Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act:

EPA's Response to Public Comments

Volume 10: The Cause or Contribute Finding

The Cause or Contribute Finding

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FOREWORD

This document provides responses to public comments on the U.S. Environmental Protection Agency's (EPA's) Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, published at 74 FR 18886 (April 24, 2009). EPA received comments on these Proposed Findings via mail, e-mail, and facsimile, and at two public hearings held in Arlington, Virginia, and Seattle, Washington, in May 2009. Copies of all comment letters submitted and transcripts of the public hearings are available at the EPA Docket Center Public Reading Room, or electronically through http://www.regulations.gov by searching Docket ID *EPA-HQ-OAR-2009-0171*.

This document accompanies the Administrator's final Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act (Findings) and the Technical Support Document (TSD), which contains the underlying science and greenhouse gas emissions data.

EPA prepared this document in multiple volumes, with each volume focusing on a different broad category of comments on the Proposed Findings. This volume of the document provides responses to public comments regarding the cause or contribute finding.

In light of the very large number of comments received and the significant overlap between many comments, this document does not respond to each comment individually. Rather, EPA summarized and provided a single response to each significant argument, assertion, and question contained within the totality of comments. Within each comment summary, EPA provides in parentheses one or more lists of Docket ID numbers for commenters who raised particular issues; however, these lists are not meant to be exhaustive and EPA does not individually identify each and every commenter who made a certain point in all instances, particularly in cases where multiple commenters expressed essentially identical arguments.

Several commenters provided additional scientific literature to support their arguments. EPA's general approach for taking such literature into consideration is described in Volume 1, Section 1.1, of this Response to Comments document. As with the comments, there was overlap in the literature received. EPA identified the relevant literature related to the significant comments, and responded to the significant issues raised in the literature. EPA does not individually identify each and every piece of literature (submitted or incorporated by reference) that made a certain point in all instances.

Throughout this document, we provide a list of references at the end of each volume for additional literature cited by EPA in our responses; however, we do not repeat the full citations of literature cited in the TSD.

EPA's responses to comments are generally provided immediately following each comment summary. In some cases, EPA has discussed responses to specific comments or groups of similar comments in the Findings. In such cases, EPA references the Findings rather than repeating those responses in this document.

Comments were assigned to specific volumes of this Response to Comments document based on an assessment of the principal subject of the comment; however, some comments inevitably overlap multiple subject areas. For this reason, EPA encourages the public to read the other volumes of this document relevant to their interests.

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Acronyms and Abbreviations

CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CAIT	Climate Analysis Indicators Tool
CCSP	U.S. Climate Change Science Program
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
GHG	greenhouse gases
GWP	global warming potential
HFC	hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
LULUCF	land use, land-use change, and forestry
N_2O	nitrous oxide
ODS	ozone-depleting substance
PFC	perfluorocarbon
PM	particulate matter
PSD	Prevention of Significant Deterioration
SF_6	sulfur hexafluoride
Tg	teragram
TSD	Technical Support Document
UNFCCC	United Nations Framework Convention on Climate Change
USGCRP	U.S. Global Change Research Program
VOC	volatile organic compound

10.0 The Cause or Contribute Finding

10.1 Definition of "Air Pollutant"

Comment (10-1):
Some commenters (e.g., 3435.1, 3449.1, 4173, 10922) state that Section 202(a) of the Clean Air Act (CAA) addressed an "air pollutant" in the singular, and therefore each greenhouse gas (GHG) should be addressed individually (both in the Findings and in the science).

Response (10-1):
EPA addresses why the six long-lived and well-mixed GHGs as a group are included in both the definition of "air pollution" and the definition of "air pollutant" in the Findings. See Section V of the Findings for a discussion of the Administrator's rationale for including all six GHGs in the definition of air pollutant. The statutory language demonstrates that EPA has ample discretion to combine air pollution agents with shared attributes when defining an air pollutant.

Section 202 (a) (1) of the CAA states that:

> The Administrator shall by regulation prescribe (and from time to time revise) standards applicable to the emission of any **air pollutant** from any class or classes of new motor vehicles or new motor vehicle engines, which in [her] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.

(Emphasis added). Thus, the first step in analyzing whether emissions of any air pollutant from new motor vehicles cause or contribute to air pollution which endangers is to define the term "air pollutant." Section 302(g) states that as used in the CAA,

> [t]he term "air pollutant" means any air pollution agent **or combination of such agents**, including any physical, chemical, biological, radioactive (including source material, special nuclear material, and byproduct material) substance or matter which is emitted into or otherwise enters the ambient air. Such term includes any precursors to the formation of any air pollutant, to the extent the Administrator has identified such precursor or precursors for the particular purpose for which the term "air pollutant" is used.

(Emphasis added). This language clearly contemplates that EPA may combine two or more *air pollution agents* into one air pollutant. Once one thinks of GHGs as *air pollution agents,* rather than air pollutants themselves, the concept of combining several for purposes of defining a single air pollutant under Section 302(g) becomes clearer.

The language of CAA Section 302(g) is quite broad, providing EPA ample discretion to determine what combination of air pollution agents are a reasonable definition of air pollutant. As the Supreme Court noted in *Massachusetts v. EPA,* 549 U.S. 497 (2007), this is a "sweeping" and "capacious" definition, and GHGs are "unquestionably 'agents' of air pollution." 549 U.S. at 528, 532, 529 n.26. Although the Court did not interpret the term "combination of" air pollution agents, there is no reason this phrase would be interpreted any less broadly than the definition as a whole. Congress used the term "any," which is typically given an expansive meaning, and did not qualify the kind of combinations that the agency could define as a single air pollutant.

Because Congress provided EPA broad discretion to determine an appropriate combination of air pollutant agents that should be treated as a single air pollutant, we then turn to the reasons for combining

the GHGs in the definition of air pollutant. As noted in the Findings, the important common attributes are (as described more fully in the Findings):

> They are all directly emitted (not formed by secondary processes in the atmosphere)
> They are all sufficiently long-lived in the atmosphere after they are emitted that they become "well-mixed," which means that their concentration is essentially uniform in the atmosphere (as opposed to having significant local/regional variation)
> They have well understood atmospheric properties (e.g., radiative forcing)
> Grouping them is consistent with the focus of climate science—their effects are considered as a group in the Intergovernmental Panel on Climate Change (IPCC) reports (i.e., the IPCC reports assess the climate change effects on health, society, and the environment as a result of human-induced climate change driven by the group of GHGs)
> Grouping them is consistent with the focus of climate policy—the United Nations Framework Convention on Climate Change (UNFCCC) requires reporting of these six gases; the commitments under the UNFCCC and Kyoto Protocol are based on the combined emissions of these six gases
> It is standard practice to compute the "carbon dioxide (CO_2) equivalency" of aggregate emissions using global warming potentials (GWPs)

All of these common attributes are relevant to the air pollution for which GHGs are agents—in other words, they are all related to increased atmospheric concentrations of the mix of six GHGs and climate change science and policy. Thus, they are a reasonable basis upon which to decide that it is appropriate to define the air pollutant as the combination of these six GHGs that share these attributes. Importantly, it is the commonality of these attributes that provides the reasonable basis for grouping several air pollution agents together, not whether they are all emitted from any given source category that may be before the Agency.[1]

Indeed, HFCs are already widely considered to be a "single" GHG, despite being a group of a large number of substances with a shared chemical attribute. The same is true for perfluorocarbons (PFCs). Yet those advocating a definition of "air pollutant" that is composed of either each GHG individually, or the group of four GHGs emitted by motor vehicles (see below), do not advocate inclusion of only those hydrofluorocarbons (HFCs) emitted by motor vehicles. Thus, even these alternative approaches recognize the reasonableness of grouping like substances into a single air pollutant, even if not all members of that group are emitted by the source category before the Agency.

EPA has exercised that discretion here by defining the air pollutant for purposes of this Section 202(a) determination as the specified group of well-mixed GHGs. The reasons for this are provided in the Findings and discussed above, and demonstrate the reasonableness of this definition.

Comment (10-2):

A number of commenters (e.g., 3217.1, 3327.1, 3347.1, 3388, 3473.1, 3498.1, 3559.1, 3568.1, 3605.1, 3628.1, 3747.1, 4173) question the inclusion of sulfur hexafluoride (SF_6) and PFCs in an endangerment finding arising from Section 202(a) as they are not emitted from motor vehicles. Numerous commenters (e.g., 3347.1, 3605.1, 3628.1, 3747.1, 4173) question EPA's definition of "air pollutant" and its relationship to the definition of "air pollution" (i.e., question why air pollution is much broader in scope

[1] We note that there are potential flexibilities presented by a definition that recognizes the shared attributes of the six GHGs and groups them as a single air pollutant. See, e.g., Proposed Prevention of Significant Deterioration and Title V GHG Tailoring Rule, 74 FR 55292, 55327-29 (Oct. 27, 2009).

and the result of multiple sources beyond Section 202[a] sources), as well as the relevance of the fact that motor vehicles do not emit two of the six GHGs in both definitions. They argue that by improperly defining "air pollutant" to include PFCs and SF_6—substances that are not present in motor vehicle emissions—the Agency has exceeded its statutory authority under CAA Section 202(a). One commenter (4173) states that "treating the gases as a group leads to the irrational regulatory conclusion that emissions of PFCs, SF6 and HFCs from onroad vehicles 'cause or contribute to' a danger to the public health or welfare." Commenters (e.g., 3347.1, 3605.1, 3747.1) contend that past endangerment findings under Section 202(a) demonstrate EPA's consistent approach of defining "air pollutant(s)" in accordance with the Act's clear direction, to include only those emitted from the relevant source category (citing Notice of Proposed Rulemaking for Heavy-Duty Engine and Vehicle Standards finding that "emissions of NO_x, VOCs, SO_x, and PM from heavy-duty trucks can reasonably be anticipated to endanger the public health or welfare" (U.S. EPA, 2006: 65 Fed. Reg. 35436, June 2, 2000). Commenters (e.g., 3498.1, 4173) argue that EPA itself is inconsistent in the Proposal, sometimes referring to "air pollutant" as the group of six GHGs, and other times falling back on four GHGs emitted by motor vehicles. Some commenters (e.g., 0914, 1924) question the decision to include SF_6 or PFCs in the endangerment decision while excluding water vapor.

Response (10-2):

EPA addresses why the six long-lived and well-mixed GHGs, including PFCs and SF_6, are included in both the definition of "air pollution" and the definition of "air pollutant" in the Findings. See Section V of the Findings for a discussion of the Administrator's rationale for including all six GHGs in the definition of air pollutant. We elaborate further below. Note that, compared to the Proposed Findings, the Final Findings now refer to "well-mixed GHGs" when referring to the group air pollutant to consistently mean the group of all six well-mixed GHGs.

As stated in the Findings, all six GHGs share a set of common attributes. We disagree with the commenters who claim that the definition of air pollutant must strictly depend on the specific compounds emitted by a source category, which in this case are on-road vehicles covered by Section 202(a) of the CAA. It is not necessarily the source category being evaluated that determines, by itself, the reasonableness of defining a group air pollutant. As discussed above, the statutory language demonstrates that EPA has ample discretion to combine air pollution agents with shared attributes when defining an air pollutant. Using the broad discretion provided by the definition of "air pollutant" to define the air pollutant in this way, without limiting it to just the individual gases emitted by the specific source category, makes sense because it gives effect to the shared attributes (discussed above and in the Findings) and how they are relevant to the air pollution to which they contribute. An approach that combines *some* air pollution agents with shared attributes together, but not others simply because the particular source category before EPA may not emit those other agents, essentially ignores or devalues the reasons that make combining the air pollution agents together reasonable. The fact that these six air pollution agents share these common, relevant attributes is true regardless of the source category being evaluated for contribution. Grouping these six substances as one air pollutant is reasonable regardless of whether a contribution analysis is undertaken for CAA Section 202(a) sources that emit one subset of the six substances (e.g., CO_2, methane [CH_4], nitrous oxide [N_2O], and HFCs, but not PFCs and SF_6), or for another category of sources that may emit another subset. For example, electronics manufacturers that may emit N_2O, PFCs, HFCs, SF_6, and other fluorinated compounds, but not CO_2 or CH_4 unless there is on-site fuel combustion; power plants emit CO_2, CH_4, and N_2O, but not HFCs.

Defining the group air pollutant in this manner is also consistent with the requirement in Section 202(a) that we determine whether "emissions of the air pollutant" contributes to the air pollution that endangers. The emissions of the single air pollutant are reasonably and readily considered to be the combination of emissions of the individual gases that make up the combination air pollutant. As with other air pollutants that are composed of one or more air pollution agents (e.g., particulate matter [PM]), EPA sums the

emissions of whichever of the GHG air pollution agents motor vehicles emit to determine the total emissions of the GHG air pollutant.

That emissions of well-mixed GHGs from the transportation sources covered under Section 202(a) of the Act contribute to the total GHG air pollution does not imply that SF_6 is emitted from those sources, any more than a statement that volatile organic compounds (VOCs) emitted from a given source contribute to ozone air pollution would imply that every single possible VOC is emitted from that source. Likewise, saying that motor vehicles emit HFCs does not imply they emit every chemical compound that is included in the group of compounds recognized as HFCs. Motor vehicles commonly emit only certain HFCs, those that are used as refrigerants in motor vehicles. The statement on contribution implies no more than what EPA did—EPA determined the contribution of the emissions of the well-mixed GHGs from new motor vehicles by determining the contribution of the actual emissions of the members of well-mixed GHG air pollutant class emitted by those vehicles. Any possible confusion on what this means is removed by the discussion in the Findings and this Response to Comments document.

Commenters mischaracterize the decision on contribution in the Heavy Duty Engine and Vehicle Standards rulemaking. EPA considered the emissions of those air pollutants, commonly recognized groups of pollutants, but did not discuss the question of whether it was required to limit its consideration to only those compounds emitted by this category of vehicles and engines. Implicitly EPA rejected any such approach, as EPA did not determine, and did not need to determine, whether these vehicles and engines emitted every one of the chemical compounds included in the large groupings of chemicals covered, for example, by VOCs and PM. EPA also did not consider whether all of the various oxides of nitrogen were in fact emitted by these vehicles and engines. Thus this past practice, as well as other similar examples, shows that EPA has routinely evaluated emissions of a group air pollutant from a source category by considering those emissions from the source category within the group, without considering whether the group does or does not include any compounds that are not emitted by the source category. EPA has followed the same approach in this case.

The well-mixed GHGs clearly share the key common attribute for climate change discussed above. The GWP calculation for each GHG gas is analogous to the stratospheric ozone depletion calculation for the many different Montreal Protocol ozone-depleting substances, or the tropospheric ozone production efficiency for VOCs. In each case, the various different substances can be compared based on their contribution to a common kind of air pollution problem. For these and the other reasons discussed in the Findings, it is reasonable to include the six GHGs within a single group for the definition of "air pollutant."

The reasoning for the inclusion of the fluorinated gases while excluding water vapor is discussed in Volume 9, "Other Substances," of the Response to Comments document and in Section IV.A.6 of the Findings, regarding the definition of air pollution. The same arguments apply for excluding water vapor from the definition of air pollutant.

Comment (10-3):

Several commenters (e.g., 2977.1, 3579, 3579.1) argue that GHGs are not "air pollutants" under the CAA. In particular, at least one commenter (3579.1) contends that EPA must show how GHGs impact or materially change "ambient air" when defining air pollutant and making the endangerment finding. This commenter argues that because CO_2 is a naturally occurring and necessary element in the atmosphere, it cannot be considered to materially change air.

Response (10-3):

These arguments have already been rejected by the Supreme Court, and are specifically addressed in Section V of the Findings.

Comment (10-4):
Several commenters (e.g., 3435.1, 3704.2, 3702.1) disagree with EPA's proposed definition of a single air pollutant composed of the six GHGs as a class. They argue that the analogy to VOCs is misplaced because VOCs are all part of a defined group of chemicals, for which there are established quantification procedures, and for which there were extensive data showing that the group of compounds had demonstrated and quantifiable effects on ambient air and human health and welfare, and for which verifiable dispersion models existed. They contend this is in stark contrast to the entirely diverse set of organic and inorganic compounds EPA has lumped together for purposes of the Proposed Findings, and for which no model can accurately predict or quantify the actual impact or improvement resulting from controlling the compounds. Moreover, they argue that the gases EPA is proposing to list together as one pollutant are all generated by different processes and, if regulated, would require different types of controls; the four gases emitted by mobile sources can generally be limited only by using controls that are specific to each.

Other commenters (e.g., 4173) argue that while the definition of "air pollutant" is flexible enough to allow certain mixtures of polluting "agents" to be considered together, it expressly references the term "air pollutant" in the singular and does not suggest that an agent that already has been designated as individual pollutant may be captured and possibly counted a second time as part of a broadly defined group of unrelated agents comprising a single "pollutant." Rather, they continue, common sense suggests that Congress could not have intended for EPA to adopt the "kitchen sink" interpretation of "pollutant" it has proposed, because the six GHGs are discrete, unrelated agents that are generated by a variety of disparate sources and activities.

Response (10-4):
The rationale for including the six long-lived and well-mixed GHGs in both the definition of "air pollution" and "air pollutant" is provided in the Findings, Sections IV.A and V, respectively; some additional arguments are provided here. EPA disagrees with these arguments against the definition of GHGs as a class of air pollutant. The six GHGs share common physical attributes that are central to the climate change problem (e.g., relative atmospheric lifetimes and heat-trapping capability), so it is inaccurate to state that these gases are unrelated. For example, the common physical attributes of these six gases have enabled the quantification and common use of global warming potentials (GWPs) to allow for estimates of CO_2 *equivalent* units among these six gases. This has been the common practice for the past 15 years or so, as employed by EPA and the entire climate change research and policy community. Furthermore, EPA disagrees that there are no quantification procedures for the six GHGs. The Inventory of U.S. Greenhouse Gases and Sinks published annually by EPA, for example, demonstrates the use of emission estimation methods consistent with IPCC's National Guidelines for Greenhouse Gas Inventories (Eggelston, 2006). These gases are represented in climate models with known heat-trapping properties and atmospheric lifetimes, such that the climate effect of these gases can be assessed over time.

EPA also disagrees with the argument that because the six GHGs are emitted from a variety of sources or may require a variety of different controls, that this is a reason not to group the six GHGs together. As explained in the Findings, it is not necessarily the source category being evaluated that determines the reasonableness of defining a group air pollutant. In this case the most important aspect of the compounds is the shared attributes of the group. In other words, it is more important what the climate "sees," as these GHGs will essentially have the same effect on the climate regardless of the type (or location) of the source.

This approach is indeed analogous to how VOCs are a defined group of chemicals; although VOCs include a variety of chemicals that share the common attribute of photochemical reactivity, these chemicals also have attributes that differ, are produced by a large number of different sources, and may be controlled with a variety of different control technology and work practices. VOCs are considered as a class in a definition of "air pollutant," and yet not all VOCs are regulated each time a VOC standard is promulgated. Therefore, we do not find that the definition of GHGs as an air pollutant is in anyway inconsistent with precedents already set under the Act.

It is not clear which of the six GHGs that combined are the definition of air pollutant in the Findings the commenter above believes is already an individual air pollutant, which they argue precludes it being part of the well-mixed GHG air pollutant. Nonetheless, as discussed above, EPA has broad authority to define "air pollutant" and determine what grouping of air pollution agents is reasonable. The statutory language does not prohibit EPA from grouping an air pollution agent in more than one definition of air pollutant, as long as the reason for including that air pollution agent in both definitions is reasonable.

Comment (10-5):

Some commenters (e.g., 4004.1, 4036.5) agree with EPA's definition of "air pollutant," stating that EPA has used a similar approach to other pollutants, including VOCs and PM, which have health effects that are both similar to others in their classification and different. At least one commenter (e.g., 2889.1) states that EPA appropriately proposed to treat GHGs as a single air pollutant, based on appropriate GWP weighting.

They also agree that EPA should use AR4 GWPs, adjusted over time as the science evolves, to weigh the various GHGs. Nonetheless, these commenters also suggest that EPA should carefully balance the advantages of promulgating a single CO_2e-weighted GHG air pollutant with the possible needs to regulate individual GHG classes separately, based on the differing nature, emission sources, and markets for each GHG class. After summarizing EPA's 1996 proposed rule regarding an ozone-depleting substance (ODS) significance level in the Prevention of Significant Deterioration (PSD) program, the commenter noted many strong policy reasons to adopt an aggregation approach with respect to individual classes of GHGs, such as HFCs not specially created for societal use: 1) it is far easier from an administrative standpoint to regulate and track emissions of a class of compounds rather than basing determinations on their GWP; 2) the pollutants should be aggregated based upon their environmental impact, and not their use by sources; 3) aggregating GHGs within classes allows users maximum flexibility, and allows the PSD program to be as transparent as possible.

Response (10-5):

We agree with the commenters that the concept of aggregating the six GHGs has a clear precedent in EPA's approach to other pollutants. The use of GWPs for comparing emissions of gases in terms of CO_2 equivalents is consistent with UNFCCC, IPCC, U.S. Climate Change Science Program (CCSP), U.S. Global Change Research Program (USGCRP), and standard scientific practice. EPA clarifies, however, that the definition of air pollutant does not itself include the concept of CO_2 equivalency. The air pollutant is the group of these six gases. The fact that a CO_2 equivalency metric exists demonstrates the common attributes of these six gases with respect to climate change. CO_2 equivalency is considered when determining whether the emissions from new motor vehicles of the gases that make up this air pollutant contribute to the air pollution. The use of CO_2 equivalency is brought in to help evaluate whether the emissions of the air pollutant meet the contribution criteria of Section 202(a). However, the definition of air pollutant does not itself include a term of CO_2 equivalency. Whether to use CO_2 equivalency to characterize the emissions of the air pollutant is best considered as an issue to address in the kind of decision-making or other action that is being taken with respect to the emissions of the air pollutant.

10.2 Assessment of Contribution

Comment (10-6):
Several commenters (e.g., 3325.1, 3252.1, 33941.1) note that although EPA looks at emissions from all motor vehicles regulated under Section 202(a) in its contribution analysis, the May Presidential announcement (Office of the Press Secretary, 2009) indicated that EPA was planning to regulate only a subset of 202(a) sources. Thus, they question whether the correct contribution analysis should look only at the emissions from that subset and not all of 202(a) sources.

Response (10-6):
This comment is addressed in Section V.C of the Findings.

Comment (10-7):
Commenters (e.g., 3252.1, 3286.1, 3320.1, 3379.1, 3482.1, 3705.1) argue that because emission standards will not eliminate all GHG emissions from motor vehicles, the comparison should compare the amount of GHG emissions *reduced* by those standards to the global GHG emissions. They also contend that the cost of the new standards will cause individual consumers, businesses, and other vehicle purchasers to hold on to their existing vehicles to a greater extent, thereby decreasing the amount of emissions reductions attributable to the standard and appropriately considered in the contribution analysis. At least one commenter (e.g., 2892.1) goes further and contends that EPA can only include that incremental reduction that the EPA regulations will achieve beyond any reductions resulting from Corporate Average Fuel Economy (CAFE) standards that the National Highway Traffic Safety Administration will set.

Response (10-7):
See Section V.C of the Findings on why the Administrator reasonably looks at current emissions of Section 202(a) source categories for the contribution analysis. As discussed in the Findings, there is no basis in the statutory language for the argument that when evaluating contribution, the Administrator must look not at current emissions from Section 202(a) source categories, but the reduction of those emissions that will occur from the standards that follow such a contribution finding and then only the incremental reduction that occurs beyond those projected to result from any CAFE standards.

Comment (10-8):
Many commenters (e.g., 3325.1, 3394.1, 4037.1) argue that EPA cannot compare emissions from the current fleet of 202(a) motor vehicles for the contribution analysis. Rather, they contend that EPA must compare emissions from the subset of 202(a) vehicles subject to any attendant GHG regulations—that is, only "new" motor vehicles, which they continue is by definition a smaller number than from the entire existing 202 inventory. More specifically, one commenter (3347.1) estimates that there are over 600 million passenger cars on the roads today worldwide, that about 50 million are new motor vehicles, and around 11 million new motor vehicles are manufactured in the U.S. annually. This commenter continues that new motor vehicles manufactured in the U.S. make up around 1.8% of the global motor vehicle sectors, and that emissions from new motor vehicles are most likely lower per vehicle than the existing fleet due to fuel economy improvements. Thus, some commenters conclude the source category of new motor vehicles in the U.S. represent a minimal contribution to the global stock of GHG emissions, and do not justify regulation under Section 202(a).

At least one commenter (3553.1) appears to believe that EPA is considering the total GHG contribution from the entire transportation sector, citing the Proposed Findings. This comment appears to be similar to that above, arguing that EPA is asserting it has no choice but to regulate new car emissions under the Clean Air Act because it cannot regulate old car emissions.

Response (10-8):
These comments are addressed in Section V.C.2.c of the Findings. Note that, as explained in the Findings, the Administrator considered the emissions from Section 202(a) source categories, not from all transportation sources.

Comment (10-9):
Several commenters (e.g., 2889.1, 3436.1, and 4036.5) agree with EPA's contribution analysis, and its proposed findings that emissions of the single air pollutant from Section 202(a) sources contribute to the air pollution which endangers. They also agree with EPA's discussion that if the substances were looked at as individual air pollutants, the emissions from Section 202(a) sources would still contribute.

Response (10-9):
We agree with the commenters that the well-mixed GHG emissions from Section 202(a) source categories contribute to the air pollution which endangers.

Comment (10-10):
At least one commenter (3217.1) argues that the EPA significantly overstates the certainty of current climate science and knowledge. According to the commenter, these documents also fail to include pertinent information about GHG emissions and global warming. Specially, the commenter claims that the rate of growth of CO_2 emissions globally will swamp U.S. emissions and that the EPA does not provide context or a complete picture of the global emissions of CO_2 because it fails to describe how quickly emissions are increasing from the developing world. The commenter states that, according to data from the Global Carbon Project, from 2000 through 2007, China's carbon dioxide emissions increased 98%, India's increased 36%, the global total increased 26%, Russia's increased 10%, the U.S.'s increased 3%. The commenter argues that Figure 2.3 in the TSD should be accompanied with context for the rate of growth of GHG emissions from developing countries such as China. The commenter states that the EPA fails to note that if the U.S. reduced CO_2 emissions from the transportation sector to zero, the rest of the world would replace those emissions in less than 2 years at the current rate of growth. Furthermore, if the U.S. were to completely cease using fossil fuels, the increase from the rest of the world would, according to the commenter, replace U.S. carbon dioxide emissions in less than eight years.

Response (10-10):
EPA is aware of how the rate of GHG emissions growth varies from nation to nation, but EPA disagrees that these effects are either completely missing in EPA's analyses, and disagrees that some of the issues, if more explicitly accounted for, would alter the Findings. First, it is EPA's view that, for the contribution finding comparisons, the primary use of current (either data year 2007 or 2005) GHG emissions data is also a reasonable proxy for emissions over the last few years and for the near term. The fact that China, the United States, India, and Russia are now the world's major GHG emitters is not something that is expected to fundamentally change for the foreseeable future. Likewise, given the magnitude of Section 202(a) source category GHG emissions—currently one of the largest sources in the world—it is EPA's view that the finding that the group air pollutant contributes to air pollution would not change if EPA attempted to project future emissions, where Section 202(a) sources may then be a smaller percentage of the world's total emissions but nevertheless remain one of the world's largest sources.

Though it is true that emissions in developing countries are rising faster than those of the United States, the commenters fail to mention that, given the long atmospheric lifetimes of these well-mixed GHGs, historic emissions are also largely responsible for the current and near-term concentrations of GHGs in the atmosphere. For that reason, the United States' share of current atmospheric concentrations would be somewhat larger than the percentage of current U.S. emissions compared to current global emissions. The future emission projections underlying future projections of climate change do indeed take into account different scenarios of how different regions of the world are developing, and therefore how GHG emission growth rates will vary by region.

How emissions may be addressed and reduced from Section 202(a) sources is not part of the Administrator's cause or contribute test. Furthermore, the commenters put forth highly hypothetical scenarios, in that it would be very unrealistic for the United States to undertake such significant emission reduction action with zero implications for the rest of the world.

10.3 Level of Contribution

10.3.1 Single Air Pollutant Composed of the Well-Mixed Greenhouse Gases

Comment (10-11):
Some commenters (e.g., 3217.1, 3394.1, 3449.1) argue that EPA must provide some basis for determining de minimis amounts that fall below the threshold of "contributing" to the endangerment of public health and welfare under CAA Section 202(a). For example, commenters (e.g., 3285.1, 3449.1, 3722) note that water vapor represents the GHG with the greatest impact on global warming—all other GHGs represent only approximately 5% of all contribution to the climate change phenomenon (74 Fed. Reg. at 18897). They question whether this small percentage is de minimis since EPA is not including water vapor in the endangerment finding at this time. Commenters (e.g., 3449.1, 3702.1) also argue that EPA cannot act arbitrarily by determining that a constituent contributing less than 5% to endangerment in one instance is de minimis and another contributing the same percentage is endangering public health and welfare. They request that EPA revise preamble language to make clear that the regulated community can rely on its past determinations with respect to "contribution" determinations to predict future agency action and should promulgate guidance on how it determines whether a contribution exceeds a de minimis level for purposes of CAA Section 202(a) before finalizing the Proposal.

At least one commenter (3394.1) takes issue with EPA's statement it "need not determine at this time the circumstances in which emissions would be trivial or de minimis and would not warrant a finding of contribution." The commenter argues that by also stating that the emissions of methane would contribute, when methane emissions from Section 202(a) source categories were less than 0.01% of total global GHG emissions in 2005, EPA is implicitly determining that a share of total emissions of less than one one-hundredth of one percent is not "trivial or de minimis." This determination, they continue, is inconsistent with EPA's suggestion that it would apply a de minimis exception under Section 202(a)(1). More fundamentally, they argue, that determination reflects an incoherent and internally inconsistent approach by EPA in this proceeding to the question of what constitutes a statutorily cognizable "contribution."

Response (10-11):
We disagree with the assessment that water vapor accounts for the overwhelming share of the global warming or climate change problem, and thus to endangerment. The role of water vapor is discussed in Section 4(a) of the TSD, and in Volumes 2 and 9 of the Response to Comments document. The claimed "95% contribution" of water vapor is also irrelevant in that what constitutes the natural greenhouse effect is not at stake here; rather, it is the *change* or intensification of the natural greenhouse effect, and thus

heating effect, due to changes in GHGs that causes endangerment. Anthropogenic changes in GHG concentrations contribute the vast majority of positive radiative forcing in the recent past and in the projected future scenarios. As explained in Section IV.A.6 of the Findings, water vapor is excluded from the definition of air pollution precisely because direct human emissions of water vapor are not a significant driver of human-induced climate change.

The issue of determining a bright line or defining a de minimis threshold is discussed in Section V.C.2 of the Findings.

Comment (10-12):
At least one commenter (3347.1) argues that EPA overestimated the percent emissions from the 202 source category, noting that while EPA estimates it to be 4.3% of global GHG emissions, the IPCC data suggests the number is only 3.4%—EPA's estimate is 20% too high.

Response (10-12):
For global and national GHG emissions data, EPA uses the World Resource Institute's (WRI's) Climate Analysis Indicators Tool, or CAIT (WRI, 2009) and not the more aggregated emissions data bases used by the IPCC's Fourth Assessment Report. This is not meant to be a reflection on the quality of the IPCC's emission data. EPA elected to use CAIT for our analysis because it is the most up to date tool which contains gross emission estimates for all gases, all countries, and all sources (2005). Much of the analysis conducted in the Findings involves comparing emissions from the Section 202(a) source category against the emissions of other nations and the total amount of emissions from the global transportation sector. The IPCC's Fourth Assessment report distributes GHG emissions to regions of the globe, but not to specific countries as the CAIT tool does.

EPA's view is that CAIT is an appropriate tool to use for this analysis because it contains national level data submitted by Parties to the UNFCCC, and other independent and peer-reviewed data sets, such as those from the International Energy Agency. These emission inventories are derived from bottom-up methodologies that use data on specific emission-generating activities. The major difference between the aggregated global emission totals provided in CAIT and in the IPCC's Fourth Assessment Report is that the IPCC's Fourth Assessment report contains CO_2 emissions and CO_2 uptake from land-use change, whereas these emissions are not included in CAIT. It is EPA's view that determining the percentage of GHG emissions from Section 202(a) source categories without considering land-use change is an appropriate analysis for a number of reasons. First, "gross" emissions (i.e., without netting out any carbon uptake from terrestrial carbon sinks) from CAIT is more appropriate than "net" emissions (i.e., accounting for carbon uptake from terrestrial carbon sinks) from IPCC because the global top-down (i.e., derived from atmospheric measurements and not on-the-ground activities) data from the IPCC Fourth Assessment Report does not precisely identify anthropogenic versus natural land-use emissions by country. Second, including land-use changes means including removals (sinks) as well as emissions, which creates a like-to-like comparison problem because there are no such carbon sinks covered under Section 202(a) of the Act. Third, this approach of using gross emissions follows international convention under the UNFCCC, where member nations report their GHG emissions separately, both with and without land-use change; Parties to the UNFCCC want separate reporting of gross and net emissions because use of the net numbers only can obscure emission trends. If we were to use the U.S. domestic net emissions number (with land-use) as the denominator, then the actual share of U.S. emissions from Section 202(a) would go up dramatically because the U.S. land-use change and forestry sector is a big net sink, though all gross emission sectors would be affected equally, such that Section 202(a) sources would still rank as the second largest GHG-emitting sector behind electricity generation.

When the GHG emissions from land-use change are removed from the IPCC's Fourth Assessment Report's emissions total, the total global GHG emission estimates from CAIT and the IPCC are in good agreement (less than a 5% difference).

The commenter is correct that, had EPA used the IPCC Fourth Assessment Report in the Proposed Findings (which estimated that the total global emissions of the six well-mixed GHGs were 49,000 teragrams (Tg) of CO_2 equivalent in 2004), then Section 202(a) source category emissions (1,665 Tg of CO_2 equivalent for year 2006) would be 3.4% of the global total. However, considering these alternative numbers, the Administrator would still find that Section 202(a) emissions contribute to the air pollution that endangers, because this number would still represent one of the world's largest GHG sources.

Comment (10-13):
A commenter (3394.1) states that, because of its reliance on the annual U.S. inventory on GHGs for projections, the TSD does not account for land use change and forestry emission and sinks. The commenter objects to the fact that while the forestry sinks are included in the text, they are sometimes not included in the figures. Also, the commenter notes that if other nations do include land use, land-use change, and forestry (LULUCF) emissions, the U.S. emissions may appear larger in proportion than they really are.

Response (10-13):
First, the 2005 inventories for all nations reported in the TSD are produced using the same methodologies: none of these national emission estimates include LULUCF emissions, and it is therefore appropriate to compare U.S. emissions to global emissions in 2005 on this basis. Indeed, as stated in the caption for Figure 2.3, the data "[e]xcludes land use, land-use change and forestry, and international bunker fuels. More recent emission data are available for the United States and other individual countries, but 2000 is the most recent year for which data for all countries and all gases are available including emissions from LULUCF."

However, we do address recent U.S. LULUCF emissions in the text: "Removals of carbon through land use, land-use change and forestry activities are not included in Figure 2.2 but are significant; net sequestration is estimated to be 1062.6 $TgCO_2eq$ in 2007, offsetting 14.9% of total emissions (EPA, 2009b)." The caption for Figure 2.2 also reiterates the fact that LULUCF and international bunker fuel emissions are not included in the data shown. Therefore, the TSD is clear and consistent in its discussion of emissions and the inclusion or lack thereof of LULUCF emissions.

For comparison, using the CAIT (WRI, 2009) inventory for 2000 (the last year that land-use change and forestry emissions are available globally through this tool), U.S. emissions are 21.17% of the global total CO_2-equivalent emissions without LULUCF emissions, 15.41% including those emissions, and 15.35% including those emissions and emissions from international bunker fuels. Please also refer to the response immediately above regarding the use of the CAIT tool.

Comment (10-14):
Other commenters (e.g., 3394.1, 3597) disagree with EPA's proposed contribution findings, arguing that U.S. EPA's own analysis of light-duty vehicles in the ANPR (Light Vehicle Technical Support document Docket U.S. EPA-HQ-OAR-2008-0318-0084) determined that GHG emission standards for new vehicles and new vehicle motors would produce a reduction of, at most, approximately 0.01 degree Celsius in mean global temperature. They argue that this is a value that cannot be measured except by the most

sensitive satellites.

Commenters (e.g., 3394, 3449.1, and 3747.1) argue that the "cause or contribute" prong of the Proposal's endangerment analysis fails to satisfy the applicable legal standard, which requires more than a minimal contribution to the "air pollution reasonably anticipated to endanger public health or welfare." They contend that emissions representing approximately 4% of total global GHG emissions are a minimal contribution to global GHG concentrations. These commenters disagree with statements in the Proposal that the "unique, global aspects of the climate change problem tend to support a finding that lower levels of emissions should be considered to contribute to the air pollution than might otherwise be appropriate when considering contribution to a local or regional air pollution problem." They argue there is no basis in the Act or existing EPA policy for this position, and that it reveals an apparent effort to expand EPA's authority into the "truly trivial or de minimis" sources that are acknowledged to be outside the scope of regulation, in that it expands EPA's authority to regulate pollutants to address global effects.

Commenters (e.g., 3347.1, 3747.1) also assert that contrary to EPA's position, lower contribution numbers are appropriate when looking at local pollution, like nonattainment concerns—in other words, in the context of a statutory provision (such as Section 213) specifically aimed at targeting small source categories to help nonattainment areas meet air quality standards. However, they conclude this policy is simply inapplicable in the context of global climate change.

EPA received many comments (e.g., 3252.1, 3325.1, 3347.1, 3379.1, 3394.1, and 4037) on the appropriate comparison(s) for the contribution analysis. At least one commenter (3347.1) argues that in order to get around the "problem" of basing an endangerment finding upon a source category that contributes only 1.8% annually to global GHG emissions, EPA inappropriately also made comparisons to total U.S. GHG emissions. This commenter argues that a comparison of 202(a) source emissions to U.S. GHG emissions, versus global GHG emissions, is arbitrary for the purposes of the cause or contribute analysis, because it conflicts with the Administrator's definition of "air pollution," as well as the nature of global warming. They note that throughout the Proposal, the Administrator focuses on the global nature of GHGs. Thus, they continue, while percentage share of motor vehicle emissions at the U.S. level may be relevant for some purposes, it is irrelevant to a finding of whether these emissions contribute to air pollution, which the Administrator has proposed to define on a global rather than a domestic basis. Commenters (e.g., 3449.1) also accuse EPA of arbitrarily picking and choosing when it takes a global approach (e.g., endangerment finding) and when it does not (e.g., contribution findings).

Response (10-14):

We disagree that the temperature or emissions reductions resulting from GHG standards are the appropriate emissions to use for a "contribute" finding. The appropriate measure should be the emissions from the sector as a whole, regardless of the reductions resulting from any set of proposed standards. Section V.B of the Findings provides the Administrator's approach for making the cause or contribute finding, and Section V.C contains responses to key comments.

Comments addressing the emissions contribution from projected emissions of new motor vehicles are addressed in Section V.C.2.c of the Findings.

We disagree with the commenters that a 4% contribution to global GHG emissions is trivial. As stated in the Findings, this 4% figure as a result of Section 202(a) source emissions represents a larger contribution to global emissions than almost every single country in the world, with the exceptions of China, the U.S., Russia and India; this means the contribution from 202(a) sources alone is higher than countries as large as Japan, Brazil and Germany. As stated in Section V.B.1 of the Findings, no single GHG source category dominates on the global scale—in this context, a source category that contributes 4% of GHG emissions is quite significant. *See Massachusetts v. EPA*, 549 U.S. at 1457-58 ("Judged by any standard, U.S.

motor-vehicle emissions make a meaningful contribution to greenhouse gas concentrations and hence, . . . to global warming.").

Finally, we disagree with the comment that the cause or contribute finding is based inappropriately on a comparison of Section 202(a) source category emissions to total U.S. emissions. Section V.B of the Findings describes the Administrator's rationale for the cause or contribute finding, and explains why both the U.S. and international comparisons were considered, and why these comparisons, independently and together, support the cause or contribute finding.

10.3.2 Each GHG as an Individual Air Pollutant

Comment (10-15):
Commenter (3603.1) disagrees with the finding that methane as an individual air pollutant can be found to contribute because methane emissions from existing Section 202(a) sources represent only 0.03% of U.S. GHGs, and that number is overstated because the finding should refer to only new vehicles, not the entire existing fleet. Commenter states that this 0.03% is below the threshold noted in the proposal and in other proceedings such as interstate transport.

Response (10-15):
As explained in Section V of the Findings, the Administrator is not defining methane as an individual air pollutant under Section 202(a), thus EPA is not responding directly to the argument that the Administrator could not make a finding of contribution for methane as an individual air pollutant.

Note that methane is being included in both the definition of "air pollution" and the definition of "air pollutant" because it shares all of the same common attributes with the other five well-mixed GHGs. Importantly, methane is itself the second most important GHG directly emitted by human activities, in terms of its anthropogenic heating effect on the climate. This is why methane is consistently a standard part of climate change science analysis and policy discussions. Recognizing the important role that methane plays in climate change, EPA now for several years has been running methane voluntary programs to target cost-effective emission reductions in key sectors, within the U.S. and internationally.

The amount of emissions of methane, or comparisons based on those amounts, are not relevant for determining whether emissions of the air pollutant—defined as the aggregate group of well-mixed GHGs—contributes to the air pollution. The relevant amounts and comparisons in that case concern the total emissions of the air pollutant, not a part of such emissions.

Comment (10-16):
A commenter (3377.1) notes that N_2O is produced in extremely small amounts by motor vehicles—almost certainly less than the estimate provided by automotive manufacturers. The commenter also cautions EPA that CH_4 regulations from motor vehicles might discourage compressed natural gas vehicles that would otherwise provide a CO_2 reduction benefit, and therefore recommends no CH_4 regulations.

Response (10-16):
The commenter did not provide a specific estimate or any documentation regarding their claim that N_2O emissions from motor vehicles are extremely small. Further, the commenter is in error in implying that the TSD relies upon estimates provided by automotive manufacturers. In fact, the values EPA used in Section 2(a) of the TSD are taken from EPA's *Inventory of Greenhouse Gas Emissions and Sinks 1990–*

2007 (U.S. EPA, 2009). The estimation methodologies and associated uncertainty are discussed in Section 3.1 of the Inventory.

With regard to CH_4 regulations mentioned by the commenter, these Findings do not put forth any policy or regulatory proposals or strategies that would respond to the threat of climate change. Sections III.C and F of the Findings define the appropriate scope of the endangerment analysis in this regard.

Comment (10-17):
One commenter (3427.1) objects to the reasoning behind the proposed Finding's statement that not including HFCs "would be inconsistent with the U.S. practice of encouraging hydrofluorocarbon emission reductions," claiming that this is irrelevant.

Response (10-17):
As explained in Section V of the Findings, the Administrator is not defining HFCs as an individual air pollutant under Section 202(a), thus EPA is not responding directly to the argument that the Administrator could not make a finding of contribution for HFCs as an individual air pollutant. The reasoning for including HFCs (and the other five GHGs) together in both the definition of "air pollution" and "air pollutant" is addressed in the Findings. As explained in the Findings, HFCs share common properties with the other GHGs and are included in the common focus of climate change research, and therefore it is appropriate and consistent with the science to include HFCs in the combined mix of these gases.

Consistency with the practice of encouraging HFC emission reductions has not been included in the reasoning of the current finding. The rationale for not considering mitigation measures in the Finding is further discussed in Response to Comments, Volume 1.

References

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