT by vehicle type and model year, fuel type, and/or functional road class (e.g., limited access highways, arterials with traffic signals, etc.). Other types of emissions-related data include vehicle operation and environmental conditions that can affect emissions during travel, such as idling practices and ambient temperature. Travel activity and other emissions-related data can vary over time, between regions, and between metropolitan and rural areas within a given State. EPA can

use these data to evaluate how changes in vehicle technology or travel activity can affect emissions.

EPA currently collects on-road mobile source data to better understand criteria air pollutant emissions, and some of these data can also be used to understand GHG emissions. For example, States provide VMT data to the Agency through the AERR.<sup>125</sup> EPA currently relies on AERR data to develop the NEI<sup>126</sup> which is used for, among other things, evaluating Federal vehicle and fuel standards for criteria pollutants and mobile source air toxics.

The AERR requires State air agencies to report mobile source data, including VMT data at the county level by roadway type<sup>127</sup>, every three calendar years beginning with the 2002 calendar year (i.e., states report mobile source inventories for 2005, 2008, 2011, etc.). The most recent submissions are for the 2005 calendar year. Although not required by the rule, EPA understands that some State air

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<sup>125</sup> EPA promulgated the AERR in December 2008 (73 FR 76539) (40 CFR part 51, subpart A). EPA promulgated the AERR to consolidate, reduce, and simplify the current requirements; add limited new requirements; provide additional flexibility to states in the ways they collect and report emissions data; and accelerate the reporting of emissions data to EPA by state and local agencies. The AERR replaces the Consolidated Emissions Reporting Rule (CERR) which was promulgated in June 2002 (67 FR 39602) in part to streamline existing periodic emissions inventory requirements for criteria pollutants.

<sup>126</sup> EPA prepares a national database of air emissions information from numerous state and local air agencies, from tribes, and from industry: <http://www.epa.gov/ttn/chief/eiinformation.html>.

<sup>127</sup> Under the AERR, VMT data should reflect both roadway type and vehicle type information.

agencies consult with State and local transportation agencies in preparing VMT data submissions. States also submit other information that can be used to estimate criteria pollutant emissions, e.g., age and speed distributions of vehicles by vehicle class and roadway type, fuel properties by county, month, and year, and temperature and humidity data by county, month, and year. The AERR also requires certain emissions-related information, such as activity data (e.g. hours/day of operation), for nonroad mobile sources, according to similar submission requirements as described above.

In addition to EPA's existing data collection requirements, there are other sources of travel activity and emissions-related data. DOT currently collects statewide VMT data for urban and rural roadway types through its Highway Performance Monitoring System. DOT and DOE also publish statistical reports such as the Census Transportation Planning Package, National Personal Transportation Survey, and the Urban Mobility Study. In the past, the U.S. Census Bureau conducted the Vehicle Inventory and Use Survey, which provided valuable data on the physical and operational characteristics of the



nation's private and commercial truck populations.<sup>128</sup> In specific geographic areas, agencies such as metropolitan planning organizations, State departments of transportation, transit agencies, air quality agencies, and county planning agencies also collect and project State and local travel activity and emissions data to meet Federal requirements, such as DOT's transportation planning requirements and EPA's SIP and transportation conformity requirements.

In light of the existing data available to EPA, the Agency is not proposing any new reporting requirements for State and local governments at this time. However, EPA is interested in requesting comment on several topics.

(1) Should EPA require States, local governments, or other entities to report additional travel activity or emissions-related data beyond what is required under EPA's existing reporting requirements? How would such data be used to inform future climate policy?

(2) What, if any, are the specific gaps in the currently reported travel activity or emissions-related data that are important for understanding on-road mobile

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<sup>128</sup> The primary goal of the Vehicle Inventory and Use Survey database was to produce national and state-level estimates of the total number of trucks. This survey was conducted every 5 years, until it was discontinued in 2002.

source GHG emissions? For example, would it be helpful for EPA to better understand State- or county-level VMT growth rates (e.g., based on VMT data collected over the past five or ten years or other methodology) or emissions data related to the freight sector (e.g., hours of long-duration truck idling or truck data that was previously provided by the Vehicle Inventory and Use Survey)? What is the quality of currently reported State and local VMT data, and should travel activity and emissions-related data quality be improved?

(3) Is it sufficient to collect travel activity or emissions-related data every three years as currently required, or should EPA collect such data on an annual basis, similar to other collections discussed in today's action?

(4) Should EPA consider any threshold(s) for States, local governments, or other entities that must report additional travel activity or other emissions-related data? For example, should additional data be reported only from larger metropolitan areas with more sophisticated transportation systems (e.g., metropolitan planning organizations with an urbanized population of 200,000 or more)?

(5) What nonroad activity data is of most interest for understanding GHG emissions, and should EPA consider any additional requirements for reporting such data beyond what is currently required?

b. Mobile Source Fleet Operator Data

Mobile source fleet operators<sup>129</sup> are in a unique position to collect data that reflect real-world conditions that are difficult to integrate into vehicle and engine testing procedures or to capture in travel activity surveys. Fleet operator data includes fuel consumption, which can be robustly converted into CO<sub>2</sub> emissions, distance traveled, and the number and/or weight of passengers and freight transported. EPA currently collects fleet operator data from sources that include DOT surveys such as the Vehicle Inventory and Use Survey (described in Section V.QQ.4.a of this preamble, but discontinued in 2002), in-use testing as part of vehicle and engine manufacturer compliance programs, ad-hoc internal and external field studies and surveys, and voluntary programs such as the SmartWay Transport Partnership. The rest of this section of the preamble describes the data EPA collects as part of

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<sup>129</sup> For the purpose of our request for comments, "fleet operators" are defined as entities that have operational control over mobile sources. "Operational control" is defined as having the full authority to introduce and implement operational, environmental, health, and safety policies.

our voluntary programs as well as the DOT's (DOT) rail and aviation fleet reporting requirements, and requests comment on the need for, and substance of, any additional reporting requirements.

EPA believes that one of the most important functions of collecting fleet operator data is to inform operators about their emissions profiles and to shed light on opportunities to reduce emissions through the use of clean technologies, fuels, and operational strategies. Through the SmartWay Transport Partnership program, EPA requires participating truck and rail equipment operators, or "partners," to report data as part of their voluntary commitment to measure and improve the environmental performance of their fleets. EPA uses this data to evaluate partner performance. Partners report annually on their fuel consumption by fuel type, miles traveled, and tonnage of freight carried. Truck operators also have the option of reporting the configuration and model year of each of their trucks. There is no minimum emissions reporting threshold for either truck or rail operators. EPA requires partners to report their annual data through the SmartWay Freight Logistics Environmental and Energy

Tracking performance model.<sup>130</sup> The SmartWay Freight Logistics Environmental and Energy Tracking model translates the partners' fuel consumption data into CO<sub>2</sub> emissions based on EPA's default emissions factors for fuels. EPA does not publicly release individual partners' emissions data. At present, the SmartWay Transport Partnership has received annual data from more than 400 trucking companies and all seven Class I rail companies. These partners' CO<sub>2</sub> emissions represent approximately 20 percent and 80 percent, respectively, of the 2005 national inventory of trucking and rail GHG emissions.<sup>131</sup>

EPA's Climate Leaders program also requires participating companies that operate mobile sources to report CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, and HFC emissions from those sources annually as a part of their voluntary commitment to develop a comprehensive, corporate-wide GHG inventory. There are no minimum emissions reporting thresholds for mobile sources. Companies quantify mobile source emissions based on the Climate Leaders reporting protocol,<sup>132</sup> which outlines several methods for calculating CO<sub>2</sub> including applying EPA's

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<sup>130</sup> The SmartWay Freight Logistics Environmental and Energy Tracking model and accompanying user guide and glossary is available at [www.epa.gov/otaq/smartway/smartway\\_fleets\\_software.htm](http://www.epa.gov/otaq/smartway/smartway_fleets_software.htm)

<sup>131</sup> *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005*, EPA, 2007.

<sup>132</sup> See *Direct Emissions from Mobile Combustion Sources and Direct HFC and PFC Emissions from Use of Refrigeration and Air Conditioning Equipment*, available at [www.epa.gov/climateleaders/resources/cross-sector.html](http://www.epa.gov/climateleaders/resources/cross-sector.html).

default factors to fuel consumption data. The reporting protocol also includes default N<sub>2</sub>O and CH<sub>4</sub> factors for non-road fuel consumption and on-road miles traveled by vehicle model year or technology type. Additionally, the reporting protocol includes default HFC leakage factors for mobile A/C units. As with SmartWay, EPA does not publicly release individual participating companies' emissions data. Currently, the Climate Leaders program has received mobile source data from 37 companies representing roughly 0.09 percent of the 2005 national inventory of transportation sector GHG emissions.<sup>133</sup>

In addition, DOT collects and publicly releases extensive data from rail and aircraft operators. All seven Class I<sup>134</sup> rail operators are required to report annual fuel consumption and ton-miles, among other data, to the Surface Transportation Board per the reporting guidelines in 49 U.S.C. 11145. Large certificated air carriers,<sup>135</sup> small

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<sup>133</sup> *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005*, EPA, 2007.

<sup>134</sup> A "Class I railroad" is defined as a carrier that has an annual operating revenue of \$250 million or more after applying the railroad revenue deflator formula, which is based on the Railroad Freight Price Index developed by the U.S. Department of Labor, BLS. The formula is the current year's revenues x 1991 average index/current year's average index.

<sup>135</sup> The definition of "large certified air carrier", "small certified air carrier", and "commuter air carrier" for Form 41 reporting requirements is available at: [www.bts.gov/programs/statistical\\_policy\\_and\\_research/source\\_and\\_accuracy\\_compendium/form41\\_schedule.html](http://www.bts.gov/programs/statistical_policy_and_research/source_and_accuracy_compendium/form41_schedule.html).

certificated air carriers, and commuter air carriers with more than \$20,000,000 in annual operating revenues must report monthly fuel usage data to the Bureau of Transportation Statistics via Form 41 pursuant to 14 CFR part 217 and part 241. Large certificated air carriers must also report monthly traffic data including distance traveled, tonnage of freight transported, and number of passengers transported.

In light of the existing data available to EPA, the Agency is not proposing mandatory reporting requirements for mobile source fleet operators, but is requesting comments on the need for, and substance of, potential reporting requirements at this time. We request comment on the following questions:

(1) Should fleet operators be required to report to EPA outside of voluntary participation in the SmartWay or Climate Leaders programs? How would this data be used to inform future climate policy?

(2) Are there certain categories of mobile sources that should be included or excluded in potential reporting requirements (e.g., lawn mowers, commercial light-duty vehicles, heavy-duty trucks, rail equipment, aircraft, waterborne vehicles)?

(3) Should one or more minimum emissions thresholds apply based on the mobile source category, and what would be appropriate annual thresholds?

(4) Are there certain categories of fleets that should be included or excluded from potential reporting requirements (e.g. public fleets versus private fleets)?

(5) If reporting requirements were to be introduced, what types of data should operators report (e.g., fuel consumption for estimating CO<sub>2</sub> and non-road N<sub>2</sub>O and CH<sub>4</sub> emissions; mileage and vehicle technology for estimating on-road N<sub>2</sub>O and CH<sub>4</sub> emissions; efficiency metrics such as emissions per tons carried)?

(6) What type of data verification or quality control should EPA require in any potential reporting requirements?

(7) For potential reporting requirements, are there preferred emissions quantification methods other than those presented in the SmartWay Freight Logistics Environmental and Energy Tracking model or the Climate Leaders reporting protocol?

## **VI. Collection, Management, and Dissemination of GHG**

### **Emissions Data**

#### A. Purpose



This section of the preamble describes the process by which EPA proposes to collect, manage, and disseminate data under the GHG reporting rule.

Section V.B of this preamble describes the proposed establishment of a new reporting system that would accept electronic submissions of GHG emissions and supporting data, quality assure the submissions, store the results, and provide access to the public. The new system would follow Agency standards for design, security, data element and reporting format conformance, and accessibility.

Existing sources that would be affected by the proposed GHG reporting rule may currently report emissions or other data to the Agency (or in some cases States) under other titles of the CAA including Title I (Emission Inventory, SIP, NSPS and NESHAP), Title II (National Emissions Standards Act), Title IV (Acid Rain), Title V (Air Operating Permits) and Title VI (Stratospheric Ozone Protection). EPA intends to develop a reporting scheme that minimizes the burden of stakeholders by integrating the new reporting requirements with existing data collection and data management systems, when feasible. Also, EPA would work with States to ease the burden on reporters to State and Federal systems by harmonizing data management, where possible.

Section VI.B of this preamble further describes the proposal regarding the frequency and timeliness of reporting, the requirement for a Designated Representative certification, and the units of measure for submissions and published results.

Section VI.C of this preamble describes QA that EPA would perform to ensure the completeness, accuracy, and validity of submissions. It also describes the feedback that EPA would provide to emission reporters indicating the results of the electronic data quality checks.

Section VI.D of this preamble discusses publication of data that would be collected under the proposed mandatory GHG reporting rule. EPA proposes to make data collected under this rule available to State agencies and the public, with the exception of any CBI data, as discussed in Section I.C of this preamble. EPA requests comments on proposed strategies regarding data collection, management, and dissemination outlined in this section of the preamble.

## B. Data Collection

### 1. Data Collection Methods

If a reporting source already reports GHG emissions data to an existing EPA program, the Agency would make efforts to minimize any additional burden on the sources. Some existing programs, however, have data collection and

reporting requirements that are inconsistent with the proposed requirements for the mandatory GHG reporting rule. When it is not feasible to adapt the existing program to collect the appropriate emissions data and supplemental data, EPA proposes to require affected sources to submit the data in the requested format to the new data reporting system for the mandatory GHG reporting rule.

Emission sources may fall into one or more categories:

(1) Reporting sources that use existing data collection and reporting methods and would not be required to report separately to the new data reporting system for the GHG reporting rule.

(2) Reporting sources that use existing data collection and reporting methods but would be required to report the data separately to the new data reporting system for the GHG reporting rule.

(3) Reporting sources that are not currently required to collect and report GHG emissions data to EPA and would be required to report using the new data reporting system for the mandatory GHG reporting rule.

EPA believes that using existing data collection methods and reporting systems, when feasible, to collect data required by this proposed rule would minimize additional burden on sources and the Agency. We seek

comment on the use of existing collection methods and reporting systems to collect information required by this proposed rule.

For those sources that do not report GHGs or data used to calculate GHG emissions through an existing reporting system, EPA proposes to develop a new system for emission reporters to submit the required data. The detailed data elements that would be reported and other requirements are specified in Sections III, IV and V of this preamble. In general, reporters using this new method would report annually to the Agency covering each calendar year by March 31 of the following year (e.g., annual emissions for calendar year 2010 would be reported by March 31, 2011.)

## 2. Data Submission

The Designated Representative (described in proposed 40 CFR part 98, subpart A and Section IV.G of this preamble) must use an electronic signature device (for example, a PIN or password) to submit a report. If the Designated Representative holds an electronic signature device that is currently used for valid electronic signatures accepted under another Agency program, we propose that the new reporting system would also accept valid electronic signatures executed with that device where feasible. (See 40 CFR 3.10 and the definitions of

"electronic signature device" and "valid electronic signature" under 40 CFR 3.3.)

### 3. Unique Identifiers for Facilities and Units

We believe that the Agency's reporting format for a given reporting year could make use of several ID codes - unique codes for a unit or facility. To ensure proper matching between databases, e.g., EPA-assigned facility ID codes and the ORIS (DOE) ID code, and consistency from one reporting year to the next, we are proposing that the reporting system provide each facility with a unique identification code to be specified by the Administrator.

### 4. Reporting Emissions in a Single Unit of Measure

To maintain consistency with existing State-level and Federal-level greenhouse gas programs in the U.S. and internationally, the Agency is proposing that all emission measurements be in the SI, also referred to as metric, units. Data used in calculations and supplemental data for QA could still be submitted in English weights and measures (e.g., mmBtu/hr) but the specific units of measure would be included in the data submission. All emissions data would be submitted to the agency in kg or metric tons per unit of time (per year in most cases, but for a few source categories emissions per hour, day, month, quarter, or other unit of time could also be required).

## 5. Conversion of Emissions to CO<sub>2</sub>e

Under this proposed rule, reporters would submit the quantity of each applicable GHG emitted (or other metric) in two forms. The data would be in the form of quantity of the gas emitted (e.g., metric tons of N<sub>2</sub>O) per unit of time and CO<sub>2</sub>e emissions per unit of time. Reporting the quantity and type of gas emitted allows for future recalculation of CO<sub>2</sub>e emissions in the event that GWP factors change.

## 6. Delegation of Authority to State Agencies to Collect GHG Data

The Agency proposes that affected sources submit the emissions data and supplemental data directly to EPA. The Agency believes this would reduce the burden on reporters and State agencies, provide faster access to national emission data, and facilitate consistent QA.

Under CAA Section 114(b), EPA may delegate the authority to collect emissions data from stationary sources to State agencies provided the State agency can satisfy the procedural requirements. We seek comment on the possibility of delegating the authority to State agencies that request such authority and assessing whether the State agency has procedures that are deemed consistent and adequate with the procedures outlined in this rule. For example, how should

EPA determine whether a requesting State agency has "consistent and adequate" procedures?

#### 7. Submission Method

EPA proposes to require all sources affected by this rule to report in an electronic format to be specified by the Administrator. Advantages of electronic reporting include reduced burden on reporters and EPA staff, greater accuracy because data do not need to be manually entered by EPA staff, enhanced ability to conduct electronic audits to ensure data quality, improved comparability because data would be reported in a consistent format, and improved data availability for EPA and the public.

By not specifying the exact reporting format in the regulatory text, EPA maintains flexibility to modify the reporting format and tools in a timely manner. Changes based on stakeholder comment, implementation experience, and new technology could be executed without regulatory action. EPA has used this approach successfully with existing programs, such as the ARP and the Title VI Stratospheric Ozone Protection Program, facilitating the deployment of new reporting formats and tools that take advantage of technologies (e.g., XML) and reduce the burden on reporters and the Agency. The electronic reports submitted under this rule would also be subject to the

provisions of 40 CFR 3.10, specifying EPA systems to which electronic submissions must be made and the requirements for valid electronic signatures.

### C. Data Management

#### 1. QA Procedures

The new reporting system would include automated checks for data completeness, data quality, and data consistency. Such automated checks are used for many other Agency programs (e.g., ARP.)

#### 2. Providing Feedback to Reporters

EPA has established a variety of mechanisms under existing programs to provide feedback to reporters who have submitted data to the Agency. EPA will consider the approaches used by other programs (e.g., electronic confirmations, results of QA checks) and develop appropriate mechanisms to provide feedback to reporters for the GHG reporting rule. The process is largely dependent upon such factors as the type of data being submitted and the manner of data transmission. Regardless of data collection system specifics, the goal is to ensure appropriate transparency and timeliness when providing feedback to submitting entities.

### D. Data Dissemination

#### 1. Public Access to Emissions Data



The Agency proposes to publish data submitted or collected under this rulemaking through EPA's Web site, reports, and other formats, with the exception of any CBI data, as discussed in Section I.C of this preamble. This level of transparency would inform the public and facilitate greater data verification and review. Transparency helps to ensure data quality and build public confidence in the data so the data can be used to support the development of potential future climate policies or programs.

EPA proposes to disseminate the data on an annual basis. Under this proposed rule, affected sources would be required to report at least on an annual basis, with some reporting more frequently to existing data reporting programs (e.g., the ARP). The Agency believes it would be appropriate to post or publish data collected under this rule once a year after the reporting deadline. The Agency recognizes the high level of public interest in this data, and proposes to disclose it in a timely manner, while also assuring accuracy.

## 2. Sharing Emission Data with Other Agencies

There are a growing number of programs at the State, Tribe, Territory, and Local level that require emission sources in their respective jurisdictions to monitor and

report GHG emissions. These programs would likely still continue because they may be broader in scope or more aggressive in implementation than this proposal. In order to be consistent with and supportive of these programs and to reduce burden on reporters and program agencies, EPA proposes that it share emission data with the exception of any CBI data, as discussed in Section III.C of this preamble, with relevant agencies or approved entities using, where practical, shared tools and infrastructure.

## **VII. Compliance and Enforcement**

### **A. Compliance Assistance**

To facilitate implementation and compliance, EPA plans to conduct an active outreach and technical assistance program following publication of the final rule. The primary audience would be potentially affected industries. We intend to develop implementation and outreach materials to help facilities understand if the rule applies to them and explain the reporting requirements and timetables. The program particularly would target industrial, commercial, and institutional sectors that do not routinely deal with air pollution regulations.

Compliance materials could be tailored to the needs of various sectors. These materials might include, for example, compliance guides, brochures, fact sheets,

frequently asked question and answer documents, sample reporting forms, and GHG emissions calculating tools. We also are considering a compliance assistance hotline for answering questions and providing technical assistance. (We may also want to consider creating a compliance assistance center (<http://www.assistancecenters.net>). EPA requests comment on the types of assistance needed and the most effective mechanisms for delivering this assistance to various industry sectors.

#### B. Role of the States

State and local air pollution control agencies routinely interact with many of the sources that would report under this rule. Further, as mentioned in Section II of this preamble, many States have already implemented or are in the process of implementing mandatory GHG reporting and reduction programs. In fact, many States may have reporting programs that are broader in scope or more aggressive in implementation because those programs are either components of established reduction programs (e.g., cap and trade) or being used to design and inform specific complementary measures (e.g., energy efficiency).

Therefore, State and local agencies will serve an important role in communicating the requirements of the rule and providing compliance assistance. In concert with

their routine inspection and other compliance and enforcement activities for other CAA programs, State and local agencies also can assist with educating facilities and assuring compliance at facilities subject to this rule.

As discussed in Section VI of this preamble, CAA section 114(b) allows EPA to delegate to States the authority to implement and enforce Federal rules. At this time, however, EPA does not propose to formally delegate implementation of the rule to State and local agencies. Even without delegation, EPA will work with States to ease burden on reporters to State and Federal systems by harmonizing data management, where possible. Further, as discussed in Section VI of this preamble, EPA is proposing to make the data collected under this rule available to States and other interested parties as soon as possible. For example, the quarterly data reported to EPA under Title IV of the CAA is often available on EPA's website within a month after it is reported. Furthermore, we recognize that many States with mandatory reporting programs are members of TCR. In some cases, TCR would provide States support in reporting tools, database management and serve as the ultimate repository for data reported under State programs, after the States have verified the data. Given the leadership many of the States have shown in developing and

implementing GHG reporting and reduction programs, EPA is seeking comment on the possibility of delegating the authority to collect data under this rule to State agencies. Overall, we request comments on the role of States in implementing this rule and on how States and EPA could interact in administering the reporting program.

### C. Enforcement

Facilities that fail to report GHG emissions according to the requirements of the proposed rule could potentially be subject to enforcement action by EPA under CAA sections 113 and 203-205. The CAA provides for several levels of enforcement that include administrative, civil, and criminal penalties. The CAA allows for injunctive relief to compel compliance and civil and administrative penalties of up to \$32,500 per day.<sup>136</sup>

Deviations from the rule that could ultimately be considered violations include but are not limited to the following:

X Failure to report GHG emissions.

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<sup>136</sup> The Federal Civil Penalties Inflation Adjustment Act of 1990, Public Law 101-410, 104 Stat. 890, 28 U.S.C. 2461, note, as amended by Section 31001(s) (1) of the Debt Collection Improvement Act of 1996, Public Law 104-134, 110 Stat. 1321-373, April 26, 1996, requires EPA and other agencies to adjust the ordinary maximum penalty that it will apply when assessing a civil penalty for a violation. Accordingly, EPA has adjusted the CAA's provision in Section 113(b) and (d) specifying \$25,000 per day of violation for civil violations to \$32,500 per day of violation.

- X Failure to collect data needed to estimate GHG emissions.
- X Failure to continuously monitor and test as required. Note that merely filling in missing data as specified does not excuse a failure to perform the monitoring or testing.
- X Failure to keep records needed to verify GHG emissions estimates.
- X Failure to estimate GHG emissions according to the methodology(s) specified in the rule.
- X Falsification of reports.

### **VIII. Economic Impacts of the Proposed Rule**

This section of the preamble examines the costs and economic impacts of the proposed rule, including the estimated costs and benefits of the proposed rule, and the estimated economic impacts of the proposed rule on affected entities, including estimated impacts on small entities. Complete detail of the economic impacts of the proposed rule can be found in the text of the regulatory impact analysis (RIA) (EPA-HQ-OAR-2008-0318-002).

#### A. How are compliance costs estimated?

EPA estimated costs of complying with the proposed rule for process emissions of GHGs in each affected industrial facility, as well as emissions from stationary combustion sources at industrial facilities and other facilities, and emissions of GHGs from mobile sources. 2006 is the representative year of the analysis in that the annual costs were estimated using the 2006 population of

emitting sources. EPA used available industry and EPA data to characterize conditions at affected sources. Incremental monitoring, recordkeeping, and reporting activities were then identified for each type of facility and the associated costs were estimated.

The costs of complying with the proposed rule would vary from one facility to another, depending on the types of emissions, the number of affected sources at the facility, existing monitoring, recordkeeping, and reporting activities at the facility, etc. The costs include labor costs for performing the monitoring, recordkeeping, and reporting activities necessary to comply with the proposed rule. For some affected facilities, costs include costs to monitor, record, and report emissions of GHGs from production processes and from stationary combustion units. For other facilities, the only emissions of GHGs are from stationary combustion. EPA's estimated costs of compliance are discussed in greater detail below:

Labor Costs. The costs of complying with and administering this proposed rule include time of managers, technical, and administrative staff in both the private sector and the public sector. Staff hours are estimated for activities, including:

- X Monitoring (private): staff hours to operate and maintain emissions monitoring systems.
- X Reporting (private): staff hours to gather and process available data and reporting it to EPA through electronic systems.
- X Assuring and releasing data (public): staff hours to quality assure, analyze, and release reports.  
Staff activities and associated labor costs would potentially vary over time. Thus, cost estimates are developed for start-up and first-time reporting, and subsequent reporting. Wage rates to monetize staff time are obtained from the BLS.

Equipment Costs. Equipment costs include both the initial purchase price of monitoring equipment and any facility/process modification that may be required. For example, the cost estimation method for mobile sources involves upstream measurement by the vehicle manufacturers. This may require an upgrade to their test equipment and facility. Based on expert judgment, the engineering costs analyses annualized capital equipment costs with the appropriate lifetime and interest rate assumptions. Cost recovery periods and interest rates vary by industry, but typically, one-time capital costs are amortized over a 10-year cost recovery period at a rate of 7 percent.

B. What are the costs of this proposed rule?

For the cost analysis, EPA gathered existing data from EPA, industry trade associations, States, and publicly



available data sources (e.g., labor rates from the BLS) to characterize the processes, sources, sectors, facilities, and companies/entities affected. Costs were estimated on a per entity basis and then weighted by the number of entities affected at the 25,000 metric tons CO<sub>2</sub>e threshold.

To develop the costs for the rule, EPA estimated the number of affected facilities in each source category, the number and types of combustion units at each facility, the number and types of production processes that emit GHGs, process inputs and outputs (especially for monitoring procedures that involve a carbon mass balance), and the measurements that are already being made for reasons not associated with the proposed rule (to allow only the incremental costs to be estimated). Many of the affected sources categories, especially those that are the largest emitters of GHGs (e.g., electric utilities, industrial boilers, petroleum refineries, cement plants, iron and steel production, pulp and paper) are subject to national emission standards and we use data generated in the development of these standards to estimate the number of sources affected by the reporting rule.

Other components of the cost analysis included estimates of labor hours to perform specific activities, cost of labor, and cost of monitoring equipment. Estimates

of labor hours were based on previous analyses of the costs of monitoring, reporting, and recordkeeping for other rules; information from the industry characterization on the number of units or process inputs and outputs to be monitored; and engineering judgment by industry and EPA industry experts and engineers. Labor costs were taken from the BLS and adjusted to account for overhead. Monitoring costs were generally based on cost algorithms or approaches that had been previously developed, reviewed, accepted as adequate, and used specifically to estimate the costs associated with various types of measurements and monitoring.

A detailed engineering analysis was conducted for each subpart of the proposed rule to develop unique unit costs. This analysis is documented in the RIA. The TSDs for each source category provide a discussion of the applicable measurement technologies and any existing programs and practices. Section 4 of the RIA contains a description of the engineering cost analysis.

Table VIII-1 of this preamble presents by subpart: the number of entities, the downstream emissions covered, the first year capital costs and the first year annualized costs of the proposed rule. EPA estimates that the total national annualized cost for the first year is \$168

million, and the total national annualized cost for subsequent years is \$134 million (2006\$). Of these costs, roughly 5 percent fall upon the public sector for program administration, while 95 percent fall upon the private sector. General stationary combustion sources, which are widely distributed throughout the economy, are estimated to incur approximately 18 percent of ongoing costs; other sectors incurring relatively large shares of costs are oil and natural gas systems (21 percent of ongoing costs), and iron and steel manufacturing (11 percent).

The threshold, in large part, determines the number of entities required to report GHG emissions and hence the costs of the rule. The number of entities excluded increases with higher thresholds. Table VIII-2 of this preamble provides the cost-effectiveness analysis for the various thresholds. Three metrics are used to evaluate the cost-effectiveness of the emissions threshold. The first is the average cost per metric ton of emissions reported (\$/metric ton CO<sub>2</sub>e). The second metric for evaluating the threshold option is the incremental cost of reporting emissions. The incremental cost is calculated as the additional (incremental) cost per metric ton starting with the least stringent option and moving successively from one threshold option to the next. The third metric shown is

the marginal cost of reported emissions. For this analysis, the marginal cost of reporting indicates the cost per metric ton of each threshold option relative to the 25,000 metric ton CO<sub>2</sub>e proposed threshold). For more information about the first year capital costs (unamortized), project lifetime and the amortized (annualized) costs for each subpart, please refer to section 4 of the RIA and the RIA cost appendix. Not all subparts require capital expenditures but those that do are clearly documented in the RIA.

**Table VIII-1. Estimated Covered Entities, Emissions and Costs by Subpart (2006\$)**

Subpart	Number Covered of Entities	Downstream Emissions		First Year Capital Costs		First Year Total Annualized Costs <sup>2</sup>	
		(Million of MtCO <sub>2</sub> e)	Share	(Million )	Share	(Million )	Share
Subpart A -General Provisions							
Subpart B - Reserved							
Subpart C -General Stationary Fuel Combustion Sources	3,000	220.0	6%	\$12.7	15%	\$29.0	17%
Subpart D -Electricity Generation	1,108	2,262.0	58%	\$0.0	0%	\$3.3	2%
Subpart E -Adipic Acid Production	4	9.3	0%	\$0.0	0%	\$0.1	0%
Subpart F -Aluminum Production	14	6.4	0%	\$0.0	0%	\$0.4	0%
Subpart G -Ammonia Manufacturing	24	14.5	0%	\$0.0	0%	\$0.4	0%
Subpart H -Cement Production	107	86.8	2%	\$5.4	6%	\$6.9	4%
Subpart I -Electronics Manufacturing	96	5.7	0%	\$0.0	0%	\$3.6	2%
Subpart J -Ethanol Production	85	0.0	0%	\$0.3	0%	\$0.5	0%
Subpart K -Ferroalloy Production	9	2.3	0%	\$0.0	0%	\$0.3	0%
Subpart L -Fluorinated Gas Production	12	5.3	0%	\$0.0	0%	\$0.0	0%
Subpart M -Food Processing	113	0.0	0%	\$0.0	0%	\$0.6	0%
Subpart N -Glass Production	55	2.2	0%	\$0.0	0%	\$0.6	0%
Subpart O -HCFC-22 Production	3	13.8	0%	\$0.0	0%	\$0.0	0%
Subpart P -Hydrogen Production	41	15.0	0%	\$0.0	0%	\$0.6	0%

Subpart	Number Covered of Entities	Downstream Emissions		First Year Capital Costs		First Year Total Annualized Costs <sup>2</sup>	
		(Million of MtCO <sub>2</sub> e)	Share	(Million )	Share	(Million )	Share
Subpart Q –Iron and Steel Production	121	85.0	2%	\$0.0	0%	\$18.2	11%
Subpart R –Lead Production	13	0.8	0%	\$0.0	0%	\$0.3	0%
Subpart S –Lime Manufacturing	89	25.4	1%	\$4.9	6%	\$5.3	3%
Subpart T –Magnesium Production	11	2.9	0%	\$0.0	0%	\$0.1	0%
Subpart U – Miscellaneous Uses of Carbonates	0	0.0	0%	\$0.0	0%	\$0.0	0%
Subpart V –Nitric Acid Production	45	17.7	0%	\$0.2	0%	\$0.9	1%
Subpart W –Oil and Natural Gas Systems	1,375	129.9	3%	\$37.8	43%	\$32.5	19%
Subpart X – Petrochemical Production	88	54.8	1%	\$0.0	0%	\$1.6	1%
Subpart Y –Petroleum Refineries	150	204.7	5%	\$1.6	2%	\$3.7	2%
Subpart Z –Phosphoric Acid Production	14	3.8	0%	\$0.8	1%	\$0.8	0%
Subpart AA –Pulp and Paper Manufacturing	425	57.7	1%	\$14.8	17%	\$9.2	5%
Subpart BB –Silicon Carbide Production	1	0.1	0%	\$0.0	0%	\$0.0	0%
Subpart CC –Soda Ash Manufacturing	5	3.1	0%	\$0.0	0%	\$0.0	0%
Subpart DD –Sulfur Hexafluoride (SF <sub>6</sub> ) from Electric Power Systems	141	10.3	0%	\$0.0	0%	\$0.4	0%
Subpart EE –Titanium Dioxide Production	8	3.7	0%	\$0.0	0%	\$0.1	0%
Subpart FF – Underground Coal Mines	100	33.5	1%	\$0.6	1%	\$2.3	1%
Subpart GG –Zinc Production	5	0.8	0%	\$0.0	0%	\$0.1	0%
Subpart HH –Landfills	2,551	91.1	2%	\$7.9	9%	\$15.3	9%
Subpart II –Wastewater	0	0.0	0%	\$0.0	0%	\$0.0	0%
Subpart JJ –Manure Management	43	1.5	0%	\$0.0	0%	\$0.2	0%
Subpart KK –Suppliers of Coal and Coal-based Products & Subpart LL –Suppliers of Coal-based Liquid Fuels	1,237	<sup>1</sup>	0%	\$0.0	0%	\$11.0	7%
Subpart MM –Suppliers of Petroleum Products	214	<sup>1</sup>	0%	\$0.0	0%	\$2.0	1%
Subpart NN –Suppliers of Natural Gas and Natural Gas Liquids	1,554	<sup>1</sup>	0%	\$0.0	0%	\$2.1	1%
Subpart OO –Suppliers of Industrial Greenhouse Gases	121	464.1	12%	\$0.0	0%	\$0.4	0%
Subpart PP –Suppliers of Carbon Dioxide (CO <sub>2</sub> )	13	<sup>1</sup>	0%	\$0.0	0%	\$0.0	0%
Subpart QQ – Motor Vehicle and Engine Manufacturers	350	35.4	1%	\$0.0	0%	\$7.4	4%
Private Sector, Total	13,205	3,869.9	100%	\$87.1	100%	\$160.4	95%
Public Sector, Total	NA	NA	NA	NA	NA	\$8.0	5%

Subpart	Number Covered of Entities	Downstream Emissions		First Year Capital Costs		First Year Total Annualized Costs <sup>2</sup>	
		(Million of MtCO <sub>2</sub> e)	Share	(Million )	Share	(Million )	Share
Total	13,205	3,869.9	100%	\$87.1	100%	\$168.4	100%

<sup>1</sup> Emissions from upstream facilities are excluded from these estimates to avoid double counting.

<sup>2</sup> Total costs include labor and capital costs incurred in the first year. Capital Costs are annualized using appropriate equipment lifetime and interest rate (see additional details in RIA section 4).

**Table VIII-2. Threshold Cost-Effectiveness Analysis (2006\$)**

Threshold (metric tons CO <sub>2</sub> e)	Entities (covered)	Total Costs (million \$)	Million Metric Tons CO <sub>2</sub> e/year (covered)	Percentage of Total Emissions Reported	Average Cost (\$/metric ton)	Incremental Cost (\$/metric ton)	Marginal Cost* (\$/metric ton)
100,000	6,598	\$101	3,699	52%	\$0.03	--	-\$0.35
25,000	13,205	\$160	3,870	55%	\$0.04	\$0.35	--
10,000	20,765	\$213	3,916	56%	\$0.05	\$1.16	\$1.16
1,000	59,587	\$426	3,951	56%	\$0.11	\$6.09	\$3.29

\* Cost per metric ton relative to the selected option.

Table VIII-3 of this preamble presents costs broken out by upstream and downstream sources. Upstream sources include the fuel suppliers and industrial GHG suppliers. Downstream suppliers include combustion sources, industrial processes, and biological processes. Most upstream facilities (e.g., coal mines, refineries, etc.) are also direct emitters of GHGs and are included in the downstream side of the table. As shown in Table VIII-3 of this preamble, over 99 percent of industrial processes emissions are covered at the 25,000 metric tons CO<sub>2</sub>e threshold for a cost of approximately \$36 million. However, it should be noted that due to data limitations the coverage estimates for upstream and downstream source categories are approximations.

Table VIII-3. Upstream versus Downstream Costs

Upstream <sup>1</sup>				Downstream <sup>2,3,4</sup>			
Source Category	#Reporters	Emissions Coverage (%) <sup>10</sup>	First Year Cost (millions)	Source Category	#Reporters <sup>2</sup>	Emissions Coverage <sup>3,10</sup> (%)	First Year Cost <sup>3</sup> (millions)
Coal Supply	1,237	100.0%	\$11.03	Coal <sup>5,6</sup> Combustion	N/A	99.0%	N/A
Petroleum Supply	214	100.0%	\$1.99	Petroleum <sup>5</sup> Combustion <sup>10</sup>	N/A	20.0%	N/A
Natural Gas Supply	1,554	68.0%	\$2.14	Natural Gas <sup>5</sup> Combustion	N/A	23.0%	N/A
				Sub Total Combustion	4,108	N/A <sup>5</sup>	\$46.16
Industrial Gas Supply	133	99.91%	\$0.41	Industrial Gas Consumption	265	28.0%	\$3.70
				Industrial Processes	1,077	99.6%	\$36.12
				Fugitive Emissions (coal, oil and gas)	1,475	86.6%	\$34.86
				Biological Processes	2,792	55.5%	\$16.59
				Vehicle <sup>7</sup> and Engine Manufacturers <sup>9</sup>	350	84.0%	\$7.41

Notes

<sup>1</sup> Most upstream facilities (e.g., coal mines, refineries, etc.) are also direct emitters of greenhouse gases, and are included in the downstream side of the table.

<sup>2</sup> Estimating the total number of downstream reporters by summing the rows will result in double-counting because some facilities are included in more than one row due to multiple types of emissions (e.g., facilities that burn fossil fuel and have process/fugitive/biological emissions will be included in each downstream category).

<sup>3</sup> The coverage and costs for downstream reporters apply to the specific source category, i.e., the fixed costs are not "double-counted" in both stationary combustion and industrial processes for the same facility.

<sup>4</sup> The thresholds used to determine covered facilities are additive, i.e., all of the source categories located at a facility (e.g., stationary combustion and process emissions) are added together to determine whether a facility meets the proposed threshold (e.g., 25,000 metric tons of CO<sub>2</sub>e/yr).

<sup>5</sup> Estimates for the number of reporters and total cost for downstream stationary combustion do not distinguish between fuels. National level data on the number of reporters could be estimated. However, estimating the number of reporters by fuel was not possible because a single facility can combust multiple fuels. For these reasons there is not a reliable estimate of the total of the emissions coverage from the downstream stationary combustion.

<sup>6</sup> Approximately 90 percent of downstream coal combustion emissions are already reported to EPA through requirements for electricity generating units under the Acid Rain Program.

<sup>7</sup> Due to data limitations, the coverage for downstream sources for fuel and industrial gas consumption in this table does not take into account thresholds. Assuming full emissions coverage for each source slightly overstates the actual coverage that would result from this rule. To estimate total emissions coverage downstream, by fuel, we added total emissions resulting from the respective fuel combusted in the industrial and electricity generation sectors and divided that by total national GHG emissions from the combustion of that fuel.

<sup>8</sup> The percent of coverage here is percentage of vehicle and engine manufacturers covered by this proposal rather than emissions coverage. This rule proposes to collect an emissions rate for the four "transportation-related" GHG emissions (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and HFCs). The amounts of CH<sub>4</sub> and N<sub>2</sub>O are dependent

- on factors other than fuel characteristics such as combustion temperatures, air-fuel mixes, and use of pollution control equipment.
- <sup>9</sup> The emissions coverage for petroleum combustion includes combustion of fuel by transportation sources as well as other uses of petroleum (e.g., home heating oil). It cannot be broken out by transportation versus other uses as there are difficulties associated with tracking which products from petroleum refiners are used for transportation fuel and which were not. We know that although refiners make these designations for the products leaving their gate, the actual end use can and does change in the market. For example, designated transportation fuel can always be used as home heating oil.
- <sup>10</sup> Emissions coverage from the combustion of fossil fuels upstream represents CO<sub>2</sub> emissions only. It is not possible to estimate nitrous oxide and methane emissions without knowing where and how the fuel is combusted. In the case of downstream emissions from stationary combustion of fossil fuels, nitrous oxide and methane emissions are included in the emissions coverage estimate. They represent approximately 1 percent of the total emissions.
- <sup>11</sup> EPA estimates that the majority of the costs for manufacturers of vehicles and engines can be attributed to the reporting requirements for non-CO<sub>2</sub> gases.

C. What are the economic impacts of the proposed rule?

EPA prepared an economic impact analysis to evaluate the impacts of the proposed rule on affected industries and economic sectors. In evaluating the various reporting options considered, EPA conducted a cost-effectiveness analysis, comparing the cost per metric ton of GHG emissions across reporting options. EPA used this information to identify the preferred options described in today's proposed rule.

To estimate the economic impacts of the proposed rule, EPA first conducted a screening assessment, comparing the estimated total annualized compliance costs by industry, where industry is defined in terms of North American Industry Classification System (NAICS) code, with industry average revenues. Overall national costs of the rule are significant because there are a large number of affected



entities, but per-entity costs are low. Average cost-to-sales ratios for establishments in affected NAICS codes are uniformly less than 0.8 percent.

These low average cost-to-sales ratios indicate that the proposed rule is unlikely to result in significant changes in firms' production decisions or other behavioral changes, and thus unlikely to result in significant changes in prices or quantities in affected markets. Thus, EPA followed its *Guidelines for Preparing Economic Analyses* (EPA, 2002, p.124-125) and used the engineering cost estimates to measure the social cost of the proposed rule, rather than modeling market responses and using the resulting measures of social cost. Table VIII-4 of this preamble summarizes cost-to-sales ratios for affected industries.

**Table VIII-4. Estimated Cost-To-Sales Ratios for Affected Entities**

<b>NAICS</b>	<b>NAICS Description</b>	<b>Average Cost Per Entity (\$1,000/entity)</b>	<b>Average Entity Cost-to-Sales Ratio<sup>1</sup></b>
211	Oil & gas extraction	\$23	0.1%
212	Mining (except oil & gas)	\$10	0.1%
221	Utilities	\$1	<0.1%
322	Paper mfg	\$22	0.1%
324	Petroleum & coal products mfg	\$16	<0.1%
325	Chemical mfg	\$12	<0.1%
327	Nonmetallic mineral product mfg	\$51	0.8%
331	Primary metal mfg	\$112	0.4%
334	Computer & electronic product mfg	\$37	0.1%

NAICS	NAICS Description	Average Cost Per Entity (\$1,000/entity)	Average Entity Cost-to-Sales Ratio <sup>1</sup>
335	Electrical equipment, appliance, & component mfg	\$37	0.2%
486	Pipeline transportation	\$12	0.1%
562	Waste management & remediation services	\$6	0.2%
325199	All other basic organic chemical mfg	\$24	<0.1%
325311	Nitrogenous fertilizer mfg	\$19	0.1%
327310	Cement mfg	\$65	0.2%
331112	Electrometallurgical ferroalloy product mfg	\$28	<0.1%
3272	Glass & glass product mfg	\$11	0.1%
325120	Industrial gas mfg	\$3	<0.1%
331112	Electrometallurgical ferroalloy product mfg	\$150	0.3%
3314	Nonferrous metal (except aluminum) production & processing	\$23	0.1%
327410	Lime mfg	\$60	0.4%
325311	Nitrogenous fertilizer mfg	\$20	0.1%
324110	Petroleum refineries	\$19	<0.1%
325312	Phosphatic fertilizer mfg	\$60	0.1%
322110	Pulp mills	\$22	<0.1%
324110	Petroleum refineries	\$24	<0.1%
327910	Abrasive product mfg	\$11	0.1%
3251	Basic chemical mfg	\$9	<0.1%
325188	All other basic inorganic chemical mfg	\$9	<0.1%
3314	Nonferrous metal (except aluminum) production & processing	\$19	0.1%

<sup>1</sup>This ratio reflects first year costs. Subsequent year costs will be slightly lower because they do not include initial start-up activities.

D. What are the impacts of the proposed rule on small entities?

As required by the RFA and SBREFA, EPA assessed the potential impacts of the proposed rule on small entities (small businesses, governments, and non-profit organizations). (See Section IX.C of this preamble for definitions of small entities.)

EPA believes the proposed thresholds maximize the rule coverage with 85 to 90 percent of U.S. GHG emissions reported by approximately 13,205 reporters, while keeping reporting burden to a minimum and excluding small emitters. Furthermore, many industry stakeholders that EPA met with expressed support for a 25,000 metric ton CO<sub>2</sub>e threshold because it sufficiently captures the majority of GHG emissions in the U.S., while excluding smaller facilities and sources. For small facilities that are captured by the rule, EPA has proposed simplified emission estimation methods where feasible (e.g., stationary combustion equipment under a certain rating can use a simplified mass balance approach as opposed to more rigorous direct monitoring) to keep the burden of reporting as low as possible. For further detail on the rationale for excluding small entities through threshold selection please see the Thresholds TSD (EPA-HQ-OAR-2008-0508-046).

EPA conducted a screening assessment comparing compliance costs for affected industry sectors to industry-specific receipts data for establishments owned by small businesses. This ratio constitutes a "sales" test that computes the annualized compliance costs of this proposed rule as a percentage of sales and determines whether the

ratio exceeds some level (e.g., 1 percent or 3 percent).<sup>137</sup>

The cost-to-sales ratios were constructed at the establishment level (average reporting program costs per establishment/average establishment receipts) for several business size ranges. This allowed EPA to account for receipt differences between establishments owned by large and small businesses and differences in small business definitions across affected industries. The results of the screening assessment are shown in Table VIII-5 of this preamble.

**Table VIII-5. Estimated Cost-To-Sales Ratios by Industry and Enterprise Size<sup>a</sup>**

Industry	NAICS	NAICS Description	SBA Size Standard (effective March 11, 2008)	Average Cost Per Entity (\$1,000/entity)	All Enterprises	Owned by Enterprises with:					
						<20 Employees <sup>f</sup>	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
Oil and Gas Extraction	211	Oil & gas extraction	500	\$23	0.1%	1.5%	0.1%	0.1%	0.0%	0.0%	0.0%
Petroleum and Coal Products	212	Mining (except oil & gas)	500	\$10	0.1%	0.9%	0.2%	0.1%	0.1%	0.1%	0.1%
SF6 from Electrical Systems	221	Utilities	b	\$1	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Pulp & Paper Manufacturing	322	Paper mfg	500 to 750	\$22	0.1%	1.3%	0.3%	0.1%	0.1%	0.0%	0.0%
Petroleum and Coal Products	324	Petroleum & coal products mfg	c	\$16	0.0%	0.4%	0.1%	0.1%	0.0%	0.1%	0.0%
Chemical Manufacturing	325	Chemical mfg	500 to 1,000	\$12	0.0%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%
Cement & Other Mineral Production	327	Nonmetallic mineral product mfg	500 to 1,000	\$51	0.8%	4.9%	1.0%	0.5%	0.4%	0.6%	0.4%
Primary Metal Manufacturing	331	Primary metal mfg	500 to 1,000	\$112	0.4%	9.1%	1.4%	0.4%	0.2%	0.1%	0.2%
Computer and Electronic Product Manufacturing	334	Computer & electronic product mfg	500 to 1,000	\$37	0.1%	2.9%	0.5%	0.1%	0.1%	0.1%	0.1%
Electrical Equipment, Appliance, and Component Manufacturing	335	Electrical equipment, appliance, & component mfg	500 to 1,000	\$37	0.2%	2.9%	0.5%	0.2%	0.1%	0.1%	0.1%

<sup>137</sup> EPA's RFA guidance for rule writers suggests the "sales" test continues to be the preferred quantitative metric for economic impact screening analysis.

Industry	NAICS	NAICS Description	SBA Size Standard (effective March 11, 2008)	Average Cost Per Entity (\$1,000/entity)	All Enterprises	Owned by Enterprises with:					
						<20 Employees <sup>f</sup>	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
Oil & Natural Gas Transportation	486	Pipeline transportation	d	\$12	0.1%	0.1%	0.4%	0.4%	NA	NA	NA
Waste Management and Remediation Services	562	Waste management & remediation services	e	\$6	0.2%	0.9%	0.1%	0.1%	0.1%	0.0%	0.1%
Adipic Acid	325199	All other basic organic chemical mfg	1,000	\$24	0.0%	0.9%	0.3%	0.1%	NA	0.0%	NA
Ammonia	325311	Nitrogenous fertilizer mfg	1,000	\$19	0.1%	1.0%	0.6%	NA	NA	NA	NA
Cement	327310	Cement mfg	750	\$65	0.2%	2.1%	1.6%	0.3%	NA	NA	0.1%
Ferroalloys	331112	Electrometallurgical ferroalloy product mfg	750	\$28	0.0%	NA	NA	NA	NA	NA	NA
Glass	3272	Glass & glass product mfg	500 to 1,000	\$11	0.1%	1.7%	0.2%	0.1%	0.0%	0.1%	0.0%
Hydrogen Production	325120	Industrial gas mfg	1,000	\$3	0.0%	0.6%	0.0%	0.1%	NA	NA	NA
Iron and Steel	331112	Electrometallurgical ferroalloy product mfg	750	\$150	0.3%	NA	NA	NA	NA	NA	NA
Lead Production	3314	Nonferrous metal (except aluminum) production & processing	750 to 1,000	\$23	0.1%	1.5%	0.2%	0.1%	NA	NA	0.1%
Lime Manufacturing	327410	Lime mfg	500	\$60	0.4%	16.5%	1.2%	NA	NA	NA	NA
Nitric Acid	325311	Nitrogenous fertilizer mfg	1,000	\$20	0.1%	1.0%	0.6%	NA	NA	NA	NA
Petrochemical	324110	Petroleum refineries	c	\$19	0.0%	0.3%	0.0%	0.0%	0.0%	NA	NA
Phosphoric Acid	325312	Phosphatic fertilizer mfg	500	\$60	0.1%	10.1%	NA	NA	NA	NA	NA
Pulp and Paper	322110	Pulp mills	750	\$22	0.0%	1.5%	NA	NA	NA	NA	NA
Refineries	324110	Petroleum refineries	c	\$24	0.0%	0.4%	0.0%	0.0%	0.0%	NA	NA
Silicon Carbide	327910	Abrasive product mfg	500	\$11	0.1%	0.8%	0.2%	0.1%	NA	NA	NA
Soda Ash Manufacturing	3251	Basic chemical mfg	500 to 1,000	\$9	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%
Titanium Dioxide	325188	All other basic inorganic chemical mfg	1,000	\$9	0.0%	0.7%	0.4%	0.1%	NA	NA	NA
Zinc Production	3314	Nonferrous metal (except aluminum) production & processing	750 to 1,000	\$19	0.1%	1.2%	0.1%	0.1%	NA	NA	0.1%

<sup>a</sup> The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments. Since the SBA's business size definitions (<http://www.sba.gov/size>) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for SBREFA screening analyses.

- <sup>b</sup> NAICS codes 221111, 221112, 221113, 221119, 221121, 221122 - A firm is small if, including its affiliates, it is primarily engaged in the generation, transmission, and/or distribution of electric energy for sale and its total electric output for the preceding fiscal year did not exceed 4 million MW hours.
- <sup>c</sup> 500 to 1,500. For NAICS code 324110 - For purposes of Government procurement, the petroleum refiner must be a concern that has no more than 1,500 employees nor more than 125,000 barrels per calendar day total Operable Atmospheric Crude Oil Distillation capacity. Capacity includes owned or leased facilities as well as facilities under a processing agreement or an arrangement such as an exchange agreement or a throughput. The total product to be delivered under the contract must be at least 90 percent refined by the successful bidder from either crude oil or bona fide feedstocks.
- <sup>d</sup> NAICS codes 486110 = 1,500 employees; NAICS 486210=\$6.5 million annual receipts; NAICS 486910 = 1,500 employees; and NAICS 486990 =\$11.5 million annual receipts.
- <sup>e</sup> Ranges from \$6.5 to \$13.0 million annual receipts; Environmental Remediation services has a 500 employee definition and the following criteria. NAICS 562910 - Environmental Remediation Services:
- 1) For SBA assistance as a small business concern in the industry of Environmental Remediation Services, other than for Government procurement, a concern must be engaged primarily in furnishing a range of services for the remediation of a contaminated environment to an acceptable condition including, but not limited to, preliminary assessment, site inspection, testing, remedial investigation, feasibility studies, remedial design, containment, remedial action, removal of contaminated materials, storage of contaminated materials and security and site closeouts. If one of such activities accounts for 50 percent or more of a concern's total revenues, employees, or other related factors, the concern's primary industry is that of the particular industry and not the Environmental Remediation Services Industry.
  - 2) For purposes of classifying a Government procurement as Environmental Remediation Services, the general purpose of the procurement must be to restore a contaminated environment and also the procurement must be composed of activities in three or more separate industries with separate NAICS codes or, in some instances (e.g., engineering), smaller sub-components of NAICS codes with separate, distinct size standards. These activities may include, but are not limited to, separate activities in industries such as: Heavy Construction; Special Trade Construction; Engineering Services; Architectural Services; Management Services; Refuse Systems; Sanitary Services, Not Elsewhere Classified; Local Trucking Without Storage; Testing Laboratories; and Commercial, Physical and Biological Research. If any activity in the procurement can be identified with a separate NAICS code, or component of a code with a separate distinct size standard, and that industry accounts for 50 percent or more of the value of the entire procurement, then the proper size standard is the one for that particular industry, and not the Environmental Remediation Service size standard.
- <sup>f</sup> Given the Agency's selected thresholds, enterprises with fewer than 20 employees are likely to be excluded from the reporting program.
- NA: Not available. SUSB did not report the data necessary to calculate this ratio.

EPA was not able to calculate a cost-to-sales ratio for manure management (NAICS 112) as SUSB (SBA, 2008a) data does not provide establishment information for agricultural

NAICS codes (e.g., NAICS 112 which covers manure management). EPA estimates that the total first year reporting costs for the entire manure management industry to be \$0.2 million with an average cost per ton reported of \$0.14.

As shown, the cost-to-sales ratios are less than 1 percent for establishments owned by small businesses that EPA considers most likely to be covered by the reporting program (e.g. establishments owned by businesses with 20 or more employees).

EPA acknowledges that several enterprise categories have ratios that exceed this threshold (e.g., enterprise with one to 20 employees). EPA took a conservative approach with the model entity analysis. Although the appropriate SBA size definition should be applied at the parent company (enterprise) level, data limitations allowed us only to compute and compare ratios for a model establishment within several enterprise size ranges. To assess the likelihood that these small businesses would be covered by the rule, we performed several case studies for manufacturing industries where the cost-to-receipt ratio exceeded 1 percent. For each industry, we used and applied emission data from a recent study examining emission

thresholds<sup>138</sup>. This study provides industry-average CO2 emission rates (e.g., tons per employee) for these manufacturing industries.

The case studies showed two industries (cement and lime manufacturing) where emission rates suggest small businesses of this employment size could potentially be covered by the rule. As a result, EPA examined corporate structures and ultimate parent companies were identified using industry surveys and the latest private databases such as Dun & Bradstreet. The results of this analysis show cost to sales ratios below 1 percent.

For the other enterprise categories identified with ratios between 1 percent and 3 percent EPA examined industry specific bottom up databases and previous industry specific studies to ensure that no entities with less than 20 employees are captured under the rule.

Although this rule would not have a significant economic impact on a substantial number of small entities, the Agency nonetheless tried to reduce the impact of this rule on small entities, including seeking input from a wide range of private- and public-sector stakeholders. When

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<sup>138</sup> Nicholas Institute for Environmental Policy Solutions, Duke University. 2008. Size Thresholds for Greenhouse Gas Regulation: Who Would be Affected by a 10,000-ton CO2 Emissions Rule? Available at: <http://www.nicholas.duke.edu/institute/10Kton.pdf>



developing the proposed rule, the Agency took special steps to ensure that the burdens imposed on small entities were minimal. The Agency conducted several meetings with industry trade associations to discuss regulatory options and the corresponding burden on industry, such as recordkeeping and reporting. The Agency investigated alternative thresholds and analyzed the marginal costs associated with requiring smaller entities with lower emissions to report. The Agency also recommended a hybrid method for reporting, which provides flexibility to entities and helps minimize reporting costs.

Additional analysis for a model small government also showed that the annualized reporting program costs were less than 1 percent of revenue. These impacts are likely representative of ratios in industries where data limitations do not allow EPA to compute sales tests (e.g., general stationary combustion and manure management). Potential impacts of the proposed rule on small governments were assessed separately from impacts on Federal Agencies. Small governments and small non-profit organizations may be affected if they own affected stationary combustion sources, landfills, or natural gas suppliers. However, the estimated costs under the proposed rule are estimated to be small enough that no small government or small non-profit

is estimated to incur significant impacts. For example, from the 2002 Census (in \$2006), revenues for small governments (counties and municipalities) with populations fewer than 10,000 are \$3 million, and revenues for local governments with populations less than 50,000 is \$7 million. As an upper bound estimate, summing typical per-respondent costs of combustion plus landfills plus natural gas suppliers yields a cost of approximately \$17,047 per local government. Thus, for the smallest group of local governments (<10,000 people), cost-to-revenue ratio would be 0.8 percent. For the larger group of governments less than 50,000, the cost-to-revenue ratio is 0.3 percent.

E. What are the benefits of the proposed rule for society?

EPA examined the potential benefits of the GHG reporting rule. Because the benefits of a reporting system are based on their relevance to policy making, transparency issues, and market efficiency, and therefore benefits would be very difficult to quantify and monetize. Instead of a quantitative analysis of the benefits, EPA conducted a systematic literature review of existing studies including government, consulting, and scholarly reports.

A mandatory reporting system would benefit the public by increased transparency of facility emissions data. Transparent, public data on emissions allows for

accountability of polluters to the public stakeholders who bear the cost of the pollution. Citizens, community groups, and labor unions have made use of data from Pollutant Release and Transfer Registers to negotiate directly with polluters to lower emissions, circumventing greater government regulation. Publicly available emissions data also would allow individuals to alter their consumption habits based on the GHG emissions of producers.

The greatest benefit of mandatory reporting of industry GHG emissions to government would be realized in developing future GHG policies. For example, in the EU's Emissions Trading System, a lack of accurate monitoring at the facility level before establishing CO<sub>2</sub> allowance permits resulted in allocation of permits for emissions levels an average of 15 percent above actual levels in every country except the United Kingdom.

Benefits to industry of GHG emissions monitoring include the value of having independent, verifiable data to present to the public to demonstrate appropriate environmental stewardship. Such monitoring allows for inclusion of standardized GHG data into environmental management systems, providing the necessary information to achieve and disseminate their environmental achievements.

Standardization would also be a benefit to industry, once facilities invest in the institutional knowledge and systems to report emissions, the cost of monitoring should fall and the accuracy of the accounting should improve. A standardized reporting program would also allow for facilities to benchmark themselves against similar facilities to understand better their relative standing within their industry.

#### **IX. Statutory and Executive Order Reviews**

##### A. Executive Order 12866: Regulatory Planning and Review

Under section 3(f)(1) of EO 12866 (58 FR 51735, October 4, 1993), this action is an "economically significant regulatory action" because it is likely to have an annual effect on the economy of \$100 million or more. Accordingly, EPA submitted this action to the OMB for review under EO 12866 and any changes made in response to OMB recommendations have been documented in the docket for this action.

In addition, EPA prepared an analysis of the potential costs and benefits associated with this action. A copy of the analysis is available in Docket No. EPA-HQ-OAR-2008-0508-002 and is briefly summarized in Section VIII of this preamble.

##### B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the OMB under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The ICR document prepared by EPA has been assigned EPA ICR number 2300.01.

EPA plans to collect complete and accurate economy-wide data on facility-level greenhouse gas emissions. Accurate and timely information on greenhouse gas emissions is essential for informing future climate change policy decisions. Through data collected under this rule, EPA will gain a better understanding of the relative emissions of specific industries, and the distribution of emissions from individual facilities within those industries. The facility-specific data will also improve our understanding of the factors that influence greenhouse gas emission rates and actions that facilities are already taking to reduce emissions. Additionally, EPA will be able to track the trend of emissions from industries and facilities within industries over time, particularly in response to policies and potential regulations. The data collected by this rule will improve EPA's ability to formulate climate change policy options and to assess which industries would be affected, and how these industries would be affected by the options.

This information collection is mandatory and will be carried out under CAA sections 114 and 208. Information identified and marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2. However, emissions information collected under CAA sections 114 and 208 cannot be claimed as CBI and will be made public.

The projected cost and hour burden for non-federal respondents is \$143 million and 1.63 million hours per year. The estimated average burden per response is 2 hours; the proposed frequency of response is annual for all respondents that must comply with the proposed rule's reporting requirements, except for electricity generating units that are already required to report quarterly under 40 CFR part 75 (EPA Acid Rain Program); and the estimated average number of likely respondents per year is 18,775. The cost burden to respondents resulting from the collection of information includes the total capital cost annualized over the equipment's expected useful life (averaging \$20.7 million), a total operation and maintenance component (averaging \$22.4 million per year), and a labor cost component (averaging \$100.0 million per year). Burden is defined at 5 CFR 1320.3(b). These cost

numbers differ from those shown elsewhere in the RIA for several reasons:

- X ICR costs represent the average cost over the first three years of the rule, but costs are reported elsewhere in the RIA for the first year of the rule and for subsequent years of the rule.;
- X The costs of reporting electricity purchases have been excluded from the ICR, but are still reported in the RIA, although electricity use reporting has been removed from the proposed rule and EPA is soliciting comment on it (see Section 4.2.2, pg 4-18); and
- X The first-year costs of coverage determination, estimated to be \$867.60 per facility for approximately 16,800 facilities that ultimately determine they do not have to report, are included in the ICR but not in the RIA (see Section 4.2.2, pg 4-18). These costs, averaged over 3 years, are \$4.87 million incurred by an average of 5,613 respondents per year.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9. To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments to OMB at the Office of Information and Regulatory Affairs,

Office of Management and Budget, 725 17th Street, NW,  
Washington, DC 20503, Attention: Desk Office for EPA.

Since OMB is required to make a decision concerning the ICR between 30 and 60 days after [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER], a comment to OMB is best assured of having its full effect if OMB receives it by [INSERT DATE 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

#### C. Regulatory Flexibility Act (RFA)

The RFA generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business as defined by the Small Business Administration's regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town,



school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of today's proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. The small entities directly regulated by this proposed rule include small businesses across all sectors encompassed by the rule, small governmental jurisdictions and small non-profits. We have determined that some small businesses will be affected because their production processes emit GHGs that must be reported, or because they have stationary combustion units onsite that emit GHGs that must be reported. Small governments and small non-profits are generally affected because they have regulated landfills or stationary combustion units onsite, or because they own a LDC.

For affected small entities, EPA conducted a screening assessment comparing compliance costs for affected industry sectors to industry-specific data on revenues for small businesses. This ratio constitutes a "sales" test that computes the annualized compliance costs of this proposed rule as a percentage of sales and determines whether the

ratio exceeds some level (e.g., 1 percent or 3 percent). The cost-to-sales ratios were constructed at the establishment level (average compliance cost for the establishment/average establishment revenues). As shown in Table VIII-5 of this preamble, the cost-to-sales ratios are less than 1 percent for establishments owned by small businesses that EPA considers most likely to be covered by the reporting program<sup>139</sup>.

The screening analysis thus indicates that the proposed rule will not have a significant economic impact on a substantial number of small entities. See Table VIII-4 of this preamble for sector-specific results. The screening assessment for small governments compared the sum of average costs of compliance for combustion, local distribution companies, and landfills to average revenues for small governments. Even for a small government owning all three source types, the costs constitute less than 1 percent of average revenues for the smallest category of governments (those with fewer than 10,000 people).

Although this proposed rule will not have a significant economic impact on a substantial number of

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<sup>139</sup> U.S. Small Business Administration (SBA). 2008. Firm Size Data from the Statistics of U.S. Businesses: U.S. Detail Employment Sizes: 2002. <[http://www.census.gov/csd/susb/download\\_susb02.htm](http://www.census.gov/csd/susb/download_susb02.htm)>.

small entities, EPA nonetheless took several steps to reduce the impact of this rule on small entities. For example, EPA determined appropriate thresholds that reduce the number of small businesses reporting. In addition, EPA is not requiring facilities to install CEMS if they do not already have them. Facilities without CEMS can calculate emissions using readily available data or data that are less expensive to collect such as process data or material consumption data. For some source categories, EPA developed tiered methods that are simpler and less burdensome. Also, EPA is requiring annual instead of more frequent reporting.

Through comprehensive outreach activities, EPA held approximately 100 meetings and/or conference calls with representatives of the primary audience groups, including numerous trade associations and industries that include small business members. EPA's outreach activities are documented in the memorandum, "Summary of EPA Outreach Activities for Developing the Greenhouse Gas Reporting Rule," located in Docket No. EPA-HQ-OAR-2008-0508-055. EPA maintains an "open door" policy for stakeholders to provide input on key issues and to help inform EPA's understanding of issues, including thresholds for reporting and greenhouse gas calculation and reporting methodologies.

EPA continues to be interested in the potential impacts of the proposed rule on small entities and welcomes comments on issues related to such impacts.

D. Unfunded Mandates Reform Act (UMRA)

Title II of the UMRA of 1995 (UMRA), 2 U.S.C. 1531-1538, requires Federal agencies, unless otherwise prohibited by law, to assess the effects of their regulatory actions on State, local, and Tribal governments and the private sector.

EPA has developed this regulation under authority of CAA sections 114 and 208. The required activities under this Federal mandate include monitoring, recordkeeping, and reporting of GHG emissions from multiple source categories (e.g., combustion, process, biologic and fugitive). This rule contains a Federal mandate that may result in expenditures of \$100 million for the private sector in any one year. As described below, we have determined that the expenditures for State, local, and Tribal governments, in the aggregate, will be approximately \$14.1 million per year, based on average costs over the first three years of the rule. Accordingly, EPA has prepared under section 202 of the UMRA a written statement which is summarized below.

Consistent with the intergovernmental consultation provisions of section 204 of the UMRA, EPA initiated an

outreach effort with the governmental entities affected by this rule including State, local, and Tribal officials. EPA maintained an "open door" policy for stakeholders to provide input on key issues and to help inform EPA's understanding of issues, including impacts to State, local and Tribal governments. The outreach audience included State environmental protection agencies, regional and Tribal air pollution control agencies, and other State and local government organizations. EPA contacted several States and State and regional organizations already involved in greenhouse gas emissions reporting. EPA also conducted several conference calls with Tribal organizations. For example, EPA staff provided information to tribes through conference calls with multiple Tribal working groups and organizations at EPA and through individual calls with two Tribal board members of TRI. In addition, EPA held meeting and conference calls with groups such as TRI, NACAA, ECOS, and with State members of RGGI, the Midwestern GHG Reduction Accord, and WCI. See the "Summary of EPA Outreach Activities for Developing the Greenhouse Gas Reporting Rule," in Docket No. EPA-HQ-OAR-2008-0508-055 for a complete list of organizations and groups that EPA contacted.

Consistent with section 205 of the UMRA, EPA has identified and considered a reasonable number of regulatory alternatives. EPA carefully examined regulatory alternatives, and selected the lowest cost/least burdensome alternative that EPA deems adequate to address Congressional concerns and to provide a consistent, comprehensive source of information about emissions of GHGs. EPA has considered the costs and benefits of the proposed GHG reporting rule, and has concluded that the costs will fall mainly on the private sector (approximately \$131 million), with some costs incurred by State, local, and Tribal governments that must report their emissions (less than \$12.4 million) that own and operate stationary combustion units, landfills, or natural gas local distribution companies (LDCs). EPA estimates that an additional 1,979 facilities owned by state, local, or tribal governments will incur approximately \$1.7 million in costs during the first year of the rule to make a reporting determination and subsequently determine that their emissions are below the threshold and thus, they are not required to report their emissions. Furthermore, we think it is unlikely that State, local and Tribal governments would begin operating large industrial facilities, similar

to those affected by this rulemaking operated by the private sector.

Initially, EPA estimates that costs of complying with the proposed rule will be widely dispersed throughout many sectors of the economy. Although EPA acknowledges that over time changes in the patterns of economic activity may mean that GHG generation and thus reporting costs will change, data are inadequate for projecting these changes. Thus, EPA assumes that costs averaged over the first three years of the program are typical of ongoing costs of compliance. EPA estimates that future compliance costs will total approximately \$145 million per year. EPA examined the distribution of these costs between private owners and State, local, and Tribal governments owning GHG emitters. In addition, EPA examined, within the private sector, the impacts on various industries. In general, estimated cost per entity represents less than 0.1% of company sales in affected industries. These costs are broadly distributed to a variety of economic sectors and represent approximately 0.001 percent of 2007 Gross Domestic Product; overall, EPA does not believe the proposed rule will have a significant macroeconomic impact on the national economy. Therefore, this rule is not subject to the requirements of section 203 of UMRA because

it contains no regulatory requirements that might significantly or uniquely affect small governments.

EPA does not anticipate that substantial numbers of either public or private sector entities will incur significant economic impacts as a result of this proposed rulemaking. EPA further expects that benefits of the proposed rule will include more and better information for EPA and the private sector about emissions of GHGs. This improved information would enhance EPA's ability to develop sound future climate policies, and may encourage GHG emitters to develop voluntary plans to reduce their emissions.

This regulation applies directly to facilities that supply fuel or chemicals that when used emit greenhouse gases, and to facilities that directly emit greenhouse gases. It does not apply to governmental entities unless the government entity owns a facility that directly emits greenhouse gases above threshold levels such as a landfill or large stationary combustion source. In addition, this rule does not impose any implementation responsibilities on State, local or Tribal governments and it is not expected to increase the cost of existing regulatory programs managed by those governments. Thus, the impact on governments affected by the rule is expected to be minimal.



E. Executive Order 13132: Federalism

EO 13132, entitled "Federalism" (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure "meaningful and timely input by State and local officials in the development of regulatory policies that have Federalism implications." "Policies that have Federalism implications" is defined in the EO to include regulations that have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government."

This proposed rule does not have Federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in EO 13132. However, for a more detailed discussion about how this proposal relates to existing State programs, please see Section II of this preamble.

This regulation applies directly to facilities that supply fuel or chemicals that when used emit greenhouse gases or facilities that directly emit greenhouses gases. It does not apply to governmental entities unless the

government entity owns a facility that directly emits greenhouse gases above threshold levels such as a landfill or large stationary combustion source, so relatively few government facilities would be affected. This regulation also does not limit the power of States or localities to collect GHG data and/or regulate GHG emissions. Thus, EO 13132 does not apply to this rule.

In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comments on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This proposed rule is not expected to have Tribal implications, as specified in EO 13175 (65 FR 67249, November 9, 2000). This regulation applies directly to facilities that supply fuel or chemicals that when used emit greenhouse gases or facilities that directly emit greenhouses gases. Facilities expected to be affected by the proposed rule are not expected to be owned by Tribal governments. Thus, Executive Order 13175 does not apply to this proposed rule.

Although EO 13175 does not apply to this proposed rule, EPA sought opportunities to provide information to Tribal governments and representatives during development of the rule. In consultation with EPA's American Indian Environment Office, EPA outreach plan included tribes. EPA conducted several conference calls with Tribal organizations. For example, EPA staff provided information to tribes through conference calls with multiple Indian working groups and organizations at EPA that interact with tribes and through individual calls with two Tribal board members of TCR. In addition, EPA prepared a short article on the GHG reporting rule that appeared on the front page a Tribal newsletter—Tribal Air News—that was distributed to EPA/OAQPS's network of Tribal organizations. EPA gave a presentation on various climate efforts, including the mandatory reporting rule, at the National Tribal Conference on Environmental Management on June 24-26, 2008. In addition, EPA had copies of a short information sheet distributed at a meeting of the National Tribal Caucus. See the "Summary of EPA Outreach Activities for Developing the GHG reporting rule," in Docket No. EPA-HQ-OAR-2008-0508-055 for a complete list of Tribal contacts.

EPA specifically solicits additional comment on this proposed rule from Tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 F.R. 19885, April 23, 1997) as applying only to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the EO has the potential to influence the regulation. This action is not subject to EO 13045 because it does not establish an environmental standard intended to mitigate health or safety risks.

H. Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use

This proposed rule is not a "significant energy action" as defined in EO 13211 (66 FR 28355, May 22, 2001) because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Further, we have concluded that this rule is not likely to have any adverse energy effects. This proposal relates to monitoring, reporting and recordkeeping at facilities that supply fuel or chemicals that when used emit greenhouse gases or facilities that directly emit greenhouse gases and does not impact energy supply, distribution or use. Therefore, we conclude that this rule is not likely to have any adverse effects on energy supply, distribution, or use.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law No. 104-113 (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking involves technical standards. EPA proposes to use more than 40 voluntary consensus standards from six different voluntary consensus standards bodies: ASTM, ASME, ISO, Gas Processors Association, American Gas Association, and American Petroleum Institute. These voluntary consensus standards will help facilities monitor, report, and keep records of greenhouse gas emissions. No new test methods were developed for this proposed rule. Instead, from existing rules for source categories and voluntary greenhouse gas programs, EPA identified existing means of monitoring, reporting, and keeping records of greenhouse gas emissions. The existing

methods (voluntary consensus standards) include a broad range of measurement techniques, including many for combustion sources such as methods to analyze fuel and measure its heating value; methods to measure gas or liquid flow; and methods to gauge and measure petroleum and petroleum products. The test methods are incorporated by reference into the proposed rule and are available as specified in proposed 40 CFR 98.7.

By incorporating voluntary consensus standards into this proposed rule, EPA is both meeting the requirements of the NTTAA and presenting multiple options and flexibility for measuring greenhouse gas emissions.

EPA welcomes comments on this aspect of the proposed rulemaking and, specifically, invites the public to identify potentially-applicable voluntary consensus standards and to explain why such standards should be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 12898 (59 FR 7629, February 16, 1994) establishes Federal executive policy on environmental justice. Its main provision directs Federal agencies, to the greatest extent practicable and permitted by law, to make

environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the U.S.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it does not affect the level of protection provided to human health or the environment. This proposed rule does not affect the level of protection provided to human health or the environment because it is a rule addressing information collection and reporting procedures.

**List of Subjects**

**40 CFR Part 86**

Environmental protection, Administrative practice and procedure, Air pollution control, Reporting and recordkeeping requirements, Motor vehicle pollution.

**40 CFR Part 87**

Environmental protection, Air pollution control, Aircraft, Incorporation by reference.

**40 CFR Part 89**

Environmental protection, Administrative practice and procedure, Confidential business information, Imports,

Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements, Research, Vessels, Warranty.

**40 CFR Part 90**

Environmental protection, Administrative practice and procedure, Confidential business information, Imports, Labeling, Reporting and recordkeeping requirements, Research, Warranty.

**40 CFR Part 94**

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by reference, Labeling, Penalties, Vessels, Reporting and recordkeeping requirements, Warranties.

**40 CFR Part 98**

Environmental protection, Administrative practice and procedure, Greenhouse gases, Incorporation by reference, Suppliers, Reporting and recordkeeping requirements.

**40 CFR Part 600**

Administrative practice and procedure, Electric power, Fuel economy, Incorporation by reference, Labeling, Reporting and recordkeeping requirements.

**40 CFR Part 1033**

Environmental protection, Administrative practice and procedure, Confidential business information, Incorporation



by reference, Labeling, Penalties, Railroads, Reporting and recordkeeping requirements.

**40 CFR Part 1039**

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by reference, Labeling, Penalties, Reporting and recordkeeping requirements, Warranties.

**40 CFR Part 1042**

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by reference, Labeling, Penalties, Vessels, Reporting and recordkeeping requirements, Warranties.

**40 CFR Parts 1045, 1048, 1051, and 1054**

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by reference, Labeling, Penalties, Reporting and recordkeeping requirements, Warranties.

**Mandatory Reporting of Greenhouse Gases**

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**40 CFR Part 1065**

Environmental protection, Administrative practice and procedure, Incorporation by reference, Reporting and recordkeeping requirements, Research.

Date: \_\_\_\_\_

\_\_\_\_\_  
Lisa P. Jackson,  
Administrator.