Response to Comments
Phase II NOx SIP Call Rulemaking

Contract No. 68-D-00-283, Work Assignment No. 3-50

Prepared for:
Jo Ann Allman
MD-C539-02
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Prepared by:
Barbara Bauer
E.H. Pechan & Associates, Inc.
3622 Lyckan Parkway, Suite 2002
Durham, NC 27707

April 1, 2004

TABLE OF CONTENTS

I. DC Circuit Remands/Vacaturs 1

II. Scope of Final Rule 2

II.A How do We Treat Cogenerators and Non-Acid Rain Unit 2

II.A.1 What is the Historical Definition of Acid Rain Units 2
II.A.2 What is the Nox SIP Call Definition of EGU. 2
II.A.3 What Minor Revisions Are Being Made to the Definition of EGU in the NOx SIP Call and Section 126 2
II.A.4 What Methodology Are We Using to Classify EGU/Non-EGU Cogeneration Units 2
II.A.5 What is the Effect on Cogeneration Unit Classification of Applying the Same Methodology as Used for Other Units, Rather Than the One-Third Potential Electrical Output Capacity/25 MWe Sales Criteria 2

II.B. Control Level for Stationary Reciprocating Internal Combustion (IC) Engines 3
II.B.1 Level of NOx Control to Assume for Budget 3
II.B.2 NOx Uncontrolled Level 3
II.B.3 Controlled Level 14
II.B.4 Flexibility/Averaging 28
II.B.5 NSR Exclusion 28
II.B.6 Early Reductions 31
II.B.7 Executive Order 13211 32
II.B.8 Presumptive Technology 33
II.B.9 Monitoring 34
II.B.10 Emission Factors for 2- and 4-Stroke Engines 34
II.B.11 Other Comments 35

III. Court Decision's Effect on Georgia and Missouri 42

IV. Modifications Made to NOx Emission Budgets 49

V. Compliance Supplement Pools 51

VI. SIP Submittal Dates 51

VII. Compliance Dates 54
VII.A EGUs 54
VII.B Georgia and Missouri 55
VII.C Internal Combustion Engines 57

VIII. Other Relevant Comments 62

IX. Comments Outside the Scope of Rule 64

I. DC Circuit Remands/Vacaturs

Commenter:
RJ Reynolds Tobacco Company (RJRTC), XII-D-31

Comment:
One commenter stated that because the Court of Appeals vacated the inclusion of small cogenerators as EGUs in Appalachian Power Company v. EPA, 249 F.3d 1032 (D.C. Cir. 2001), that EPA must make new findings of Significant Contribution and provide a three-year compliance period for these sources. The commenter further stated that EPA was attempting to circumvent the three-year compliance period by stating that the Court of Appeals remanded instead of vacated the Rule as it relates to small cogenerators.

EPA Response:
The EPA agrees with the commenter that the Court vacated our inclusion of small cogenerators as EGUs in the NO_x SIP Call/Section 126 Rule. The proposed Rule also states that "[t]he Court vacated and remanded [. . .] our inclusion of small cogenerators as EGUs." 67 FR 8399. [See also 67 FR 8400, 8402].

However, EPA disagrees with the commenter that EPA is required to provide sources a period of three years to comply when a finding of significant contribution is made under Section 110(a)(2)(D)(i)(I) of the CAA. The Clean Air Act includes an "overarching" principle that the national ambient air quality standards (NAAQS) be achieved as expeditiously as possible. 63 FR 57449 (October 27, 1998). For example, under section 181 of the Clean Air Act, the "primary standard attainment date for ozone shall be as expeditiously as practicable but not later than [certain statutorily prescribed attainment dates]." 42 U.S.C. 7511; see also 42 U.S.C. 7502(a)(2)(A). In today's rulemaking, we are setting an implementation date to assure that the downwind states realize the air quality benefits of regional NO_x reductions as soon as practicable. This accords with Congress' intent that downwind areas attain the standard "as expeditiously as practicable." (Sections 181(a), 172(a)). See, also Section VII: Compliance Date

Further, in response to the various court decisions, we proposed a new EGU definition that addressed the classification of cogenerators as EGUs. We also proposed not to apply the one-third potential electrical output capacity/25 Mwe sales exclusion criteria for cogeneration units. However, we did not propose to include reductions from either small EGUs or small non-EGUs. "No reductions by small EGUs or small non-EGUs [were] included in that determination." 67 FR 8409. In today's action, EPA is not requiring reductions from either small EGUs or small non-EGUs.

II. Scope of Rule

II.A How do we Treat Cogenerators and Non-Acd RainUnits

II.A.1 What is the Historical Definition of Acid Rain Units

II.A.2 What is the NOx SIP Call Definiton of Acid Rain Unit

II.A.3 What Minor Revisions Are Being Made to the Definition of EGU in the NOx SIP Call and Section 126

II.A.4 What Methodology Are We Using to Classify EGU/Non-EGU Cogeneration Units

II.A.5 What is the Effect on Cogeneration Unit Classification of Applying the Same Methodology as Used for Other Units, Rather Than the One-Third Potential Electrical Output Capacity/25 MWe Sales Criteria

Commenter
K.J. Hornbarger, American Forest & Paper Association, XII-D-02 (same as XII-D-04)

Comment:
The EPA proposes to define "large EGU' to include (but for some "transiton rules") any unit that serves a turbine generator with a nameplate capacity of 25 MWe on a greater, if any amount of the electiricty is generated for sale. In contrast, EPA has since 1979 defined "electric utility steam geenrating unit" to be a unit that is constructed for the purpose of supplying more than one-third of its potential electric output capacity and more than 25 MWe to any utility power distribution system for sale. Congress used almost identical language to exclude cogeneration units from the definitions of "utility unit" for purposes of the Acid Rain Program, in CAA section 402(17(C). While EPA justifies its decision to apply different emission limitations to units producing electricity for sale than to units not producing electricity for sale in part because it is "a long-standing approach" (67 Fed.Reg. 8405) EPA at the same time rejects its long-staanding approach of including ony those coggeneration units constructed for the purpose of supplying more than one-third of their potential electric output capacity and more than 25 MWe under the regulations applicable to units generating electricity for sale.

The EPA has not justified departure from its long-standing definition of EGU. The EPA's primary claimed justification for this departure from long-standing policy is that the one-third/25 MWe criterion was a surrogate for whether the unit was owned by an electric utility, and that the practical distinctions between utilities and non-utilities have blurred as a result of deregulation of the electricity market. In so doing, EPA incorrectly describes the reason for the one-third/25 MWe criterion and ignores important differences between industrial cogeneration units and other electricity generating units.

EPA Response
Although we have decided for the final rule to use the "one-third potential electrical output capacity/15 MWe sales" criteria, we are not persuaded by most of the arguments commenters raised. For the reasons discussed in detail in the proposed rule (67 FR 8405-06), we continue to believe that the increasingly competitive nature of the electric power industry and the significant and increasing participation of non-utilities in competitive electricity markets support similar treatment of utilities and non-utilities. We also note that deregulation at the State level involves sales to end-users, particularly residential and commercial customers, and a slow-down (or halt) in State-level deregulation would not change this conclusion because the wholesale electricity market – where utilities and non-utilities can compete for whoesale sales – continues to be deregulated at the Federal level. Commenters claimed, but do not provide any documentation of the magnitude, that failure to apply the "one-third potential electrical output capacity/25 MWe sales" criteria will discourage new industrial cogeneration. Further, while commenters argued that industrial companies with cogeneration units would be disadvanted because the units' NOx control costs would be reflected in the costs of the products produced using energy from the units, they ignore the fact that industrial companies that instead buy electricity from utilities, would presumably have utility units' NOx control costs reflected in electricity purchase costs.

For further discussion of EGU definition see Section II.A in final rule**.**

II.B Control Level for Stationary Reciprocating Internal Combustion (IC) Engines

II.B.1 Level of NOx Control to Assume for Budget

II.B.2 NOx Uncontrolled Level

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

Comment:
The EPA should rely on the July 2000 AP-42 emission factor document for the average uncontrolled emission rates (11.7 g/bhp-hr for 2-stroke engines and 15.1 g/bhp-hr for 4-stroke engines). The commenters state that the July 2000 factors are best because they are:

a. based on actual engine emission tests;
b. engines tested are similar to "large" SIP call engines;
c. not based on horsepower categories;
d. tests for both 2- and 4- stroke engines; and
e. documented quality control.

EPA Response:
The EPA reviewed the data used to update AP-42. In order to focus on the types of engines addressed in the NOx SIP call, EPA examined test data from those engines greater than 2,000 horsepower (hp) operating at greater than 90% load.[1] The average emission rate is 12.2 g/bhp-hr or, if 2 very low values are removed,[2] 14.9 g/bhp-hr. The group of large engines in this database represents only 2 engine models and 8 tests; both models are 4-stroke engines. According to comments from INGAA, about 85% of the large IC engines in the SIP call area are 2-stroke.[3] We conclude that this database is helpful, but too limited to draw any conclusions by itself, considering the large amount of data available from other sources. Instead, these data must be reviewed along with other data as described below.

As described in footnotes in the July 2000 AP-42 document, the data presented do not differentiate between uncontrolled lean-burn engines and engines that may be turbocharged.[4] Thus, the average "uncontrolled" emissions reported may include some engines with lower NOx emissions due to the turbocharging. It is important to note that essentially all modern engines above 300kW are turbocharged to achieve higher power densities.[5] The effect of turbocharging is to increase the air/fuel ratio, which will lower the NOx emissions. Thus, the AP-42 data (2002 document) appear to reflect a newer engine population with a lower average emission rate which may not be representative of the older SIP call population.

Commenter:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; El Paso Corporation, XII-F-13

Comment:
The commenters state that EPA's proposed 16.8 g/bhp-hr average is derived from "mostly" new engine models in 1991, not the entire, current population of existing engines. According to commenters, the ACT document numbers are not representative of older SIP Call type engines. The

---

[1]See Bill Neuffer memo to the docket # XII-J-02.

[2]These 2 values (2.2 and 6.3 g/bhp-hr) probably represent reduced engine emissions due to turbocharging.

[3] Table A-6 of 9-01 INGAA report, September 1, 2001.

[4]See footnotes "(a)" to Tables 3.2-1 and 3.2-2 in the July 2000 AP-42 document.

[5]"Technology Characterization: Reciprocating Engines" prepared by Energy Nexus Group, Inc, Feb.2002, page 16.

commenters also indicate that EPA's weighted average approach does not correspond to engine models in the SIP call population.

EPA Response:
The EPA has examined data from the pipeline industry, data recently collected by the Agency, and data from the ACT document. These include data from large engines covered by the SIP Call as suggested by some commenters. The EPA believes the data support the 16.8 value proposed, as described below.

One of the data sets that support the 16.8 g/bhp-hr level was provided by the pipeline industry members, which was based on a survey of LEC retrofit installation in SIP call States.

In a November 20, 2000 letter from Tennessee Gas Pipeline & Transcontinental Gas Pipe Line to the Ozone Transport Commission, survey data presented in Attachment A of the letter include both pre-LEC and post-LEC data for 86 engines in SIP Call States. Most of the engines are 2000 hp or greater. Table 1 of the letter summarizes the data and states that the average uncontrolled NOx emissions level for these 86 engines is 16.8 g/bhp-hr. The range of uncontrolled values is 7.0-25.8 g/bhp-hr. Considering only those engines greater than or equal to 2,000 hp, there are 66 engines with an average uncontrolled emissions rate of 18.2 g/hp-hr (see table below).

From Attachment A (engines > or = 2,000 hp):

Location	Engine	Uncontrolled(g/bhp-hr)
AL-Station 110	C-B V-250-16 (2)	23.9
MD -Station 190	Clark TCV-10;16	14.2, 12.2
NJ - Station 505	I-R 412 KVS (8)	21.8
NY- Station 237	Clark TCV-10	9.0
NY -Station 241	Clark TLA-10(2 engines at)	7.0
NY- Station 224	I-R KVS 412(4)	16.0
NY - Station 237	I-R KVS-412 (2)	16.0
PA- Station 219	C-B GMV-10(2)	16.0
PA - Station 307	Clark TCV-10	9.0
PA- Station 307	I-R KVS-412 (4)	16.0
PA - Station 219	C-B V-250-16	11.0
PA- Station 200	Clark TLA-6 (4)	14.5
PA -Station 200	Clark TCV-10(2)	9.0
PA- Station 200	Clark TCV-16	12.0
PA- Station 515	C-B GMWC-10(3)	25.8
PA - Station 535	I-R 36 KVS	18.6
PA - Station 520	I-R 412 KVS (5)	22.4
PA- Station 535	I-R 512 KVS (3)	17.8-2; 17.2

PA- Station 515	C-B V-250-10 (2)	23.3	
PA- Station 195	C-B V-250-12 (2)	18.1	
TN - Station 87	C-B V-250-16		11.0
TN -Station 2101	I-R KVS-412	16.0	
TN- Station 2101	C-B V-250-8	18.0	
VA - Station 180	Clark TCV-10 (3)	12.0	
VA - Station 185	I-R 412 KVS (10)	22.4	

In Attachment B of the same 11-20-00 letter, pre-LEC and post-LEC data for 20 engines are summarized (see table below). Fourteen of the 20 engines are 2,000 hp or greater. The letter states that the average uncontrolled NOx emissions for the 20 engines is 14.1 g/bhp-hr and the range of uncontrolled values is 7.0-18.0 g/bhp-hr. Considering only the engines from this data set greater than or equal to 2,000 hp, the average uncontrolled emissions for these engines is also 14.1 g/hp-hr.

From Attachment B (engines > or = 2,000 hp):

Station	Engine	Uncontrolled(g/hp-hr)	
NY- Station 237	Clark TCV-12	9.0	
NY- Station 241	Clark TLA-10 (2 engines)	7.0	
NY- Station 237	I-R KVS-412	16.0	
NY- Station 224	"	16.0	
NY- Station 237	"	16.0	
NY- Station 224	"	16.0	
PA- Station 307	" (4 engines)	16.0	
PA- Station 219	C-B V-250-16		11.0
TN- Station 87	C-B V-250-16		18.0
TN- Station 2101	C-B V-250-8	18.0	

Consolidated Natural Gas Service, a Dominion Company, a major pipeline company, also sent a letter to the Ozone Transport Commission (OTC) concerning the OTC's development of a set of model NOx rules. The attachment to Dominion's 11-22-00 letter to OTC, contains uncontrolled and RACT emission rates for 62 engines retrofit with LEC (see Table 1 below). The average uncontrolled emission rate considering all 62 engines from this data set is 17.6 g/bhp-hr. Considering the average emissions for each of the 18 models - the average by models is 17.2 g/bhp-hr. Although these engines are "major" sources since they are subject to RACT, it is not clear if all are "large" engines with respect to the NOx SIP call.

Table 1. Uncontrolled Emissions - Dominion's 11/22/00 Letter

Number of Engines	Engine Model	Uncontrolled NOx emissions (g/hp-hr)
2	Ajax DPC-600	15.5

5	Clark HBA-5T	23
6	Clark HLA-8	27
5	Clark TLA-6	16
3	Clark TLA-6	16
2	Clark TLA-6	16
5	Clark TLA-6	16
2	Clark TCV-10	16
3	Clark TLA-10	16
4	Clark TCV-10	16
2	Cooper 14W330	13
5	Cooper GMVC-6	11
3	IR 36 KVS-FT	20
1	IR 48 KVS-ET	20
3	IR 103 KVG-ML	16
3	IR 104 KVG-LL	16
3	IR 512 KVS-FT	16
5	IR 512 KVS-ET	20
Total: 62 engines		Average: 17.6

In response to comments we received, EPA collected additional test data to better determine controlled and uncontrolled emission levels from the current population of large engines in the NOx SIP call area. The data were placed in the docket and are summarized in Table 2 below. The average uncontrolled NOx level from this set of 42 test values is 16.7 g/bhp-hr, nearly identical to the proposed level of 16.8 g/bhp-hr.

Table 2. Uncontrolled Emissions - Additional Test Data - SIP Call Area

Engine Model	Uncontrolled NOx emissions (g/hp-hr)	Location	Reference
CB GMW	20.6	GA Transco Station 120	5-22-02 fax from EPA Region 4
CB GMW	20.1 (avg. 6 tests)	TX Transco Station 40	6-3-02 e-mail from TNRCC
CB GMW-6TF	17.4	KY Texas Gas	4-10-02 e-mail from Jon Trout
CB GMW-8	14.5	TN Tenneco Station 87	6-2-02 e-mail from EPA Region 4
CB V-250	18.3	PA Transco Station 195	6-28-02 e-mail from State of PA
CB V-250	23.3	PA Transco Station 515	6-28-02 e-mail from State of PA
CB 8V-250	16.9	TN MW Station 2101	6-2-02 e-mail from EPA Region 4
CB 16V-250	18.3	TN Tenneco Station 87	6-2-02 e-mail from EPA Region 4
CB 16V-250	23.9	AL Tenneco Station 110	5-22-02 e-mail from EPA Region 4
CB GMWA	13.6	KY Tenn. Gas Jefferson Co.	4/10/02 email from Jon Trout
CB GMWA-8	16.0	TX Vidor	6-3-02 e-mail from TNRCC
CB GMWA-8	20.9	TN Coastal Cottage Grove	1-5-01 letter Coastal to State of TN
CB GMWC	25.8	PA Transco Station 515	6-28-02 e-mail from State of PA
CB GMWC-10	32.4	TN Tenneco Station 87	6-2-02 e-mail from EPA Region 4 and 2-21-95 letter from Tenneco to TN
CB GMVA	18.2	CA Mobil Rincon	EC/R 9-00 report, p.30

CB W330	12.5	NY Tenn. Gas Station 241	5-29-02 e-mail from EPA Region 2
Clark HLA	27	PA Dominion South Bend	6-28-02 e-mail from State of PA
Clark HBA-8T	8.4 (avg of 7 tests)	MD Transco Station 190	1995 test data sent by Maryland - 9/02
Clark TCV-10 TCV-16	8.4 11.3	Transco Station 200	6-28-02 e-mail from State of PA
Clark TCV-12	13	NY Station 237	5-29-02 e-mail from EPA Region 2 (OEM estimate)
Clark TCVC-20	10.1	TN ANR Cottage Grove	6-2-02 e-mail from EPA Region 4
Clark TCVD-16	12.8 13.0	TN Coastal Cottage Grove	6-1-02 e-mail from EPA Region 4 and 10-5-00 letter Coastal to TN
Clark TLA	9.6		10-92 Acurex report to GRI
Clark TLA	13	NY Tenneco Syracuse	5-29-02 fax from EPA Region 2
Clark TLA	9.8	MI Consumers Energy Oversiel	6-7-02 e-mail from State of Michigan
Clark TLA	13.4 13.1 16.1 15.7	NY Algonquin Stony Point (4 engines)	5-24-02 fax from EPA Region 2
Clark TLA	13.3 11.5 15.0	MD Transco Station 190 (3 engines)	Information sent by Maryland - 8/02
IR KVS-412	8.1		10-92 Acurex report for GRI
IR KVS	24.4	PA Transco Station 520	6-5-91 letter from Transco

IR KVS	25	NY Tenneco Clymer Station	5-29-02 fax from EPA Region 2
IR KVS	25	NY Tenneco Clifton Springs	5-29-02 fax from EPA Region 2
IR KVS	24.8 (1 test result for 2 engines)	TN Tenneco Station 2101	6-02-02 e-mail from EPA Region 4 and 2-21-95 letter from Tenneco to TN
IR KVS	19.4	TX Vidor Station	6-3-02 e-mail from TNRCC
IR KVR	8.2	TX Motiva	6-3-02 e-mail from TNRCC
IR KVT-512	21.4	TN Tenneco Station 2101	6-02-02 e-mail from EPA Region 4 and 2-21-95 letter from Tenneco to TN
	16.7 Average		

Uncontrolled emissions data are also reported in chapter 3 of the EC/R report,[6] as summarized below. The data show a wide range of values, due in part to the inclusion of some engines considered by the EC/R report as controlled. And, the data generally support an uncontrolled emission rate higher than that suggested by commenters and similar to that proposed by EPA.

A 1994 Gas Research Institute (GRI) report indicated separate emission levels for 2 stroke (12.5 g/bhp-hr) and 4 stroke-engines (13.2 g/bhp-hr). Test results for 2 stroke engines range from 2-29 g/bhp-hr. For 4-stroke engines, results range from 1-25 g/bhp-hr. The report noted that the higher end 25-29 g/bhp-hr was representative of the older uncontrolled engines (these are the engines most likely affected by the SIP Call). Engines equipped with turbochargers and intercoolers as original design features typically emit 7-15 g/bhp-hr. The lower end of the range often reflects the newer lean burn engines which achieve 1-2 g/bhp-hr. Thus, the average emission levels presented in this GRI report were calculated including some engines considered controlled for purposes of the EC/R report.

In the AP-42 (10/96) document, uncontrolled emissions are reported for 2-stroke engines at 10.9 g/bhp-hr and for 4-stroke at 11.8 g/bhp-hr. This report uses many of the same test data references as 1994 GRI report. The EC/R report states that it appears likely the uncontrolled data include test reports from newer lean-burn engines that would be considered controlled.

[6]"Stationary Reciprocating Internal Combustion Engines: Updated Information on NOx Emissions and Control Techniques," EC/R Incorporated, September 1, 2000 (EC/R report on IC engines).

In the AP-42 (1997 draft revision) document, uncontrolled emissions for 2 stroke are 12.2 g/bhp-hr and 15.0 g/bhp-hr for 4-stroke. This is based on 38 tests for 2-stroke and 18 tests for 4-stroke. EC/R notes that some lean burn engines in this database are actually controlled emissions by LEC technology.

A 1996 GRI report includes data on six 2 stroke engines representing 5 models. Each engine was tested 2-5 times. The 2-stroke engine averages ranged from 4.9 - 20.8 g/bhp-hr and the 4-stroke engine averages ranged from 7.0 g/bhp-hr - 22.0 g/bhp-hr. The test data were more concentrated towards the lower end of each range.

A 1998 GRI report includes data from a Cooper Z-330 engine that had not been retrofitted with Clean Burn to be up to 24 g/bhp-hr.[7] Emissions from 2 other models were reported to range from 6-13 g/bhp-hr and 11.5 for another model.

Uncontrolled 1995 test data from a PG&E site for 2 Cooper Bessemer W-330 models is reported to be 18.9 and 16.7 g/bhp-hr. (EC/R reference 9, page 3 -14, letter and attachments, dated February 3, 2002, from Carol Burke, PG&E to W. Neuffer - 2/3/00.)

Test data from So Cal Gas is reported for 2 Ingersoll Rand 412KVS models to be 21.4 and 17.0 g/bhp-hr. (Reference page 3-4, EC/R report.)

A 1990 GRI report stated that uncontrolled emissions from lean and rich burn engines range from 7-26 g/bhp-hr.

A 1992 paper prepared by Cooper Industries for Society of Petroleum Engineers states that, prior to regulation, for both lean and rich burn engines, NOx emissions range from 10-20 g/bhp-hr.

A 1997 Manufacturers of Emission Control Association report states that the typical NOx emission not for engines slightly lean of stoichiometric is 18 g/bhp-hr.

A 1994 Oil and Gas Journal article on natural gas compressor station engines indicates that typically emissions are 15 g/bhp-hr, for both lean and rich burn engines.

During a visit to a So Cal Gas plant, a representative of the plant stated that for a DeLaval HVA16C engine, uncontrolled emissions were 28 g/bhp-hr prior to installing LEC.

---

[7] "NOx Control for Two-Cycle Pipeline Reciprocating Engines" prepared by Arthur D. Little, Inc. for GRI, December 1998, figure 1-1.

Product literature from Ajax Superior Division of Cooper Energy indicates uncontrolled emissions from an Ajax 2-stroke lean-burn engine (110 -720 bhp) range from 3.0-9.5 g/bhp-hr and from a Superior 4-stroke lean-burn engine (825-2650 bhp) range from 15.0 - 22.1 g/bhp-hr.

As described in the ACT document, uncontrolled emission levels were provided to EPA by several engine manufacturers. These emission levels were tabulated and averaged for engines with similar power ratings. Most manufacturers provided emission data only for current production engines, but some included older engine lines as well. For lean burn engines, the average ranges from 7.9-18.6 g/hp-hr. The 7.9 g/hp-hr represents the smallest engine category and is considerably lower than all the other lean burn engines size categories. As can be seen from the data below, there is considerable agreement in the value for the larger engines, with a average range of 16.5-18.6. This is significant because the SIP call specifically addresses large engines.

From Table 4-1 - ACT Document

Lean burn engines (g/bhp-hr)

Size (HP)	No. of engines in data base	Highest	Lowest	Average
0-400	7	17.5	3.0	7.9
401-1,000	17	27.0	15.5	18.6
1,001-2,000	43	27.0	14.0	17.8
2,001-4,000	30	27.0	10.0	17.2
4,001+	25	17.5	10.0	16.5

As noted in the TSD, there are several reasons to use the ACT document data:

*Using the applicable ACT document rather than AP-42 is consistent with how EPA treated other non-EGU source categories, including glass, process heaters, iron & steel, and other industrial source categories in the NOx SIP call rulemaking.

*The ACT document provides a comprehensive look at the IC engine class and has the advantage of using a consistent data set for uncontrolled emissions, costs, and controls.

*If we used AP-42 uncontrolled numbers, it would be logical to use the AP-42 controlled numbers. However, the AP-42 controlled data set is limited in terms of technologies considered, costs, and expected decreases in emissions.

*The ACT document uses a large data set from which to draw conclusions.

*ACT test data are available in several horsepower size categories; this is important since EPA chose to not calculate emission reductions from the smaller IC engines. The 16.8 g/bhp-hr appears to be more representative of larger engines, which are the engines affected by the NOx SIP call.

As suggested by commenters, EPA also examined the available data separately for 2- and 4-stroke engines. As shown in Table 3, the test data for the large IC engines in the SIP call area indicate uncontrolled levels of 16.4 and 18.9, respectively, for the 2- and 4-stroke engines. Using information from the pipeline industry that about 85% of the engines in the SIP Call area are 2-stroke, the weighted average of the 16.4 and 18.9 values is 16.8, identical to EPA's proposed value.[8] EPA believes these data support the 16.8 value proposed by EPA.

Table 3. Uncontrolled Emissions - 2 - Stroke; 4- Stroke

Data Source	2-Stroke Average Emission Rate (# engine tested)	4-Stroke Average Emission Rate (# engine tested)
Attachment A	15.7 g/hp-hr (28)	19.7 g/hp-hr (37)
Attachment B	11.7 " (6)	16.0 " (8)
Dominion	17.6 " (44)	18.0 " (18)
Additional Tests	16.1 " (35)	20.1 " (9)
Totals	16.4 " (114)	18.9 " (76)

In summary, based on the ACT data, the data contained in the industry letters to OTC, and data EPA recently collected, EPA believes there is considerable agreement/support for our proposed 16.8 g/bhp-hr uncontrolled emission rate. The data do not support commenters suggestion for a lower value, namely 11.7 g/bhp-hr for 2-stroke engines and 15.1 g/bhp-hr for 4-stroke engines. Therefore, EPA concludes that it is appropriate to use the proposed 16.8 g/bhp-hr level as representative of average, uncontrolled emissions.

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

[8]For large lean-burn IC engines in the NOx SIP Call states, 2-stroke engines represent 83% of the total large engines and 85% of the total large engine horsepower. (From INGAA's April 22, 2002 comments, pages 2 and 10.)

Comment:
The ACT document does not provide any rationale for sub-categorizing engines by horsepower. The Emission Factor Documentation Report finds no linkage between horse power and emissions.

EPA Response:
The ACT document points out that uncontrolled emissions for the smaller size range (0-400 hp) are lower (7.9 g/bhp-hr) than values for the larger size categories (16.5-18.6 g/bhp-hr). This is significant because the SIP Call specifically addresses large engines.

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; El Paso Corporation, XII-F-13

Comment:
The commenters state that the 16.8 g/bhp-hr uncontrolled emission average in the ACT document cannot be replicated. Also, the details of the data are unavailable. The NOx ACT reflects 1991 manufacturer's letters for new, 4-stroke engines; EPA needs to make these letters available.

EPA Response:
The manufacturers' letters that were referenced in the ACT were placed in the docket. Table 4-1 of the ACT document (p. 4-12) presents uncontrolled emission factors for several classes of IC engines - rich burn; lean burn; diesel and dual fuel. We obtained additional information from 8 vendors. The population for lean burn engines is broken into 5 size classes based on horsepower. An average uncontrolled emission factor is shown for each of the 5 size classes. The 16.8 includes all emission estimates for all sizes of engines; including the 7.9 g/bhp-hr for the smallest size engines. The average is weighted towards the number of engines in the data base for each size class.[9] It should also be noted that the average uncontrolled emission rates for all but the smallest size engines are close to or higher than 16.8. They are 18.6; 17.8; 17.2; and 16.5 g/bhp-hr. It should also be noted that the IC engines used by INGAA's members are of the largest size. The manufacturers' letters were placed in the docket. Thus, EPA's weighted average approach corresponds to the larger engine models, which are indeed representative of the SIP call population.

Also as noted in the EC/R report (p.3-6), to compute the total capacity of the range the numbers of engine models in the range were multiplied by the horsepower at the midpoint of the range. The weighted average uncontrolled NOx emissions was then computed based on these range capacities.

[9] The calculation is as follows - 7(7.9) + 17(18.6) + 43(17.8)+ 30(17.2) + 25(16.5) which was then divided by the total number of engines, 122.

The result was a weighted average of 17.0 g/bhp-hr. This calculation was repeated for the 2 rated horsepower ranges greater than 2,000 hp (the engines most likely to be affected by the SIP Call) and the resulting weighted average was 16.8 g/bhp-hr (EC/R Report, p. 3-6).

II.B.3 Controlled Level

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

Comment:
Appendix B to INGAA's 4-22-02 comment letter lists 226 lean-burn large and small IC engines in SIP Call states that were retrofitted with LEC technology and for which they could obtain state NOx permit limits. The average post-control NOx permit levels for 2-stroke and 4-stroke engines are reported to be 5.0 and 3.7, respectively. The INGAA states that NOx permit limits are appropriate for use in calculating the average post-control emission rate for lean-burn engines in the NOx SIP Call area, for the following reasons:

> *These engines are located in the NOx SIP Call states, and represent the same makes and models as the large NOx SIP Call engines.
>
> *These engines operate under state permit limits that reflect the emission control achieved by LEC on actual and identified individual engines.
>
> *The emission control limits were established as the result of a formal regulatory process conducted by the state permitting agencies.
>
> *The LEC retrofits are consistent with the technology and costs identified by EPA's NOx SIP Call technical support documents.

EPA Response:
The EPA disagrees that permit limits are appropriate for determining the post-control emission rate. Permit limits generally do not reflect the actual emission rate and, thus, are not appropriate to determine the emission rates to be expected from installation of LEC technology. For example, State records indicate permit limits of 18 and 8 g/bhp-hr even though LEC technology is in place and the target emission rate in the State RACT plan is 3 g/bhp-hr for both engines.[10] In another case, the permit level

[10]See docket for e-mail from John Patton dated 5/30/02 and attachments.

is 3.0, but the actual rate is reported as 1.7.[11] The permit limits for 6 engines at a station in one State are 3.0 g/bhp-hr while the test data show emissions at less than 1.1 g/bhp-hr for each engine.[12] The EPA agrees with the comment that the costs for LEC retrofits are consistent with the costs identified by EPA's NOx SIP Call technical support documents.

Further, if EPA were to use permit rates, we would be required to consider permit limits set in areas outside the SIP call region. California and Texas permits, for example, have very low emission rates for IC engines.[13] The permit levels suggested by commenters are limited because the permits generally reflect RACT requirements. However, highly cost-effective controls under the NOx SIP call are not limited to RACT-level stringency and should take into account improvements in control efficiency and cost effectiveness that have occurred over the last several years since the RACT generation of controls.

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; New Hampshire Department of Environmental Services, XII-D-15; CMS Trucking Gas Company (Truckline), XII-D-16; CMS Panhandle, XII-D-17; Natural Gas Pipeline Company of America (Natural), XII-D-24; Transcontinental Gas Pipe Line Corporation (Transco), XII-D-25; American Gas Association, XII-D-33; Dominion Energy, Inc. (or Dominion Resources), XII-D-38

Comment:
Commenters state that data used by EPA to support the proposed controlled levels[14] are for new or rebuilt engines--not retrofits--and therefore cannot be relied upon. Several commenters indicate the importance of examining the specific engines in the SIP call States to determine whether the reductions assumed by EPA are achievable.

---

[11]See docket for 11-20-00 letter from Tennessee Gas Pipeline and Transcontinental Gas Pipeline, Attachments A & B.

[12]See docket for 6-10-02 mail from Randy Hamilton, State of Texas, TNRC, to Bill Neuffer.

[13]Ventura Co Rule 74.9 (in effect 9/89 -12/93) applied to engines greater than or equal to 100 hp and required 125 ppm (1.7 g/bhp-hr) or 80% control. Current Ventura County Rule 74.9 requires 45 ppmv (0.6 g/bhp-hr) or 94% control. For Best Available Retrofit Control Technology, California Air Resources Board for engines greater than or equal to 100 hp, selected 65 ppm (0.9 g/bhp-hr) or 90% control. This level is based on Sacramento AQMD Rule 412. In Houston, Texas, applicable requirements are 0.5-0.6 gb/hp-hr for lean burn engines.

[14]The EPA proposed to select a value within the range of 82-91% control (1.5-3.0 g/bhp-hr controlled level assuming 16.8 uncontrolled level) based primarily on information in the ACT document.

Industry experience, through RACT retrofits, has demonstrated that the stringent emission rates of 1.5 to 3.0 g/bhp-hr are not achievable on many engines; the average emission reduction to be expected for LEC retrofits is 70%.

Comments from the New Hampshire Department of Environmental Services expressed support of the NOx control levels for stationary internal combustion engines proposed by EPA.

EPA Response:
EPA agrees that low emission combustion (LEC) technology is a proven technology for natural gas-fired lean-burn engines.[15] However, EPA disagrees on the appropriate level of control to assume from installation of the LEC technology. In response to comments, EPA collected additional test data, including data representative of emissions from large engines in the SIP call area. To determine the appropriate level of control, EPA examined all available data, including data from State permits and test data on new, rebuilt, and retrofit engines with LEC technology. These data were placed in the docket. A summary of the data is provided below in Table 4. As suggested by commenters, the data have also been organized to show LEC retrofit test data for large engine models found in the NOx SIP call area.

In their April 22, 2002 comments, INGAA identified the most common models of large natural gas transmission engines in the SIP Call Area. In addition, INGAA identified engines that had been retrofit with LEC in the SIP Call area. In response to these comments, EPA contacted the various EPA Regional Offices to obtain information on specific large lean burn engines used by the gas pipeline industry that have been retrofit with LEC in the SIP call area. Data from the EPA Regional Offices and other emission test results were obtained. The results for all these engine models are summarized in Table 4.

Table 4. Large IC Engines Tested with Retrofit LEC Controls

Engine Model	Number of engines tested	Test Results (g/bhp-hr)	% of total units in the SIP Call Area
Clark BA-8T	3	1.3, 3.1, 3.2	1
Clark HLA	6	1.7, 1.9, 2.4, 2.5, 2.7, 2.8 (Avg - 2.3)	5

[15]For example, December 1, 1998 letter from INGAA to EPA docket, February 16, 1999 memo from INGAA to Tom Helms, EPA, and April 26, 2002 comment letter from Kinder Morgan (Natural Gas Pipeline Company of America).

Clark TLA	20	0.4- 4.0 (others - 0.5(2) 0.8., 0.9(2), 1.0, 1.1, 1.2, 1.3(2), 1.4 (2), 1.7,1.9, 2.3, 2.4(2), 2.9) Avg - 1.5	1
Clark TCV	6	1.4-3.6(others - 2.5, 3.0, 3.3,3.5) Avg- 2.9	18
Cooper-Bessemer(C-B) GMW	2	0.7, 4.3	17
C-B V-250	8	1.6 - 3.4(2) (others - 2.6, 2.8; 3.0, 3.2, 3.3) Avg - 2.9	12
C-B GMWA	1	0.6	8
C-B GMWC	3	3.1 (3 engines tested)	6
C-B GMVA	2	0.5, 3.3 Avg - 1.9	2
C-B 12V-275	2	1.3, 3.1	0
C-B 8Q155L	1	1.9	0
C-B GMV	1	1.9	0
C-B W-330	1	0.5	1
Ingersoll-Rand(I-R) KVG	4	Avg - 2.0	1
I-R KVR	2	1.4, 2.1	1
I-R KVS	13	0.4, 1.1, 1.2, 1.3, 2.3, 2.5, 2.6, 2.8, 3.0, 3.0, 3.3, 3.6, 3.7	7
Totals	75	0.4 - 4.3	80

Models without test data - C-B LSV - 6%; Worthington MLV - 3%; Clark TCVC - 3%; C-B Z-330 - 2%; C-B GMVH - 2%; Nordberg FSE - 1%; I-R KVB - 1%; Worthington - 1%; C-B GMWH - 1%; C-B GMWS - 1% Total - 21%[16]

The data in Table 4 show that 56 of 75 engines with LEC retrofits have NOx emission test levels that are at or below 3.0 g/hp-hr. Nineteen of 75 engines (25%) have emission test results greater than 3.0 g/hp-hr with the maximum being 4.3 g/hp-hr. The next highest was 4.0 g/hp-hr. The average emission level achieved by these 75 engines is 2.2 g/hp-hr.

The data in Table 5 use the same data as in Table 4, except the data are limited to large engines in the NOx SIP call area. The data show that 40 of the 56 tests have NOx emission levels at or below 3.0 g/bhp-hr. The LEC technology retrofit on these large engines achieved, on average, an emission rate of 2.3 g/bhp-hr. Considering the similarity of the resulting average controlled emission rates in Tables 4 &5 and the ample set of data for large engines in the SIP Call area, EPA agrees with commenters that it is reasonable to focus on the set of data for large engines in the SIP Call area.

Table 5. Large IC Engines in SIP Call Area Tested with Retrofit LEC Controls

Engine Model	Number of engines tested	Test results (g/hp-hr)
Clark BA-8T	3	1.3, 3.1, 3.2
Clark HLA	6	1.7, 1.9, 2.4, 2.5, 2.7, 2.8
Clark TCV	5	1.7; 3.0, 3.3, 3.5, 3.6
Clark TLA	13	0.4, 0.5, 0.5, 1.1, 1.3, 1.3, 1.4, 1.9, 2.3, 2.4, 2.4, 2.9, 4.0
C-B 12V-275	2	1.3, 3.1
C-B GMV	1	1.9
C-B GMW	2	0.7, 4.3
C-B GMWA	1	0.6
C-B GMWC	1	3.1
C-B V-250	8	1.6, 2.6, 2.8, 3.0, 3.2, 3.3, 3.4, 3.4

[16]The total percentage (models with and without test data; 80 and 21) do not add to 100 due to rounding convention.

C-B W-330	1	0.5, See Table 8
Cooper Quad 8Q155L	1	1.9
I-R KVS	12	1.1, 1.2, 1.3, 2.3, 2.5, 2.6, 2.8, 3.0, 3.0, 3.3, 3.6, 3.7
Totals	56	0.4 - 4.0 (Avg - 2.3)

As suggested by commenters, EPA also examined the data in Tables 4 and 5 separately for 2- and 4-stroke engines (Tables 6-9 below). In Table 6, data for the large IC engines with LEC retrofit indicate controlled levels of 2.2 g/bhp-hr for 2- or 4-stroke engines. Test data for the large IC engines with LEC retrofit in the SIP call area indicate controlled levels of 2.3 and 2.5, respectively, for the 2- and 4-stroke engines. Assuming 85% of the engines in the SIP Call area are 2-stroke, the weighted average of the 2.3 and 2.5 values is 2.3. Thus, based on the available data, the emission factor is the same whether considering 2- and 4-stroke engines together or separately.

Table 6 - Large IC Engines Tested with Retrofit LEC Controls -- 2 stroke

Engine Model	Number of engines tested	Test Results (g/bhp-hr)	% of total units in the SIP Call Area
Clark BA-8T	3	1.3, 3.1, 3.2 (Avg - 2.5)	1
Clark HLA	6	1.7, 1.9, 2.4, 2.5, 2.7, 2.8 (Avg-2.3)	5
Clark TCV	6	1.4-3.6 (other tests - 3.0, 3.3, 3.5, 2.5) Avg- 2.9	18
Clark TLA	20	0.4- 4.0 (others - 0.5(2), 0.8, 0.9, 0.9, 1.0, 1.1, 1.2, 1.3(2), 1.4(2), 1.7, 1.9, 2.3, 2.4(2), 2.9) Avg - 1.5	1
Cooper-Bessemer (C-B) 8Q155L	1	1.9	0
C-B 12V-275	2	1.3, 3.1 (Avg - 2.2)	
C-B GMV	1	1.9	0

C-B GMVA	2	0.5, 3.3 Avg - 1.9	2
CB GMW	2	0.7, 4.3; Avg - 2.5	17
C-B GMWA	1	0.6	8
C-B GMWC	3	3.1 (3 engines tested)	6
C-B V-250	8	1.6 - 3.4 (other -2.8; 3.4, 3.3, 3.0, 2.6, 3.2) Avg - 2.9	12
C-B W-330	1	0.5	1
Total	56 engines	Avg - 2.2	

Table 7 – Large IC Engines Tested with Retrofit LEC Controls -- 4 stroke

Ingersoll Rand (I-R) KVG	4	Avg - 2.0	1
I-R KVR	2	1.4 - 2.1 (Avg - 1.8)	1
I-R KVS	13	0.4, 1.1, 1.2, 1.3, 2.3, 2.5, 2.6, 2.8, 3.0, 3.0, 3.3, 3.6, 3.7; Avg - 2.4	7
Total	19	Avg- 2.2	

Table 8 - Large IC Engines in SIP Call Area Tested with Retrofit LEC Controls -- 2 stroke

Engine Model	Number of engines tested	Test results (g/hp-hr)
C-B 12V-275	2	1.3, 3.1 (Avg - 2.2)
C-B GMV	1	1.9
C-B GMW	2	0.7, 4.3 (Avg- 2.50
C-B GMWA	1	0.6
C-B GMWC	1	3.1

C-B V-250	8	1.6, 2.6, 2.8, 3.0, 3.2, 3.3, 3.4, 3.4 (Avg - 2.9)
C-B W-330	1	0.5
Cooper Quad 8Q155L	1	1.9
Clark BA-8T	3	1.3, 3.1, 3.2 (Avg - 2.5)
Clark HLA	6	1.7, 1.9, 2.4, 2.5, 2.7, 2.8 (Avg - 2.3)
Clark TCV	5	1.7; 3.0, 3.3, 3.5, 3.6 (Avg- 3.0)
Clark TLA	13	0.4, 0.5, 0.5, 1.1, 1.3, 1.3, 1.4, 1.9, 2.3, 2.4, 2.4, 2.9, 4.0 (Avg- 1.7)
Total	44 engines	Avg- 2.3

Table 9 - Large IC Engines in SIP Call Area Tested with Retrofit LEC Controls -- 4 stroke

I-R KVS	12	1.1, 1.2, 1.3, 2.3, 2.5, 2.6, 2.8, 3.0, 3.0, 3.3, 3.6, 3.7 (Avg - 2.5)

Additional information generally supporting the 1.5 to 3.0 g/bhp-hr proposed emission rates for controlled emissions for lean burn IC engines are available from several other sources (see TSD), including the following:

1. Controlled level of 2.3 g/bhp-hr (clean burn 2-cycle) in AP-42 (1996).
2. 1990 GRI report assumes LEC meeting a 2 g/bhp-hr limit (p. 10).
3. 1994 GRI reports LEC retrofits can average less than 2 g/bhp-hr (p. 4-20).
4. 1998 GRI report indicates clean burn achieves 2 g/bhp-hr or lower (p. 2-2).
5. Urban, et al 1989 paper states that low-emission engines (e.g., clean burn) generally produce NOx emissions below 2.5 g/bhp-hr.[17]

[17]"Emission Control Technology for Stationary Natural Gas Engines" C.W. Urban, H.E. Dietzmann, and E.R. Fanick, Southwest Research Institute, Journal of Engineering for Gas Turbines and Power, July 1989, Vol. 111/369.

6. 2000 E/CR report analyzes several data sources and concludes that NOx emission test results "support the conclusion that 2.0 g/bhp-hr is achievable for new engines and most engines retrofitted with LEC technology." (p. 4-12).

The EPA also reviewed test data on IC engines with LEC technology that are not large, retrofit gas pipeline engines. These data are discussed in the TSD and generally show that installation of LEC technology on this group of engines also produces emissions less than 3.0 g/bhp-hr, on average.

The set of data for large engines in the SIP Call area cover about 80% of the engine models in the NOx SIP call area. However, emission rates for some of the engine models for which test data are not available are likely to be higher than the 2.3 average value. For example, Worthington and Nordberg engines are known to be difficult to retrofit. One vendor reported achieving a level of 6 g/bhp-hr for certain Worthington engines.[18] As noted in the TSD, a Worthington UTC 165 in New York reduced NOx emissions to 4.4 g/hp-hr. A pipeline company commented that they operate 6 Worthington engines and that 4.0 g/bhp-hr is their targeted emission reduction level, based on vendor projections.[19] Thus, it appears that a 4.0 to 6.0 g/bhp-hr level is achievable on these difficult to retrofit Worthington engines. At this time, EPA believes that 5.0 g/bhp-hr is a reasonable emission rate, on average, for engines known to be difficult to retrofit. Although not all of the 21% of engine models for which test data are not available are likely to be difficult to retrofit, EPA believes it is reasonable to treat these engines as one group and to conservatively assume that this group of engines would achieve a 5.0 level, on average.

In summary, based on the available test data, EPA believes it is reasonable to assume 79% of the large engines in the SIP Call area are able to meet a 2.3 level, on average, and that 21% are able to meet a 5.0 level, on average, with LEC technology. Thus, calculating the weighted average for installation of LEC technology retrofit on all of these large IC engines results in a 2.9 g/bhp-hr emission rate.

Commenter:
Interstate Natural Gas Association of America (INGAA), XII-D-09

Comment:
In their letter of October 25, 2002, INGAA commented that the additional data collected by EPA includes data on 27 lean-burn engines and the data indicate that the average retrofit LEC technology level is 2.7 g/bhp-hr for 2-stroke engines, which represent the bulk of the engine horsepower in the SIP Call area. In addition, INGAA commented that the data reported on the IC engines retrofit with LEC have a number of problems, including scarcity of before-and-after tests on the same engine, and the

---

[18]"Stationary Reciprocating Internal Combustion Engines: Updated Information on NOx Emissions and Control Techniques," EC/R Incorporated, September 1, 2000, page 4-5.

[19] Docket number XII-D-24

absence of data on load or other operating conditions of the tested engines. The INGAA also commented that the vendor references cited by EPA indicate that the retrofit LEC technology is intended to result in emissions to meet a 3 g/bhp-hr limit.

EPA Response:
The EPA agrees that test data cited by INGAA and the vendor estimates, indicate that the average retrofit LEC technology level is in the 2.7 - 3.0 g/bhp-hr range. The EPA also notes that these comments are fairly consistent with a November 20, 2000 letter to the OTC from two pipeline companies which recommended a limit of no less than 3.0 g/bhp-hr, with an alternative standard of no more than 80% reduction. This range is also consistent with the available test data for large engines in the SIP Call area described above, which indicate an average value of 2.9 g/bhp-hr.

As INGAA points out, there is some uncertainty in the test data due, for example, to lack of data on operating load in some cases. In addition, there is some uncertainty due to the lack of data for all engine models. Due to this uncertainty, EPA believes it is appropriate to consider a minor adjustment to the control level suggested by the test data. The difference between selecting a 2.9 value (suggested primarily by the test data) or a 3.0 value (suggested by some pipeline companies and vendor comments) for the controlled emission rate is very small, only a one percent difference. That is, the two values result in either an 82 or 83% control level, assuming a 16.8 g/bhp-hr uncontrolled value. Thus, while EPA's analysis of the test data indicate a 2.9 value is reasonable, in view of the recommended 3.0 level from some industry and vendor comments, and considering the uncertainties in the data and the small difference in the resultant control level, EPA believes it is appropriate to select the upper range of the control levels proposed, namely 3.0 g/bhp-hr.

Commenters:
Texas Gas Transmission Corp., Williams Gas Pipeline, XII-D-07; Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; El Paso Corporation, XII-F-13

Comment:
None of the test data EPA cites is relevant to LEC retrofit, and therefore cannot be relied upon to support an assumed average NOx reduction for compliance of any particular engine. Of the 476 tests cited in the TSD, 98% of those cited, or 466 tests, cannot properly be used by EPA to estimate the effectiveness of LEC retrofit on existing lean-burn engines. The remaining ten tests (or 2%) did involve retrofit LEC. However, these ten tests alone cannot properly be used to estimate an average NOx emission reduction for all LEC retrofits. The remaining tests were conducted on only *two* engine models.

EPA Response:
As described above, EPA collected additional data on LEC retrofit experience. Nevertheless, EPA believes that new and rebuilt engines' data are relevant because the applied technology is basically the same as the retrofit case. Data on the performance of LEC for large, new and rebuilt IC engine models

are contained in the ACT and other documents and provided in the tables below. Table 10 shows 17 large, new engines with reported test results that vary from 1.0 - 6.0 g/hp-hr. The average is 1.8 g/hp-hr.

Data from rebuilt engines are also available. Rebuilding involves completely replacing the cylinder heads with redesigned heads and replacing or modifying numerous other engine components. The retrofit cylinder heads are cast with a precombustion chamber within the interior of the head. Recently, simpler and less expensive LEC retrofit technologies have been developed.. Table 11 shows emission test results on ten rebuilt engines; the results vary from 0.5 - 2.5 g/hp-hr with an average of 1.2 g/hp-hr. These data for large new and rebuilt engines also show that LEC technology achieves emissions rates lower than 3.0 g/bhp-hr limit, on average.

An Energy-Tech online article compared NOx emissions from the Dresser-Rand "SIP combustion system," retrofit and from new production line units. "The KVR-based 4-stroke development engine the SIP combustion System was compared to the existing PCC combustion system used on BACT applications," and found "the SIP system will achieve lower NOx emissions than the production PCC system on this engine.[20]"

Table 10 - NOx Emissions for Large, New IC Engines with LEC

Engine Model/Location	Controlled (G/hp-hr)	Reference
Clark TCV -10 (2 engines)	2.6	ACT (p.5-68)
Clark TCV-10	1.0	GRI Transmission Report
Clark TCVD(2 engines)	1.6, 1.6	Sanders Memo; INGAA - 9/01; p.33
C-B GMVH -10, 12	6.0, 1.5	ACT - p.5-68
C-B GMVH	1.4	INGAA - 2/17/99
C-B W 330/Tn Gas Station 241 - NY	0.6	5/29/02 Fax from Ted Gardella
C-B W330/Columbia Gas - Crawford, OH(2 engines)	1.4, 1.4	6/14/02 email from John Paskevicz
C-B Q155HC/ Consumers Energy/ Ray Station/MI (2 engines	2.0, 2.0	6/7/02 email - Dennis Dunlap

[20]Docket # XII-K-88.

I-R KVSE (2100-2900 hp)	1.2	INGAA 9/01, pg. 33; Sanders ref. 4.
I-R KVS/National Fuel Gas Supply	1.0	5/24/02 email - Ted Gardella
I-R 412	1.1	INGAA 2/17/99 Attachment C
Superior 16SGTB/Columbia Gas - Gala Station/VA	1.1	Telecon with Dean Down/Roanoke, Va

Table 11 - NOx Emissions for Large IC engines Rebuilt with LEC

Engine Model	Controlled NOx (g/hp-hr)	Reference
C-B 10V-250	1.3	ACT- p.5-68
C-B GMVA-8/Mobil - Ventura Co, CA	3.0	EC/R p.30
C-B GMVA/Santa Barbara Co, CA -Engine 67	0.5	INGAA 9/01 - D-2
C-B GMV/So Cal Gas - Goleta, CA - 1,100 HP	0.6	EC/R - p. 4-8; INGAA - 9/01 -P.40
C-B W330 -PG&E - Hinckley., Ca(2 engines)	1.0, 1.3	EC/R = p.4-8; INGAA- 9/01 - F-5
I-R KVS/So Cal Gas -Aliso Canyon (3 engines)	0.51, 0.62, 0.64	EC/R report (p.4-8)
I-R KVS/Williams Gas Pipeline Station 505 -NJ	2.5	INGAA 9-01, p.34

Commenter:
New Hampshire Department of Environmental Services, XII-D-15

Comment:
The State of New Hampshire pointed out that it established 2.5 g/bhp-hr as RACT for gas engines in 1994. The agency then wrote "If DES were to establish NOx RACT for these engines in 2002, these limits would be more stringent due to the improvements in NOx retrofit controls and engines designs."

EPA Response:
RACT controls have emission rates that can be reached with a "reasonable" amount of control. The RACT rules adopted for lean burn engines more than 6 years ago include: CT, NH, and NJ at 2.5 g/bhp-hr and MA and NY at 3.0 g/bhp-hr. The EPA generally agrees that there have been improvements in NOx retrofit controls and engine designs, however, the control level for the Phase II NOx SIP Call rulemaking is primarily based on demonstrated control levels on a wide range of engine models.

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; New Hampshire Department of Environmental Services, XII-D-15; CMS Truckline Gas Company (Truckline), XII-D-16; CMS Panhandle Eastern Companies (Panhandle), XII-D-17; Natural Gas Pipeline Company of America (Natural), XII-D-24; American Gas Association (AGA), XII-D-33

Comment:
Some commenters suggested EPA should adopt no more than 70 percent reduction as the average NOx reduction from large lean- burn IC engines in the SIP Call area. This level of reduction is supported by in-field experience with retrofit LEC, and is consistent with the NOx control level for IC engines recommended by OTAG and previously proposed by EPA.

Comments from the State of New Hampshire refer to the STAPPA/ALAPCO control technique guideline, OTAG policy paper on non-utility sources, RACT experience and the OTC model rule. New Hampshire comments that 90% control is feasible.

EPA Response:
The OTAG Final Report, Chapter 5, Appendix C, indicates that LEC is expected to achieve 80-93% emission reduction. As described above, RACT controls installed 6 years ago achieved reductions greater than 70% and available data described above support selecting a greater than 70% reduction.

Commenter:
Interstate Natural Gas Association of America (INGAA), XII-D-09

Comment:
The ACT is estimating "achievable levels" not an average emission level of engines with LEC. By disregarding the 6.0 g/bhp-hr, the ACT is demonstrating that it is reporting the best performing engines, rather than developing an average of available data. EPA should use the average of LEC controlled engines.

EPA Response:
As described above, EPA reviewed the available data from many sources and determined the average emission rates for LEC technology controlled engines. The selection of an appropriate controlled

emissions level takes into consideration a number of large IC engines and the average emissions level from that group. The EPA analysis is not limited to the set of data presented in the ACT document.

Commenter:
El Paso Corporation, XII-F-13

Comment:
OEM rebuilds should not be confused with LEC retrofit. A rebuild essentially replaces everything from the crankcase up, at costs far greater than the LEC retrofit costs used by EPA in its cost-effectiveness analysis for the proposed NOx SIP Call.

EPA Response:
An engine rebuild is generally not necessary in order to install LEC technology. For example, "screw-in" technology is available for most engine models at relatively low cost (see TSD for details). Alternatively, for operators that choose to rebuild the engine and install LEC technology, if the maintenance is scheduled during an engine's regularly scheduled rebuild time, then a majority of the installation cost may be treated as a normal maintenance cost and not a cost directly incurred to achieve emission reduction.[21]

Commenter:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

Comment:
In the proposed rule EPA invited comment on how many of the large natural gas-fired IC engines are from lean-burn operation and how many from rich-burn. INGAA commented in their 9/1/01 report that 156 of the 168 large engines listed in the NOx SIP Call Inventory that have SIC codes associated with the natural gas transmission industry are lean-burn models, with one exception. The other 12 engines are either no longer in service, are owned by a company not included in the industry database or are duplicates. For the purposes of calculating the IC engine portion of the NOx SIP Call state budgets, INGAA recommended that EPA should assume that all the large natural gas fired stationary engines in the inventory are lean burn. Comments from the State of Indiana indicated there are no large, rich-burn engines in the State.

EPA Response:
As pointed out by the commenters, the vast majority of large IC engines in the NOx SIP call inventory are natural gas-fired lean-burn engines. Furthermore, the emission inventory does not contain sufficient detail to determine exactly which engines are lean burn and which are not. For these reasons EPA agrees with the comment that it is reasonable to assume that all the large natural gas stationary engines in the

[21]"Determination of RACT and BARCT for Stationary Spark-Ignited Internal Combustion Engines,"California Air Resources Board, November 2001, pg. V-4.

inventory are lean-burn for the purposes of calculating the IC engine portion of the NOx SIP Call state budgets.

II.B.4 Flexibility/Averaging

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; CMS Truckline Gas Company (Truckline), XII-D-16; CMS Panhandle Eastern Companies (Panhandle), XII-D-17; Natural Gas Pipeline Company of America (Natural), XII-D-24; State of Missouri Department of Natural Resources, XII-D-30; American Gas Association (AGA), XII-D-33; Dominion Energy, Inc. (or Dominion Resources), XII-D-38; CMS Panhandle Companies and speaking for the gas transmission industry as Chairman of the INGAA NOx SIP Call Task Group, XII-F-11

Comment:
Several commenters noted that the response of IC engines to retrofit NOx controls is highly variable and that the average NOx reduction used to calculate the NOx SIP Call budgets is not necessarily the level that all large engines can achieve. Because of this variability, these commenters suggest that state air agencies should assign NOx reductions to the owners or operators of IC engines, but not attempt a uniform definition of the required control technology, or specification of a single compliance limit. The commenters suggest that EPA include language in the final rule stating that the Agency recommends, and will approve, SIPs which provide that owners or operators of large engines in the NOx SIP Call inventory develop company- specific compliance plans to demonstrate achievement of NOx reductions. In addition to describing the standards for emissions reduction averaging in the final rule, EPA also should issue a guidance letter to the states urging them to provide flexibility for IC engines. The industry listed a number of advantages to the company compliance plan approach to meeting the engine NOx reductions in the NOx SIP Call rule:

> -Engine owners and operators would accept enforceable and verifiable measures to control engines to meet assigned NOx SIP Call reductions.
> -Based on the company compliance plans, states would be able to clearly demonstrate to EPA their compliance with Phase II of the NOx SIP Call.
> -EPA, the states, and the regulated companies would not have to work through the technical confusion of definitions of lean-burn and rich-burn engines, and whether individual engines could in fact achieve certain control levels with a prescribed control technology.
> -Compliance with NOx SIP Call requirements could be achieved with minimum impacts on cost, natural gas capacity, and operational reliability.

One pipeline company felt that EPA should encourage states, implementing the engine portion of the NOx SIP Call to focus primarily on the population of large engines, which emitted more than 1 ton per day during the 1995 ozone season and which formed the basis for the Agency's calculation of the desired

emission reductions. Retrofitting this population of engines is more feasible and is the most cost-effective method for achieving reductions due to economies achieved by controlling larger sources.

EPA Response:
The EPA addressed this issue in a guidance memorandum dated August 22, 2002. As discussed in the memo,[22] where States choose to regulate large IC engines, EPA encourages the States to allow owners and operators of large IC engines the flexibility of achieving the NO_x tons/season reductions by selecting from either a variety of technologies or a combination of technologies applied to various sizes and types of IC engines. Flexibility would be helpful as companies take into account that individual engines or engine models may respond differently to control equipment. That is, while certain controls are known to have a specific average control effectiveness for an engine population, some individual engines that install the controls would be expected to be above and some below that average control level, simply because it is an average. Although the issue of flexibility does not affect the setting of the NOx SIP call budget, it is an important issue as States take steps to meet their NOx SIP call requirements.

During the SIP development process the States may establish a NO_x tons/season emissions decrease target for individual companies and then provide the companies with the opportunity to develop a plan that would achieve the needed emissions reductions. The companies may select from a variety of control measures to apply at their various emission units in the State or portion of the State affected under the NO_x SIP call. These control measures would be adopted as part of the SIP and must yield enforceable and demonstrable reductions equal to the NO_x tons/season reductions required by the State. What is important from EPA's perspective is that the State, through a SIP revision, demonstrate that all the control measures contained in the SIP are collectively adequate to provide for compliance with the State's NO_x budget during the 2007 ozone season.

II.B.5 NSR Exclusion

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; CMS Truckline Gas Company (Truckline), XII-D-16; CMS Panhandle Eastern Companies (Panhandle), XII-D-17; Natural Gas Pipeline Company of America (Natural), XII-D-24; American Gas Association (AGA), XII-D-33; Dominion Energy, Inc. (or Dominion Resources), XII-D-38

Comment:
Some commenters stated that the final rule should provide an exemption from New Source Review (NSR) regulations for IC engines that install NOx controls for compliance with the NOx SIP call.

---

[22] August 22, 2002 memo from Lydia Wegman to EPA Regional Air Directors providing guidance on issues related to stationary internal combustion engines and the NOx SIP call.

According to the commenters, installation of the required emission controls will likely result in increases in emissions of carbon monoxide and/or volatile organic compounds (VOC). As a result, the facilities could exceed the "significant" levels for carbon monoxide or VOC, thereby subjecting those facilities to either Prevention of Significant Deterioration or Nonattainment New Source Review permit requirements; and in turn result in increased compliance costs. Pipeline industry comments request that EPA expressly state in its final remand response that installing controls on IC engines to meet NOx SIP call requirements will not trigger NSR for NOx under the "actual-to-potential" test. Commenters also request EPA to state that installing retrofit controls is an "environmentally beneficial" action that qualifies for a NSR exclusion for any collateral increases of other criteria pollutants. One commenter noted that if there is an increase in facility rated capacity by any NO_x control project, FERC review and approval is required. FERC is charged with "certifying" natural gas compressor facilities.

EPA Response:
The EPA addressed many of these issues in its August 22, 2002 guidance memorandum.[23] As discussed in the memorandum, where sources choose to install combustion modification technology to reduce emissions of NO_x at natural gas-fired lean-burn IC engines, EPA believes this action should be considered by permitting authorities for exclusion from major NSR as a pollution control project. Further, the memo indicates that, unless information regarding a specific case indicates otherwise, installation of combustion modification technology for the purpose of reducing NO_x emissions at natural gas-fired lean-burn IC engines can be presumed, by its nature, to be environmentally beneficial. The EPA recently addressed the issue of the "actual to potential" test.[24] In most cases, EPA believes that LEC retrofit technology will not increase emissions of CO or VOC to the extent that NSR is triggered. As noted below; in many cases emissions of CO and VOC will decrease with the installation of LEC technology**.** Thus, EPA believes that the permit process will not hamper efforts to install controls on IC engines.

In the Federal Register on December 31, 2002, EPA codified/finalized the Pollution Prevention Project exclusion. On Table 2 - Environmentally Beneficial Pollution Control Projects, LEC for IC engines is mentioned. However, for the present time the regulatory changes generally only affect States with delegation authority to implement the Federal PSD program, which became effective on March 3, 2003. For states continuing to implement their existing programs for another 2-3 years, the August 22, 2002, guidance memo mentioned above is appropriate.

Information from IC engine manufacturers indicates that LEC technology may not increase CO and/or VOC emissions. According to Cooper-Bessemer, LEC reduces NOx to less than 3 g/hp-hr with no CO

[23]August 22, 2002 memo from Lydia Wegman to EPA Regional Air Directors providing guidance on issues related to stationary internal combustion engines and the NOx SIP call.

[24]On November 22 2002, EPA announced changes to the New Source Review program, including changes to the method of calculating future emissions.

or HC emission increase and fuel economy is slightly improved while the engine maintains full power.[25] According to another manufacturer, Clark, precombustion chambers have been developed with no increase in CO or HC emissions.[26] Additional information states that LEC technology consisting of lean-burn operation, precombustion chambers, and enhanced in-cylinder mixing of fuel and air has been applied to Ingersoll-Rand KVS, KVSR, KVT, TVS, TVR, and SVS models with no significant increase in CO or HC emissions. Also, there are no decreases in engine fuel economy or available horsepower.[27] Another reference states that LEC technology has no CO or HC increases and that fuel economy is slightly improved.[28] Additional information indicates that precombustion chambers reduce NOx, HC and CO emissions.[29]

II.B.6 Early Reductions

Commenter:
Natural Gas Pipeline Company of America (Natural), XII-D-24

Comment:
Industry comments recommend that EPA provide specific guidance in the final rule that directs states to recognize emission reductions that companies have made since 1995. Companies should be allowed credit for emission reductions achieved since 1995 for determining compliance with their portion of the states emission reductions required to meet the emissions budgets

EPA Response:
The EPA addressed this issue in a guidance memorandum dated August 22, 2002. As discussed in the memo, EPA agrees that creditable reductions with respect to the NOx SIP call may include emission controls in place during or prior to 1995 as well as after 1995 for the large engines. In addition, States

---

[25]Low -Cost Nox Controls for Pipeline Engines - Cooper-Bessemer/GMV Series -GRI - 3/95. Docket XII-K-94.

[26]Low-Cost NOx Controls for Pipeline Engines" - GTI - see www.gastechnology.org/pub/oldcontent/pubs3/trans/tp_lcncpe.html. Docket XII-K-93.

[27]Low-Cost NOx Controls for Pipeline Engines" - GTI - see www.gastechnology.org/pub/oldcontent/pubs3/trans/tp-inger.html. Docket XII-K-90.

[28]See www.gastechnology.org/pub/oldcontent/pubs3/trans/tp-coopr.html

[29]See www.ceconet.com/gas_tran_comp/products/Precombustion/Precombustion.htm and "The SIP Combustion System for NOx Reduction on Existing Dresser-Rand Gas Engines" at www.energy-tech.com/issues/html/we9503_001.html, (Docket XII-K-88)

generally may use emission reductions achieved after 1995 at the smaller engines as part of their NO_x SIP call budget demonstration.

II.B.7 Executive Order 13211

Commenters:
Texas Gas Transmission Corporation - Williams Gas Pipeline, XII-D-07; Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

Comment:
Executive Order 13211 requires EPA to analyze the effect of its regulations on the Nation's energy supply, distribution and use. Commenters state that EPA failed to analyze, or even recognize, its deadline's potential effect on the United States' natural gas transmission system. The commenters indicate that the proposal's impractical compliance deadline could compromise much of the Nation's gas transmission and storage system. Thus, the commenters ask EPA to provide a compliance period that is adequate to avoid these problems and that the Agency must conduct a study that demonstrates (after notice and opportunity for comment) that it has fully considered all of the impacts on energy supply and distribution.

EPA Response:
EPA disagrees with this comment. . In accordance with Executive Order 13211, EPA completed an energy impact analysis of this rule, on October 2, 2001. (*See*, Docket No. OAR-2001-0008, Item No. XII-L-06] The Analysis which estimates the energy impacts associated with the Phase II portion of the NOx SIP Call, covers all large EGUs that do not participate in the Acid Rain Trading Program and large IC engines in the District of Columbia and the 21 States of the NOx SIP Call region, as well as all NOx SIP Call sources (cement kilns, utility boilers, industrial boilers, combustion turbines, and IC engines) in the fine grid portions of Georgia and Missouri. This analysis also considered impacts on sources in only the fine grid portions of Michigan and Alabama.

The analyses indicated minimal effects, less than 0.5 percent nationally, on both energy supply, distribution and demand, including natural gas. The analyses also included all IC engines in Georgia and Missouri even though only the fine grid portions of these states are affected by this rule.

The EPA notes that the more prevalent LEC retrofit, which has been in use for almost twenty years, is the screw-in precombustion chamber. (Stationary Reciprocating Internal Combustion Engines Updated Information on Nox Emissions and Control Techniques, Revised Final Report, prepared by Ec/R, Inc. for EPA, p. 4-2, September 1, 2000, available on the Internet at http://www.epa.gov/ttn/naaqs/ozone/rto/fip/data/rfic_engine.pdf). This kind of retrofit is both less costly and time-consuming than other kinds of LEC retrofit. For example, Columbia Gas Transmission Corporation, using screw-in precombustion chambers, retrofitted two IC engines at its Bedford Co., PA, facility within three days (found in reprint of article in "American Gas & Oil Reporter", May 1998,

available on the Internet at http://www.dieselsupply.com/dscartic.htm.). EPA has also found that most, if not all, natural gas pipeline stations are equipped with multiple IC engines and that not all engines are operated at the same time. Therefore, EPA believes that LEC retrofits can be phased-in making it less likely for an entire station to go offline for a LEC retrofit. Thus, because a phased-in approach is feasible, EPA believes that engine stations can continue operating close to their standard level thereby avoiding service interruptions. EPA also notes that the December 1998 Gas Research Institute report concluded that "installation of the [LEC] retrofit kit is not expected to impact the normal maintenance interval." (NOx Control for Two-Cycle Pipeline Reciprocating Engines, p. 4-11, December 1998). The energy impact analysis also indicated that IC engines retrofitted with LEC will experience, on average, an energy savings of half a million BTUs per hour per engine, and therefore savings in operating costs.

In addition, EPA notes that States have flexibility to decide the source categories to regulate in developing SIPs for compliance with the NOx SIP call requirements. [63 FR 57,424]. In its August 22, 2002 memo the Agency reiterated that:

> "[A] State is free to choose whatever mix of controls will meet its budget and is free not to regulate IC engines at all. Where States choose to regulate large IC engines, EPA encourages the States to allow owners and operators of large IC engines the flexibility to achieve the NOx tons/season reductions by selecting from among a variety of technologies or a combination of technologies applied to various sizes and types of IC engines." In addition, the EPA requirement of the SIPs is that they "demonstrate that all the control measures contained [in the SIP] are collectively adequate to provide for compliance with the State's NOx budget during the 2007 ozone season."

[Memo from Lydia Wegman, Director, Air Quality Strategies and Standards Division, USEPA to Air Division Directors, US EPA Regions I-V, VII (August 22, 2002)].

Hence, the Agency is not requiring dependence upon emission controls from a particular source category for a State to comply with the NOx budget as set by this final rule.

The comment on the compliance deadline is addressed in section VII .K of this document.

Thus, with the improvements in ease of LEC retrofits, that include scheduling retrofits during maintenance cycles, the adequate time the Agency believes exists for implementation, and the flexibility granted to States to meet their NOx budgets, we do not believe the concerns expressed about effects on natural gas transmission from compliance with the Phase 2 NOx SIP call rule are warranted.

II.B.8 Presumptive Technology

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; Indiana Department of Environmental Management Office of Air Quality, XII-D-36

Comment:

Because of the variability of gas pipeline engines in the NOx SIP Call area, industry commenters suggest that state air agencies should assign NOx reductions to the owners or operators of IC engines, but not attempt a uniform definition of the required control technology, or specification of a single compliance limit. There is significant variability both in the pre-controlled emission levels of lean burn engines and in the response of any particular engine to the retrofit installation of LEC technology.

EPA Response:
As suggested, EPA has dropped from the final rulemaking the definition of LEC retrofit technology and the presumption of NOx reduction effectiveness. The definition and presumption are not necessary to establish the NOx budget. Nevertheless, EPA believes that, on average, LEC technology achieves an 82% reduction from uncontrolled emissions.

II.B.9 Monitoring

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; Natural Gas Pipeline Company of America (Natural), XII-D-24

Comment:
Industry comments recommended that EPA should specify in the final rule the types of monitoring that will be acceptable.

EPA Response:
The EPA addressed this issue in a guidance memorandum dated August 22, 2002. As discussed in the memo, acceptable monitoring is not limited to those monitoring methods such as continuous or predictive emissions measurement systems that rely on automated data collection from instruments. Non-automated monitoring may provide a reasonable assurance of compliance for IC engines provided such periodic monitoring is sufficient to yield reliable data for the relevant time periods determined by the emission standard.

II.B.10 Emission Factors for 2- and 4-Stroke Engines

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

Comment:
Some commenters asked EPA to use separate emission factors for 2- and 4-stroke engines.

EPA Response:
As described above, EPA examined "uncontrolled" emissions from 2- and 4-stroke engines separately and concluded that the data support the 16.8 value proposed by EPA. The EPA also examined the

available "controlled" data separately for 2- and 4-stroke engines. Test data for the large IC engines in the SIP call area indicate controlled levels of 2.3 and 2.5, respectively, for the 2- and 4-stroke engines. Assuming 85% of the engines in the SIP Call area are 2-stroke, the weighted average of the 2.3 and 2.5 values is 2.3. Thus, because the 2-stroke engines dominate the SIP Call inventory and the controlled value for the 4-stroke engines is nearly identical, there is no benefit from using separate emission factors. Furthermore, EPA's emission inventory is not detailed enough to identify which engines are 2- or 4-stroke engines; thus, EPA needs to use an average value to represent the combined population of large, lean-burn engines. The EPA believes the difference between the two values is relatively small, there is a great deal of overlap, some key industry reports also use a single value, the available data for 2- and 4-stroke engines support the value EPA proposed, control techniques are the same, and EPA has already subdivided the category of IC engines. For these reasons EPA has chosen to not further subdivide the IC engines category.

II.B.11 Other Comments

Commenter:
Texas Gas Transmission Corporation -Williams Gas Pipeline, XII-D-07

Comment:
The EPA needs to consider the interaction between the NOx controls required by the NOx SIP call rules and the HAP controls required by the MACT rule for IC engines before either rule is finalized. Some data on LEC technology suggest that LEC may result in increased emissions of some HAPs. Requiring sources to install NOx control technology that increases HAP emissions at the same time that the EPA and industry are both expending a great amount of time, effort and money reducing HAP emissions makes little sense.

EPA Response:
This rulemaking does not require sources to install controls on IC engines. Rather, this rulemaking establishes, in part, NOx emission budgets for specific States or portions of States. As noted above, where States choose to control IC engines, EPA encourages the States to provide sources with flexibility in determining which IC engines to control and by what control techniques. This flexibility would enable sources to tailor their control efforts to meet requirements related to NOx and HAPs in the best manner.

The proposed MACT rule for RICE currently has HAP emission limitations for existing 4 stroke rich burn (4SRB) engines and all new RICE, i.e. 2 stroke lean burn, 4 stroke lean burn, compression ignition, and 4SRB engines.. The control technologies that reduce the level of HAP emitted from IC engines–NSCR or oxidation catalyst–are also expected to reduce emissions of criteria pollutants, primarily CO, NOx, and PM; VOC are also reduced. Rich-burn IC engines which control by NSCR, would also get 90% NOx reduction. NOx emissions will remain the same before and after an oxidation catalyst system.

The toxic substances of most concern emitted from IC engines burning gaseous fuels are VOCs. These VOCs are the result of incomplete combustion, and can be reduced by methods that either improve combustion inside the engine or destroy VOCs in the exhaust. In addition, if an engine is misfiring or has other operational problems, VOC emissions can be excessive. In NSCR, the engine exhaust is routed to a catalyst bed across where NOx is reduced to nitrogen gas; at the same time, VOC and carbon monoxide are oxidized to water and carbon dioxide. If a NO_x control technique were found to increase VOC emissions to unacceptable levels, an oxidation catalyst can be used to reduce these emissions. The oxidation catalyst is an add-on control device that reduces CO and VOC emissions to CO_2 and H_2O. VOC emission reductions on lean-burn engines can be achieved through the use of oxidation catalysts without impacting NOx reduction performance.

Commenters:
Texas Gas Transmission Corporation - Williams Gas Pipeline, XII-D-07; Natural Gas Pipeline Company of America (Natural), XII-D-24

Comment:
Worthington IC engines have been identified by the EPA as engines "that may be particularly difficult to retrofit and which may exceed the 1.5 to 3.0 g/bhp-hr LEC retrofit level." One pipeline company, Natural Gas Pipeline Company of America (Natural), stated they have six (6) Worthington IC engines that are classified as "large" engines under the NOx SIP Call regulations. The company indicated that in 2001 it began developing emission control technology for a Worthington engine at one of its compressor stations in Illinois and is anticipating completing and conducting emission testing by the third quarter of 2002. Natural also indicated that it expects to reduce emissions from this Worthington engine from approximately 12 g/bhp-hr to 4.0 g/bhp-hr (a 67% reduction). Natural further indicated that it will not know what emission reduction level will actually be achieved until completion of this project, even though the vendor projection is 4.0 g/bhp-hr. However, if successful, Natural expects to use the same technology to further reduce emissions from other Worthington MLV-10 engines to the 4 g/bhp-hr.

The control levels for IC engines being proposed by EPA for calculating budget reductions are too high because they do not include allowance for degradation of the control level over time. In addition, it is not clear that the proposed control levels can be attained on all engines.

EPA Response:
The EPA agrees that some engines may exceed 3.0 g/bhp-hr even with NOx controls and commends Natural for its efforts to develop controls for the Worthington engines. As described above, EPA believes that the total population of large IC engines can, on average, achieve levels below 3.0 g/bhp-hr. Regarding degradation of controls over time, no data were submitted by the commenter to support this concern; thus, EPA has not included such an allowance.

Commenters:

Natural Gas Pipeline Company of America (Natural), XII-D-24; Dominion Energy, Inc. (or Dominion Resources), XII-D-38

Comment:
EPA should clarify that the desired emission reduction is based on the emission inventory of the engines that emitted 1 ton of NOx per day during the 1995 ozone season. Regarding the definition of large internal combustion engines, Natural agrees that internal combustion engines should be classified as "large" based on the one ton per day of actual emissions during the 1995 baseline year. This classification criterion is consistent with the definition of "large" emission sources adopted in the original NOx SIP Call rulemaking.

EPA Response:
EPA agrees that the NOx SIP call emission budget is calculated, in part, from emission reductions based on the emission inventory of the IC engines that emitted 1 ton of NOx per day during the 1995 ozone season.

Commenter:
Interstate Natural Gas Association of America (INGAA), XII-F-10

Comment:
According to EPA's corrected emissions inventory 189 large IC engines are covered by the SIP call. These engines account for less than 1% of the total NOx emissions identified in the OTAG region. INGAA has identified 168 of these engines-almost 90% as used in gas transmission or storage service. While the natural gas industry believes they should do their share in reducing NOx emissions, the plain fact is that their percentage of the total NOx SIP Call budgets is very low.

EPA Response:
The percentage of emission reductions from IC engines relative to the total NOx SIP call emission reductions–about 4%–is not insignificant. Further, emissions from individual, large IC engines are relatively high compared to other source categories and, collectively, emissions from large IC engines are substantial. Large[30] natural gas-fired lean-burn IC engines are primarily used in pipeline transmission service and some are used in field storage pumping operations. Gas turbines are also used in these operations. On a capacity basis the IC engines and turbines in pipeline transmission service are about evenly divided.[31,32] The uncontrolled emission rate from IC engines is about ten times greater than the

---

[30]Large, as defined in the NOx SIP call (63 FR 57356, October 27, 1998), means an IC engine which emitted, on average, greater than 1.0 ton/day during the 1995 ozone season.

[31]Alternative Control Techniques (ACT) document, "NO_x Emissions from Stationary Reciprocating Internal Combustion Engines," (ACT document for IC engines) EPA-453/R-93-032, July 1993, page 3-15. The ACT documents were required by section 183(c) of the Clean Air Act

uncontrolled emission rate for gas turbines.[33] That is, uncontrolled NOx emissions from large IC engines are greater than 3.0 lbs/mmBtu while uncontrolled NOx emissions from gas turbines are about 0.3 lbs/mmBtu. Furthermore, the NOx budget calculation includes a 60% reduction from uncontrolled levels for the large gas turbines.

The EPA has identified 180 large engines in the fine grid that are potentially affected by the SIP call. These engines collectively emit about 50,000 tons of NOx per ozone season. This is over 20% of the total emissions from the non-EGU sources identified in the NOx SIP call as having highly cost-effective controls available. Furthermore, 35% of the total non-EGU emission reductions in the NOx SIP call are from IC engines.

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

Comment:
Another commenter requested EPA remove or explain and identify technical material in support of its statement that "engines with very high air/fuel ratios and with advanced ignition technology can reduce emissions to about 1 g/bhp-hr." The commenter also asked EPA to clarify the applicable IC engines and to further clarify that this assertion does not pertain to the NOx SIP Call IC engines unless EPA has information that demonstrates that this statement can be applied to retrofit LEC on older (pre-1990) lean-burn engines in the NOx SIP Call.

EPA Response:
See Section 4 of the "Retrofit NOx Control Technologies for Natural Gas Prime Movers," Gas Research Institute, March 1994, GRI-94/0329 (1994 GRI report). (Docket XII-K-23). At page 4-1 the document states "As discussed in Section 2, newer lean-burn engines are designed to operate with higher A/F ratios and with an advanced high-energy ignition technology. These newer engines have much lower NOx emissions, some as low as 1 g/hp-hr. Although many are part of the current inventory, these low-NOx models are not the subject of the report, which focuses on control technologies that are feasible for retrofit on the existing uncontrolled population of compressor station engines." This document also states that newer 2 and 4 cycle lean burn engines have very low NOx emissions and that the technology used in these models when used for retrofit on certain uncontrolled engine models, yields nearly equivalent performance.

Amendments of 1990 and subject to public review prior to publication.

[32]"Retrofit NOx Control Technologies for Natural Gas Prime Movers," Gas Research Institute, March 1994, GRI-94/0329, page 2-4, (1994 GRI report).

[33]See, for example, data from EPA's AP-42, Emission Factors document, Table 3.2-1, 10/96.

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

Comment:
Commenters state that the concept of LEC as an incremental technology is not technically correct and the statement, "Application of components of LEC technology will yield incremental emissions reductions," should be deleted for the final rule. A LEC retrofit kit involves a system solution that combines various technical elements for a specific engine model to reach a very high air/fuel ratio, and then achieve reliable ignition and general engine operations.

EPA Response:
EPA agrees that a single definition of LEC technology is unnecessary and has deleted this provision. EPA also agrees that LEC technology produces a very high air-to-fuel ratio. Turbocharging, for example, is one component of an LEC application. With turbocharging, a higher air-to-fuel ratio is possible than without turbocharging. The degree of turbocharging, however, may be adjusted. Similarly, aftercoolers or ignition enhancement affect the air-to-fuel ratio. Design of any LEC retrofit kit will integrate these components for specific engine performance and emissions goals.

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

Comment:
While EPA's preamble states that all engines can be retrofitted, the support document on which that statement is based says only that retrofits are "generally" available, "particularly" for the "most plentiful" engine models. Commenters assert that, in effect, this qualification confirms that, even in EPA's opinion, retrofits are not available for the less plentiful engine models.

EPA Response:
As described below, EPA continues to believe that virtually all engines can be retrofit with LEC technology. This information is also contained in the docket and the revised TSD.

As previously noted, INGAA supplied information on the engine models used by the natural gas pipeline industry in the SIP Call area. The EPA also obtained information from various IC engine manufacturers. This information is summarized in Table 12 below.

Table 12 -- Availability of Retrofitting LEC for Various Large IC Engine Models in SIP Call Area

Engine Model	Number of Engines	% of Total Units	% of Total HP	LEC Available?
Clark TCV	28	18	22	Yes

Cooper-Bessemer (C-B) GMW	26	17	10	Yes
C-B V-250`	19	12	13	Yes
C-B GMWA	12	8	5	Yes
Ingersoll-Rand(I-R) KVS	11	7	4	Yes
C-B LSV	10	6	7	Yes
C-B GMWC	9	6	5	Yes
Clark HLA	8	5	3	Yes
Worthington MLV	5	3	4	Yes
Clark TCVC	4	3	8	Yes
C-B Z-330	3	2	6	Yes
C-B GMVH	3	2	1	Yes
C-B GMVA	3	2	1	Yes
Clark TCVD	2	1	3	Yes
I-R KVR	2	1	2	Yes
Nordberg FSE	2	1	1	??
Clark TLA	2	1	1	Yes
C-B W-330	1	1	1	Yes
I-R KVT	1	1	1	Yes
Clark BA	1	1	0.3	Yes
I-R KVG	1	1	0.2	Yes
Worthington ML	1	1	1	Yes
C-B GMWH	1	1	1	Yes
C-B GMWS	1	1	1	Yes
Total	156	100	100	All but 2 of 156 engines

Various references were obtained on the availability of LEC to be retrofitted on existing engines.

For Cooper-Bessemer engines, All 2 and 4 cycle Cooper engines (Cooper-Bessemer, Enterprise, Superior, Ajax) can be retrofitted with LEC; either Clean Burn or EcoJet. Also the EcoJet can be adapted to any IC engine model including Worthingtons and Clarks. The Clean Burn system can only be installed on a Cooper engine (Cooper, Enterprise, Ajax, Superior).[34]

For Clark, Ingersoll-Rand engines several sources of information were obtained. Low cost PCC retrofits are available for engines that are Clark TLA, TLAB-D; TCV, TCVA-D; HLA, BA, HBA models.[35]

According to Dresser-Rand personnel, the screw-in prechamber (SIP) has been installed on 79 engines at 7 different owner/operators in 5 different states. The SIP can be installed on any Dresser-Rand, Ingersoll-Rand, Clark or Worthington engine.[36] Screw-in prechambers are available for TCV, TCVA, TVAD, TLA, TLAD, TCVC,LA, HLA, BA, HBA, RA, HRA, KVS, KVSR, KVR, and KVT.[37]

LEC using lean-burn operation, precombustion chambers, and enhanced in-cylinder mixing of fuel and air can be applied to Ingersoll-Rand KVS, KVSR, KVT, TVS, TVR, and SVS models regardless of the number of cylinders.[38]

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10

Comment:
Commenters disagree with EPA's claim that all retrofitters will "generally" guarantee performance levels of 2.0 g/bhp-hr or less. Manufactures of retrofit kits have almost invariably either been unwilling to offer any guarantees at all, or offer guarantees far too qualified to be of any practical use.

---

[34]Telecon with Ron Billig - 7/12/02; docket number XII-E-14.

[35]"Low- Cost NOx Controls for Pipeline Engines" See docket number XII-K-93 or www.gastechnology.org/pub/oldcontent/pubs3/trans/tp_lcncpe.html

[36]Telecon dated 6/7/02; docket number XII-E-15.

[37]"The SIP combustion System for NOx Reductions on Existing Dresser-Rand Gas Engines" see (Docket XII-K-96) or (www.dresser-rand.com/e-tech/tp014/tp014prt.htm).

[38]"Low-Cost Nox Controls for Pipeline Engines," see docket at XII-K-90 or www.gastechnology.org/pub/oldcontent/pub3/trans/tp-inger.html,

EPA Response:
Information obtained by EPA from the various IC engine manufacturers indicates that LEC technology is often guaranteed by the manufacturers to achieve at most 3.0 g/hp-hr.

> From Copper-Bessemer, a reasonable level of performance expected to be achieved by LEC retrofits is 3 g/hp-hr.[39]
>
> According to another major vendor (Dresser- Rand/Clark), LEC has no problem meeting the 3.0 g/hp-hr level even for Worthington engines.[40]
>
> Information at www.enginuityinc.com indicates that addition of a PCC system to Duke Energy; Vidor, Texas met a 2.0 g/bhp-hr guarantee.

Based on this information, the TSD has been revised to state that IC engine manufacturers will typically guarantee the LEC performance to be 3.0 g/hp-hr or less.

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; CMS Trucking Gas Company (Truckline), XII-D-16; CMS Panhandle Eastern Companies (Panhandle), XII-D-17; El Paso Corporation, XII-F-13

Comment:
The EPA should remove irrelevant and incorrect data from support documents.

EPA Response:
The EPA has updated and revised portions of the TSD.

---

[39] Telecon of 7/12/02; docket number XII-E-14. Also see docket XII-K-91, www.gastechnology.org/pub/oldcontent/pubs3/trans/tp-coopr.html.

[40]Telecon of 6/7/02; docket number XII-E-15. Also see "Low-Cost Nox Controls for Pipeline Engines" www.gastechnology.org/pub3/trans/tp_lcncpe.html which states that Dresser-Rand has confidence that screw in prechambers and fuel valves can be guaranteed to achieve 3.0 g/hp-hr for Clark engines (docket XII-K-93). In addition, see From "Low-Cost Nox Controls for Pipeline Engines", www.gastechnology.org/pub/oldcontent/pub3/trans/tp-inger.html, which states that LEC (using lean-burn operation, precombustion chambers, and enhanced in-cylinder mixing of fuel and air) applied to Ingersoll-Rand KVS, KVSR, KVT, TVS, TVR, and SVS models meets any existing (3/ghp-hr) or anticipated NOx RACT requirement (docket XII-K-90).

III. Court Decision's Effect on Georgia and Missouri

Commenter:

Holden & Associates, Inc. representing Oglethorpe Power Corporation, XII-D-22

Comment:
The EPA can not move forward with the proposed rule when it has not provided affected parties in Georgia a chance to evaluate the details which form EPA's basis for the rulemaking. To provide a meaningful opportunity to comment on the rule as applied to Georgia, EPA must make available the data that underlie the revised budgets, including the list of sources included in the budgets, the emission estimates for those sources and their assumed emission reductions. Accordingly, Oglethorpe Power reserves the right to correct any errors in EPA's databases concerning its sources after the close of the comment period and to contest any errors that it can not now ascertain.

EPA Response:
As identified in Table 1 and Section 7.C., *What Is Our Response to the Court Decision on Georgia and Missouri?* of the Proposed Rule, [67 FR 8415], the counties that we are including in the calculation of NOx budgets for the States of Georgia and Missouri are those that are found to be completely within the fine grid portion of the OTAG defined domain. As no other data or affected non-EGU source definition has changed since the Technical Amendment to the NOx SIP Call and supporting source data were published [65 FR 11222], the underlying data are simply the same published inventory and reduction calculations but are now limited to the Table 1 referenced counties.

Commenter

T.L. Garret for Kansas City Power and Light Company, XII-D-08, D. Marshall, Clean Air Task Force, XII-D-11, Savannah Electric and Power Company, XII-D-32, A.E. Stinchfield, Ga-Pacific Corporation, XII-D-37

Comment
Several commenters stated that our inclusion of portions of the State of Georgia was not supported by reliable data and sound science especially in light of Michigan, "that remanded and vacated in its entirety [the inclusion of whole states of Georgia and Missouri]," due to "EPA's unsupportable determination of significant contribution." Several commenters also stated that we had failed to provide data to support the inclusion of portions of the State of Georgia that are within the fine grid. Another commenter argued that we had failed to provide information to support inclusion of affected sources in Georgia.

EPA Response:

In Michigan, the D.C. Circuit Court held that "[t]he fine grid modeling of *parts* of Missouri and Georgia showed emissions in the aggregate meeting the EPA's threshold contribution criteria." Michigan, 213 F.3d at 683 (emphasis in original). The Court noted that "EPA's explanation and technique make clear that emissions from the fine grid areas may have been the sole source of the finding." *Id*. The Court also found that it was "no mere techno-fortuity that the fine grid included enough of Missouri to include the city of St. Louis and enough of Georgia to include Atlanta: the[se] fine grid portions of both states are closest to other nonattainment areas, such as Chicago and Birmingham, and generally higher ozone density." *Id*. However, the Court vacated and remanded the NOx SIP Call budgets for the States of Georgia and Missouri finding that the budgets "not only encompass the whole state but are calculated on the basis of hypothesized cutbacks from areas that have *not* been shown to have made significant contributions." *Id* at 684. (emphasis in original). The Court further held that "EPA must first establish that there is a measurable contribution" from the coarse grid portion of the State before holding the coarse grid portion of the State responsible for the significant contribution of downwind ozone nonattainment in another State. *Id*. In Appalachian Power Company v. EPA, 251 F. 3d 1026, 1040-1 (2001), the Court found that "insofar as the TAs [technical amendments] include a statewide Missouri emission budget they are unlawful under Michigan." Therefore, the Court did not call into question the proposition that the fine grid portions of Georgia and Missouri should be considered as making a significant contribution to downwind nonattainment. We also note that Georgia and Missouri industry petitioners maintained that, as we believe, there was record support for inclusion of emissions from the eastern half of Missouri and the northern-two thirds of Georgia as contributing to downwind ozone problems. Michigan, 213 F. 3d at 681.

In addition, in the NOx SIP Call Rule, we found that "[s]ources that are closer to the nonattainment area tend to have much larger effects on the air quality than sources that are far away." (63 FR 25919.) Further, OTAG's technical findings and recommendations concluded that areas located in the fine grid should receive additional controls because they contribute to ozone in other areas within the fine grid.

Today's rulemaking finalizes our revision of the budgets for Georgia and Missouri to reflect the Court's pronouncements in Michigan. This is also consistent with OTAG's recommendations and findings. We have revised neither our existing determination nor our bases for the determination that sources in the fine grid portion of Georgia and Missouri are contributing significantly to downwind nonattainment. We are revising the NOx budgets for Georgia and Missouri to reflect the inclusion of only the sources that are within the fine grid portions of both States. Accordingly, we also continue to rely on the Technical Support Document and Notice of Data Availability which are the underlying documents for the NOx SIP Call Rule.

Commenters:

R. Kilpatrick, C. Tucker, V. Reeves, Georgians for Clean Energy, Souther Organizing Committees for Economic and Social Justic and Southern Alliance for Elean Energy, XII-D-14, D.M. Fraley, City Utilities, XII-D-26

Comment:
Several commenters supported our inclusion of the fine grid portions of Missouri and Georgia. One commenter requested that we not exclude sources within any county that partially lies within the coarse grid area in the affected States.

EPA Response:
Today's action is in response to the court's decision that vacated our inclusion of the entire States of Georgia and Missouri. Michigan v. EPA, 213 F.3d 663. (D.C. Cir. 2000), cert. denied, 121 S. Ct. 1225 (2001)(Michigan). "*EPA must first establish that there is a measurable contribution*" from the coarse grid portion of the State before holding the coarse grid portion responsible for the significant contribution of downwind ozone nonattainment in another state. *Id*. At 683-84 (emphasis in original).

As explained in our February 22, 2002 proposal, "because of difficulties and uncertainties with accurately dividing emissions between the fine and coarse grid of individual counties for the purpose of setting overall NOx emissions budgets, we believe that the calculation of the emissions budgets should be based on all counties which are wholly contained within the fine grid." (67 FR 8415). We believe this is consistent with the Court's ruling. Thus, we are finalizing the budgets for Georgia and Missouri to include only those counties that lie wholly within the fine grid portions of both States as described above.

Commenter:

Savannah Electric and Power Company, XII-D-22

Comment:
One commenter requested the reconsideration of our inclusion of sources that are "just inside the fine grid." This commenter based its request on modeling showing that sources in Georgia south of 32.67 degrees latitude do not significantly contribute to nonattainment ozone areas in downwind States.

EPA Response:
We have evaluated the modeling submitted by this commenter and found that the modeling does not refute the overall conclusions we have drawn concerning the impacts of NOx emissions in the relevant geographic areas. The commenter quantified the contribution from those emissions in Georgia south of 32.67 degrees latitude (i.e., southern Georgia) by modeling the four OTAG episodes with emissions in southern Georgia removed (i.e., zero-out). The results of this modeling, as presented by the commenter, suggest that emissions in southern Georgia contribute less than 2 parts per billion (ppb) to the peak daily 1-hour ozone in 1-hour nonattainment areas outside of Georgia in each of the four episodes. In view of these results, the commenter contends that the contribution from southern Georgia to all downwind nonattainment areas is not significant since the contribution is less than the 2 ppb screening criteria used by EPA in the NOx SIP Call to identify those upwind State-to-downwind nonattainment area linkages that were clearly not significant. However, the commenter misinterpreted the definition of EPA's 2 ppb screening criteria by limiting the analysis of contribution to just the episode peak concentration in the

downwind areas. By doing so, the contractor did not consider or present any data to evaluate the contribution from southern Georgia to other ozone exceedances (i.e., less than the peak value but exceeding the NAAQS) predicted in each downwind area. For example, southern Georgia may not impact the predicted episode peak for the 1-hour ozone standard in Birmingham by 2 ppb, but southern Georgia could have contributed at least 2 ppb to one or more of the other 88 exceedances in Birmingham. Unfortunately, the commenter did not provide any data to permit an examination of the contribution of emissions from southern Georgia to all exceedances in downwind nonattainment areas. Thus, the comment that southern Georgia does not significantly contribute to downwind nonattainment because they did not examine all contributions above 2 ppb. Therefore,
to the extent that the sources are modeled by the commenter in a county that falls within the fine grid part of Georgia, we do not believe we should reconsider its inclusion in the NOx SIP Call.

Commenter:

N.W. Fichthorn, Hunton & Williams for Union Electric Company, d/b/a/ Ameren UE, XII-D-29

Comment:
One commenter argued that the Court vacated our determination of significant contribution for all of Missouri in Michigan, and therefore, we no longer have a basis for including any portion of Missouri in the NOx SIP Call. The commenter also argued that we made no significant contribution finding for eastern Missouri but rather based our findings on emissions from the whole State.

EPA Response:
We disagree with the comment. As stated elsewhere in this rule, with respect to the fine grid parts of Georgia and Missouri, the Court found that "the fine grid modeling of *parts* of Missouri and Georgia showed emissions in the aggregate meeting the EPA's threshold contribution criteria." Michigan, 213 F.3d. At 683. We also note that Georgia and Missouri industry petitioners maintained that there was record support for inclusion of emissions from the eastern half of Missouri and the northern-two thirds of Georgia as contributing to downwind ozone problems. *Id.,* at 681. The OTAG's recommendations and findings concluded that areas located in the fine grid should receive additional controls because they contribute to ozone in other areas within the fine grid. In addition, our modeling showed that emissions in both Georgia and Missouri make a significant contribution to nonattainment in other areas. Therefore, we believe there is record support for inclusion of eastern Missouri.

Commenter:

N.W. Fichthorn, Hunton & Williams for Union Electric Company, d/b/a/ Ameren UE, XII-D-29

Comment: One commenter argued that as a result of the vacatur in Michigan, we have to justify the inclusion of eastern Missouri in the NOx SIP Call taking into consideration facts in existence at the time of our proposal.

EPA Response:
We disagree. As stated earlier, the Court found that the modeling showed that emissions from the fine grid portions of the States of Georgia and Missouri met EPA's "threshold 'contribution' criteria." The Court also let stand OTAG's modeling analyses (except with respect to Wisconsin). Thus, the inclusion of eastern Missouri accords with the Court pronouncements on the fine grid/coarse grid. EPA does not believe it needs to revise the existing determination that sources in the fine grid parts of Missouri contribute significantly to nonattainment downwind. The basis for this determination continues to be: (1) the results of our State-by-State modeling; (2) the relatively high amount of NOx emissions per square mile in the fine grid portions of the State; and (3) the closeness of the fine grid portions of the State to downwind nonattainment areas compared to the coarse grid part.

Commenter:

N.W. Fichthorn, Hunton & Williams for Union Electric Company, d/b/a/ Ameren UE, XII-D-29

Comment:
One commenter stated that it was erroneous to continue using data that was 4 years old as our basis for the inclusion of eastern Missouri in the NOx SIP Call in light of data showing that areas receiving measurable contributions from Missouri sources are now in attainment of the 1-hour ozone standards.

EPA Response:
We disagree with the comment that downwind ozone nonattainment areas have achieved attainment of the 1-hour ozone standards. More specifically, Chicago has not yet attained the 1-hour ozone standard. Chicago's attainment demonstration relies, in part, on implementation of Missouri's statewide NOx rule, approved by EPA into the SIP. The NOX SIP Call reductions in Missouri are needed for Chicago to attain/maintain the 1-hour standard.

Although the attainment plan was approved, we believe it is important to point out that there are inherent uncertainties in the plan, including hourly emission estimates and emissions growth projections. Further, without the NOx SIP Call, Missouri may come under increased pressure to relax the existing State rule, which could jeopardize attainment in Chicago. Additionally, the SIP- approved State rule has not yet been implemented and was, in fact, recently revised by the State.
The reductions are highly cost effective and would also help offset emissions from a number of large sources locating upwind of St. Louis and avoid very costly local controls in the future.

In general, we believe an agency should not revisit an otherwise sound rulemaking just due to the passage of time leading to changed circumstances, because circumstances always change. Specifically, we disagree that a new emissions inventory is necessary that takes into account Missouri's statewide NOx rule and other post-1998 CAA rules. Because SIPs are constantly changing, it is impractical to revise emission inventories and modeling analyses each time changes are made. For example, the NOx limits the commenter cites have since been revised by the State and are yet to be approved by EPA.

Further, completing the NOx SIP Call in Missouri is an equitable approach. It would be inequitable to use 2003 air quality analysis for Missouri but to hold other NOx SIP Call States to the 1998 analysis. It should also be noted that we intend to review the NOx SIP Call Rule and will make adjustments if necessary (63 FR 57428). This program is the single most important measure to reduce interstate pollution in the short term. Reductions of NOx emissions from the program will enhance the protection of public health for over 100 million people in the eastern half of the United States -- including people in Missouri. It is a centerpiece of the clean air plans for many cities, including the Chicago area.

Comments: Another commenter stated that the current State of Missouri control regulations would achieve greater NOx emissions and greater improvements than the NOx SIP Call.

EPA Response:
We disagree. Missouri adopted and, in December 2000, we approved a statewide NOx rule which requires emissions reductions in the eastern third of the State and lesser reductions in the remainder of the State for large EGUs. While we approved this rule because it helped address the ozone nonattainment issue in St Louis, we did not find that this rule addressed the significant transport of NOx to other areas that we had identified in the NOx SIP Call. Revisions to the statewide NOx rule were adopted on April 24, 2003 and were submitted as a SIP revision on September 18, 2003.
Both the SIP-approved statewide NOx rule and the revisions to the rule submitted to EPA would achieve less NOx emissions reductions than implementation of the NOx SIP Call. Missouri's current and proposed revised NOx rules are less stringent than the NOx SIP Call requirements. The emissions reductions under the NOx SIP Call are greater by about 20 percent statewide and 40 percent in the fine grid compared to the SIP-approved Missouri rule. The NOx SIP Call also offers the advantages of a cap and trade program, including certainty of emissions reductions; the State rules have no emissions cap. While the current State rule and the SIP revisions may accomplish reductions similar to those under the NOx SIP Call in the short-term, without an emissions cap there is no assurance that the required reductions will continue in the long-term.

Reductions are more effective in preventing interstate transport to key downwind areas under the NOx SIP Call as they must occur in the eastern part of Missouri and trading is not allowed between eastern and western Missouri EGUs. The Missouri rules read the requirement for NOx reductions throughout the entire State. Therefore, the emissions reductions are not focused in the geographical area of interest.

The NOx SIP Call budget also includes reductions in emissions from large cement kilns, industrial boilers, and stationary IC engines. The NOx SIP Call would allow fewer emissions statewide, as shown in Table 2 below.

Table 2. Comparison of Ozone Reductions in the NOx SIP Call and the Missouri Statewide Rule

EGU Emissions (tons per ozone season)	Fine Grid	Statewide

Actual 2001 Emissions	30,872	60,102
NOx SIP Call	13,400 cap	37,600[a] in 2001[b, c]
MO current SIP-approved rule	23,100 in 2001[c]	46,900 in 2001[c]
MO revised rule	19,100 in 2001d	49,600 in 2001[c]

a. Assuming Missouri's current SIP-approved rule remains effective in the coarse grid (reductions from rule are included in the attainment demonstrations for St. Louis and Chicago).

b. The table only compares EGU emissions; the NOx SIP Call requires 2,900 tons additional NOx reductions due to controls on cement, industrial boilers and engines in the fine grid.

c. Estimated emissions based on actual 2001 heat input; emissions after 2001 would be higher as the State rule has no cap.

Further, we informed the State of some problem areas in their recent rule revisions. In addition to the issues above, there are other SIP-approvability concerns with the Missouri statewide rule which make it likely that the rule would have to undergo further revision. These include concerns about the credibility of early reduction credits which appear not to be actual surplus.

IV. Modifications Made to NOx Emission Budgets

Commenter:
International Paper - Augusta Mill, XII-D-21

Comment:
Since Georgia's allocation is recalculated and reopened for comment, EPA should use this opportunity to correct errors. International Paper is aware of at least one error in the reduction credits, and baseline affected units. International Paper-Augusta Mill's No. 1 power boiler is a combination boiler, which did not have 50% heat input capacity of fossil fuel in 1995. Applying the Part 97 definition to this unit, the unit is not an affected unit, and should not be included in the NO_x reduction calculation.

EPA Response:
After reviewing the commenter's submittals and the base year 1995 emissions and heat input data, EPA agrees with the modification request and approves the removal of power boiler No. 1 at International Paper's Augusta Mill from the budget reduction calculation for the reason that it did not appear to fire more than 50% heat input during the ozone season of 1995 from fossil fuels.

Commenter:
Indiana Department of Environmental Management - Office of Air Quality, XII-D-36

Comment:
The IDEM would like to clarify the Phase I and II budgets listed in Tables 7 and 8 in the proposed rule making (page 8418). First, the Phase I budget in these tables is listed as 234,625 tons. In the budget demonstration for the NOx SIP Call, approved by U.S. EPA, IDEM estimated the 2007 Phase I budget as 233,633 tons. Second, there is a 19 ton discrepancy in the Phase II incremental difference listed in Tables 7 and 8. The 2007 projected emissions for Indiana's large internal combustion engines are 5,199 tons. (Refer to non-EGU inventory in the budget demonstration). An 82% reduction applied to 5,199 tons results in 4,263 tons and not 4,244 tons listed in Table 7; a difference of 19 tons. A 91% reduction applied to the IC engines results in 4,731 tons projected emissions as compared to 4,712 tons in Table 8, a difference of 19 tons. These corrections, when applied to U.S. EPA's Phase II budget number in Tables 7 and 8 (234,625 tons) result in a revised Phase II budget with 82% control equal to 230,362 tons as compared to 230, 381 tons in Table 7 and with 91% control equal to 229,894 tons as compared to 229,913 tons in Table 8. Emission reductions equal to 82% and 91% applied to the large internal combustion engines in Indiana's Phase I budget (233,633 tons) result in Phase II budgets equal to 229,370 tons and 228,902 tons respectively.

EPA Response:
The Phase I and II budgets listed in Tables 7 and 8 of the proposed rulemaking [67 FR 8415] were based on the emission inventories prepared in support of the Technical Amendment to the NOx SIP Call [65 FR 11222] and did not take into account emission inventory and budget calculation changes submitted by Indiana and approved by EPA. The EPA does agree that the emission budgets and reductions approved by EPA in the State's demonstration are correct. These accepted values are 338,907 tons NOx / ozone season for the 2007 base case and 233,633 tons NOx / ozone season for Phase I. Additionally, EPA agrees with Indiana's estimation of the additional reductions proposed for Phase II from IC engines. These accepted values are 229,370 tons NOx /ozone season under the 82% emission reduction from IC engines and 228,902 tons
NOx /ozone season under the 91% emission reduction scenario.

Commenter:
Georgia-Pacific Corporation (G-P), XII-D-37

Comment:
In its February 22 proposal, EPA proposed to reduce the NOx budget for Georgia from 209,914 tons to 150,656 tons. However, in its proposal the Agency did not publish a detailed list of sources that would continue to be included in SIP Call and the budgets for these individual sources. (As of the date these comments were submitted, EPA has not published the list on its web site either.) Because these data are lacking, Georgia-Pacific cannot comment on the reasonableness of these proposed overall budgets. Moreover, G-P has not had the opportunity to examine the budgets for its own facilities and comment on any mistakes that might be present in the data. This issue is critical because the State of Georgia will be promulgating banking and trading rules as part of its SIP revision, and will depend on the data in EPA's budget to craft the specific form of these rules. Georgia-Pacific recommends that EPA publish a detailed

list of Georgia sources and their respective NOx emission rates as soon as possible. Furthermore, Georgia-Pacific reserves the right to correct any errors in EPA's database concerning G-P's sources after the close of the comment period on this proposal.

EPA Response:
As identified in Table 1 and Section 7.C., *What Is Our Response to the Court Decision on Georgia and Missouri?* of the Proposed Rule, [67 FR 8415], the counties that we are including in the calculation of NOx budgets for the States of Georgia and Missouri are those that are found to be completely within the fine grid portion of the OTAG defined domain. As no other data or affected non-EGU source definition has changed since the Technical Amendment to the NOx SIP Call and supporting source data were published [65 FR 11222], the underlying data are simply the same published inventory and reduction calculations but are now limited to the Table 1 referenced counties.

V. Compliance Supplement Pools

Commenter:
El Paso Corporation**,** XII-D-10

Comment:
Some commenters stated that the NOx SIP call's Compliance Supplement Pool (CSP) should be available to IC engine operators. "We have not found any language that prohibits or excludes IC engines from this program, and the benefit of early reductions for these types of sources is just as valid as it is for the larger electric generating units.

EPA Response:
The Compliance Supplement Pool is limited to use by certain sources within the NOx Budget Trading Program. The CSP is limited to the large boilers and turbines that are in the trading program–not IC engines. The CSP was created to help that group of sources meet compliance deadlines without jeopardizing electric reliability. The commodity–allowances–is useful only to sources within the trading program.

VI. SIP Submittal Dates

Commenter:
Illinois Environmental Protection Agency, XII-D-03; Texas Gas Transmission Company, XII-D-07; Council of Industrial Boiler Owners, XII-D-13; Georgia Power Company, XII-D-18; The Georgia Coalition for Sound Environmental Policy, XII-D-19; Holden & Associates (for Oglethorpe Power Corporation), XII-D-22; Transcontinental Gas Pipe Line Corporation, XII-D-25; Hunton & Williams for the Utility Air Regulatory Group (UARG), XII-D-28; Hunton & Williams for Union Electric Company d/b/a/ AmerenUE, XII-D-29; State of Missouri Department of Natural Resources, XII-D-30; R.J. Reynolds Tobacco Company, XII-D-31; Savannah Electric and Power Company, XII-D-32; Georgia

Department of Natural Resources, XII-D-34; Municipal Electric Authority of Georgia, XII-D-35; Indiana Department of Environmental Management, XII-D-36

Comment:
Several commenters contend that the range of SIP submittal dates that EPA proposed (i.e., 6 months to 1 year from final promulgation of this rulemaking, but no later than April 1, 2003) does not allow enough time for States to develop a SIP. They noted that this is due to the fact that the proposal was published on February 22, 2002 and the comment period was scheduled to end on April 15, 2002, and that the final rule would not be promulgated in time to allow adequate time for States to complete their rulemaking processes. These comments fell into several categories based on their recommendation for a SIP submittal date: (1) EPA is not allowing enough time for SIP submittal; (2) EPA should set a SIP submittal date 12 months from the date of final promulgation of this rule; (3) EPA should allow more than 12 months for States to submit SIPs; and (4) EPA should allow 18 months for SIP submittals as authorized in section 100(k)(5).

EPA Response:
After considering these comments, EPA is requiring that SIP revisions be submitted with 12 months after the date of signature of this final rule. We believe this is adequate time to submit a NOx reduction SIP. The original NOx SIP call allowed 12 months to submit SIPs meeting the full NOx SIP Call, with a submittal date of September 30, 1999. In response to a motion filed by State Petitioners, the D.C. Circuit issued a stay of the SIP submission deadline pending further order of the Court. *Michigan v. PEA, 213 F.3d 663 (D.C. Cir. 2000)* (May 25, 1999 order granting stay in part). On April 11, 2000, EPA filed a motion with the Court to lift the stay of the SIP submission date. We requested that the Court lift the stay as of April 17, 2000. On June 22, 2000, the Court granted our request in part. The Court ordered that we allow the States 128 days from the June 22, 2000 date of the order to submit their SIPs making the SIPs due on October 30, 2000. By setting this submission date, the Court recognized the 12 month submission schedule required in the NOx SIP call. Phase II of the NOx SIP call requires a much smaller subset of sources to reduce NOx emissions, and we believe that 12 months to submit a final SIP is reasonable. In addition as earlier stated, this action is being taken under section 110(k)(5) which requires SIP revisions within a specified period but "not to exceed 18 months" after a finding of inadequacy by the Agency.

The EPA recognizes that the proposed NOx SIP submittal date of 6 months to 1 year from final promulgation of this rulemaking, but no later than April 1, 2003 is no longer appropriate due to the February 22, 2002 publication date of the proposed rule. The EPA is also aware that some States have lengthy rulemaking processes that may require longer than 12 months for full adoption of regulations. However, States have the ability to set their rulemaking procedures and can provide adequate mechanisms to adopt regulations to address interstate transport. Many States already have emergency or other shortened procedures in place in order to bypass regular rulemaking procedures in certain

circumstances. Moreover, EPA notes that States that fail to submit SIPs to meet the SIP Call within 12 months are not precluded from submitting plans after that date. Areas will not be subject to mandatory sanctions under section 179 of the CAA until 18 months after EPA finds that the States failed to submit a plan in response to the SIP call. Furthermore, if the State makes a late submission, EPA's approval of that program would serve to replace any Federal plan that may have taken effect in the interim. The EPA notes that States can submit draft plans (i.e., plans that have not completed the final steps in the State administrative process) for parallel processing. 47 FR 2703 (June 23, 1982). While this type of submission may not preclude a finding of failure to submit, it can help ensure that the State program is approved as a SIP revision (and as a replacement for any promulgated FIP) in the most expeditious manner. As we did for the Phase I NOx SIP submittals, the EPA Regional Offices and Headquarters will work closely with the States to ensure that approvability issues are resolved to allow SIPs to be submitted as expeditiously as possible

Commenter:
Clean Air Task Force representing 22 citizens groups, XII-D-11

Comment:
This commenter urges prompt action by EPA and indicates that States do not need a full 12 months to submit these Phase II SIPs because the changes to State NOx budgets in EPA's latest proposal are quite small. These comments recommend a SIP submittal date 6 months from publication of the Notice of Final Rulemaking.

EPA Response:
The maximum allowed submittal date under the CAA is 18 months. Many States have administrative procedures that make less than 12 months a very difficult task. Considering all of these factors, EPA believes that a 12 month period is reasonable.

Commenters:
Illinois Environmental Protection Agency, XII-D-03; Texas Gas Transmission Corporation-Williams Gas Pipeline, XII-D-07; Council of Industrial Boiler Owners (CIBO), XII-D-13; Georgia Power Company, XII-D-18; The Georgia Coalition for Sound Environmental Policy, XII-D-19; Holden & Associates, Inc. representing Oglethorpe Power Corporation, XII-D-22; Transcontinental Gas Pipe Line Corporation (Transco), XII-D-25; State of Missouri Department of Natural Resources, XII-D-30; RJ Reynolds Tobacco Company (RJRTC), XII-D-31; Savannah Electric and Power Company, XII-D-32; Georgia Department of Natural Resources (EPD), XII-D-34; Indiana Department of Environmental Management Office of Air Quality, XII-D-36

Comment:
Many commenters stated that the time period proposed is too short and States need more time.

Comments from two States, pipeline companies, power companies, and a citizens group recommend EPA set the SIP submittal date to be 12 months from publication of NFR

Comments from one State recommend the SIP submittal date be18 months from publication of NFR. An industry group states that 12 months is not enough time.

EPA Response:
Commenters representing a variety of interests--States, industry, and citizens–all recommend a SIP submittal date 12 months after publication of the final rulemaking notice. The Phase I NOx SIP Call also provided a 12 month period. One group urged a 6 month time frame. In addition, a few comments suggested a period longer than 12 months. The maximum allowed under the CAA is 18 months. Many States have administrative procedures that make less than 12 months a very difficult task. Considering all of these factors, EPA believes that a 12 month period is reasonable.

VII. Compliance Dates

VII.A EGUs

Commenters:
Hunton & Williams for the Utility Air Regulatory Group (UARG), XII-D-28; Hunton & Williams for Union Electric Company d/b/a/ AmerenUE, XII-D-29

Comment:
Comments from a utility group recommend EPA should apply the same 1309 day compliance period for Phase II SIP Call requirements that applies to sources for Phase I compliance pursuant to the original SIP Call rule schedule, as implemented by the D.C. Circuit in its order of August 30, 2000, in Michigan. That order provides that, in "accord []with the status quo principle the court applied in [its June 22, 2000 order] extending the deadline for submitting SIP revisions . . . . sources in States subject to the NOx SIP Call rule will have 1309 days for implementing SIP revisions, as provided in the original rule." The 1309-day period was measured from the new October 30, 2000 deadline for SIP submissions; the date that is 1309 days after the SIP submission deadline–i.e., May 31, 2004–therefore became the new source compliance date. The EPA should apply the same approach here.

EPA Response:
The EPA does not believe that the 1,309-day period used for setting the May 31, 2004 compliance date for Phase I SIPs would be appropriate for the non-Acid Rain EGUs and any cogeneration units whose classification changed from EGUs to non-EGUs under today's rule. The Court's decision to provide units 1,309 days after submittal of SIPs was based on the amount of time that we provided units to comply with the original NOx SIP Call, which had a compliance deadline of May 1, 2003. The original NOx SIP Call required States to make significantly more emissions reductions (i.e., all the reductions that were subsequently designated as either Phase I or Phase II reductions in response to the Court's

decision) than the reductions (i.e., only the Phase II reductions for non-Acid Rain EGUs and any cogeneration units whose classification changed from EGUs to non-EGUs under today's rule) addressed here. Greater emissions reductions require the installation of more emission controls, which in turn requires more resources such as boiler-makers and cranes. The analysis that we performed for the proposed Phase II rule shows that less time is required to install emission controls for the smaller number of Phase II units than the significantly larger number of Phase I units in the trading program.

Additionally, we believe that for all of the States (except Georgia and Missouri), non-Acid Rain EGUs and any cogeneration units that were previously classified as EGUs and whose classification changed to non-EGUs under today's rule were included in the Phase I SIPs that were already submitted.[4141] Several States (i.e., Connecticut, District of Columbia, Delaware, Massachusetts, Maryland, New Jersey, New York, Pennsylvania, and Rhode Island) have submitted SIPs that cover non-Acid Rain EGUs and any cogeneration units whose classification changed from EGUs to non-EGUs under today's rule, as well as Phase I EGUs and non-EGUs, and require compliance with the allowance holding requirement starting May 1, 2003 (or, if later, the date on which the source commences operation). The remaining States other than Georgia and Missouri (i.e., Alabama, Illinois, Indiana, Kentucky, Michigan, North Carolina, Ohio, South Carolina, Tennessee, Virginia, and West Virginia) have submitted SIPs that cover non-Acid Rain EGUs and any cogeneration units whose classification changed from EGUs to non-EGUs under today's rule, as well as Phase I EGUs and non-EGUs and require compliance starting May 31, 2004 (or, if later, the date on which the source commences operation). Moreover, the CAA contains an overarching principle that downwind areas attain the ozone NAAQS "as expeditiously as practicable." [Sections 191(a), 172(a)]. The emissions reductions from today's rulemaking reflect the emissions reductions mandated under the NOx SIP Call in order to prevent significant contribution to nonattainment in downwind States. Thus, we are setting an implementation date that will assure that the downwind States realize the air quality benefits of NOx reductions in order to achieve attainment or reasonable further progress toward attainment (63 FR 57449-50).

VII.B Georgia and Missouri

Commenters:
Illinois Environmental Protection Agency, XII-D-03; Texas Gas Transmission Company, XII-D-07; Clean Air Task Force representing 22 citizens groups, XII-D-11; Council of Industrial Boiler Owners, XII-D-13; The Georgia Coalition for Sound Environmental Policy, XII-D-19; Transcontinental Gas Pipe

[41] We note that the non-EGU classification of those cogeneration units that have been consistently treated as non-EGUs in the NOx SIP Call and the Section 126 Rule was not remanded and vacated by the Court, and we maintain that the May 31, 2004 compliance date for such units is not at issue in today's rulemaking. However, even assuming arguendo that their compliance date were at issue, there would be no basis for establishing a later compliance date since these units (like, e.g., the non-Acid Rain EGUs) are already subject to the May 31, 2004 date under the Phase I SIPs.

Line Corporation, XII-D-25; State of Missouri Department of Natural Resources, XII-D-30; Georgia-Pacific Corporation (G-P), XII-D-37

Comment:
Comments from 22 Citizen Groups recommend the May 2004 and May 2005 dates, as proposed.

The State of Georgia supports the May 2005 compliance deadline proposed due to the time frames in the Atlanta SIP. All other commenters recommend more time than was proposed is needed for sources to comply.

Illinois believes that a minimum of 24 months from the date final SIP submittals are required is needed for sources to complete the necessary construction and installation of controls to comply with the Phase II provisions. Missouri recommends 1309 days after the SIP submittal date.

EPA Response:
For all sources in Georgia and Missouri, we proposed a compliance date of May 1, 2005 (or, if later, the date on which the source commences operation). This compliance date was based on a proposed SIP submittal deadline of April 1, 2003 and would have provided sources 25 months after SIP submittal to install controls. Based on the April 1, 2005 SIP submittal deadline being finalized in today's final rule, providing sources with 25 months to install controls would result in a compliance deadline of May 1, 2007. Because this would be after the 2006 ozone season, we are finalizing a compliance deadline of May 1, 2007 (or, if later, the date on which the source commences operation).

As we explained in the NOx SIP Call, we believe a 25-month compliance timeframe is reasonable given the amount of controls that need to be installed. If Missouri and/or Georgia elect to control large EGUs under a trading program, we project that the most time-consuming control installation will require installation of two SCRs and one SNCR. We also believe that this can be done in 25 months (67 FR 8395). Thus, We disagree with those commenters that recommended more time to comply based on the need for sources to complete necessary construction and implementation of controls.

For instance, a SCR was installed on the AES Somerset Plant in New York in 9 months from contract award to completion. Reliant Energy completed construction of two SCRs on two 900 MW units at their Keystone Plant in Pennsylvania in 46 weeks. Even assuming that the engineering and permitting took a year, this job was completed in less than 24 months. It should also be noted that this job was completed in 2003. This was part of the peak construction period for SCRs under Phase I of the NOx SIP Call. Projects in Georgia and Missouri, being constructed after the bulk of the SCRs for the NOx SIP Call have been installed, should have much less competition for resources.

Furthermore, the NOx SIP Call provides Missouri with CSP allowances that Missouri may use to address situations when installation cannot be completely finished by the compliance date. It should also be noted that while we believe that the SCRs can be installed within 25 months, if Missouri completes its

SIP by December 31, 2005, sources will actually have 29 months to install the SCRs. This assumes that affected sources do not begin any work on the SCRs until after the SIP is finalized. Because, sources should have a strong indication as to whether they will need to install the SCRs before the SIP is completed, they will actually have more than 29 months to install the SCRs.

Commenter:
Hunton & Williams for Union Electric Company d/b/a AmerenUE, XII-D-29

Comment:
Electro-catalytic oxidation (ECO) technology, if successful, might be installed on at least one Ameren (a Missouri/Illinois utility) unit in eastern Missouri (the Sioux plant). Ameren urges EPA to withdraw the SIP Call for Missouri because, even if their new technology is successful on the 1st unit, they would need until 2009 to install controls on the 2nd unit.

EPA Response:
The EPA supports the development of new technology, such as the electro-catalytic oxidation (ECO) technology which is being considered for a plant in Ohio and might be installed on one or two Ameren utility units in eastern Missouri (the Sioux plant). Because of the flexibility inherent in the NOx SIP Call, EPA believes Ameren could meet the SIP Call requirements and develop the ECO technology. Options include installing controls, using allowances generated at other Ameren units in Missouri/Illinois, receiving allowances from State's compliance supplement pool, purchasing allowances, or a combination of these actions. In addition, the revised Statewide NOx rule includes an incentive provision for innovative technology under which Ameren may be eligible for emission reduction credits associated with its ECO technology development.

VII.C Internal Combustion Engines

Commenters:
Illinois Environmental Protection Agency, XII-D-03; Texas Gas Transmission Corporation, Williams Gas Pipeline, XII-D-07; Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; Clean Air Task Force representing 22 citizen groups, XII-D-11; Council of Industrial Boiler Owners (CIBO), XII-D-13; CMS Truckline Gas Company (Truckline), XII-D-16; CMS Panhandle Eastern Companies (Panhandle), XII-D-17; The Georgia Coalition for Sound Environmental Policy (GCSEP), XII-D-19; Natural Gas Pipeline Company of America (Natural), XII-D-24; Transcontinental Gas Pipe Line Corporation (Transco), XII-D-25; Hunton & Williams for the Utility Air Regulatory Group (UARG), XII-D-28; Hunton & Williams for Union Electric Company d/b/a AmerenUE, XII-D-29; State of Missouri Department of Natural Resources, XII-D-30; Georgia-Pacific Corporation (G-P), XII-D-37; Dominion Energy, Inc. (or Dominion Resources), XII-D-38; Interstate Natural Gas Association of America (INGAA), XII-F-10; NiSource, Inc., XII-F-12

Comment:
Several commenters from the pipeline industry suggest the need to stagger or phase-in the compliance activities over several years. Industry comments generally recommend May 2007 or 36-43 months from SIP submittal. These commenters refer to the September 1998 SIP call which gave 43 months from SIP submittal while the February 2002 NPR gives 13 months only.

Additional comments from the pipeline industry state that EPA ignores time needed to get permits; that EPA assumes 160 engines would be off-line in same winter heating season; and that EPA failed to consider the problem of having multiple engines at one facility subject to retrofit requirements during the same short compliance time frame. EPA has not presented any data concerning the supply of parts and equipment, or of adequate numbers of trained installation personnel. For each IC engine, time is required to research the factory build sheet, review unit specific maintenance records for the duration of the engines operational history, and conduct an on-site inspection of the unit.

EPA Response:
The pipeline industry has considerable experience with the installation of LEC technology. While there is some evidence that installation of controls on a few engines within one year is reasonable**,** installing controls on many engines in a narrow time frame is more problematic. As discussed below, EPA believes that the proposed time frame of about 13 months should be extended to a minimum of 24 months from the SIP submittal date and the initial compliance date should occur within the ozone season. In extending the compliance date, EPA notes that the pipeline industry has considerable experience with the installation of LEC technology. EPA also notes that while there is evidence that installation of controls on a few engines within one year is reasonable, installing controls on many engines in a narrow time frame is more problematic.

The following is a summary of the additional information EPA obtained subsequent to our proposal. One manufacturer estimated the time between request for cost proposal and contract to be 2-5 months and typically 3-4 months. It then takes 4-5 months for delivery and an additional 1 month to install and commence operation. This adds up to a total of 7-11 months.[42] Another manufacturer estimated the time between cost proposal and contract is 2-4 weeks to obtain bids; 2-3 months for selection of bids;12-20 weeks for parts delivery to site; and 2 weeks to 1 ½ month for field installation.[43] Another manufacturer estimated from request for cost bids to shipping of parts takes 6-8 months for delivery and an additional 2-4 weeks to install and commence operation. This adds up to a total of 6 ½ - 6 months.[17] Information from the Ventura County Air Pollution Control District in California estimated 2 weeks to 1 month to install LEC and the total time estimated from request for cost proposal and commencing operation of LEC was 6- 9 months. A gas pipeline company, CMS Energy, stated that a compliance schedule of 11 months was easy to meet for 1-2 engines but would put a stress on the system for 200 engines.

---

[42] See docket number XII-E-01.

[43]See docket number XII-E-02.

Columbia Gas Transmission Corporation installed controls on 2 engines in Bedford Co., PA in three days, meeting the 3.0 g/bhp-hr standard set by the State.[44] Thus, there is some agreement that the necessary compliance period for installation of controls on a small number of engines is less than one year.

The EPA disagrees with the comment that 160 engines would be off-line at the same time. The EPA expects some companies to choose to phase-in installation of the control equipment over a 2-year period (or longer if the companies begin retrofit activities sooner) and that installation activities would occur primarily in the summer along with normally scheduled maintenance activities. Further, as noted below, not all of the potentially affected IC engines should be expected to need LEC retrofits and not in the same time frame.

In response to Phase II of the NOx SIP call, some States may seek emission reductions from source categories other than IC engines. Other States have already met their NOx budgets and do not need to further control IC engines for purposes of the NOx SIP call. Still other States have met at least a portion of the Phase II NOx SIP Call reductions due to emission reductions affecting other source categories contained in their 1-hour ozone nonattainment area plans. This reduces the need to retrofit IC engines in those States.

In many cases, companies may use "early reductions" achieved at IC engines due to other requirements, such as RACT.[45] For example, many IC engines were previously controlled to meet RACT requirements in many of the NOx SIP call States. These emission reductions help States meet their NOx budgets and, thus, decrease the amount of additional reductions needed. According to a information submitted by INGAA, a 1996-97 survey determined that 245 lean burn engines in the SIP Call area have LEC.[46] Many engines in the NOx SIP call area already have decreased NOx emissions at rich-burn engines through NSCR.[47] States may choose to credit these reductions instead of requiring new reductions at other engines in order to meet the SIP budget. Many more NOx reductions are likely to result from future MACT controls at IC engines. These factors also reduce the need to retrofit IC engines in some States.

---

[44]See http://www.dieselsupply.com/dscartic.htm for reprint of article from May 1998 of "American Oil & Gas Reporter."

[45]August 22, 2002 memo from Lydia Wegman to EPA Regional Air Directors providing guidance on issues related to stationary internal combustion engines and the NOx SIP call.

[46]"IC Engine OTAG Questions" document prepared by INGAA, 2/17/00. Many of these engines are smaller than the "large" engines identified in the NOx SIP Call.

[47]Alpha Gamma memo of 6-19-02.

The EPA agrees with industry comments that pipeline companies will phase-in the control equipment over a multi-year time frame.[48] Some companies may choose to stagger installation of the controls, beginning even before completion of the EPA rulemaking.[44] Stretching out the installation time frame in this manner would help the companies achieve the results on time. Further, companies might choose to install controls in some of their engines in a time frame that coincides with the engine rebuild cycle, which may occur before being required by state regulations.[49] In another case, installation of the LEC retrofit kit was estimated to span 3 to 4 weeks and the installation was not expected to impact the normal maintenance interval.[50] These approaches will help reduce the time needed to install the controls.

The EPA believes the industry has demonstrated that multiple engines at compressor stations can be successfully retrofitted over a 24 month time frame. For example, the Jefferson Town Compressor Station's RACT compliance plan of April 2000 describes the installation of LEC using a phased approach over a 2 year period. Four engines were retrofitted during summer 2001 and the remaining 5 engines were retrofitted in summer 2002. Each engine was expected to be out of service for approximately 6 weeks and, due to heavy demand during winter heating season, all engines were expected to be operable from October -April. Two additional cases show installation on multiple engines in short time periods. Southern California Gas Co. completed testing of one engine in 1995 and installed precombustion chambers on six engines in its Mojave Desert operating area. The conversion of the first unit was completed in October 1995 and the conversion of the sixth unit was in November 1996. The engines met the 2.0 g/bhp-hr standard set by the Mojave Air District. Furthermore, as cited in a case study in Vidor, Texas, 6 engines in the Beaumont/Port Arthur area were retrofitted in summer of 1999.[51]

As shown below, EPA also examined historic time frames allowed by the Congress and various regulatory agencies to achieve compliance with NOx requirements following State/local rule adoption. These time frames generally illustrate the successful implementation of past regulatory programs involving the installation of NOx controls.

In the 1990 amendments to the CAA, Congress added RACT requirements for major sources of NOx. All categories of major NOx sources in certain areas of the nation were required to install RACT as expeditiously as practicable or no later than May 31, 1995. Thus, for a much larger number of sources

---

[48]INGAA letter of July 16, 2002.

[49]A top-end overhaul is generally recommended between 8,000 and 30,000 hours of operation that entails a cylinder head and turbocharger rebuild (see Table 4 from "Technology Characterization: Reciprocating Engines" prepared by Energy Nexus Group for EPA, 2-02).

[50]GRI 12-98 report "NOx Control for Two-Cycle Pipeline Reciprocating Engines," page 4-11.

[51] See http://www.enginuityinc.com

than affected by this rulemaking, Congress allowed a maximum of 30 months from the SIP submittal deadline of November 15, 1992.

Subsequent to the initial set of NOx RACT SIP revisions, EPA approved NOx RACT SIP submittals in some areas which had been exempt from the requirements. For example, in Dallas, SIP rules required RACT as expeditiously as practicable or 24 months from the State adoption date (rule adopted March 21, 1999). On December 31, 1997, the State of Texas implemented a RACT requirement for all major NO_x sources in the Houston area and adopted a compliance date of November 15, 1999 for this program (22.5 months). In a recent case, the State of Louisiana allowed up to a 3-year period in Baton Rouge, coinciding with their attainment deadline.

In addition, the California Air Resources Board guidance document on IC engines subject to RACT limits, recommends final compliance within two years of a district's rule adoption.[52] The guidance states that this time period should be sufficient to evaluate control options, place purchase orders, install equipment, and perform compliance verification testing. The Sacramento Air District in California required compliance within 2 years of rule adoption (June 1995).

Regarding the need to obtain permits, EPA believes that States will process permits expeditiously, especially those permits associated with pollution control projects. The EPA has specifically encouraged States in a recent memo (see NSR exclusion discussion below) to consider exempting pollution control projects from certain permitting requirements. Further, by moving the compliance date to at least 24 months after the SIP submittal date, EPA believes that the time needed to revise permits will not adversely affect the compliance schedule.

Further, the Act contains an overarching principle that downwind areas attain the ozone NAAQS "as expeditiously as practicable." (Sections 181(a), 172 (a)). The emissions reductions from this rulemaking reflect the emission reductions mandated under the NOx SIP Call in order to prevent significant contribution to nonattainment in downwind states. Thus, EPA believes that emissions reductions in 2006 may help some areas achieve attainment and help some nonattainment areas achieve reasonable further progress towards attainment. 63 FR 57449-50

While EPA provided a compliance date of 1,309 days from SIP submittal for Phase I sources, EPA does not believe it should provide the same compliance date for sources affected by today's rulemaking. This is because the subset of sources affected by this rulemaking have been aware of the applicability of the NOx SIP Call since 1998. Further, some states have already adopted SIPs that meet the full NOx SIP Call requirements.

---

[52] "Determination of RACT and BARCT for Stationary Spark-Ignited Internal Combustion Engines,"California Air Resources Board, November 2001, pg. IV-15.

In summary, several factors described above will serve to minimize the number of large IC engines that would need to be scheduled for LEC retrofit. Further, companies that phase-in compliance activities over several years would also reduce the number of IC engines needing LEC retrofit per year. It is important to note that RACT experience shows that companies can install LEC retrofit over a 2-year time frame, even where multiple engines are located at the same compressor station. In recent RACT compliance time decisions, State/Local regulatory agencies generally specified 24 month periods to install controls. The Congress in its 1990 CAA amendments allowed a maximum of 30 months for all major NOx sources across the nation to install RACT; this was a much larger task than installation of controls at IC engines in certain States. As a result, EPA believes that a 2-year period after the SIP submittal due date is adequate for the installation of controls.

Further, because the NOx SIP call is directed at emissions during the ozone season, EPA believes that the initial month where compliance is required should occur during the ozone season. Therefore, the compliance date is 24 months from the SIP submittal date if the SIP submittal date occurs during the ozone season or, if not, 24 months from the SIP submittal date plus the days until the next ozone season begins (May 1).

Commenters:
Texas Gas Transmission Corporation -Williams Gas Pipeline, XII-D-07; Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; Transcontinental Gas Pipe Line Corporation (Transco), XII-D-25; Nisource, Inc., XII-F-12

Comment:
One comment recommended the compliance date be based on the SIP revision approval date not the SIP submittal date. Other comments indicated that States will not allow operators to implement controls until the SIP has been approved.

EPA Response:
The EPA is not aware of any State that will not allow operators to reduce emissions. Once a State has adopted the requirements, a source can begin taking actions to comply. As stated in other comments,[53] many pipeline companies have chosen to begin a phased-in installation of controls even prior to States' adoption of the applicable requirements.

VIII. Other Relevant Comments

Commenters:
Natural Gas Pipeline, XII-D-24; Transcontinental Gas Pipe Line Corporation, XII-D-25; American Gas Association, XII-D-33

[53]See docket for letter of July 17, 2002 letter from INGAA.

Comment:
The EPA received comments in support of comments made by INGAA addressing the portion of the proposed rule regarding NOx emission reductions from stationary IC engines. Specifically, INGAA commented that the final rule should adopt 70 percent or less as the average NOx reduction from large lean-burn IC engines in the SIP Call area. The commenters agree with INGAA that the proposed rule imposes unnecessary burdens on our nation's energy delivery system and conflicts with national energy policy. In addition, the commenters noted that EPA should seek to achieve its air quality goals in ways that promote a more cost-efficient energy delivery system.

EPA Response:
See Section II.B.2 and Administrative Requirements Section of the final rule.

Commenters:
Georgia Power Company, XII-D-18; Savannah Electric and Power Company, XII-D-32; Georgia-Pacific Corporation, XII-D-37

Comment:
The EPA received comments in support of comments made by Utility Air Regulatory Group (UARG).

EPA Response:
See Section III. Court Decision's Effect on Georgia and Missouri of this document.

Commenters:
Georgia Power Company, XII-D-18; The Georgia Coalition for Sound Environmental Policy (GCSEP), XII-D-19; Savannah Electric and Power Company, XII-D-32; Municipal Electric Authority of Georgia, XII-D-35; Georgia-Pacific Corporation, XII-D-37

Comment:
The EPA received comments in support of comments made by Georgia Coalition for Sound Environmental Policy .

EPA Response:
See Section III. Court Decision's Effect on Georgia and Missouri of this document.

Commenters:
Georgia Power Company, XII-D-18; Savannah Electric and Power Company, XII-D-32; Municipal Electric Authority of Georgia, XII-D-35

Comment:

The EPA received comments in support of comments made by Georgia Power Company stating the EPA needs to develop a rule for the NOx SIP Call for Georgia that is reasonable and supported by detailed data.

EPA Response:
See Section III. Court's Decision's Effect on Georgia and Missouri of this document.

Commenters: Council of Industrial Boiler Owners, XII-D-13; Citizens Thermal Energy, XII-D-27; Georgia-Pacific Corporation, XII-D-37

Comment:
The EPA received comments in support of comments made by Council of Industrial Boiler Owners

EPA Response:
See Section II.A. How do we Treat Cogenerators and Non-Acid Rain Units? of this document.

Commenters:
American Forest and Paper Association, XII-D-02; Georgia-Pacific Corporation, XII-D-37

Comment:
The EPA received comments in support of the comments made by American Forest and Paper Association .

EPA Response:
See Section II.K. What are the Phase II Compliance Dates? of the final rule.

IX. Comments Outside the Scope of Rule

Commenter:
Clean Air Task Force, XII-D-11; Georgians for Clean Energy, Southern Organizing Committee for Economic and Social Justice, and Southern Alliance for Clean Energy, XII-D-14

Comment:
The EPA received comments in support of the proposed rulemaking and urges EPA to finalize the SIP Call as expeditiously as possible.

EPA Response:
The EPA agrees with the commenters that EPA should promulgate the SIP Call. The EPA Administrator has signed the final rule, and it is being published in the Federal Register.

Commenters:

Georgia Power Company, XII-D-18; Georgia Coalition for Sound Environmental Policy, XII-D-19; Long Aldridge Attorneys at Law representing Duke Energy Murray, LLC, and Duke Energy Sandersville, LLC, XII-D-20; Holden and Associates, Inc. representing Oglethorpe Power Corporation, XII-D-22; Savannah Electric and Power Company, XII-D-32

Comment:
The EPA received a number of comments related to the growth factors used to develop the EGU portion of the emission budgets.

EPA Response:
While this issue was part of the court's remand, EPA is not addressing these comments as part of this rulemaking because they are outside of the scope of today's final rulemaking. In the February 22, 2002 proposed rulemaking (67 FR 8401), EPA explained, "today's proposed action does not address the EGU growth remand, we intend to act on these issues separately." On May 1, 2002 (67 FR 21868), EPA took action affirming both the growth rates and the methodology used to develop those growth rates.

Commenters:
Interstate Natural Gas Association of America (INGAA), XII-D-09; El Paso Corporation, XII-D-10; Natural Gas Pipeline Company of America (Natural), XII-D-24; American Gas Association (AGA), XII-D-33; Interstate Natural Gas Association of America (INGAA), XII-F-10

Comment:
Several commenters request that EPA withdraw or amend the proposed Federal Implementation Plan. On October 21, 1998, EPA proposed a Federal Implementation Plan that contained provisions related to IC engine control. These provisions were intended for the control technology (SCR) that EPA had previously identified as appropriate for lean-burn engines. The comments support EPA's current proposal which states that SCR is not an appropriate control technology for the NOx SIP Call engines. Because a number of states have considered adopting measures similar to the FIP, the commenters ask that the final NOx SIP Call rule contain language explaining to the states that certain portions of the FIP proposal related to lean-burn engine control are no longer appropriate.

EPA Response:
This comment is outside the scope of this rulemaking action and our responses are for purposes of providing information only. On October 21, 1998, EPA proposed FIP requirements for States that failed to meet the NO_x SIP call requirements published on October 27, 1998. In subsequent litigation, the issue of the level of control for IC engines was remanded to EPA. Our subsequent February 22, 2002 proposed rule, which proposed control levels for IC engines, and our August 22, 2002 guidance memorandum supercede the proposed FIP requirements and reflect EPA's current position on IC

engines. For example, although the FIP proposed selective catalytic reduction (SCR) for large natural gas lean-burn engines, we proposed LEC instead of SCR as a highly cost-effective control technology for large natural gas lean-burn engines. As a result, EPA would need to repropose the FIP requirements for IC engines prior to issuing a final FIP concerning the IC engines. A FIP reproposal would need to be consistent with the final rule on the NOx SIP call and control levels for IC engines. This comment is not the subject of this rulemaking action and the 1998 FIP proposal does not affect the setting of the NOx SIP call budget.