MARYLAND

FOUNDED 1634

Department of the Environment

TECHNICAL SUPPORT DOCUMENT

FOR

COMAR 26.11.30 – Control of Portland Cement Manufacturing Plants

MDE

April 10, 2015
PREPARED BY:
MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard
Baltimore Maryland 21230

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I. Purpose of Regulatory Action

The purpose of this action is to create a separate chapter applicable to Portland Cement Manufacturing Plants containing requirements unique to them. The new chapter COMAR 26.11.30 combines existing requirements in COMAR 26.11.01, .06, and .29 regarding NOx, SOx, visible emissions and particulate matter that apply to Portland cement manufacturing plants into one chapter.

This action establishes slightly more stringent emission NOx limitations based upon recommended limits for cement kilns from the Ozone Transport Commission (OTC) to satisfy Reasonably Available Control Technology (RACT) requirements under the Clean air Act for the 2008 8-hour ozone standard. Older, less stringent NOx limits in COMAR 26.11.09.08 will be repealed.

This action also establishes a new method for continuous monitoring of particulate matter emissions for both cement kilns and clinker coolers required by the 2013 National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants effective September 1, 2016.

The two Portland cement manufacturing plants in Maryland are required to operate continuous opacity monitors (COMs). EPA has recently added requirements for continuously monitoring particulate matter in the 2013 National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants which provided an alternative monitoring procedure for visible emissions. In this action cement kilns have the option of using continuous opacity monitors or the NESHAP alternative methods of visible emission monitoring for opacity. Clinker coolers and kilns have the option of using continuous opacity monitors or the NESHAP alternative methods of visible emission monitoring for opacity after September 1, 2016. Under these regulations, operation of a COM requires the facility to follow the quality assurance procedures in COMAR 26.11.31.

This action will be submitted to the U.S. Environmental Protection Agency (EPA) for approval as part of Maryland's State Implementation Plan.

II. Facts for Proposal

A. Background

In an effort to streamline regulations pertaining to Portland Cement Manufacturing Plants, the Maryland Department of the Environment (MDE) is compiling the requirements for these facilities in a separate chapter. This action separates Portland Cement Manufacturing Plants and Natural Gas Compression Stations currently together in COMAR 26.11.29 into two separate Chapters: COMAR 26.11.30 Control of Portland Cement Manufacturing Plants and COMAR 26.11.29 Natural Gas Pipeline Compression Stations. The existing COMAR 26.11.06.05 Sulfur Compounds from Other than Fuel-Burning Equipment establishes a concentration standard for SO2 for cement kilns depending on the location of the plant and the date the plant was constructed. These requirements for SO2 are being moved into COMAR 26.11.30. NOx emission standards and continuous emission monitoring requirements for installations at Portland cement plants were specified in COMAR 26.11.29. These NOx requirements for Portland cement plants are also being relocated into new COMAR 26.11.30

In 2012, EPA designated areas as attainment and nonattainment with respect to the national ambient air quality standard for ozone revised in 2008. Under the federal Clean Air Act, 42 U.S.C. § 7401 et seq., sources in ozone nonattainment areas classified as moderate and above are subject to a NOx Reasonably Available Control Technology (RACT) requirement. Areas in the Ozone Transport Region are also subject to this requirement regardless of designation. Section 182 of the Clean Air Act requires the Maryland Department of the Environment (MDE) to review and revise NOx RACT requirements in the Maryland State Implementation Plan (SIP) as necessary in light of the new more stringent ambient air quality standards. In reviewing existing NOx RACT requirements for adequacy, MDE considers technological advances and the stringency of the revised ozone standard. In 2007, the Ozone Transport Commission (OTC) compiled a Technical Support Document on Identification and Evaluation of Candidate Control Measures which included recommendations for NOx emission limitations for cement kilns based on the type of kiln. MDE concluded the recommended rates represented RACT for cement kilns in Maryland and these rates will become effective April 1, 2017.

New particulate matter (PM) continuous emission monitoring procedures are specified in EPA's 2013 National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants. After September 1, 2016, these facilities will be required to use these procedures to determine compliance with particulate matter standards. The NESHAP procedure uses stack test data to calibrate a PM continuous emission monitor (CEM) and then uses the PM CEM as a Continuous Parametric Monitoring System (CPMS).

The PM CPMS can also be calibrated for use as a parametric monitoring device to determine compliance with opacity standards. The system offers an alternative to COMs for monitoring visible emissions. Under this action, MDE proposes the option to either operate COMs or PM CPMS to monitor visible emissions. The NESHAP procedures have been integrated into the Visible Emissions and Particulate Matter requirements of the new chapter 30.

B. Sources Affected and Location

There are two existing Portland cement manufacturing plants in Maryland, one in Carroll County and one in Washington County. The Carroll County plant has a pre-calciner, pre-heater kiln. The Washington County plant is currently modifying their kiln from a long-dry kiln to a pre-calciner, pre-heater kiln and will complete the modification by 2017. See Section IV of this report for additional details on existing Portland Cement Plants in operation in Maryland.

C. Requirements

The purpose of this action is to:
1. Create a new Chapter, COMAR 26.11.30, for emission reduction requirements for Portland Cement Plants in operation in Maryland; and

2.Combine all of the existing requirements in COMAR 26.11.01, .06, and .29 regarding NOx, SOx, visible emissions and particulate matter that apply to Portland cement manufacturing plants into one chapter, COMAR 26.11.29, under a separate action; and

3. Repeal NOx emission limitations in COMAR 26.11.09.08 which apply to Portland cement manufacturing plants and establish new NOx emission limitations based upon recommended control measures for cement kilns from the 2007 Ozone Transport Commission (OTC) Technical Support Document on Identification and Evaluation of Candidate Control Measures; and

4. Add cement kilns to COMAR 26.11.01.10 which delineates the types of facilities that need to operate a COM to measure opacity; and

5. Establish new continuous particulate matter monitoring procedures, as specified in EPA's 2013 National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants. The new procedures will be used to demonstrate compliance with particulate matter emissions limitations and may be used to demonstrate compliance with opacity standards for cement kilns and clinker coolers under the specified circumstances instead of using a COM; and

6. Require cement kilns subject to COM requirements to comply with the Quality Assurance Requirements for COMs in existing COMAR 26.11.31.

The Department makes note that under separate action amendments to COMAR 26.11.29 are being proposed. Existing and new requirements for Control of NOx Emissions from Internal Combustion Engines Located at Natural Gas Pipeline Compression Stations will be under COMAR 26.11.29. Existing and new requirements for Portland cement manufacturing plants will be under COMAR 26.11.30.

D. Comparison to Federal Standards

There are corresponding federal standards to these proposed regulations, but the proposed regulations are not more restrictive or stringent.

There is an equivalent federal standard for the use of CEMS to demonstrate NOx compliance by cement plants. It is found in 40 CFR 60 Appendix F. New particulate and monitoring procedures as specified in EPA's 2013 National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants replace the need for COMs.

E. Expected Emissions Reductions

On and after April 1, 2017, Portland cement kilns will need to meet a NOx emission limitation based upon recommended control measures for cement kilns from the 2007 Ozone Transport Commission (OTC) Technical Support Document on Identification and Evaluation of Candidate Control Measures. (See Appendix A) The proposed NOx emission rate for long dry kilns is 3.4 pounds of NOx per ton of clinker produced and for pre-calciner kilns, an emissions rate of 2.4 pounds of NOx per ton of clinker produced.

The NOx emission requirements under COMAR 26.11.30.07 only requires affected sources to increase the amount of ammonia reagent used in existing pollution control equipment to meet the proposed NOx emission limitations in 2017.

As a result of this regulation, the Portland cement plant in Carroll County will reduce annual NOx emissions by about 14% or 400 tons based on 2012/2013 production. The Portland cement plant in Washington County will reduce annual NOx emissions by about 33% or 510 tons based on 2012/2013 production. See Section IV of this report for additional details on existing Portland Cement Plants in operation in Maryland.

Lehigh Cement Company LLC located in Carroll County is a 2 Million tons per year clinker plant. Calculating from the existing emission rate times the average tons/ year of clinker used at a plant results in 14% reduction.

at 2.8 lbs NOx/ton clinker = 2,800 tons of NOx per year
at 2.4 lbs NOx/ton clinker = 2,400 tons of NOx per year
Reduction of 400 tons of NOx per year

Holcim currently is a 600,000 ton per year clinker plant. Calculating from the existing emission rate times the average tons/ year of clinker used at a plant results in 33% reduction.

at 5.1 lbs NOx/ton clinker = 1,530 tons NOx per year
at 3.4 lbs NOx/ton clinker = 1,020 tons NOx per year
Reduction of 510 tons of NOx per year

As part of a federal action, the Portland cement plant in Washington County will be upgrading the kiln to a pre-heater/pre-calciner kiln by September 6, 2016. Under the federal action, the kiln will then be required to meet a year round NOx limit of 1.8 lbs NOx/ton of clinker on a 30-day rolling average. The 1.8 lbs NOx/ton of clinker standard is lower than the 2.4 lbs NOx/ton of clinker contained in COMAR 26.11.30.07, so the actual reductions from the plant are expected to be greater than calculated in this report.

F. Estimate of Economic Impact

I. Summary of Economic Impact.

The Portland cement plant in Carroll County is a pre-calciner, pre-heater kiln. Currently, the operators inject 600-730 liters/hr of ammonia into their Selective Non-Catalytic Reduction (SNCR) control technology to keep NOx emissions below 2.5 lbs NOx/ton of clinker to ensure compliance with the current 2.8 pounds of NOx per ton of clinker limit. Operating the SNCR costs approximately $1,000,000 per year. Using a linear equation, the plant would need to inject 760 liters/hr of ammonia to keep their NOx emissions below 2.4 lbs NOx/ton clinker to ensure compliance with a margin of safety. To meet the NOx emission rate of 2.4 lbs NOx/ton clinker produced, the additional ammonia could cost approximately $150,000 per year.

Holcim is currently injecting approximately 1360 - 1590 liters/hour of ammonia into their SNCR to comply with the 5.1 lbs NOx/ton of clinker NOx RACT limit as currently applies for long-dry kilns. Holcim would need to inject between 1,930 - 2,160 liters/hour of ammonia to keep their NOx emissions below the 3.4 lbs NOx/ton clinker NOx emission standard that becomes effective on April 1, 2017 to ensure compliance.

However, as part of a federal action, Holcim will be upgrading their cement plant to a pre-heater/pre-calciner kiln by September 6, 2016. Therefore, Holcim will not need to meet the 3.4 lbs NOx/ton clinker NOx emission standard that applies to long-dry kilns. Greater NOx reductions will be achieved at the plant as a result of the upgrade to a pre-heater/pre-calciner kiln. The pre-heater/pre-calciner kiln will further be required to meet a year round NOx limit of 1.8 lbs NOx/ton of clinker on a 30-day rolling average as required by the federal action. The 1.8 lbs NOx/ton per ton of clinker is lower than the 2.4 lbs NOx/ton of clinker in Maryland’s proposed regulations for a pre-heater/pre-calciner kiln, so ultimately the proposed regulations do not have an economic impact on the Washington County facility.

The operation of a continuous particulate matter emissions monitor is required under the federal cement NESHAP. The option to use this instrument to satisfy the COM requirement for monitoring opacity from cement kilns represents a possible cost savings to the facility. Monitoring of opacity has been required since the early 1990s and is not an additional cost.

II. Types of Economic Impact.	Revenue (R+/R-) Expenditure (E+/E-)	Magnitude
A. On issuing agency:	NONE	
B. On other State agencies:	NONE	
C. On local governments:	NONE	

	Benefit (+) Cost (-)	Magnitude
D. On regulated industries or trade groups:		
Compliance Costs	(-)	$150,000
E. On other industries or trade groups:		
MD Contractors	(+)	Indeterminate
F. Direct and indirect effects on public:	NONE	

III. Assumptions. (Identified by Impact Letter and Number from Section II.)

D. Ammonia reagent injection with the existing control technology is required to meet the NOx emission rate.

E. Installation of technology and maintenance is usually performed by specially trained tradesmen. The magnitude of demand is unknown.

Economic Impact on Small Businesses

The proposed regulation has minimal or no economic impact on small businesses.

Impact on Individuals with Disabilities

The proposed regulation has no impact on individuals with disabilities.

III. Proposed Regulation

Title 26 DEPARTMENT OF THE ENVIRONMENT

Subtitle 11 AIR QUALITY

Chapter 30 Control of Portland Cement Manufacturing Plants

Authority: Environment Article, §§1-101, 1-404, 2-101—2-103, 2-301—2-303, 10-102, and 10-103, Annotated Code of Maryland

ALL NEW MATTER

.01 Scope. *This chapter contains all of the general requirements that apply to Portland cement manufacturing plants. New or modified cement plants may be subject to more restrictive requirements that are included in a permit issued by the Department. Portland cement manufacturing plants subject to this chapter may also be subject to federal New Source Performance Standards under 40CFR Part 60 Subpart F and National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry under 40CFR Part 63 Subpart LLL.*

.02 Applicability.

A. The requirements of this chapter apply to cement kilns and other installations located at Portland cement manufacturing plants.

B. Any source which is subject to the provisions of this chapter may also be subject to the provisions of any other chapter. However, when this chapter establishes an emission standard for a specific installation which differs from the general emission standards in COMAR 26.11.06.01--.09, this chapter takes precedence.

.03 Definitions.

A. Definitions. In this chapter, the following terms have the meanings indicated.

B. Terms defined.

(1) "Cement kiln" means an installation, including any associated pre-heater or pre-calciner devices, that produces clinker by heating limestone and other materials to produce Portland cement.

(2) "Cement manufacturing installation" means process equipment used for subsequent production of Portland cement.

(3) "Clinker cooler" means an installation into which clinker product leaving the kiln is placed to be cooled by air supplied by a forced air draft or natural draft supply system.

(4) "Long dry kiln" means a cement kiln that does not have a pre-calciner and in which dry starting raw materials are fed into the kiln.

(5) "PM continuous parametric monitoring system" (CPMS) means a continuous emission monitoring system used to establish a parameter range for the purposes of demonstrating compliance.

(6) "Pre-calciner kiln" means a cement kiln that contains a pre-calciner at the bottom of the pre-heater tower before the materials enter the kiln.

(7) "30-day rolling average" means the arithmetic average of all valid hourly NOx emission rates of the previous 720 valid hours on a rolling basis.

(8) "30 process operating day" means:

(a) The first day after the compliance date following completion of the field testing and data collection that demonstrates that the CPMS or CEMS has satisfied the relevant CPMS performance evaluation or CEMS performance specification acceptance criteria.

(b) For purposes of this chapter, the performance test period is complete at the end of the 30th consecutive operating day.

.04 Particulate Matter.

A. The owner or operator of a cement manufacturing installation may not cause or permit the discharge of emissions of particulate matter to exceed the limits in §B of this regulation.

B. Emission Limits.

(1) Areas I, II, V, and VI. In Areas I, II, V, and VI, a person may not cause or permit particulate matter to be discharged from any installation in excess of 0.05 grains per standard cubic foot dry.

(2) Areas III and IV. In Areas III and IV, a person may not cause or permit particulate matter to be discharged from any installation in excess of 0.03 grains per standard cubic foot dry.

(3) Compliance with the particulate matter standards of §.04B(1) and (2) shall be demonstrated by a 3-run stack test using Method 5 or Method 5I of 40 CFR part 60.

C. Particulate matter monitoring requirements for cement kilns and clinker coolers. On or after September 1, 2016, the owner or operator of a cement kiln or clinker cooler at a Portland cement manufacturing plant shall:

(1) Use a PM continuous parametric monitoring system (CPMS) to establish a site-specific operating parameter limit corresponding to the results of the performance test as required in §.04B(3) demonstrating compliance with the PM limits in §.04B(1) and (2);

(2) Conduct the performance test as required in §.04B(3) using Method 5 or Method 5I of 40 CFR part 60;

(3) Use the PM CPMS to demonstrate continuous compliance with the site-specific operating parameter limit established in §.04C(1);

(4) Repeat the performance test as required in §.04B(3) annually and reassess and adjust the site-specific operating parameter limit of §.04C(1) in accordance with the results of the performance test using the procedures in 40 CFR 63 - § 63.1349(b)(1) (i) through (ix); and

(5) For any exceedance of the established operating parameter limit of §.04C(1) on a 30 process operating day basis, the operator of a Portland cement manufacturing plant shall follow the procedures in 40 CFR 63 - § 63.1350(b)(iii)and (iv).

.05 Visible Emission Standards.

A. The owner or operator of a cement manufacturing installation may not cause or permit the discharge of emissions which exceed the visibility standards in §B of this regulation.

B. Visibility Standards.

(1) In Areas I, II, V, and VI a person may not cause or permit the discharge of emissions from any installation or building, other than water in an uncombined form, which is greater than 20 percent opacity.

(2) In Areas III and IV a person may not cause or permit the discharge of emissions from any installation or building, other than water in an uncombined form, which is visible to human observers.

(3) Compliance with the visibility standards of §.05B(1) and (2) shall be demonstrated by a visible emission observation using Method 9 of 40 CFR part 60.

C. Visible Emission monitoring requirements for cement kilns. The owner or operator of a cement kiln at a Portland cement manufacturing plant shall either:

(1) Use a COM in accordance with the requirements of COMAR 26.11.01.10; or

(2) Use a PM continuous parametric monitoring system (CPMS) to establish a site-specific operating parameter limit for continuous visible emission compliance determinations in accordance with §.04C(1) —(5) .

D. Visible Emission monitoring requirements for clinker coolers. On or after September 1, 2016, the owner or operator of a clinker cooler at a Portland cement manufacturing plant shall either:

(1) Use a COM in accordance with the requirements of COMAR 26.11.01.10; or

(2) Use a PM continuous parametric monitoring system (CPMS) to establish a site-specific operating parameter limit for continuous visible emission compliance determinations in accordance with §.04C(1) —(5) .

.06 Sulfur Compounds.

A. Sulfur Dioxide (SO_2):

(1) Areas I, II, V, and VI. In Areas I, II, V, and VI, an owner or operator of a cement manufacturing installation may not cause emissions into the atmosphere with an SO_2 concentration greater than 2,000 ppm for sources constructed before January 17, 1972 or 500 ppm for sources constructed on or after January 17, 1972.

(2) Areas III and IV. In Areas III and IV, an owner or operator of a cement manufacturing installation may not cause emissions into the atmosphere with an SO_2 concentration greater than 2,000 ppm for sources constructed before February 21, 1971 or 500 ppm for sources constructed on or after February 21, 1971.

B. Sulfuric Acid and Sulfur Trioxide.

(1) Areas I, II, V, and VI. In Areas I, II, V, and VI, an owner or operator of a cement manufacturing installation may not cause emissions of sulfuric acid, sulfur trioxide, or any combination of them, in excess of 70 milligrams per cubic meter reported as sulfuric acid, for any source constructed before January 17, 1972 or 35 milligrams per cubic meter reported as sulfuric acid, for any source constructed on or after January 17, 1972.

(2) Areas III and IV. In Areas III and IV, an owner or operator of a cement manufacturing installation may not cause emissions of sulfuric acid, sulfur trioxide, or any combination of them, in excess of 70 milligrams per cubic meter reported as sulfuric acid for any source constructed before February 21, 1971 or 35 milligrams per cubic meter reported as sulfuric acid for any source constructed on or after February 21, 1971.

C. All calculations of emissions for §§A and B of this regulation shall be adjusted to standard conditions and 7 percent oxygen.

.07 Nitrogen Oxides (NOx).

A. A person who owns or operates a cement kiln at a Portland cement manufacturing plant shall meet the applicable NOx emission standards:

(1) For long dry kilns, maximum emissions of 5.1 pounds of NOx per ton of clinker produced; and

(2) For pre-calciner kilns, maximum emissions of 2.8 pounds of NOx per ton of clinker produced.

B. On and after April 1, 2017, the requirements in §A of this regulation no longer apply and cement kilns shall meet the applicable NOx emission standards in §C of this regulation.

C. On and after April 1, 2017 a person who owns or operates a cement kiln at a Portland cement manufacturing plant shall meet the applicable NOx emission standards:

(1) For long dry kilns, maximum emissions of 3.4 pounds of NOx per ton of clinker produced; and

(2) For pre-calciner kilns, maximum emissions of 2.4 pounds of NOx per ton of clinker produced.

D. Compliance with the emission standards in §§A and C of this regulation shall be demonstrated as a 30-day rolling average.

.08 NOx Continuous Emission Monitoring Requirements.

A. The owner or operator of a Portland cement manufacturing plant shall:

(1) Continuously monitor NOx emissions with a continuous emissions monitor (CEM) system in accordance with COMAR 26.11.01.11B(1) and (4) and C;

(2) Collect NOx emissions data that was obtained pursuant to §A(1) of this regulation; and

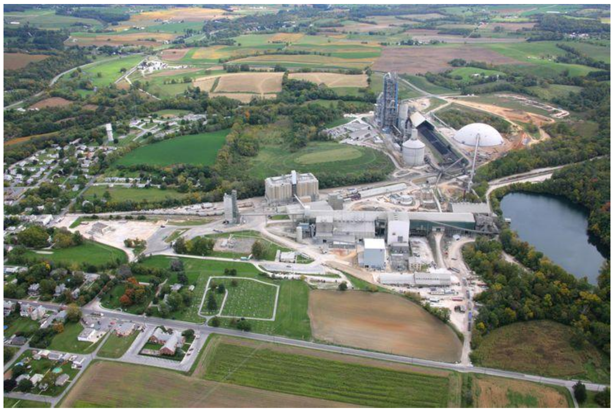
(3) Submit emissions data collected pursuant to §A(2) of this regulation to the Department as specified under COMAR 26.11.01.11E(2).

B. The NOx emissions data collected pursuant to §A(2) of this regulation shall be used to demonstrate compliance with the applicable NOx emission rate in Regulation .07 of this chapter.

END ALL NEW MATTER

IV. Maryland Portland Cement Plants

Lehigh

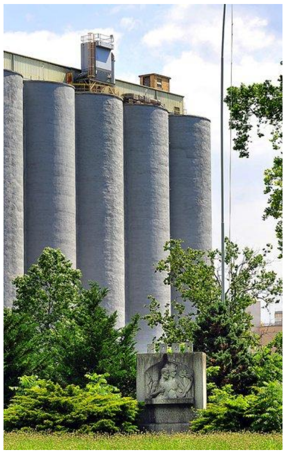


Plant profile: Lehigh Cement Company LLC owns and operates a Portland cement manufacturing plant in Union Bridge, MD. The plant is located in both Carroll and Frederick Counties. The original plant was built in 1910. The plant was purchased by Lehigh Cement Company, a division of the Heidelberg Cement Group, in 1925 and has undergone a series of modernizations and expansions, including replacing four existing long-dry kilns with one pre-heater/pre-calciner kiln system in 2001. As of 2013, the plant was producing up to 2.3 million tons cement per year. The newest plant, modernized as a pre-calciner kiln, began production in 2001 and to date, remains the largest cement production facility in North America, incorporating some of the most modern pollution control technology available today.

Lehigh is a major source of criteria air pollutants and therefore is required to have a Part 70 (Title V) Operating Permit. The plant's total annual NOx emissions for the years 2011 through 2013 are listed below:

Year	NOx emissions (tons)
2011	2,623
2012	2,888
2013	3,067

Holcim Cement Plant



Plant profile: Holcim Cement Plant is a Delaware corporation located in Hagerstown, Washington County, Maryland. The Hagerstown facility consists of two components, the Portland cement manufacturing plant and the quarry adjacent to the plant. The site quarries limestone, operates a limestone crushing plant, a raw mill system, a cement kiln/clinker cooler system, a finish mill system, and a packaging and shipping operation. Although cement production at this location dates back to 1903, the current long dry kiln has been in operation since 1971. The maximum annual clinker production from the kiln is 693,500 tons.

As part of a federal action, the Portland cement plant in Washington County will be upgrading the kiln to a pre-heater/pre-calciner kiln by September 6, 2016. The kiln will then be required to meet a year round NOx limit of 1.8 lbs NOx/ton of clinker on a 30-day rolling average. The 1.8 lbs NOx/ton per ton of clinker is lower than the 2.4 lbs NOx/ton of clinker in these regulations so the regulations do not have an economic impact on the Washington County facility.

Lehigh is a major source of criteria air pollutants and therefore is required to have a Part 70 (Title V) Operating Permit. The plant's total annual NOx emissions for the years 2011 through 2013 are listed below:

Year	**NOx emissions (tons)**
2011	1,614
2012	983
2013	1,046

V. Appendices

Appendix A – Ozone Transport Commission Identification and Evaluation of Candidate Control Measures – February 28, 2007 - page 15

Appendix B – EPA National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants - February 12, 2013 - page 142

OZONE
TRANSPORT
COMMISSION

OZONE TRANSPORT COMMISSION

Identification and Evaluation of Candidate Control Measures

Final
Technical Support Document

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February 28, 2007

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Acronyms and Abbreviations

Acronym	**Description**
BOTW	Beyond-on-the-Way – refers to additional emission controls that are being considered
CAIR	Clean Air Interstate Rule
EGAS 5.0	Economic Growth Analysis System Version 5.0
EGU	Electric Generating Unit
EPA	U.S. Environmental Protection Agency
IPM	Integrated Planning Model
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MARAMA	Mid-Atlantic Regional Air Management Association
MOBILE6	U.S. EPA's emission model for onroad sources
NESCAUM	Northeast States for Coordinated Air Use Management
NH3	Ammonia
NIF3.0	National Emission Inventory Input Format Version 3.0
NONROAD	U.S. EPA's emission model for certain types of nonroad equipment
NOx	Oxides of nitrogen
OTB/W	On-the-Books/On-the-Way – refers to emission control programs already adopted and proposed emission controls that will result in post-2002 emission reductions
OTC	Ozone Transport Commission
OTC 2001 model rules	Model rules developed by the OTC in 2001
OTC 2006 model rules	Model rules developed by the OTC in 2006
PM10-PRI	Particulate matter less than or equal to 10 microns in diameter that includes both the filterable and condensable components of particulate matter
PM25-PRI	Particulate matter less than or equal to 2.5 microns in diameter that includes both the filterable and condensable components of particulate matter
SIC	Standard Industrial Classification code
SIP	State Implementation Plan
SCC	Source Classification Code
SO2	Sulfur dioxide
VOC	Volatile organic compounds

EXECUTIVE SUMMARY

The States of the Ozone Transport Region (OTR) are faced with the requirement to submit attainment demonstration plans for the 8-hour ozone National Ambient Air Quality Standards (NAAQS). To accomplish this, most of the states will need to implement additional measures to reduce emissions that either directly impact their nonattainment status, or contribute to the nonattainment status in other states. As such, the Ozone Transport Commission (OTC) undertook an exercise to identify a suite of additional control measures that could be used by the OTR states in attaining their goals.

The OTC staff and member states formed several workgroups to identify and evaluate candidate control measures. Initially, the Workgroups compiled and reviewed a list of approximately 1,000 candidate control measures. These control measures were identified through published sources such as the U.S. Environmental Protection Agency's (EPA's) Control Technique Guidelines, STAPPA/ALAPCO "Menu of Options" documents, the AirControlNET database, emission control initiatives in member states as well as other states including California, state/regional consultations, and stakeholder input. The Workgroups developed a preliminary list of 30 candidate control measures to be considered for more detailed analysis. These measures were selected to focus on the pollutants and source categories that are thought to be the most effective in reducing ozone air quality levels in the Northeastern and Mid-Atlantic States. The Workgroups discussed the candidate control measures during a series of conference calls and workshops held periodically from the spring of 2004 through the autumn of 2006. The Workgroups collected and evaluated information regarding emission benefits, cost-effectiveness, and implementation issues. Each of the candidate control measures were summarized in a series of "Control Measure Summary Sheets". Stakeholders were provided multiple opportunities to review and comment on the Control Measure Summary Sheets.

Based on the analyses by the OTC Workgroups, the OTC Commissioners made several recommendations at the June 2006 Commissioners' meeting in Boston (OTC 2006a-d) and at the November 2006 Commissioners' meeting in Richmond (OTC 2006e-g). The Commissioners recommended that States consider emission reductions from the following source categories:

- Consumer Products
- Portable Fuel Containers
- Adhesives and Sealants Application
- Diesel Engine Chip Reflash
- Cutback and Emulsified Asphalt Paving
- Asphalt Production Plants
- Cement Kilns
- Glass Furnaces
- Industrial, Commercial, and Institutional (ICI) Boilers
- Regional Fuels

Additionally, the Commissioners directed the OTC to evaluate control measures for Electric Generating Units (EGUs) and high electric demand day units (these measures will be addressed in a separate OTC report) Finally, the Commissioners requested that EPA pursue federal regulations and programs designed to ensure national development and implementation of control measures for the following categories: architectural and maintenance coatings, consumer products, ICI boilers over 100 mmBtu/hour heat input, portable fuel containers, municipal waste combustors, regionally consistent and environmentally sound fuels, small offroad engine emission regulation, and gasoline vapor recovery (OTC 2006d).

See Appendix A for a full description of the process used by the OTC to identify and evaluate candidate control measures.

Table 1-1 summarizes information about the control measures identified by the OTC Commissioners at the June 2006 and November OTC meetings. Table 1-1 identifies the sector, the source category, and a brief description of the control measure. Next is a column that identifies the recommended approach for implementing the rule, such as an OTC model rule or updates to existing state-specific rules. The next two columns show the percent reduction from 2009 emission levels. The final column provides the cost effectiveness estimate in units of dollars per ton of pollutant removed.

Table 1-2 summarizes the expected emission reductions by pollutant, control measure and State. The emission reductions listed in Table 1-2 are for 2009, and take into account only the incremental reductions from the control measures listed in Table 1-1. Figures 1-1 and 1-2 show the anticipated emission reductions by state for VOC and NOx, respectively.

Table 1-1 Summary of OTC 2006 Control Measures

Sector	**Source Category**	**Control Measure**	**Implementation Method**	**Percent Reduction from 2009 OTB/W Emission Levels**		**Cost Effectiveness**
				NOx	**VOC**	**($/ton)**
Area	Adhesives, Sealants, Adhesive Primers, and Sealant Primers (Industrial)	Enact VOC content limits similar to those contained in the CARB RACT/BARCT document for adhesives and sealants (Dec. 1998)	Model Rule	---	64	VOC: 2,500
Area	Cutback and Emulsified Asphalt Paving	Prohibits the use of cutback asphalt during the ozone season Limits the use of emulsified asphalt during the ozone season to that which contains not more than 0.5 mL of oil distillate from a 200 mL sample as determined using ASTM Method D244	State Rule Update	---	State specific depending on current rules	VOC: minimal
Area	Consumer Products	Adopt the CARB 7/20/05 Amendments which sets new or revises existing VOC limits on 12 consumer product categories (does not include reductions for Tier2 shaving gels and antistatic aerosols since they have a later compliance date).	Model Rule	---	2	VOC: 4,800
Area	Portable Fuel Containers	Adopt the CARB 2006 Amendments broadening the definition of PFCs to include kerosene and diesel containers and utility jugs used for fuel, and other changes to make OTC Model Rule consistent with CARB requirements.	Model Rule	---	State specific	VOC: 800 to 1,400
Area and Point	Asphalt Production Plants	Area/Point Sources Batch Natural Gas 0.02 lb/ton or equivalent ppm Batch Distillate 0.09 lb/ton or equivalent ppm Drum Natural Gas 0.02 lb/ton or equivalent ppm Drum Distillate 0.04 lb/ton or equivalent ppm or Low NOx Burners, Best Management Practices	State Rule Update	10 - 35	---	NOx: <500 to 1,250
Area and	Industrial/ Commercial/ Institutional (ICI)	Option 1 – Purchase current year NOx allowances equal to reductions needed to achieve the required emission rates	Model Rule	Boiler and State	---	NOx: 600 to 18,000

Sector	**Source Category**	**Control Measure**	**Implementation Method**	**Percent Reduction from 2009 OTB/W Emission Levels**		**Cost Effectiveness ($/ton)**
				NOx	**VOC**	
Point	Boilers >250 mmBtu/hour	Option 2 – Phase I 2009 emission rate equal to EGUs of similar size; Phase II 2013 emission rate equal to EGUs of similar size		specific		
Area and Point	ICI Boilers 100-250 mmBtu/hour	NOx Strategy #1: Nat gas: 0.10 lb/mmBtu #2, #4, #6 Oil: 0.20 lb/mmBtu Coal: 0.08 to 0.22 lb/mmBtu, depending on boiler type NOx Strategy #2: Reductions achievable through LNB/SNCR, LNB/FGR, SCR or some combination of these controls NOx Strategy #3: 60% reduction from uncontrolled NOx Strategy #4: Purchase current year CAIR allowances	State Rule Update	Boiler and State specific	---	NOx: 600 to 18,000
Area and Point	ICI Boilers 25-100 mmBtu/hour	NOx Strategy #1: Nat gas: 0.05 lb/mmBtu #2 Oil: 0.08 lb/mmBtu #4, #6 Oil: 0.20 lb/mmBtu Coal: 0.30 lb/mmBtu NOx Strategy #2: 50% reduction from uncontrolled NOx Strategy #3: Purchase current year CAIR allowances	State Rule Update	Boiler and State specific	---	NOx: 600 to 18,000
Area and Point	ICI Boilers <25 mmBtu/hour	Annual boiler tune-up	State Rule Update	State specific	---	
Point	Glass Furnaces	Require furnace operators to meet the emission limits in the San Joaquin Valley rule by 2009. These limits are achievable through implementation	State Rule or Permit	Source specific	---	NOx: 1,254 to 2,500

Sector	**Source Category**	**Control Measure**	**Implementation Method**	**Percent Reduction from 2009 OTB/W Emission Levels**		**Cost Effectiveness ($/ton)**
				NOx	**VOC**	
		of "oxyfiring" technology for each furnace at furnace rebuild. If the operator does not rebuild the furnace by 2009 or implement measures to meet the limits in the San Joaquin Valley rule, the operator would be required to purchase NOx allowances equal to the difference between actual emissions and the limits in the San Joaquin Valley rule. Compliance with Rule 4354 will allow manufacturers to use a mix of control options to meet the suggested limits. Manufacturers may propose alternative compliance methods to meet the specified limits, including emissions averaging.				
Point	Cement Plants	Require existing kilns to meet a NOx emission rate of 3.88 lbs/ton clinker for wet kiln 3.44 lbs/ton clinker for long dry kiln 2.36 lbs/ton clinker for pre-heater kiln 1.52 lbs/ton clinker for pre-calciner kiln	State Rule Update	Source specific	---	NOx: <2,500
Onroad Mobile	Diesel Truck Chip Reflash	Mandatory program to upgrade the version of software in engine electronic control module (ECM), (also known as "chip reflash) to reduce off-cycle NOx emissions.	Model Rule	10	---	NOx: 20-30
Onroad Mobile	Regional Fuel based on Reformulated Gasoline Options	Extend RFG requirements to counties in OTC that currently do not have RFG.	Memorandum of Understanding - OTC	State specific	State specific	VOC: 5,200 NOx: 3,700

Table 1-2 Estimated Emission Benefits in 2009 by State Resulting from the OTC 2006 Control Measures

	VOC Emission Reduction Benefit (summer tpd)							NOx Emission Reduction Benefit (summer tpd)							
State	**Adhesives & Sealants**	**Cutback\Emulsified Asphalt Paving**	**Consumer Products**	**PFC (Area)[a]**	**PFCs (Nonroad)[a]**	**Regional Fuels**	**Total VOC Reduction**	**Diesel Engine Chip Reflash**	**Regional Fuels**	**Asphalt Production**	**Cement Kilns**	**Glass/Fiberglass[b]**	**ICI Boilers Area Sources**	**ICI Boilers Point Sources**	**Total NOx Reduction**
CT	4.2	4.3	0.7	0.4	0.1	0.0	9.7	3.5	0.0	0.0	0.0	0.0	2.8	2.1	8.4
DE	1.0	0.0	0.1	0.1	<0.1	0.0	1.4	0.6	0.0	0.2	0.0	0.0	1.2	0.1	2.1
DC	0.1	0.0	0.1	0.1	<0.1	0.0	0.4	0.8	0.0	0.0	0.0	0.0	0.4	0.4	1.6
ME	2.5	10.6	0.2	0.1	<0.1	9.1	22.6	1.4	0.2	0.7	0.0	0.0	1.1	2.8	6.2
MD	5.8	0.0	1.0	1.4	0.4	3.2	11.8	5.6	0.0	0.1	13.1	0.3	1.2	2.4	22.7
MA[d]	8.9	8.1	10.2	1.7	0.5	0.0	29.3	6.7	0.0	0.6	0.0	1.5	6.6	6.8	22.2
NH	2.3	4.4	0.3	0.2	0.1	4.3	11.5	2.0	0.2	0.0	0.0	0.0	3.4	1.9	7.5
NJ	9.2	4.7	1.4	1.0	0.3	0.0	16.7	9.7	0.0	1.0	0.0	4.9	0.0	3.4	19.0
NY	21.5	16.4	3.7	2.6	0.8	56.9	101.9	16.1	2.1	0.0	15.3	5.8	33.8	7.0	80.1
PA	21.9	8.4	2.1	1.6	0.5	58.0	92.3	12.4	2.0	0.2	14.0	24.3	12.2	9.8	73.9
RI	1.5	1.1	0.2	0.2	<0.1	0.0	3.0	0.8	0.0	0.0	0.0	0.5	2.1	0.5	3.9
VT	2.2	1.8	0.1	0.1	<0.1	7.9	12.1	0.9	0.3	0.0	0.0	0.0	0.9	0.4	2.5
No. VA[c]	1.0	<0.1	0.5	0.4	0.1	0.0	1.9	2.5	0.0	0.1	0.0	0.0	3.9	0.1	6.6
OTR	**82.3**	**59.8**	**20.5**	**9.9**	**3.0**	**139.4**	**314.8**	**63.0**	**4.8**	**3.0**	**42.5**	**37.3**	**69.5**	**37.7**	**257.8**

a) The table shows the estimated emission reduction that will occur in 2009; additional reductions will occur in later years as new, less-emitting PFCs that comply with the OTC 2006 control measure penetrate the market.

b) The table show the maximum emission reduction from glass/fiberglass furnaces when the OTC 2206 control measure is fully implemented. No all of the reduction shown will be achieved by 2009.

c) The following jurisdictions in Virginia are part of the OTR: Arlington County, Alexandria, Fairfax County, Fairfax City, Fall Church, Loudon County, Manassas City, Manassas Park, and Prince William County.

d) MA proposed rule has a January 1, 2009 effective date and includes the VOC limits from the OTC 2001 model rule and those in the OTC 2006 model rule. The 2009 benefit MA shows the benefit from both sets of limits. For all other States, the 2009 benefit shows the change in emissions from the OTC 2006 model rule only.

Figure 1-1 VOC Emission Reduction Benefits from OTC 2006 Control Measures in 2009

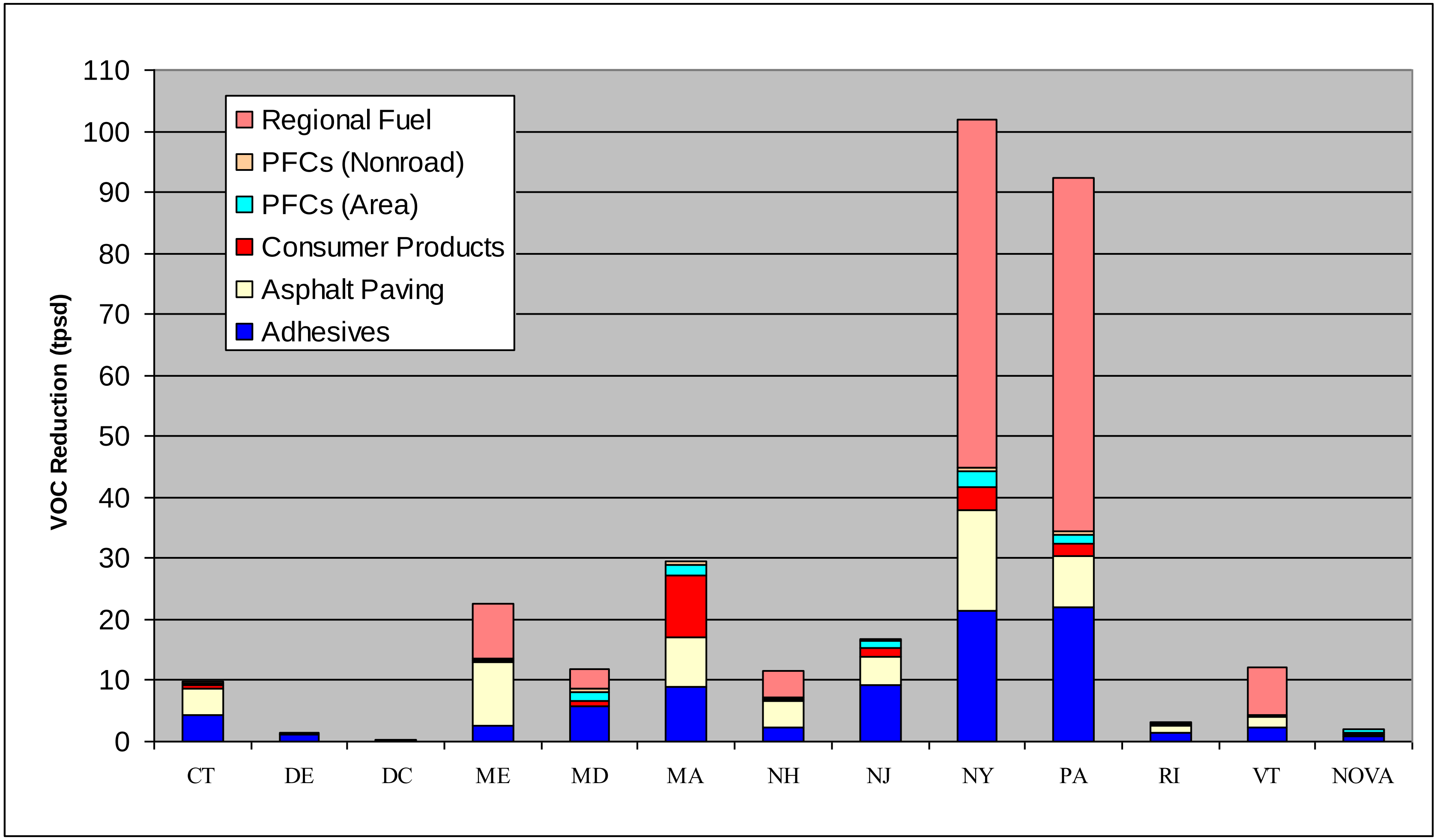
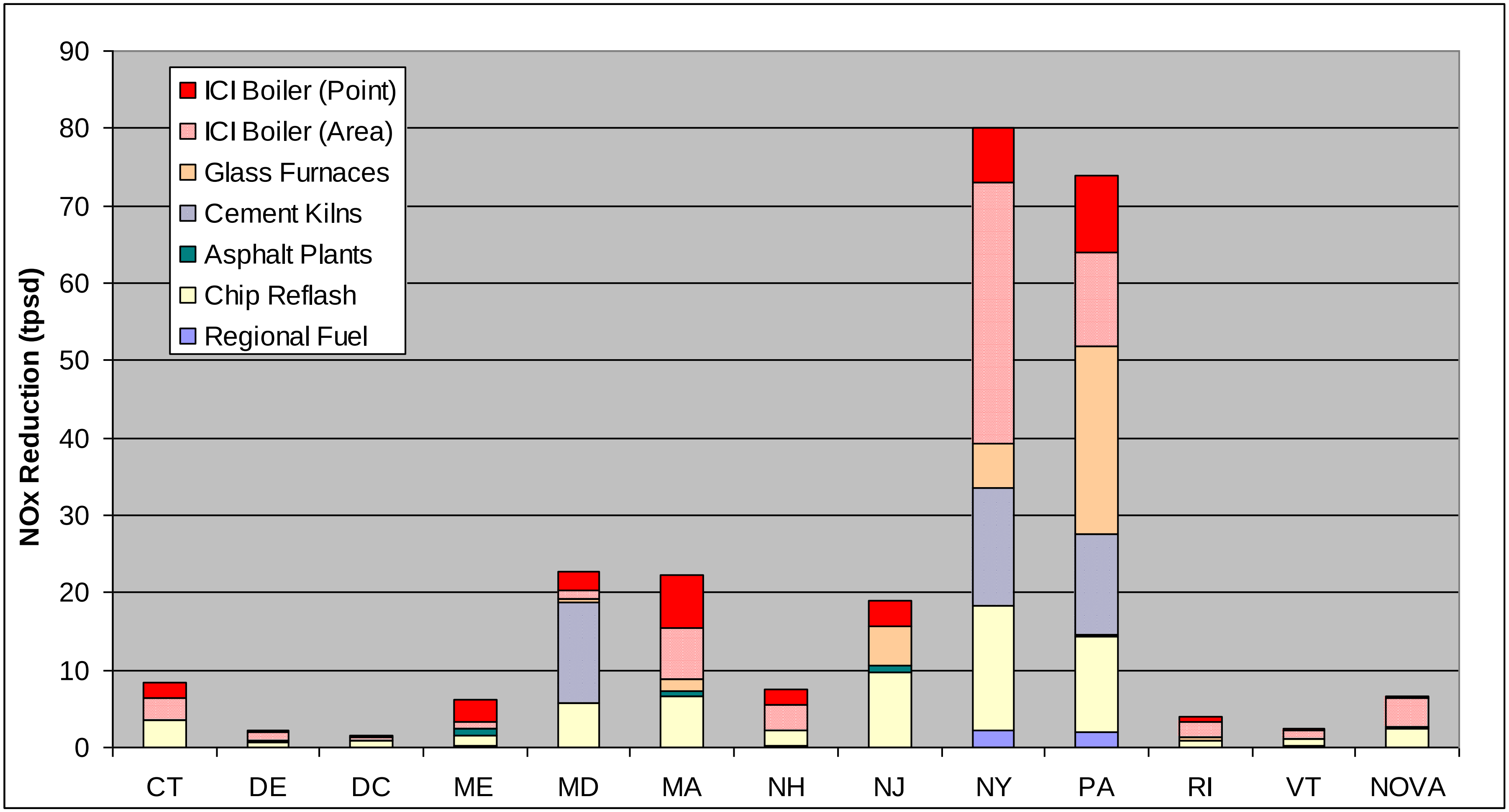


Figure 1-2 NOx Emission Reduction Benefits from OTC 2006 Control Measures in 2009



INTRODUCTION

The Ozone Transport Commission (OTC) is a multi-state organization created under the Clean Air Act (CAA). The OTC is responsible for advising EPA on transport issues and for developing and implementing regional solutions to the ground-level ozone problem in the Northeast and Mid-Atlantic regions. To supplement local and state-level efforts to reduce ozone precursor emissions, which may not alone be sufficient to attain federal standards, the OTC member states are considering control measures appropriate for adoption by all states in the region as part of their planning to attain and maintain the 8-hour ozone National Ambient Air Quality Standards (NAAQS).

The development of the control measures described in this document parallels a prior effort. The OTC developed a series of model rules in 2001 for the States to consider in adopting control measures to reduce volatile organic compound (VOC) emissions and oxide of nitrogen (NOx), which are ozone precursors, to (1) assist in the attainment of the one-hour ozone health standard, (2) address the VOC and NOx emission reduction shortfalls identified by EPA, and (3) implement the State Implementation Plans (SIP) commitments to EPA. These model rules, which have been adopted in many OTC states, will be referred to as the "OTC 2001 model rules" in this document.

The analysis in this report provides a description of the control measures identified by the OTC to help states attain the 8-hour ozone NAAQS. It also describes the associated incremental emission reductions and costs associated with each measure. The control measures analyzed in this report are those that were identified by the OTC Commissioners at the June 2006 OTC annual meeting in Boston (OTC 2006a, OTC 2006b, OTC 2006c) and at the November 2006 OTC fall meeting in Richmond (OTC 2006d, OTC 2006e, OTC 2006f). These control measures will be referred to as the "OTC 2006 control measures" in this document. For some source categories, the OTC has amended the OTC 2001 model rules or developed new model rules. These model rules will be referred to as the "OTC 2006 model rules" in this document.

The OTC 2006 model rules for volatile organic compounds (VOC) will reduce emissions from adhesives, sealants, adhesive primer, and sealant primer application; cutback and emulsified asphalt paving; consumer products; regional fuels; and portable fuel containers. The OTC 2006 control measures for oxides of nitrogen (NOx) will reduce emissions from asphalt production plants, cement kilns, diesel engine chip reflash, regional fuels, electric generating units (EGUs), glass and fiberglass furnaces, and industrial, commercial, institutional (ICI) boilers.

Section 3 describes the methods used to estimate the emission benefits of the VOC control measures. For each source category, there are subsections that describe the existing Federal and OTC State regulations that affect the VOC emissions, summarize the major elements of the control measures, discuss how the emission benefits were quantified, and present information on anticipated costs and cost-effectiveness. VOC emissions and reductions by State and source category in 2002 and 2009 are presented at the end of Section 3. Section 4 presents similar information for the NOx source categories. Section 5 presents similar information for the SO2 source categories. Section 6 provides a list of references used in developing this report.

Appendix A presents a brief description of the process that the OTC followed in identifying and evaluating candidate control measures. Appendix B lists the approximately 1,000 control measures that were initially analyzed. Appendix C contains the control measure summary sheets that were developed during this analysis. Appendices D, E, and F present the emission benefits by county for VOC, NOx, and SO2 respectively. Each appendix contains a tabulation of the 2002 base emissions, the projected 2009/2012/2018 emissions and expected emission reduction benefit from the additional control measures in 2009/2012/2018). Appendix G contains a listing of State ICI boiler regulations.

VOC ANALYSIS METHODS

This Section describes the analysis of the 2006 OTC control measures to reduce VOC emissions from five source categories: adhesives, sealants, adhesive primer, and sealant primer application; cutback and emulsified asphalt paving; consumer products; regional fuels; and portable fuel containers. For each of the five categories, there are separate subsections that discuss existing Federal/state rules, summarize the requirements of the 2006 OTC control measure, describe the methods used to quantify the emission benefit, and provide an estimate of the anticipated costs and cost-effectiveness of the control measure. At the end of Section 3, we provide the estimated emissions for 2002 and 2009 by source category and State. Appendix D provides county-by-county summaries of the emission reductions for each of the categories and projection years.

ADHESIVES, SEALANT, ADHESIVE PRIMER, AND SEALANT PRIMER APPLICATION

Adhesives, sealants, adhesive primer, and sealant primer are used in product manufacturing, packaging, construction, and installation of metal, wood, rubber, plastic, ceramics, or fiberglass materials. In general, an adhesive is any material used to bond two surfaces together. In general, a sealant is a material with adhesive properties that is used primarily to fill, seal, waterproof or weatherproof gaps or joints between two surfaces.

VOC emissions from this category result from evaporation of solvents during transfer, drying, surface preparation and cleanup operations. These solvents are the media used to solubilize the adhesive, sealant, or primer material so that it can be applied. The solvent is also used to completely wet the surface to provide a stronger bond. In plastic pipe bonding, the solvent dissolves the polyvinyl chloride pipe and reacts with the pipe to form a bond. Solvents used to clean the surface before bonding and to clean the application equipment after bonding also contribute to VOC emissions.

VOC emissions in this category are primarily from industrial and commercial operations such as wood product manufacturers, upholstery shops, adhesives retailers and architectural trades, such as building construction, floor covering installation and roof repair.

Existing Federal and State Rules

EPA published the consumer and commercial products rule on September 11, 1998 (40 CFR Part 59 Subpart D) under authority of Section 183(e) of the Clean Air Act. The Federal Part 59 Subpart C requirements for consumer products regulate five types of "household" adhesives (aerosols, contact, construction and panel, general purpose and structural waterproof). The VOC content limits for these products apply only to "household products", defined as "any consumer product that is primarily designed to be used inside or outside of living quarters or residences, including the immediate surroundings, that are occupied or intended for occupation by individuals." Thus, the Part 59 rule applies only to adhesives used in household settings and not to adhesives used in industrial or commercial applications.

The OTC developed a model rule for consumer and commercial products in 2001 (referred to as the "OTC 2001 model rule for consumer products" in this document) to regulate additional consumer product categories by requiring more stringent VOC content limits than the Federal rule. The OTC 2001 model rule for consumer products contains VOC limits for adhesives and sealants. However, with the exception of aerosol adhesives, the definitions of these products generally exempt products sold in larger containers. Specifically, the OTC 2001 model rule includes the following definitions (italics added for emphasis):

- Section 2(8) Adhesive. "Adhesive" means any product that is used to bond one surface to another by attachment. "Adhesive" does not include products used on humans and animals, adhesive tape, contact paper, wallpaper, shelf liners, or any other product with an adhesive incorporated onto or in an inert substrate. For "Contact Adhesive," *adhesive does not include units of product, less packaging, which consist of more than one gallon*. For "Construction, Panel, and Floor Covering Adhesive," and "General Purpose Adhesive", *adhesive does not include units of product, less packaging, which weigh more than one pound and consist of more than 16 fluid ounces*. This limitation does not apply to aerosol adhesives.

- Section 2(148) Sealant and Caulking Compound. "Sealant and Caulking Compound" means any product with adhesive properties that is designed to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces. "Sealant and Caulking Compound" does not include roof cements and roof sealants; insulating foams; removable caulking compounds; clear/paintable/water resistant caulking compounds; floor seam sealers; products designed exclusively for automotive uses; or sealers that are applied as continuous coatings. *"Sealant and Caulking Compound" also does not include units of product, less packaging, which weigh more than one pound and consist of more than 16 fluid ounces.* For the purposes of this definition only, "removable caulking compounds" means a compound which temporarily seals windows or doors for three to six month time intervals, and "clear/paintable/water resistant caulking compounds" means a compound which contains no appreciable level of opaque fillers or pigments; transmits most or all visible light through the caulk when cured; is paintable; and is immediately resistant to precipitation upon application.

Thus, the same products sold in containers larger than the above thresholds are not covered by the OTC 2001 model rule for consumer products.

Description of the OTC 2006 Model Rule

The OTC 2006 model rule for adhesives and sealants is based on the reasonably available control technology (RACT) and best available retrofit control technology (BARCT) determination by the California Air Resources Board (CARB) developed in 1998. The OTC 2006 model rule has the following requirements:

A. Regulates the application of adhesives, sealants, adhesive primers and sealant primers by providing options for appliers to either to use a product with a VOC content equal to or less than a specified limit or to use add-on controls;

B. Limits the VOC content of aerosol adhesives to 25 percent by weight;

C. Requirements for cleanup solvents;

D. A VOC limit for surface preparation solvents;

E. An alternative add-on control system requirement of at least 85 percent overall control efficiency (capture and destruction efficiency), by weight;

F. VOC containing materials must be stored or disposed of in closed containers;

G. Prohibits the sale of any adhesive, sealant, adhesive primer or sealant primer which exceeds the VOC content limits listed in the model rule;

H. Manufacturers must label containers with the maximum VOC content as supplied, as well as the maximum VOC content on an as-applied basis when used in accordance with the manufacturer's recommendations regarding thinning, reducing, or mixing with any other VOC containing material; and

I. Prohibits the specification of any adhesive, primer, or sealant that violates the provisions of the model rule.

Several adhesive and sealant applications and products are exempt from this model rule: tire repair, assembly and manufacturing of undersea-based weapon systems, testing and evaluation associated with research and development, solvent welding operations for medical devices, plaque laminating operations, products or processes subject to other state rules, low-VOC products (less than 20 g/l), and adhesives subject to the state rules based on the OTC 2001 consumer products model rule. Additionally, the model rule provides an exemption for adhesive application operations at stationary sources that use less than 55 gallons per calendar year of noncomplying adhesives and for stationary sources that emit not more than 200 pounds of VOCs per year from adhesives operations.

Emission Benefit Analysis Methods

Emissions from this category are classified as both point sources and area sources. About 96 percent of adhesive and sealant VOC emissions in the OTC states fall into the area source category. The remaining four percent of the VOC emissions are included in the point source inventory.

The emission reduction benefit estimation methodology for area sources is based on information developed and used by CARB for their RACT/BARCT determination in 1998. CARB estimates that the total industrial adhesive and sealant emissions in California to be about 45 tons per day (tpd). Solvent-based emissions are estimated to be about 35 tpd of VOC and water-based adhesive and sealant emissions are about 10 tpd of VOC. CARB indicated that the emission reductions would be achieved mainly due to the switch from high-VOC to low-VOC products rather than from the use of add-on control devices. CARB estimated that emission reductions achieved by statewide compliance with the VOC limits in the RACT/BARCT determination will range from approximately 29 to 35 tpd (CARB 1998, pg. 18). These emission reductions correspond to a 64.4 to 77.8 percent reduction from uncontrolled levels. For OTC modeling purposes, we used the lower end of this range (i.e., 64.4 percent reduction) to estimate the emission benefit for area sources due to the OTC 2006 model rule.

For point sources, we first identified those sources that were applying adhesives and sealants (using the source classification code of 4-02-007-xx, adhesives application). Next, we reviewed the MANEVU inventory to determine whether sources had existing capture and control systems. Several sources reported capture and destruction efficiencies in the 70 to 99 percent range. A few sources reported capture and destruction efficiencies of 99+ percent. Most of the controlled sources reported capture and destruction efficiencies in the 90-98 percent range. Sources with existing control systems that exceed an 85 percent overall capture and destruction efficiency would meet the OTC 2006 model rule provision for add-on air pollution control equipment; no additional reductions were calculated for these sources. For point sources without add-on control equipment, we used the 64.4 percent reduction discussed in the previous paragraph based on the CARB determination.

Cost Estimates

The cost of complying with the new requirements includes the cost of using alternative formulations of low-VOC or water-based adhesives, sealants, adhesive primers, and sealant primers and cleanup products. Based on information provided by the Ventura County Air Pollution Control District, CARB determined that the cost-effectiveness of their adhesives rule ranges from a savings of $1,060 per ton to a cost of $2,320 per ton of VOC reduced (CARB 1998, pg. 17). These costs are likely to be less in the OTR, because some of the one-time research and reformulation costs incurred for products sold in California will not have to be incurred again for products sold in the OTR. CARB also reports a cost-effectiveness of $9,000 to $110,000 per ton of VOC reduced for the use of add-on control equipment to comply with the requirements.

CUTBACK AND EMULSIFIED ASPHALT PAVING

Asphalt paving is used to pave, seal and repair surfaces such as roads, parking lots, drives, walkways and airport runways. Asphalt paving is grouped into three general categories: hot-mix, cutback, and emulsified. Hot-mix asphalt is the most commonly used paving asphalt. Hot-mix asphalt produces minimal VOC emissions because its organic components have high molecular weights and low vapor pressures. Cutback asphalt is used in tack and seal operations, in priming roadbeds for hot-mix application and for paving operations for pavements up to several inches thick. In preparing cutback asphalt, asphalt cement is blended or “cut back” with a diluent, typically from 25 to 45 percent by volume of petroleum distillates, depending on the desired viscosity. Emulsified asphalt is used in most of the same applications as cutback asphalt but is a lower emitting alternative to cutback asphalt. Instead of blending asphalt cement with petroleum distillates, emulsified asphalts use a blend of asphalt cement, water and an emulsifying agent, such as soap. Some emulsified asphalts contain virtually no VOC diluents; however, some emulsified asphalts may contain up to 12 percent VOC by volume.

Existing Federal and State Rules

The EPA published a Control Technique Guideline (CTG) for the use of cutback asphalt in December 1977. The CTG recommended replacing cutback asphalt binders with emulsified asphalt during the ozone season. In 1979, EPA added a specification for emulsified asphalt to the CTG recommendations to limit the content of oil distillate in emulsified asphalt to no higher than 7 percent oil distillate.

Table 3-1 summarizes the current asphalt paving rules for the 13 OTR states. Most of the states in the OTR have adopted the CTG banning cutback asphalt in the ozone season. Some states have exemptions to this rule, allowing the use of cutback asphalt with up to 5 percent VOC. For emulsified asphalt, the requirements vary greatly. The VOC content of emulsified asphalt is limited to 0-12 percent, depending on the State and the type of emulsified asphalt. Delaware completely bans the use of emulsified asphalt that contains any VOC.

Table 3-1 Summary of OTC State Rules for Cutback and Emulsified Asphalt

State	Cutback Asphalt	Emulsified Asphalt
CT	22a-174-20 (k): VOC content limited to 5% during June, July, August, and September	Nothing specified
DE	Reg. No. 24, Section 34: Ban during ozone season	Reg. No. 24, Section 34: Ban on use of emulsified asphalt that contains any VOC
DC	Chapter 7 Section 8-2:707(k): Ban during the months of April, May, June, July, August, and September	Nothing specified
ME	Chapter 131: Ban during the period May 1 through September 15, with some exceptions	Chapter 131: VOC content limited to 3-12%, depending on the type of use
MD	COMAR 26.11.11.02: Ban during the period April 16 through October 14	COMAR 26.11.11.02: Allowed upon approval of the Department; no VOC content limit specified
MA	310 CMR 7.18(9): Ozone season ban on cutback asphalt with VOC content greater than 5% by weight with exemptions including use as prime coat	Nothing Specified
NH	Env-A 1204.42: Ban during the months of June through September; cutback with up to 5% VOC allowed upon approval of Department	Env-A 1204.42: VOC content limited to 3-12%, depending on the type of use
NJ	7:27-16.19: Ban from April 16 through October 14, with some exemptions	7:27-16.19: VOC content limited to 8% by volume
NY	Part 211: Ban from May 2 through October 15	Part 211: VOC content limited to 2-12%, depending on the type of ASTM grade
PA	25 Pa. Code Section 129.64: Ban from May 1 to October 30	25 Pa. Code Section 129.64: VOC content limited to 0-12%, depending on type
RI	Reg. No. 25: Ban from April 1 to September 30, with some exemptions	Reg No. 25: VOC content limited to 3-12%, depending on application/use
VT	5-253.15: Ban on cutback asphalt with VOC content greater than 5% by weight, with some exemptions	5-253.15: Ban on emulsified asphalt with VOC content greater than 5% by weight
VA	Chapter 40, Article 39: Ban during April through October	Chapter 40, Article 39: VOC content limited to 6% by volume

Description of the OTC 2006 Model Rule

The OTC 2006 model rule for the asphalt paving control measure prohibits the use of cutback asphalt during the ozone season and limits the use of emulsified asphalt to that which contains not more than 0.5 mL of oil distillate from a 200 mL sample (as determined using American Society for Testing and Materials {ASTM} Method D244 - Test Methods for Emulsified Asphalts) regardless of application. This is equivalent to a VOC content of 0.25 percent. Exemptions may be granted under certain circumstances upon the approval of the State commissioner.

Emission Benefit Analysis Methods

The OTC 2006 control measure for asphalt paving calls for a complete ban on the use of cutback asphalt during the ozone season. As shown in Table 3-1, current state regulations generally ban the use of cutback asphalt during the ozone season. However, there are exemptions from the ban and as a result there are VOC emissions from the use of cutback asphalt during the ozone season. The OTC 2006 control measure eliminates any exemptions and totally eliminates any VOC emissions from the use of cutback asphalt during the ozone season.

The emission reductions resulting from OTC 2006 control measure for emulsified asphalt vary by State. The two percent VOC content limit on emulsified asphalt depend on the baseline VOC content of emulsified asphalt. The control measure limits emulsified asphalt to not more than 0.5 mL of oil distillate from a 200 mL sample as determined using ASTM Method D244. This is equivalent to a VOC content of 0.25 percent. The baseline VOC content may range from 0 to 12 percent. New Jersey used a VOC content of 8 percent in their baseline emission calculations (based on the 8 percent limit in their current rule). Reducing the VOC content to 0.25 percent in New Jersey will result in a 96.9 percent reduction. Delaware already bans the use of emulsified asphalt that contains any VOC, so there is no reduction in Delaware. Several other states used an average VOC content of 2.5 percent when developing their emission inventory. Thus, reducing the average VOC content from 2.5 percent to 0.25 percent results in a 90 percent reduction in VOC emissions. For States that did not supply a baseline VOC content for asphalt paving, we used the 90 percent reduction in VOC emissions from emulsified asphalt paving during the ozone season.

Cost Estimates

Low-VOC alternatives are currently available and no additional costs are expected from their use.

CONSUMER PRODUCTS

Consumer and commercial products are those items sold to retail customers for personal, household, or automotive use, along with the products marketed by wholesale distributors for use in commercial or institutional settings such as beauty shops, schools and hospitals. VOC emissions from these products are the result of the evaporation of propellant and organic solvents during use. Consumer and commercial products include hundreds of individual products, including personal care products, household products, automotive aftermarket products, adhesives and sealants, FIFRA-related insecticides, and other miscellaneous products.

Existing Federal and State Rules

EPA published the Federal consumer and commercial products rule on September 11, 1998 (40 CFR Part 59 Subpart D) under authority of Section 183(e) of the Clean Air Act. This rule limits the VOC content of 24 product categories representing 48 percent of the consumer and commercial products inventory nationwide. According to EPA, VOC emissions from those 24 product categories were reduced by 20 percent. But since over half of the inventory is unaffected by the rule, the Federal rule is estimated to yield VOC reductions of 9.95 percent of the total consumer products inventory (Pechan 2001, pg 7).

Since over half of the inventory is unregulated by the Federal Part 59 rule, the OTC developed a model rule for consumer and commercial products in 2001 (referred to as the "OTC 2001 model rule for consumer products" in this document) to be used by the OTC jurisdictions to develop regulations for additional consumer product categories and to specify more stringent VOC content limits than the Federal rule. The VOC content limits and products covered in the OTC 2001 model rule are similar to the rules developed by CARB in the late 1990s. The OTC 2001 model rule for consumer products provides background for OTC jurisdictions to develop programs to regulate approximately 80 consumer product categories and includes technologically feasible VOC content limits. The emission reductions for state programs based on the OTC 2001 model rule are estimated to be 14.2 percent of the total consumer product inventory beyond the national rule reduction (Pechan 2001, pg. 8).

Most, but not all, states in the OTR have adopted regulatory programs based on the OTC 2001 model rule for consumer products. Table 3-2 summarizes the adoption status for the 13 OTR jurisdictions.

Table 3-2 Status of OTC State's Promulgation of the OTC 2001 Model Rule for Consumer Products.

State	Effective Date of VOC Limits	Regulatory Citation
CT [a]	Initiated process to adopt in 2006	R.C.S.A. section 22a-174-40
DE	Effective January 1, 2005	Regulation Number 41
DC	Effective June 30, 2004	Regulation 719
ME	Effective May 1, 2005	Chapter 152
MD	Effective January 1, 2005	COMAR 26.11.32
MA [b]	In progress – proposed effective date is January, 2009	310 CMR 7.25(12)
NH	Effective January 1, 2007	Chapter Env-A 4100
NJ	Effective Janaury 1, 2005	Chapter 27, Subchapter 24
NY	Effective January 1, 2005	Chapter 3, Part 235
PA	Effective January 1, 2005	25 Pa. Code Chapter 130, Subchapter B
RI	Intend to develop in 2006	n/a
VT	Under Consideration	n/a
VA [c]	Effective July 1, 2005	Chapter 40, Article 50

a) Connecticut's proposed rule includes both the VOC limits from the OTC 2001 model rule and the new and revised VOC emissions limits and related provisions that were adopted by the California Air Resources Board on July 20, 2005. These new and revised VOC limits are identical to those in the OTC 2006 model rule.

b) Massachusett's proposed rule includes the VOC limits from the OTC 2001 model rule and those in the OTC 2006 model rule.

c) Virginia's rule applies only in Northern Virginia VOC Emission Control Area (10 northern Virginia jurisdictions in the OTR)

Description of the OTC 2006 Model Rule

The OTC 2001 model rule for consumer products closely mirrored a series of five CARB consumer products rules. CARB recently amended their consumer products rules in July 2005. As shown in Table 3-3, these amendments to the CARB rule affected 18 categories of consumer products (14 new categories, including subcategories, with new product category definitions and VOC limits; one previously regulated category with a more restrictive VOC limit; and two previously regulated categories with additional requirements).

Table 3-3 Consumer Products Affected by CARB's July 2005 Rule Amendments

New Categories with VOC Limits for Regulation	
Adhesive Remover – 4 subcategories Anti-Static Product Electrical Cleaner Electronic Cleaner Fabric Refresher	Footwear or Leather Care Product Hair Styling Product[a] Graffiti Remover Shaving Gel Toilet/Urinal Care Product Wood Cleaner
Previously Regulated Category with More Restrictive Limit	
Contact Adhesive[b]	
Previously Regulated Categories with Additional Requirements	
Air Fresheners	General Purpose Degreasers

a) This product category will incorporate Hair Styling Gel and include additional forms of hair styling products (i.e., liquid, semi-solid, and pump spray) but does not include Hair Spray Product or Hair Mousse.

b) This product category has been separated into 2 subcategories: General Purpose and Special Purpose

Most of these new CARB limits become effective in California by December 31, 2006. Two of the limits, anti-static products (aerosol) and shaving gels, have effective dates in either 2008 or 2009. For shaving gels, there is a VOC limit that becomes effective on December 31, 2006, with a more stringent second tier limit that becomes effective on December 31, 2009. The anti-static product (aerosol) limit becomes effective on December 31, 2008.

The OTC 2006 model rule will modify the OTC 2001 model rule based on the CARB July 20, 2005 amendments. The OTC is not including the anti-static aerosol products and the second tier shaving gel limit in its revisions to the OTC 2001 model rule because of industry concerns that meeting these limits may not be feasible. CARB acknowledged these concerns by requiring a technology review of these product categories in 2008 to determine whether the limits are achievable.

Emission Benefit Analysis Methods

The emission reduction benefit estimation methodology is based on information developed by CARB. CARB estimates 6.05 tons per day of VOC reduced in California from their July 2005 amendments (CARB 2004a, pg. 8), excluding the benefits from the two products (anti-static products and shaving gels) with compliance dates in 2008 or 2009. This equates to about 2,208 tons per year in California. The population of California as of July 1, 2005 is 36,132,147 (Census 2006). On a per capita basis, the emission reduction from the CARB July 2005 amendments equals 0.122 lbs/capita.

Since the OTC's 2006 control measure is very similar to the CARB July 2005 amendments (with the exclusion of the anti-static products and shaving gel 2008/2009 limits), the per capita emission reductions are expected to be the same in the OTR. The per capita factor after the implementation of the OTC 2001 model rule is 6.06 lbs/capita (Pechan 2001, pg. 8). The percentage reduction from the OTC's 2006 control measure was computed as shown below:

Current OTC Emission Factor = 6.06 lbs/capita

Benefit from CARB 2005 amendments = 0.122 lbs/capita
Percent Reduction = 100%*(1 - (6.06 – 0.122)/6.06)
= 2.0%

Cost Estimates

CARB estimates that the cost effectiveness of VOC limits with an effective date of December 31, 2006, to be about $4000 per ton of VOC reduced (CARB 2004, pg. 21). CARB further estimates that the average increase in cost per unit to the manufacturer to be about $0.16 per unit. Assuming CARB's estimates for the OTR provides a conservative estimate, because some of the one-time research and reformulation costs incurred for products sold in California will not have to be incurred again for products sold in the OTR.

PORTABLE FUEL CONTAINERS

Portable fuel containers (PFCs) are designed for transporting and storing fuel from a retail distribution point to a point of use and the eventual dispensing of the fuel into equipment. Commonly referred to as "gas cans," these products come in a variety of shapes and sizes with nominal capacities ranging in size from less than one gallon to over six gallons. Available in metal or plastic, these products are widely used to refuel residential and commercial equipment and vehicles when the situation or circumstances prohibits direct refueling at a service station. PFCs are used to refuel a broad range of small off-road engines and other equipment (e.g., lawnmowers, chainsaws, personal watercraft, motorcycles, etc.). VOC emissions from PFCs are classified by five different activities:

- **Transport-spillage** emissions from PFCs occur when fuel escapes from PFCs that are in transit.
- **Diurnal** emissions result when stored fuel vapors escape to the air through any possible openings while the container is subjected to the daily cycle of increasing and decreasing ambient temperatures. Diurnal emissions depend on the closed- or open- storage condition of the PFC.
- **Permeation** emissions are produced after fuel has been stored long enough in a container for fuel molecules to infiltrate and saturate the container material, allowing vapors to escape through the walls of containers made from plastic.
- Equipment refueling **vapor displacement** and **spillage** emissions result when fuel vapor is displaced from nonroad equipment (e.g., lawnmowers, chainsaws, personal watercraft, motorcycles, etc.) and from gasoline spillage during refueling of the equipment with PFCs. These VOC emissions are already taken into account in the nonroad equipment emission inventory by the NONROAD model.

Diurnal evaporative emissions are the largest category.

Existing Federal and State Rules

The OTC developed a model rule for PFCs in 2001. The OTC 2001 model rule was very similar to a rule adopted by CARB in 2000. The OTC 2001 model rule provides background for OTC jurisdictions to develop regulatory programs that require spill-proof containers to meet performance standards that reduce VOC emissions. The performance standards include a requirement that all PFCs to have an automatic shut-off feature preventing overfilling and an automatic closing feature so the can will be sealed when it is not being used. The performance standards also eliminate secondary venting holes and require new plastics to reduce vapor permeation through container walls. There is no requirement for owners of conventional PFCs to modify their PFCs or to scrap them and buy new ones. Compliance will be accomplished primarily through attrition. As containers wear out, are lost, damaged, or destroyed, consumers will purchase new spill-proof containers to replace the conventional containers. CARB determined that the average useful life of a PFC is five years. The OTC chose to assume a more conservative ten-year turnover rate, with 100 percent rule penetration occurring 10 years after adoption of the rule.

CARB estimated that the performance standards would reduce VOC emissions by 75 percent. CARB's 2004 analysis (CARB 2004b) reevaluated the estimate reductions due to some unforeseen issues with the new cans and new survey information. Based on CARB's updated data, CARB estimated that VOC emissions would be reduced by 65 percent from the first set of amendments.

CARB has also adopted a second set of amendments in two phases. The first phase was filed on January 13, 2006, effective February 12, 2006. For Phase I, CARM amended their PFC regulation to address the use of utility jugs and kerosene containers that are sometimes used by consumers for gasoline. The second phase of the amendments was filed on September 11, 2006, effective October 11, 2006. These amendments (CARB 2006) will:

- Establish a mandatory certification program and accompanying test procedures;
- Amend the existing performance standards to eliminate the automatic shutoff performance standard effective July 1, 2007;
- Amend the existing performance standards to eliminate the fill height and flow rate performance standards;
- Amend the existing PFC pressure standard;
- Amend the current test methods;
- Change the permeability standard from 0.4 to 0.3 grams/gallon-day;
- Establish a voluntary consumer acceptance-labeling program that allows participating manufacturers to label their PFCs with an ARB "Star Rating" indicating how consumers rate their products' ease of use; and
- Combine the currently separate evaporation requirement and permeation standard and test method into a single diurnal standard and test method.

In February 2007, EPA finalized a national regulation to reduce hazardous air pollutant emissions from mobile sources. Included in the final rule are standards that would reduce PFC emissions from evaporation, permeation, and spillage. EPA included a performance-based standard of 0.3 grams per gallon per day of hydrocarbons, determined based on the emissions from the can over a diurnal test cycle specified in the rule. The standard applies to containers manufactured on or after January 1, 2009. The standards are based on the performance of best available control technologies, such as durable permeation barriers, automatically closing spouts, and cans that are well-sealed.

Description of the OTC 2006 Model Rule

As shown in Table 3-4, most states in the OTR have already adopted PFC regulations based on the OTC 2001 model rule. The OTC 2001 model rule for PFCs closely mirrors the 2000 version of CARB's PFC rule. CARB recently amended their gas can regulation as discussed above in Section 3.4.1. The OTC 2006 model rule closely mirrors these CARB amendments. The 2006 amendments are estimated to reduce VOC emissions by 18.4 tons per day in California at full implementation in the year 2015, in addition to the benefits from the existing regulation. The OTC 2006 model rule will modify the OTC 2001 model rule based on the recent CARB amendments.

Table 3-4 Status of OTC State's Promulgation of the OTC 2001 Model Rule for Portable Fuel Containers

State	Date When New Containers are Required	Regulatory Citation
CT	Effective May 1, 2004	Section 22a-174-43
DE	Effective January 1, 2004	Reg. No. 41, Section 3
DC	Effective November 15, 2003	Rule 720
ME	Effective January 1, 2004	Chapter 155
MD	Effective January 1, 2003	COMAR 26.11.13.07
MA[a]	In progress (effective date will be January 1, 2009)	n/a
NH	Effective March 1, 2006	Env-A 4000
NJ	Effective January 1, 2005	Subchapter 24 (7:27-24.8)
NY	Effective January 1, 2003	Part 239
PA	Effective January 1, 2003	25 Pa. Code Chapter 130, Subchapter A
RI	In progress (late 2006 target date for final rule)	n/a
VT	Under Consideration	n/a
VA[b]	Effective January 1, 2005	Chapter 40, Article 42

a) Massachusetts' proposed rule will be based only on the OTC 2006 model rule; Massachessetts will not adopt the OTC 2001 model rule.

b) Virginia's rule applies only in Northern Virginia VOC Emission Control Area (10 northern Virginia jurisdictions in the OTR)

Emission Benefit Analysis Methods

Emissions from PFCs are accounted for in both the area and nonroad source inventories. The NONROAD model accounts for equipment refueling vapor displacement and spillage emissions result when fuel vapor is displaced from nonroad equipment (e.g., lawnmowers, chainsaws, personal watercraft, motorcycles, etc.) and from gasoline spillage during refueling of the equipment with PFCs. The area source inventory accounts for diurnal and permeation emissions associated with the fuel present in stored PFCs and transport-spillage emissions associated with refueling of a gas can at the gasoline pump. Based on the OTC 2001 model rule (Pechan 2001, pg. 11) roughly 70 percent of the VOC emissions are accounted for in the area source inventory, while the remaining 30 percent is from equipment refueling vapor displacement and spillage that is accounted for in the nonroad inventory.

The emission benefits have been calculated for the emissions accounted for in both the area and nonroad source inventory. Emissions from the nonroad category were estimated to be 30 percent of the PFC emissions accounted for in the area source inventory.

Also note that the OTC baseline emissions (i.e., 2002 emissions) do not include changes to the emission estimation methodology made by CARB in 2004. CARB conducted a new survey of PFCs in 2004, which included kerosene containers and utility jugs. Using this survey data, CARB adjusted their baseline emissions; a similar adjustment to the OTC baseline inventory has not been made.

Estimated emission reductions were based on information compiled by CARB to support their recent amendments. CARB estimated that PFC emissions in 2015 will be 31.9 tpd in California with no additional controls or amendments to the 2000 PFC rules (CARB 2005a, pg. 10). CARB further estimates that the 2006 amendment will reduce emission from PFCs by 18.4 tpd in 2015 in California compared to the 2000 PFC regulations (CARB 2005a, pg. 23). Thus, at full implementation, the expected incremental reduction is approximately 58 percent, after an estimated 65 percent reduction from the original 2000 rule.

The OTC calculations assume that States will adopt the rule by July 2007 (except in Massachusetts) and provide manufacturers one year from the date of the rule to comply. Thus, new compliant PFCs will not be on the market until July 2008. Assuming a 10-year turnover to compliant cans, only 10 percent of the existing inventory of PFCs will comply with the new requirements in the summer of 2009. Therefore, only 10 percent of the full emission benefit estimated by CARB will occur by 2009 – the incremental reduction will be 5.8 percent in 2009.

Cost Estimates

CARB estimates that the cost-effectiveness of the 2005/2006 amendments will range from $0.40 to $0.70 per pound of VOC reduced, or $800 to $1,400 per ton of VOC reduced (CARB 2005a, pg. 27). Assuming CARBs costs for the OTR provides a conservative estimate, because some of the one-time research and reformulation costs incurred for products sold in California will not have to be incurred again for products sold in the OTR.

REGIONAL FUELS

The Clean Air Act Amendments of 1990 required significant changes to conventional fuels used by motor vehicles. Beginning in 1995, “reformulated” gasoline must be sold in certain non-attainment areas and other states with non-attainment areas are permitted to opt-in. Reformulated gasoline results in lower VOC emissions than would occur from the use of normal “baseline” gasoline.

Existing Federal and State Rules

All but two states in the OTR are participating, in whole or in part, with the federal reformulated gasoline program. However, nearly one-third of the gasoline sold in the OTR is not reformulated gasoline. NESCAUM has estimated the following fraction of gasoline that is reformulated by State:

State	Current RFG Fraction	State	Current RFG Fraction
CT	100%	NJ	100%
DC	100%	NY	54%
DE	100%	PA	24%
MA	100%	RI	100%
MD	86%	NoVA	100%
ME	0%	VT	0%
NH	64%		

Description of the OTC 2006 Control Measure

The Energy Policy Act of 2005 provides the opportunity for the OTR to achieve a single clean-burning gasoline and is consistent with what OTR states have promoted through the long debate over MTBE/ethanol/RFG. Approximately one-third of the gasoline currently sold in the OTR is not reformulated. The new authority plus the potential for emission reductions from the amount of non-reformulated gasoline sold in the OTR provides an opportunity for additional emission reductions in the region as well as for a reduced number of fuels, and possibly a single fuel, to be utilized throughout the region. The OTC Commissioners recommended that the OTC member states pursue a region fuel program consistent with the Energy Act of 2005 (OTC 2006b).

Emission Benefit Analysis Methods

Emission benefits resulting from extending reformulated gasoline to all areas of the OTR have been calculated for 2006 by NESCAUM (NESCAUM 2006a).

Cost Estimates

According to USEPA's regulatory impact analysis for reformulated gasoline (USEPA 1993), the cost per ton of VOC reduced for Phase I RFG is $5,200 to $5,900. USEPA also estimated the cost of Phase II RFG was $600 per ton of VOC reduced – this reflects the incremental cost over the cost of implementing Phase I of the RFG program.

VOC EMISSION REDUCTION SUMMARY

The results of the emission benefit calculations for the OTC states are described in this subsection. The starting point for the quantification of the emission reduction benefits is the MANEVU emission inventory, Version 3 (Pechan 2006, MACTEC 2006a) and the VISTAS emission inventory, BaseG (MACTEC 2006b), for the northern Virginia counties that are part of the OTR. The MANEVU and VISTAS inventories include a 2002 base year inventory as well as projection inventories for 2009 and 2018 (MANEVU also has projections for 2012, but VISTAS does not). The projection inventories account for growth in emissions based on growth indicators such as population and economic activity. The projection inventories also account for "on-the-books/on-the-way" (OTB/W) emission control regulations that have (or will) become effective between 2003 and 2008 that will achieve post-2002 emission reductions. For example, many States have already adopted the 2001 OTC model rules for consumer products and portable fuel containers. The emission reduction benefit from the 2001 OTC model rules are already accounted for in the MANEVU and VISTAS projection inventories. Emission reductions from existing regulations are already accounted for to ensure no double counting of emission benefits occurs.

Note that the emission reductions contained in this Section are presented in terms of tons per summer day. The MANEVU base and projection emission inventories do not contain summer day emissions for all States and source categories; the VISTAS inventory only contains annual values. When States provided summer day emissions in the MANEVU inventory, these values were used directly to quantify the emission benefit from the 2006 OTC control measure. When summer day emissions were missing from the MANEVU or VISTAS inventories, the summer day emissions were calculated using the annual emissions and the seasonal throughput data from the NIF Emission Process table. If the seasonal throughput data was missing, the summer day emissions were calculated using the annual emissions and a summer season adjustment factor derived from the monthly activity profiles contained in the SMOKE emissions modeling system.

Tables 3-5 to 3-10 show State summaries of the emission benefits from the OTC 2006 VOC control measures described previously in this Section. For each of the source categories, the Tables show four columns: (1) the actual 2002 summer daily emissions; (2) the summer daily emissions for the 2009 OTB/W scenario that accounts for growth and for the emission control regulations that have (or will) become effective between 2003 and 2008 that will achieve post-2002 emission reductions; (3) the summer daily emissions for 2009 with the implementation of the OTC 2006 control measures identified in this Section, and (4) the emission benefit in 2009 resulting from the OTC 2006 control measure. Table 3-11 shows the same information for the total of all six source categories.

The largest estimated VOC emission reductions are in the most populous States – New York and Pennsylvania. The emission benefits listed for Virginia just include the Virginia counties in the northern Virginia area that are part of the OTR. Benefit estimates for all other States include the entire state. The emission benefits also assume that all OTC members will adopt the rules as described in the previous sections.

The requirement for a regional fuel throughout the OTR provides the largest emission benefit, about 139.4 tons per day across the OTR. The adhesives and sealants application model rule provides the second largest emission benefit in 2009 – 82.3 tons per day across the OTR. The incremental benefits accrued from the amendments to State's existing consumer products and portable fuel container model rules are not as large, since the States already have accrued substantial benefits from the adoption of these rules.

Appendix D provides county-by-county summaries of the VOC emission benefits from the OTC 2006 VOC model rules described previously in this Section. Appendix D also provides additional documentation regarding the data sources and emission benefit calculations that were performed. These tables can be used by the States to create additional summaries, for example, by nonattainment area.

Table 3-5 OTC 2006 VOC Model Rule Benefits by State for 2009 Adhesives and Sealants Application

State	Adhesives/Sealants Application Summer VOC Emissions (tpd)			
	2002 Actual	2009 Base	2009 Control	2009 Benefit
CT	4.8	6.6	2.4	4.2
DE	1.4	1.6	0.6	1.0
DC	0.2	0.2	0.1	0.1
ME	3.1	3.9	1.4	2.5
MD	6.9	9.1	3.3	5.8
MA	10.6	14.7	5.8	8.9
NH	2.5	3.6	1.3	2.3
NJ	14.9	15.2	6.0	9.2
NY	24.7	33.4	11.9	21.5
PA	25.5	34.0	12.2	21.8
RI	1.8	2.4	0.9	1.5
VT	2.4	3.4	1.2	2.2
NOVA	1.2	1.6	0.6	1.0
OTR	**99.8**	**129.8**	**47.5**	**82.3**

2002 Actual emissions based on the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions are based on the emissions forecasted in the MANEVU 2009 OTB/W Version 3.1 inventory and the VISTAS 2009 Base G inventory, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions).

Table 3-6 OTC 2006 VOC Model Rule Benefits by State for 2009 Cutback and Emulsified Asphalt Paving

State	Cutback and Emulsified Asphalt Paving Summer VOC Emissions (tpd)			
	2002 Actual	2009 Base	2009 Control	2009 Benefit
CT*	4.5	4.5	0.3	4.3
DE	0.1	0.1	0.1	0.0
DC	0.0	0.0	0.0	0.0
ME	8.6	10.6	0.0	10.6
MD	0.0	0.0	0.0	0.0
MA*	8.4	8.6	0.5	8.1
NH	3.8	4.8	0.5	4.4
NJ	4.9	4.8	0.1	4.7
NY	15.4	18.3	1.8	16.4
PA	7.7	9.3	0.9	8.4
RI	1.0	1.2	0.1	1.1
VT	1.4	1.8	0.0	1.8
NOVA	<0.1	<0.1	<0.1	<0.1
OTR	**55.9**	**64.0**	**4.3**	**59.8**

2002 Actual emissions based on the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions are based on the emissions forecasted in the MANEVU 2009 OTB/W Version 3.1 inventory and the VISTAS 2009 Base G inventory, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions).

* CT and MA provided revised emission estimates that differ from those in the MANEVU Version 3 inventories.

Table 3-7 OTC 2006 VOC Model Rule Benefits by State for 2009 Consumer Products

State	Consumer Products Summer VOC Emissions (tpd)			
	2002 Actual	**2009 Base**	**2009 Control**	**2009 Benefit**
CT	40.1	35.4	34.7	0.7
DE	7.3	6.7	6.5	0.1
DC	5.7	5.1	5.0	0.1
ME	10.9	9.7	9.5	0.2
MD	52.8	48.4	47.4	1.0
MA*	62.2	64.1	53.9	10.2
NH	13.7	12.6	12.4	0.3
NJ	82.9	71.9	70.5	1.4
NY	209.6	183.3	179.6	3.7
PA	119.6	104.4	102.4	2.1
RI	10.6	9.3	9.1	0.2
VT	6.1	5.6	5.5	0.1
NOVA	21.5	23.0	22.5	0.5
OTR	**642.9**	**579.5**	**559.0**	**20.5**

2002 Actual emissions based on the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions are based on the emissions forecasted in the MANEVU 2009 OTB/W Version 3.1 inventory and the VISTAS 2009 Base G inventory, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions).

* MA proposed rule has a January 1, 2009 effective date and includes the VOC limits from the OTC 2001 model rule and those in the OTC 2006 model rule. The 2009 benefit for MA shows the benefit from both sets of limits. For all other States, the 2009 benefit shows the change in emissions from the OTC 2006 model rule only.

Table 3-8 OTC 2006 VOC Model Rule Benefits by State for 2009 Portable Fuel Containers – Area Sources

State	**Portable Fuel Containers Summer VOC Emissions (tpd)**			
	2002 Actual	**2009 Base**	**2009 Control**	**2009 Benefit**
CT	9.7	6.5	6.1	0.4
DE	3.0	2.1	1.9	0.1
DC	3.6	2.5	2.4	0.1
ME	3.6	2.4	2.3	0.1
MD	39.6	24.5	23.1	1.4
MA*	18.1	18.6	16.9	1.7
NH	3.6	3.0	2.8	0.2
NJ	24.4	17.7	16.7	1.0
NY	76.6	45.0	42.4	2.6
PA	47.0	27.6	26.0	1.6
RI	3.0	2.7	2.5	0.2
VT	1.7	1.5	1.5	0.1
NOVA	8.6	6.1	5.7	0.4
OTR	**242.5**	**160.1**	**150.3**	**9.9**

2002 Actual emissions based on the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions are based on the emissions forecasted in the MANEVU 2009 OTB/W Version 3.1 inventory and the VISTAS 2009 Base G inventory, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions).

Note: The table shows the estimated emission reduction that will occur in 2009; additional reductions will occur in later years as new, less-emitting PFCs that comply with the OTC 2006 control measure penetrate the market.
* MA PFC regulation will be based on only the OTC 2006 model rule (which updates the provisions of the OTC 2001 model rule) and will have an effective date of January 1, 2009. The 2009 base emissions in MA are uncontrolled emissions. The 2009 emission benefits represent the total emission reductions from the MA rule.

Table 3-9 OTC 2006 VOC Model Rule Benefits by State for 2009
Portable Fuel Containers – Nonroad Sources

State	Portable Fuel Containers Summer VOC Emissions (tpd)			
	2002 Actual	**2009 Base**	**2009 Control**	**2009 Benefit**
CT	2.9	1.9	1.8	0.1
DE	0.9	0.6	0.6	0.0
DC	1.1	0.8	0.7	0.0
ME	1.1	0.7	0.7	0.0
MD	11.9	7.4	6.9	0.4
MA*	5.4	5.6	5.1	0.5
NH	1.1	0.9	0.8	0.1
NJ	7.3	5.3	5.0	0.3
NY	23.0	13.5	12.7	0.8
PA	14.1	8.3	7.8	0.5
RI	0.9	0.8	0.8	0.0
VT	0.5	0.5	0.4	0.0
NOVA	2.6	1.8	1.7	0.1
OTR	**72.8**	**48.0**	**45.1**	**3.0**

2002 Actual emissions estimated to be 30 percent of area source emissions (based on Pechan 2001, pg. 11)

2009 Base Inventory emissions estimated to be 30 percent of area source emissions, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions).

Note: The table shows the estimated emission reduction that will occur in 2009; additional reductions will occur in later years as new, less-emitting PFCs that comply with the OTC 2006 control measure penetrate the market.
* MA PFC regulation will be based on only the OTC 2006 model rule (which updates the provisions of the OTC 2001 model rule) and will have an effective date of January 1, 2009. The 2009 base emissions in MA are uncontrolled emissions. The 2009 emission benefits represent the total emission reductions from the MA rule.

Table 3-10 OTC 2006 VOC Model Rule Benefits by State for 2009 Regional Fuels

State	**Regional Fuels Summer VOC Emissions (tpd)**			
	2006 Actual	**2006 Base**	**2006 Control**	**2006 Benefit**
CT	87.9	87.9	87.9	0.0
DE	26.6	26.6	26.6	0.0
DC	9.1	9.1	9.1	0.0
ME	56.2	56.2	47.1	9.1
MD	158.7	158.7	155.6	3.2
MA	148.6	148.6	148.6	0.0
NH	45.3	45.3	41.0	4.3
NJ	219.6	219.6	219.6	0.0
NY	465.0	465.0	408.1	56.9
PA	363.0	363.0	305.0	58.0
RI	22.2	22.2	22.2	0.0
VT	35.9	35.9	27.9	7.9
NOVA	54.9	54.9	54.9	0.0
OTR	**1693.1**	**1693.1**	**1553.7**	**139.4**

Note: NESCAUM analysis was only completed for 2006. Data for 2002 and 2009 are not currently available

Table 3-11 OTC 2006 VOC Model Rule Benefits by State for 2009 All Six VOC Categories

State	All Six Categories Summer VOC Emissions (tpd)			
	2002 Actual	**2009 Base**	**2009 Control**	**2009 Benefit**
CT	149.9	142.9	133.2	9.7
DE	39.3	37.7	36.3	1.4
DC	19.6	17.6	17.2	0.4
ME	83.5	83.6	60.9	22.6
MD	270.0	248.1	236.3	11.8
MA	253.3	260.1	230.8	29.3
NH	70.0	70.3	58.8	11.5
NJ	354.1	334.6	317.9	16.7
NY	814.2	758.4	656.5	101.9
PA	576.8	546.7	454.3	92.3
RI	39.5	38.6	35.6	3.0
VT	48.0	48.7	36.5	12.1
NOVA	88.8	87.4	85.4	1.9
OTR	**2,807.0**	**2,674.6**	**2,359.8**	**314.8**

2002 Actual emissions based on the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions based on the emissions forecasted in the MANEVU 2009 OTB/W Version 3.1 inventory and the VISTAS 2009 Base G inventory, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section. Assumes that 2009 reductions from RFG are the same as those calculated for 2006.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions). Assumes that 2009 reductions from RFG are the same as those calculated for 2006.

NOx ANALYSIS METHODS

This Section describes the analysis of the 2006 OTC control measures to reduce NOx emissions from six source categories: diesel engine chip reflash, regional fuels, asphalt production plants, cement kilns, glass/fiberglass furnaces, ICI boilers. For each of the categories, there are separate subsections that discuss existing Federal/state rules, summarize the requirements of the 2006 OTC control measure, describe the methods used to quantify the emission benefit, and provide an estimate of the anticipated costs and cost-effectiveness of the control measure. At the end of Section 4, we provide the estimated emissions for 2002 and 2009 by source category and State. Appendix E provides county-by-county summaries of the emission reductions for each of the categories.

HEAVY-DUTY TRUCK DIESEL ENGINE CHIP REFLASH

In the mid-1990s, the U.S. Department of Justice (DOJ), EPA, and CARB determined that seven major engine manufacturers had designed their 1993 through 1998 model heavy-duty diesel engines to operate with advanced electronic engine controls that resulted in excessive NOx emissions. when these engines were operated in the vehicle under "real world" conditions, the electronic calibration would change, altering the fuel delivery characteristics and resulting in elevated NOx levels. DOJ, EPA and ARB developed Consent Decrees that required the manufacturers to provide software (the "Low-NOx Rebuild Kit" or "chip reflash") that modifies the injection timing adjustment that caused the excess NOx emissions. The kits are to be installed at the time the vehicle is brought in for a major engine rebuild/overhaul. The rate of rebuild has been considerably lower than what was envisioned under the Consent Decrees; the primary reasons being that engine rebuilds occur at considerably higher elapsed vehicle mileage than what was contemplated when the Consent Decrees were negotiated, and there is no federal oversight program to ensure that individual rebuilds are occurring at the time of rebuild. In response to this low rebuild rate, CARB has adopted a mandatory program, not tied to the time of rebuild, but rather to a prescribed period of time, within which owners must bring their vehicles into the dealer to have the reflash operation performed, with all costs borne by the engine manufacturers. (NESCAUM 2006b).

Existing Federal and State Rules

California entered into Settlement Agreements, separate from the federal Consent Decrees, but with analogous requirements for low-NOx rebuilds. The slow rate of progress in California mirrored the progress nationally. Accordingly, California embarked upon its own program, by rule, to accelerate and ultimately complete the rebuilds for trucks registered in California and for out-of-state registered trucks traveling on roadways within the state. The ARB rule, effective March 21, 2005, mandates that rebuilds occur over a prescribed time period, with a final rebuild compliance date of December 31, 2006. The CARB mandatory program faced two separate legal challenges, alleging that CARB has breached its settlement agreement and alleging that CARB is illegally establishing different emissions standards on "new engines". The Sacramento County Superior Court ruled that the Low NOx Software Upgrade Regulation is invalid. CARB indicates that it will not appeal that ruling and is suspending further enforcement of this regulation.

Description of the OTC 2006 Control Measure

NESCAUM developed a model rule for consideration by its member states to implement a low-NOx rebuild program, similar California's program. The regulation applies to the engine manufacturers and to owners, lessees, and operators of heavy-duty vehicles powered by the engines that are required to have the low-NOx rebuild. Consistent with the Consent Decrees, the engine manufacturers are required to provide the rebuild kits at no cost to dealers, distributors, repair facilities, rebuild facilities, owners, lessees, and operators, upon their request and to reimburse their authorized dealers, distributors, repair facilities and rebuild facilities for their labor costs.

Emission Benefit Analysis Methods

NESCUAM estimated potential NOx emissions reductions (tons per day) if the Northeast States were to adopt a rebuild program similar to the California program. These estimates are based on the ratio of Northeast to California in-state heavy-duty vehicle registrations, and ARB-estimated California NOx reductions of 35 TPD (NESCAUM 2006b, pg. 5). NESCAUM also estimated potential NOx emissions reductions for the Mid-Atlantic States by scaling the NESCAUM projections based on population. For the Mid-Atlantic States, the NOx benefit was calculated based on the per capita factors of a one ton per day reduction for each one million people (NESCAUM 2005).

Cost Estimates

The cost associated with the reflash has been estimated at $20-$30 per vehicle, which is borne by the engine manufacturer. There may be costs associated with potential downtime to the trucking firms, and record-keeping requirements on the dealer performing the reflash and the vehicle owner. The MRPO estimated cost effectiveness to be $1,800 to $2,500 (depending on vehicle size) due to incremental "fuel penalty" of 2 percent increase in fuel consumption (ENVIRON 2006).

REGIONAL FUELS

The Clean Air Act Amendments of 1990 required significant changes to conventional fuels used by motor vehicles. Beginning in 1995, "reformulated" gasoline (RFG) must be sold in certain non-attainment areas and other states with non-attainment areas are permitted to opt-in. Reformulated gasoline results in lower VOC emissions than would occur from the use of normal "baseline" gasoline. Phase II of the RFG program began in 2000.

Existing Federal and State Rules

All but two states in the OTR are participating, in whole or in part, with the federal RFG program. However, nearly one-third of the gasoline sold in the OTR is not RFG. NESCAUM has estimated the following fraction of gasoline that is reformulated by State:

State	Current RFG Fraction	State	Current RFG Fraction
CT	100%	NJ	100%

DC	100%	NY	54%
DE	100%	PA	24%
MA	100%	RI	100%
MD	86%	NoVA	100%
ME	0%	VT	0%
NH	64%		

Description of the OTC 2006 Control Measure

The Energy Policy Act of 2005 provides the opportunity for the OTR to achieve a single clean-burning gasoline and is consistent with what OTR states have promoted through the long debate over MTBE/ethanol/RFG. Approximately one-third of the gasoline currently sold in the OTR is not reformulated. The new authority plus the potential for emission reductions from the amount of non-reformulated gasoline sold in the OTR provides an opportunity for additional emission reductions in the region as well as for a reduced number of fuels, and possibly a single fuel, to be utilized throughout the region. The OTC Commissioners recommended that the OTC member states pursue a region fuel program consistent with the Energy Act of 2005 (OTC 2006b).

Emission Benefit Analysis Methods

Emission benefits resulting from extending reformulated gasoline to all areas of the OTR have been calculated for 2006 by NESCAUM (NESCAUM 2006a).

Cost Estimates

According to USEPA’s regulatory impact analysis for reformulated gasoline (USEPA 1993), the cost per ton of NOx reduced for Phase II RFG is $5,200 to $3,700.

ASPHALT PAVEMENT PRODUCTION PLANTS

Hot mix asphalt (HMA) is created by mixing and heating size-graded, high quality aggregate (which can include reclaimed asphalt pavement) with liquid asphalt cement. HMA can be manufactured by batch mix, continuous mix, parallel flow drum mix, or counterflow drum mix plants. The dryer operation is the main source of pollution at hot mix asphalt manufacturing plants. Dryer burner capacities are usually less than 100 mmBtu/hr, but may be as large as 200 mmBtu/hr. Natural gas is the preferred source of heat used by the industry, although oil, electricity and combinations of fuel and electricity are used. The reaction of nitrogen and oxygen in the dryer creates nitrogen oxide (NOx) emissions in the combustion zone,

Existing Federal and State Rules

Only two of the OTR states have regulations that specifically address NOx emissions from asphalt pavement manufacturing plants. New Hampshire limits NOx emissions to 0.12 pound per ton of asphalt produced, or 0.429 lb per mmBtu {Chapter Env-A 1211.08 (c)} for units greater than 26 mmBTU/hour in size. New Jersey limits NOx emissions to 200 ppmvd at seven percent oxygen {7:27-19.9(a)}. Asphalt plants in other OTR states are subject to more general fuel combustion requirements or case-by-case RACT determinations.

Description of the OTC 2006 Control Measure

NOx emissions from asphalt plants can be reduced through installation of low-NOx burners and flue gas recirculation (FGR). The OTC Commissioners recommended that OTC member states pursue as necessary and appropriate state-specific rulemakings or other implementation methods to establish emission reduction percentages, emission rates or technologies that are consistent with the guidelines shown in Table 4.1 (OTC 2006b).

Table 4.1 Addendum to OTC Resolution 06-02 Emission Guidelines for Asphalt Plants

Plant Type	Emission Rate (lbs NOx/ton asphalt produced)	% Reduction
Area/Point Sources		
Batch Mix Plant – Natural Gas	0.02	35
Batch Mix Plant – Distillate/Waste Oil	0.09	35
Drum Mix Plant – Natural Gas	0.02	35
Drum Mix Plant – Distillate/Waste Oil	0.04	35
or Best Management Practices		

Industry leaders have identified a number of Best Management Practices that allow for substantial reduction in plant fuel consumption and the corresponding products of combustion including NOx. Best management practices include:

- **Burner tune-ups**: A burner tune-up may reduce NOx emissions by up to 10 percent and may also help reduce fuel consumption. In other words, there can be a direct pay-back to the business from regular burner tune-ups.
- **Effective stockpile management to reduce aggregate moisture content**: Current information indicates that effective stockpile management can reduce aggregate moisture content by about 25 percent, corresponding to a reduction in fuel consumption by approximately 10 - 15 percent. There are a number of ways to reduce aggregate moisture: covering stockpiles, paving under stockpiles, and sloping stockpiles are all ways that prevent aggregate from retaining moisture. Best Practices are plant- and geographic locale-specific.
- **Lowering mix temperature**: A Technical Working Group of FHWA is currently investigating a number of newer formulation technologies, to understand the practicality and performance of lowering mix temperatures. Substantial reductions in mix temperatures, on the order of 20 percent or more, appear to be plausible. Lowering mix temperatures, by this amount, may reduce fuel consumption, as less heat is needed to produce the mix.
- **Other maintenance and operational best practices**: Additional practices can be employed throughout the plant to help optimize production and operations. For

example, regular inspection of drum mixing flites and other measures can be taken – all in the effort to make a plant operate more efficiently, thereby using less fuel.

Emission Benefit Analysis Methods

The emission rates and percent reductions estimates shown above for major sources were developed the state of New York based on the use of low-NOx burners and FGR. For minor sources, the requirement is the use of low-NOx burner technology. NOx emissions can be reduced by 35 to 50 percent with low-NOx burners and FGR, and by 25 to 40 percent with low-NOx burners alone. For modeling purposes, a 35 percent reduction was assumed to apply all types of asphalt plants.

The reductions estimated for this category only include emissions included in the MANEVU point source emission inventory. Only emissions from major point sources are typically included in the MANEVU point source database. Emissions from non-major sources are not explicitly contained in the area source inventory. The emissions from non-major asphalt plants are likely lumped together in the general area source industrial and commercial fuel use category. Reductions from area source emissions at asphalt production plants are included in the ICI boiler source category. Therefore, there is some uncertainty regarding the actual reductions that will occur as no accurate baseline exists for both major and minor facilities.

Cost Estimates

The anticipate costs for control are similar to those of small to midsize boilers or process heaters. Low NOx burners range from $500 to $1,250 per ton and low-NOx burners in combination with FGR range from $1,000 to $2,000 per ton. These cost-effectiveness data were provided by NYSDEC. These control efficiencies and cost-effectiveness estimates for low-NOx burners plus FGR are generally consistent EPA's published data for small natural gas-fired and oil-fired process heaters and boilers (Pechan 2005).

CEMENT KILNS

Portland cement manufacturing is an energy intensive process in which cement is made by grinding and heating a mixture of raw materials such as limestone, clay, sand and iron ore in a rotary kiln. Nationwide, about 82 percent of the industry's energy requirement is provided by coal. Waste-derived fuels (such as scrap tires, used motor oils, surplus printing inks, etc.) provide about 14 percent of the energy. NOx emissions are generated during fuel combustion by oxidation of chemically-bound nitrogen in the fuel and by thermal fixation of nitrogen in the combustion air.

There are four main types of kilns used to manufacture portlant cement: long wet kilns, long dry kilns, dry kilns with preheaters, dry kilns with precalciners. Wet kilns tend to be older units and are often located where the moisture content of feed materials from quarries tends to be high.

Cement kilns are located in Maine, Maryland, New York, and Pennsylvania. There are no cement kilns in the other OTR states. According to the MANEVU 2002 inventory (Pechan 2006), the number of cement kilns operating in 2002 by size and type was:

State	Number of Facilities	Number of Long Wet Kilns	Number of Long Dry Kilns	Number of Preheater or Precalciner

				Kilns
Maine	1	1	0	0
Maryland	3	2	2	0
New York	3	2	1	0
Pennsylvania	10	5	11	5

Existing Federal and State Rules

The NOx SIP Call required states to submit revisions to their SIPs to reduce the contribution of NOx from cement kilns. All kilns in the OTR, except for the one kiln in Maine, are subject to the NOx SIP Call. Based on its SIP Call analysis, EPA determined 30 percent reduction of baseline uncontrolled emission levels was highly cost-effective for cement kilns emitting greater than 1 ton/day of NOx. Some states elected to include cement kilns in their NOx Budget Trading Programs. For example, requirements in Pennsylvania's regulations in 25 Pa. Code Chapter 145 set a kiln allowable limit of 6 pounds per ton of clinker produced, and require sources to purchase NOx allowances for each ton of NOx actual emissions that exceed the allowable limits. Maryland did not include kilns in the trading program but instead provided two options for reducing NOx emissions:

- Option 1 – for long wet kilns, meet NOx emission limit of 6.0 pounds per ton of clinker produced; for long dry kilns, meet limit of 5.1 pounds per ton of clinker produced; and for pre-heater/pre-calciner or pre-calciner kilns, meet limit of 2.8 pounds per ton of clinker produced;
- Option 2 – install low NOx burners on each kiln or modify each kiln to implement mid-kiln firing.

The one kiln in Maine is a wet process cement kiln and has been licensed to modernize by converting to the more efficient dry cement manufacturing process. The new kiln is subject to BACT requirements.

Description of the OTC 2006 Control Measure

There is a wide variety of proven control technologies for reducing NOx emissions from cement kilns. Automated process control has been shown to lower NOx emissions by moderate amounts. Low-NOx burners have been successfully used, especially in the precalciner kilns. CemStarSM is a process that involves adding steel slag to the kiln, offering moderate levels of NOx reduction by reducing the required burn zone heat input. Mid-kiln firing of tires provides moderate reductions of NOx emissions while reducing fuel costs and providing an additional revenue stream from receipt of tire tipping fees. SNCR technology has the potential to offer significant reductions on some precalciner kilns. SNCR is being used in numerous cement kilns in Europe. A recent study (EC 2001a) indicates that there are 18 full-scale SNCR installations in Europe. Most SNCR installations are designed and/or operated for NOx reduction rates of 10-50% which is sufficient to comply with current legislation in some countries. Two Swedish plants installed SNCR in 1996/97 and have achieved a reduction of 80-85%. A second recent study (ERG 2005) of cement kilns in Texas has identified a variety of NOx controls for both wet and dry cement kilns, with reductions in the 40 to 85% range.

The OTC Commissioners recommended that OTC member states pursue, as necessary and appropriate, state-specific rulemakings or other implementation methods to establish emission reduction percentages, emission rates or technologies that are consistent with the guidelines shown in Table 4.2 (OTC 2006b). The guidelines were presented in terms of both an emission rate (lbs/ton of clinker by kiln type) as well as a percent reduction from uncontrolled levels.

Table 4.2 OTC Resolution 06-02 Emission Guidelines for Cement Kilns

Kiln Type	**Emission Rate (lbs NOx/ton of clinker produced)**	**% Reduction from Uncontrolled**
Wet Kiln	3.88	60
Long Dry Kiln	3.44	60
Pre-heater Kiln	2.36	60
Pre-calciner Kiln	1.52	60

Emission Benefit Analysis Methods

To calculate the additional reductions from the OTC 2006 Control Measure, MACTEC calculated the 2002 emission rate (lbs NOx per ton of clinker produced) for each kiln. The 2002 emission rate was compared to the OTC 2006 control measure emission rate list above to calculate a kiln-specific percent reduction. The kiln-specific percent reduction was then applied to the 2002 actual emissions to calculate the emissions remaining after implementation of the control measure.

Cost Estimates

The TCEQ study (ERG 2005) estimated a cost-effectiveness of $1,400-1,600 per ton of NOx removed for an SNCR system achieving a 50 percent reduction on modern dry preheat precalcination kilns. The study also estimate a cost-effectiveness of $2,200 per ton of NOx removed for SNCR systems achieving a 35 percent reduction on wet kilns. The most recent EPA report (EC/R 2000) shows data for two SNCR technologies, biosolids injection and NOXOUT®. These technologies showed average emission reductions of 50 and 40 percent, respectively. The cost effectiveness was estimated to be $1,000-2,500/ton depending on the size of the kiln. Costs and the cost effectiveness for a specific unit will vary depending on the kiln type, characteristics of the raw material and fuel, uncontrolled emission rate, and other source-specific factors.

GLASS/FIBERGLASS FURNACES

The manufacturing process requires raw materials, such as sand, limestone, soda ash, and cullet (scrap and recycled glass), be fed into a furnace where a temperature is maintained in the 2,700°F to 3,100°F range. The raw materials then chemically react creating a molten material, glass. The reaction of nitrogen and oxygen in the furnace creates NOx emissions. The main product types are flat glass, container glass, pressed and blown glass, and fiberglass. In the OTR, the preponderance of glass manufacturing plants is in Pennsylvania. New York and New Jersey also have several plants. Massachusetts, Maryland, and Rhode Island each have one glass manufacturing plant.

Existing Federal and State Rules

Only Massachusetts and New Jersey have specific regulatory limits for NOx emissions from glass melting furnaces. Massachusetts has a 5.3 pound per ton of glass removed limit for container glass melting furnaces having a maximum production of 15 tons of glass per day or greater. New Jersey has a 5.5 pound per ton of glass limit for commercial container glass manufacturing furnaces and an 11 pound per ton of glass for specialty container glass manufacturing furnaces. New Jersey also required borosilicate recipe glass manufacturing furnaces to achieve at least a 30 percent reduction from 1990 baseline levels by 1994. The regulations for other states with glass furnaces (Maryland, New York, Pennsylvania, and Rhode Island) do not contain specific emission limitation requirements, but rather require RACT emission controls as determined on a case-by-case basis.

Description of the OTC 2006 Control Measure

Several alternative control technologies are available to glass manufacturing facilities to limit NOx emissions (MACTEC 2005). These options include combustion modifications (low NOx burners, oxy-fuel firing, oxygen-enriched air staging), process modifications (fuel switching, batch preheat, electric boost), and post combustion modifications (fuel reburn, SNCR, SCR). Oxyfiring is the most effective NOx emission reduction technique and is best implemented with a complete furnace rebuild. This strategy not only reduces NOx emissions by as much as 85 percent, but reduces energy consumption, increases production rates by 10-15 percent, and improves glass quality by reducing defects. Oxyfiring is demonstrated technology and has penetrated into all segments of the glass industry.

The OTC Commissioners recommended that OTC member states pursue, as necessary and appropriate, state-specific rulemakings or other implementation methods to establish emission reduction percentages, emission rates or technologies that are consistent with the guidelines shown in Table 4.3 (OTC 2006g). The guidelines were presented in terms of both an emission rate (lbs/ton of glass produced) as well as a percent reduction from uncontrolled levels for the different types of glass manufactured.

Table 4.3 Addendum to OTC Resolution 06-02 Guidelines for Glass Furnaces

Type of Glass	Emission Rate (lbs NOx/ton of glass pulled) Block 24-hr Ave.	Emission Rate (lbs NOx/ton of glass pulled) Rolling 30-day Ave.
Container Glass	4.0	n/a
Flat Glass	9.2	7.0
Pressed/blown Glass	4.0	n/a
Fiberglass	4.0	n/a

Note: Compliance date is 2009. NOx allowances may be surrendered in lieu of meeting the emission rate based on a percentage of the excess emissions at the facility, at the discretion of the State.

Emission Benefit Analysis Methods

The NOx emission reduction benefit calculation varied by State depending upon the availability of data:

- New Jersey DEP evaluated the existing controls at each facility. NJDEP identified furnaces that have closed, indicated whether the facility requested banking of emissions, and specified whether the emissions from the closed furnace should remain in the projection year inventory. NJDEP also identified furnace-specific projected emission rates based on the use of oxyfuel technology.
- Pennsylvania DEP provided 2002 throughput (tons of glass pulled) and emission rate data (lbs NOx/ton of glass pulled). The 2002 emission rate was compared to the OTC 2006 control measure emission rate list above to calculate a furnace-specific percent reduction. The furnace-specific percent reduction was then applied to the 2002 actual emissions to calculate the emissions remaining after implementation of the control measure. If a furnace had an emission rate below the OTCC 2006 control measure emission rate, then no incremental reduction was calculated. PADEP also identified several furnaces that have shut down – emissions from these furnaces were set to zero in the projection year inventory.
- For all other States with glass furnaces (MA, MD, NY, and RI), furnace specific data were not available. The NOx emission reduction benefit was calculated by applying an 85 percent reduction for oxyfiring technology to the projected 2009 base inventory. This approach does not take into account existing controls at the facilities.

Cost Estimates

A recent study by the European Commission (EC 2001b) reports a 75 to 85 percent reduction in NOx based on oxyfiring technology, resulting in emission rates of 1.25 to 4.1 pounds of NOx per ton of glass produced. The cost effectiveness was determined to be \$1,254 to \$2,542 depending on the size of the furnace. EPA's Alternative Control Techniques Document (USEPA 1994) estimated an 85 percent reduction in NOx emissions for oxyfiring with a cost-effectiveness of \$2,150 to \$5,300.
Other technologies may be used to meet the limits in Table 4.3. The costs associated with meeting those limits are source-specific and depend on the existing controls in place and the emission rates being achieved. Site-specific factors greatly influence the actual achievable performance level and control costs at a particular facility.

ICI BOILERS

Industrial/commercial/institutional (ICI) boilers combust fuel to produce heat and process steam for a variety of applications. Industrial boilers are routinely found in applications the chemical, metals, paper, petroleum, food production and other industries. Commercial and institutional boilers are normally used to produce steam and heat water for space heating in office buildings, hotels, apartment buildings, hospitals, universities, and similar facilities. Industrial boilers are generally smaller than boilers in the electric power industry, and typically have a heat input in the 10-250 mmBtu/hr range; however, industrial boilers can be as large as 1,000 mmBtu/hr or as small as 0.5 mmBtu/hour. Most commercial and institutional boilers generally have a heat input less than 100 mmBtu/hour.

It is estimated that 80 percent of the commercial/institutional population is smaller than 15 mmBtu/hour. The ICI boiler population is highly diverse – encompassing a variety of fuel types, boiler designs, capacity utilizations and pollution control systems – that result in variability in emission rates and control options.

For emission inventory purposes, emissions from ICI boilers are included in both the point and area source emission inventories. Generally, the point source emission inventory includes all ICI boilers at major facilities. The point source inventory lists individual boilers, along with their size and associated emissions. The area source inventory generally includes emissions for ICI boilers located at non-major facilities. It does not provide emissions by the size of boiler, as is done in the point source inventory. Area sources emissions are calculated based on the fuel use not accounted for in the point source inventory. This is done by taking the total fuel consumption for the state (by fuel type and category), as published by the U.S. Department of Energy, and subtracting out the fuel usage reported in the point source inventory. Emissions are then calculated on a county-by-county basis using the amount of fuel not accounted for in the point source inventory and average emission factors for each fuel type.

Existing Federal and State Rules

ICI boilers are subject to a variety of Clean Air Act programs. Emission limits for a specific source may have been derived from NSPS, NSR, NOx SIP Call, State RACT rules, case-by-case RACT determinations, or MACT requirements. Thus, the specific emission limits and control requirements for a given ICI boiler vary and depend on fuel type, boiler age, boiler size, boiler design, and geographic location.

The OTC developed a draft model rule in 2001 with the following thresholds and limits:

OTC 2001 Model Rule ICI Boiler Thresholds and Limits

Applicability Threshhold	**Emission Rate Limit**	**Percent NOx Reduction**
5-50 mmBtu/hr	None	Tune-up Only
50-100 mmBtu/hr	Gas-fired: 0.10 lbs/mmBtu Oil-fired: 0.30 lbs/mmBtu Coal-fired: 0.30 lbs/mmBtu	50%
100-250 mmBtu/hr	Gas-fired: 0.10 lbs/mmBtu Oil-fired: 0.20 lbs/mmBtu Coal-fired: 0.20 lbs/mmBtu	50%
>250 mmBtu/hr*	Gas-fired: 0.17 lbs/mmBtu Oil-fired: 0.17 lbs/mmBtu Coal-fired: 0.17 lbs/mmBtu	50%

* Only for boilers not subject to USEPA’s NOx SIP Call

Implementation of the OTC 2001 model rule limits varied by State – some OTC states adopted these limits while others did not. MACTEC researched current State regulations affecting ICI boilers and summarized the rules in Appendix F. The specific requirements for each state were organized into a common format to efficiently include the State-by-State differences by fuel type and boiler size. This organization oversimplifies the source categories and size limitations that differ from State-to-State. This simplification was necessary to match the rules to the organization of the emission data bases (i.e., Source Classification Codes) being used in the analysis.

Description of the OTC 2006 Control Measure

The OTC Commissioners recommended that OTC member states pursue as necessary and appropriate state-specific rulemakings or other implementation methods to establish emission reduction percentages, emission rates or technologies for ICI boilers (OTC 2006b). These guidelines have undergone revision based on a more refined analyses. Table 4.4 provides the current OTC proposal for ICI boilers.

Emission Benefit Analysis Methods

The emission reduction benefits resulting from the OTC ICI boiler control measure were calculated differently for point and area sources. For point sources, the emission reductions were estimated by comparing the emission limits in the existing (2006) state regulations with the limits contained in the OTC ICI boiler proposal.

Table 4.4 Addendum to OTC Resolution 06-02 Guidelines for ICI Boilers

ICI Boiler Size (mmBtu/hr)	Control Strategy/ Compliance Option	NOx Control Measure
5-25		Annual Boiler Tune-Up
25-100	Option #1	Natural Gas: 0.05 lb NOx/mmBtu #2 Fuel Oil: 0.08 lb NOx/mmBtu #4 or #6 Fuel Oil: 0.20 lb NOx/mmBtu Coal: 0.30 lb NOx/mmBtu**
	Option #2	50% reduction in NOx emissions from uncontrolled baseline
	Option #3	Purchase current year CAIR NOx allowances equal to reducted needed to acheiv the required emission rates
100-250	Option #1	Natural Gas: 0.10 lb NOx/mmBtu #2 Fuel Oil: 0.20 lb NOx/mmBtu #4 or #6 Fuel Oil: 0.20 lb NOx/mmBtu Coal: Wall-fired 0.14 lb NOx/mm Btu Tangential 0.12 lb NOx/mm Btu Stoker 0.22 lb NOx/mm Btu Fluidized Bed 0.08 lb NOx/mm Btu
	Option #2	LNB/SNCR, LNB/FGR, SCR, or some combination of these controls in conjunction with Low NOx Burner technology
	Option #3	60% reduction in NOx emissions from uncontrolled baseline
	Option #4	Purchase current year CAIR NOx allowances equal to reducted needed to acheiv the required emission rates
>250	Option #1	Purchase current year CAIR NOx allowances equal to reducted needed to acheiv the required emission rates
	Option #2	Phase I – 2009 Emission rate equal to EGUs of similar size Phase II – 2012 Emission rate equal to EGUs of similar size

Tables 4-5 through 4-10 shows the current state emission limits by size range and fuel type, and the percentage reduction from the OTC proposed limits to the current state requirement. In cases where a state did not have a specific limit for a given size range, then the more general percent reduction from uncontrolled values in Table 4-4 was used. The fuel types/boiler types shown in Tables 4-5 through 4-10 were matched to SCCs in the point source inventory. MACTEC used the SCC and design capacity (mmBtu/hour) from the MANEVU and VISTAS emission inventories to apply the appropriate state specific reduction factor to estimate the emission reduction benefit.

The emission limits shown in Tables 4-5 through 4-10 generally apply only to ICI boilers located at major sources (i.e. point sources). ICI boilers located at minor sources (i.e., area sources) are generally not subject to the emissions limits. In general, emissions from area source ICI boilers are uncontrolled (except possibly for an annual tune-up requirement). The one exception is New Jersey: beginning on March 7, 2007, N.J.A.C. 27.27-19.2 requires any ICI boiler of at least 5 mmBtu/hr heat input to comply with applicable NOx emission limits whether or not it is located at a major NOx facility.

To calculate the reductions from area source ICI boilers, MACTEC applied the general percent reduction from uncontrolled values in Table 4-4 to the area source inventory (i.e., 10 percent reduction for annual tune-ups for boilers < 25 mmBtu/hr, and a 50 percent reduction for boilers between 25 and 100 mmBtu/hr).

The area source inventory does not provide information on the boiler size. To estimate the boiler size distribution in the area source inventory, we first assumed that there were no boilers > 100 mmBtu/hr in the area source inventory. Next, we used boiler capacity data from the USDOE's Oak Ridge National Laboratory (EEA 2005) to estimate the percentage of boiler capacity in the < 25 mm Btu/hr and 25-100 mm Btu/hr categories. Third, we assumed that emissions were proportional to boiler capacity. Finally, we calculated the weighted average percent reduction for area source ICI boilers based on the capacity in each size range and the percent reduction by size range discussed in the previous paragraph. For industrial boilers, the weighted average reduction was 34.5 percent; for commercial/institutional boilers, the weighted average reduction was 28.1 percent.

Table 4.5 Current State Emission Limits and Percent Reduction Estimated from Adoption of OTC ICI Boiler Proposal
Point Source Natural Gas-Fired Boilers

	Current 2006 NOx RACT Limit (lbs/mmBtu) (from State regulations) Applicability Threshold mmBtu/hour Heat Input						**OTC 2006 Percent Reduction (Current State reg compared to OTC Limit) Applicability Threshold mmBtu/hour Heat Input**				
State	**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**5 to 25**		**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**<25**
						OTC Limits (lbs/mmBtu):	**0.12**	**0.10**	**0.05**	**0.05**	**NL**
CT	0.20	0.20	0.20	0.20	0.20		40.0	50.0	75.0	75.0	10.0
DE	0.10	0.10	LNB	NL	NL		0.0	0.0	0.0	0.0	0.0
DC	0.20	0.20	NL	NL	NL		40.0	50.0	50.0	50.0	10.0
ME	0.20	NL	NL	NL	NL		40.0	60.0	50.0	50.0	10.0
MD	0.20	0.20	0.20	0.20	0.20		40.0	50.0	75.0	75.0	10.0
MA	0.20	0.20	0.10	NL	NL		40.0	50.0	50.0	50.0	10.0
NH	0.10	0.10	0.10	NL	NL		0.0	0.0	50.0	50.0	10.0
NJ	0.10	0.10	0.10	NL	NL		0.0	0.0	50.0	50.0	10.0
NY	0.20	0.20	0.10	NL	NL		40.0	50.0	50.0	50.0	10.0
PA	Source Specific NOx RACT						29.4	50.0	50.0	50.0	10.0
SE PA	0.17	0.10	Source Specific RACT				29.4	0.0	50.0	50.0	10.0
RI	0.10	0.10	0.10	NL	NL		0.0	0.0	50.0	50.0	10.0
VT	0.20	NL	NL	NL	NL		40.0	60.0	50.0	50.0	10.0
NOVA	0.2	0.2	0.2	0.2	0.2		40.0	50.0	75.0	75.0	10.0

NL indicates no limit specified in a state rule; in those cases, the more general percent reduction from Table 4-4 was used.

Source Specific NOx RACT indicates that there are no specific limits in the States' rule (i.e., limits were determined on a case-by-case basis); in those cases, the more general percent reduction from Table 4-4 was used.

SE PA refers to the five southeastern Pennsylvania counties (Bucks, Chester, Delaware, Montgomery, and Philadelphia) affected by Pennsylvania's Addition NOx Requirements (129.201)

NOVA refers to the following jurisdictions in Virginia are part of the OTR: Arlington County, Alexandria, Fairfax County, Fairfax City, Fall Church, Loudon County, Manassas City, Manassas Park, and Prince William County.

Table 4.6 Current State Emission Limits and Percent Reduction Estimated from Adoption of OTC ICI Boiler Proposal
Point Source Distillate Oil-Fired Boilers

	Current 2006 NOx RACT Limit (lbs/mmBtu) (from State regulations) Applicability Threshold mmBtu/hour Heat Input						**OTC 2006 Percent Reduction (Current State reg compared to OTC Limit) Applicability Threshold mmBtu/hour Heat Input**				
State	**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**5 to 25**		**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**<25**
						OTC Limits (lbs/mmBtu):	**0.12**	**0.20**	**0.08**	**0.08**	**NL**
CT	0.20	0.20	0.20	0.20	0.20		40.0	0.0	60.0	60.0	10.0
DE	0.10	0.10	LNB	NL	NL		0.0	0.0	0.0	0.0	0.0
DC	0.30	0.30	0.30	NL	NL		60.0	33.3	73.3	50.0	10.0
ME	0.20	0.30	0.30	NL	NL		40.0	33.3	73.3	50.0	10.0
MD	0.25	0.25	0.25	0.25	0.25		52.0	20.0	68.0	68.0	10.0
MA	0.25	0.30	0.12	NL	NL		52.0	33.3	33.3	50.0	10.0
NH	0.30	0.30	0.12	NL	NL		60.0	33.3	33.3	50.0	10.0
NJ	0.20	0.20	0.12	NL	NL		40.0	0.0	33.3	50.0	10.0
NY	0.25	0.30	0.12	NL	NL		52.0	33.3	33.3	50.0	10.0
PA	Source Specific NOx RACT						29.4	33.3	33.3	50.0	10.0
SE PA	0.17	0.20	Source Specific RACT				29.4	0.0	33.3	50.0	10.0
RI	0.12	0.12	0.12	NL	NL		0.0	0.0	33.3	50.0	10.0
VT	0.30	NL	NL	NL	NL		60.0	60.0	50.0	50.0	10.0
NOVA	0.25	0.25	0.25	0.25	0.25		52.0	20.0	68.0	68.0	10.0

NL indicates no limit specified in a state rule; in those cases, the more general percent reduction from Table 4-4 was used.

Source Specific NOx RACT indicates that there are no specific limits in the States' rule (i.e., limits were determined on a case-by-case basis); in those cases, the more general percent reduction from Table 4-4 was used.

SE PA refers to the five southeastern Pennsylvania counties (Bucks, Chester, Delaware, Montgomery, and Philadelphia) affected by Pennsylvania's Addition NOx Requirements (129.201)

NOVA refers to the following jurisdictions in Virginia are part of the OTR: Arlington County, Alexandria, Fairfax County, Fairfax City, Fall Church, Loudon County, Manassas City, Manassas Park, and Prince William County.

Table 4.7 Current State Emission Limits and Percent Reduction Estimated from Adoption of OTC ICI Boiler Proposal
Point Source Residual Oil-Fired Boilers

	Current 2006 NOx RACT Limit (lbs/mmBtu) (from State regulations) Applicability Threshold mmBtu/hour Heat Input						**OTC 2006 Percent Reduction (Current State reg compared to OTC Limit) Applicability Threshold mmBtu/hour Heat Input**				
State	**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**5 to 25**		**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**<25**
						OTC Limits (lbs/mmBtu):	**0.12**	**0.20**	**0.20**	**0.20**	**NL**
CT	0.25	0.25	0.25	0.25	0.25		52.0	20.0	20.0	20.0	10.0
DE	0.10	0.10	LNB	NL	NL		0.0	0.0	0.0	0.0	0.0
DC	0.30	0.30	0.30	NL	NL		60.0	33.3	33.3	50.0	10.0
ME	0.20	0.30	0.30	NL	NL		40.0	33.3	33.3	50.0	10.0
MD	0.25	0.25	0.25	0.25	0.25		52.0	20.0	20.0	20.0	10.0
MA	0.25	0.30	0.30	NL	NL		52.0	33.3	33.3	50.0	10.0
NH	0.30	0.30	0.30	NL	NL		60.0	33.3	33.3	50.0	10.0
NJ	0.20	0.20	0.30	NL	NL		40.0	0.0	33.3	50.0	10.0
NY	0.25	0.30	0.30	NL	NL		52.0	33.3	33.3	50.0	10.0
PA	Source Specific NOx RACT						29.4	33.3	33.3	50.0	10.0
SE PA	0.17	0.20	Source Specific RACT				29.4	0.0	50.0	50.0	10.0
RI	LNB/FGR	LNB/FGR	LNB/FGR	NL	NL		0.0	0.0	0.0	50.0	10.0
VT	0.30	NL	NL	NL	NL		60.0	60.0	50.0	50.0	10.0
NOVA	0.25	0.25	0.25	0.25	0.25		52.0	20.0	20.0	20.0	10.0

NL indicates no limit specified in a state rule; in those cases, the more general percent reduction from Table 4-4 was used.

Source Specific NOx RACT indicates that there are no specific limits in the States' rule (i.e., limits were determined on a case-by-case basis); in those cases, the more general percent reduction from Table 4-4 was used.

SE PA refers to the five southeastern Pennsylvania counties (Bucks, Chester, Delaware, Montgomery, and Philadelphia) affected by Pennsylvania's Addition NOx Requirements (129.201)

NOVA refers to the following jurisdictions in Virginia are part of the OTR: Arlington County, Alexandria, Fairfax County, Fairfax City, Fall Church, Loudon County, Manassas City, Manassas Park, and Prince William County.

Table 4.8 Current State Emission Limits and Percent Reduction Estimated from Adoption of OTC ICI Boiler Proposal Point Source Coal Wall-Fired Boilers

State	**Current 2006 NOx RACT Limit (lbs/mmBtu) (from State regulations) Applicability Threshold mmBtu/hour Heat Input**						**OTC 2006 Percent Reduction (Current State reg compared to OTC Limit) Applicability Threshold mmBtu/hour Heat Input**				
	> 250*	**100 to 250**	**50 to 100**	**25 to 50**	**5 to 25**		**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**<25**
						OTC Limits (lbs/mmBtu):	**0.12**	**0.14**	**0.30**	**0.30**	**NL**
CT	0.38	0.38	0.38	0.38	0.38		68.4	63.2	21.1	21.1	10.0
DE	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
DC	0.43	0.43	NL	NL	NL		72.1	67.4	50.0	50.0	10.0
ME	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
MD	0.38	0.65	0.38	0.38	0.38		68.4	78.5	21.1	21.1	10.0
MA	0.45	0.45	NL	NL	NL		73.3	68.9	50.0	50.0	10.0
NH	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
NJ	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
NY	0.45	0.5	NL	NL	NL		73.3	72.0	50.0	50.0	10.0
PA	Source Specific NOx RACT						29.4	72.0	50.0	50.0	10.0
SE PA	0.17	0.20	Source Specific RACT				29.4	30.0	50.0	50.0	10.0
RI	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
VT	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
NOVA	0.38	0.38	0.38	0.38	0.38		68.4	63.2	21.1	21.1	10.0

n/a indicates that there are no coal-fired ICI boilers in the state.
NL indicates no limit specified in a state rule; in those cases, the more general percent reduction from Table 4-4 was used.

Source Specific NOx RACT indicates that there are no specific limits in the States' rule (i.e., limits were determined on a case-by-case basis); in those cases, the more general percent reduction from Table 4-4 was used.

SE PA refers to the five southeastern Pennsylvania counties (Bucks, Chester, Delaware, Montgomery, and Philadelphia) affected by Pennsylvania's Addition NOx Requirements (129.201)

NOVA refers to the following jurisdictions in Virginia are part of the OTR: Arlington County, Alexandria, Fairfax County, Fairfax City, Fall Church, Loudon County, Manassas City, Manassas Park, and Prince William County.

Table 4.9 Current State Emission Limits and Percent Reduction Estimated from Adoption of OTC ICI Boiler Proposal
Point Source Coal Tangential-Fired Boilers

State	**Current 2006 NOx RACT Limit (lbs/mmBtu) (from State regulations) Applicability Threshold mmBtu/hour Heat Input**						**OTC 2006 Percent Reduction (Current State reg compared to OTC Limit) Applicability Threshold mmBtu/hour Heat Input**				
	> 250*	**100 to 250**	**50 to 100**	**25 to 50**	**5 to 25**		**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**<25**
						OTC Limits (lbs/mmBtu):	**0.12**	**0.12**	**0.30**	**0.30**	**NL**
CT	0.20	0.20	0.20	0.20	0.20		40.0	40.0	0.0	0.0	10.0
DE	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
DC	0.43	0.43	NL	NL	NL		72.1	72.1	50.0	50.0	10.0
ME	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
MD	0.38	0.65	0.38	0.38	0.38		68.4	81.5	21.1	21.1	10.0
MA	0.38	0.38	NL	NL	NL		68.4	68.4	50.0	50.0	10.0
NH	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
NJ	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
NY	0.42	0.5	NL	NL	NL		71.4	76.0	50.0	50.0	10.0
PA	Source Specific NOx RACT						29.4	76.0	50.0	50.0	10.0
SE PA	0.17	0.20	Source Specific RACT				29.4	40.0	50.0	50.0	10.0
RI	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
VT	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
NOVA	0.38	0.38	0.38	0.38	0.38		68.4	68.4	21.1	21.1	10.0

n/a indicates that there are no coal-fired boilers in the state.
NL indicates no limit specified in a state rule; in those cases, the more general percent reduction from Table 4-4 was used.

Source Specific NOx RACT indicates that there are no specific limits in the States' rule (i.e., limits were determined on a case-by-case basis); in those cases, the more general percent reduction from Table 4-4 was used.

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NOVA refers to the following jurisdictions in Virginia are part of the OTR: Arlington County, Alexandria, Fairfax County, Fairfax City, Fall Church, Loudon County, Manassas City, Manassas Park, and Prince William County.

Table 4.10 Current State Emission Limits and Percent Reduction Estimated from Adoption of OTC ICI Boiler Proposal Point Source Coal-Fired Stoker Boilers

	Current 2006 NOx RACT Limit (lbs/mmBtu) (from State regulations) Applicability Threshold mmBtu/hour Heat Input						**OTC 2006 Percent Reduction (Current State reg compared to OTC Limit) Applicability Threshold mmBtu/hour Heat Input**				
State	**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**5 to 25**		**> 250***	**100 to 250**	**50 to 100**	**25 to 50**	**<25**
						OTC Limits (lbs/mmBtu):	**0.12**	**0.22**	**0.30**	**0.30**	**NL**
CT	0.20	0.20	0.20	0.20	0.20		40.0	0.0	0.0	0.0	10.0
DE	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
DC	0.43	0.43	NL	NL	NL		72.1	48.8	50.0	50.0	10.0
ME	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
MD	0.38	0.65	0.38	0.38	0.38		68.4	66.2	21.1	21.1	10.0
MA	0.33	0.33	NL	NL	NL		63.6	33.3	50.0	50.0	10.0
NH	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
NJ	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
NY	0.3	0.3	NL	NL	NL		60.0	26.7	50.0	50.0	10.0
PA	Source Specific NOx RACT						29.4	26.7	50.0	50.0	10.0
SE PA	0.17	0.20	Source Specific RACT				29.4	0.0	50.0	50.0	10.0
RI	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
VT	n/a	n/a	n/a	n/a	n/a		0.0	0.0	0.0	0.0	0.0
NOVA	0.4	0.4	0.4	0.4	0.4		70.0	45.0	25.0	25.0	10.0

n/a indicates that there are no coal-fired boilers in the state.
NL indicates no limit specified in a state rule; in those cases, the more general percent reduction from Table 4-4 was used.

Source Specific NOx RACT indicates that there are no specific limits in the States' rule (i.e., limits were determined on a case-by-case basis); in those cases, the more general percent reduction from Table 4-4 was used.

SE PA refers to the five southeastern Pennsylvania counties (Bucks, Chester, Delaware, Montgomery, and Philadelphia) affected by Pennsylvania's Addition NOx Requirements (129.201)

NOVA refers to the following jurisdictions in Virginia are part of the OTR: Arlington County, Alexandria, Fairfax County, Fairfax City, Fall Church, Loudon County, Manassas City, Manassas Park, and Prince William County.

Cost Estimates

The OTC recently completed an analysis of ICI boiler NOx control cost estimates (Bodnarik 2006) using detailed information on direct capital equipment costs, direct installation costs, indirect capital costs, and direct and indirect operating costs. The analysis examined five types of NOx control technologies – low-NOx burners (LNB), ultra low-NOx burners (ULNB), LNB plus flue gas recirculation (LNB+FGR), LNB plus selective non-catalytic reduction (LNB+SNCR), and selective catalytic reduction (SCR). The analysis also considered various fuel types – coal, residual oil, distillate oil, and natural gas. The cost effectiveness varies by fuel type, boiler size, current regulatory requirements, current control technology, and boiler firing type. The annual cost-effectiveness was found as low as $600 per ton and as high as $18,000 per ton. In general, for most scenarios the cost effectiveness was estimated to be less than $5,000 per ton of NOx removed.

NOx EMISSION REDUCTION SUMMARY

The results of the emission benefit calculations for the OTC states are described in this subsection. The starting point for the quantification of the emission reduction benefits is the MANEVU emission inventory, Version 3 (Pechan 2006, MACTEC 2006a) and the VISTAS emission inventory, BaseG (MACTEC 2006b), for the northern Virginia counties that are part of the OTR. The MANEVU and VISTAS inventories include a 2002 base year inventory as well as projection inventories for 2009 and 2018 (MANEVU also has projections for 2012, but VISTAS does not). The projection inventories account for growth in emissions based on growth indicators such as population and economic activity. The projection inventories also account for "on-the-books/on-the-way" (OTB/W) emission control regulations that have (or will) become effective between 2003 and 2008 that will achieve post-2002 emission reductions. Emission reductions from existing regulations are already accounted for to ensure no double counting of emission benefits occurs.

Note that the emission reductions contained in this Section are presented in terms of tons per summer day. The MANEVU base and projection emission inventories do not contain summer day emissions for all States and source categories; the VISTAS inventory only contains annual values. When States provided summer day emissions in the MANEVU inventory, these values were used directly to quantify the emission benefit from the 2006 OTC control measure. When summer day emissions were missing from the MANEVU or VISTAS inventories, the summer day emissions were calculated using the annual emissions and the seasonal throughput data from the NIF Emission Process table. If the seasonal throughput data was missing, the summer day emissions were calculated using the annual emissions and a summer season adjustment factor derived from the monthly activity profiles contained in the SMOKE emissions modeling system.

Tables 4-11 to 4-17 show State summaries of the emission benefits from the OTC 2006 NOx control measures described previously in this Section. For each of the seven source categories, the Tables show four emission numbers: (1) the actual 2002 summer daily emissions; (2) the summer daily emissions for the 2009 OTB/W scenario that accounts for growth and for the emission control regulations that have (or will) become effective between 2003 and 2008 that will achieve post-2002 emission reductions; (3) the summer daily emissions for 2009 with the implementation of the OTC 2006 control measures identified in this Section, and (4) the emission benefit in 2009 resulting from the OTC 2006 control measure. Table 4-18 shows the same information for the total of all seven source categories.

The largest estimated NOx emission reductions are in the more industrialized States – New York and Pennsylvania – which have most of the cement kilns and glass furnaces in the OTR. These two states also have a large population of ICI boilers. The emission benefits listed for Virginia just include the Virginia counties in the northern Virginia area that are part of the OTR. Benefit estimates for all other States include the entire state. The emission benefits also assume that all OTC members will adopt the rules as described in the previous sections.

Appendix E provides county-by-county summaries of the NOx emission benefits from the OTC 2006 NOx control measures described previously in this Section. Appendix E also provides additional documentation regarding the data sources and emission benefit calculations that were performed. These tables can be used by the States to create additional summaries, for example, by nonattainment area.

Table 4-11 OTC 2006 NOx Model Rule Benefits by State for 2009 Heavy-Duty Truck Diesel Engine Chip Reflash

State	**Heavy-Duty Truck Diesel Engine Chip Reflash Summer NOx Emissions (tpd)**			
	2002 Actual	**2009 Base**	**2009 Control**	**2009 Benefit**
CT	66.7	n/a	n/a	3.5
DE	21.8	n/a	n/a	0.6
DC	8.1	n/a	n/a	0.8
ME	82.8	n/a	n/a	1.4
MD	105.0	n/a	n/a	5.6
MA	152.7	n/a	n/a	6.7
NH	30.5	n/a	n/a	2.0
NJ	133.5	n/a	n/a	9.7
NY	177.6	n/a	n/a	16.1
PA	437.1	n/a	n/a	12.4
RI	8.3	n/a	n/a	0.8
VT	13.7	n/a	n/a	0.9
NOVA	16.6	n/a	n/a	2.5
OTR	**1254.5**	**0.0**	**0.0**	**63.0**

n/a – not available due to lack of 2009 emissions data for on-road vehicles in NIF format.

Table 4-12 OTC 2006 NOx Model Rule Benefits by State for 2009 Regional Fuels

State	**Regional Fuels Summer NOx Emissions (tpd)**			
	2006 Actual	**2006 Base**	**2006 Control**	**2006 Benefit**
CT	81.3	81.3	81.3	0.0
DE	24.8	24.8	24.8	0.0
DC	8.4	8.4	8.4	0.0
ME	44.1	44.1	43.8	0.2
MD	144.0	144.0	144.0	0.0
MA	137.4	137.4	137.4	0.0
NH	38.4	38.4	38.2	0.2
NJ	204.2	204.2	204.2	0.0
NY	381.3	381.3	379.1	2.1
PA	284.8	284.8	282.9	2.0
RI	20.5	20.5	20.5	0.0
VT	26.3	26.3	26.0	0.3
NOVA	50.8	50.8	50.8	0.0
OTR	**1446.2**	**1446.2**	**1441.4**	**4.8**

NESCAUM analysis was only completed for 2006. Data for 2002 and 2009 are not currently available

Table 4-13 OTC 2006 NOx Model Rule Benefits by State for 2009 Asphalt Pavement Production Plants

State	Asphalt Pavement Production Plants Summer NOx Emissions (tpd)			
	2002 Actual	2009 Base	2009 Control	2009 Benefit
CT	0.0	0.0	0.0	0.0
DE	0.6	0.6	0.4	0.2
DC	0.0	0.0	0.0	0.0
ME	1.7	2.0	1.3	0.7
MD	0.2	0.2	0.1	0.1
MA	1.1	1.8	1.2	0.6
NH	0.0	0.0	0.0	0.0
NJ	1.3	2.8	1.8	1.0
NY	0.0	0.1	0.0	0.0
PA	0.6	0.7	0.5	0.2
RI	0.1	0.1	0.1	0.0
VT	0.0	0.0	0.0	0.0
NOVA	0.3	0.3	0.2	0.1
OTR	**5.9**	**8.6**	**5.6**	**3.0**

2002 Actual emissions come from the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions are the emissions forecasted in the MANEVU 2009 OTB/W Version 3.1 inventory and the VISTAS 2009 Base G inventory, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions).

Table 4-14 OTC 2006 NOx Model Rule Benefits by State for 2009 Cement Kilns

State	Cement Kilns Summer NOx Emissions (tpd)			
	2002 Actual	**2009 Base**	**2009 Control**	**2009 Benefit**
CT	0.0	0.0	0.0	0.0
DE	0.0	0.0	0.0	0.0
DC	0.0	0.0	0.0	0.0
ME	4.7	4.7	4.7	0.0
MD	17.2	17.2	4.1	13.1
MA	0.0	0.0	0.0	0.0
NH	0.0	0.0	0.0	0.0
NJ	0.0	0.0	0.0	0.0
NY	35.1	35.1	19.8	15.3
PA	44.7	44.7	30.7	14.0
RI	0.0	0.0	0.0	0.0
VT	0.0	0.0	0.0	0.0
NOVA	0.0	0.0	0.0	0.0
OTR	**101.9**	**101.9**	**59.4**	**42.5**

2002 Actual emissions come from the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions are the emissions forecasted to be the same as in 2002 (i.e., no growth was assumed).

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions).

Table 4-15 OTC 2006 NOx Model Rule Benefits by State for 2009 Glass/Fiberglass Furnaces

State	Glass/Fiberglass Furnace Summer NOx Emissions (tpd)			
	2002 Actual	2009 Base	Maximum Control	Maximum Benefit
CT	0.0	0.0	0.0	0.0
DE	0.0	0.0	0.0	0.0
DC	0.0	0.0	0.0	0.0
ME	0.0	0.0	0.0	0.0
MD	0.3	0.3	0.1	0.3
MA	1.4	1.8	0.3	1.5
NH	0.0	0.0	0.0	0.0
NJ	7.7	7.1	2.2	4.9
NY	6.1	6.8	1.0	5.8
PA	36.3	44.3	20.0	24.3
RI	0.7	0.5	0.1	0.5
VT	0.0	0.0	0.0	0.0
NOVA	0.0	0.0	0.0	0.0
OTR	**52.5**	**60.9**	**23.6**	**37.3**

2002 Actual emissions come from the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions are the emissions forecasted in the MANEVU 2009 OTB/W Version 3.1 inventory and the VISTAS 2009 Base G inventory, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

Maximum Control Inventory emissions are the emissions remaining after full implementation of the beyond-on-the-way control measures described in this Section. Not all of the anticipated reductions from the glass/fiberglass OTC 2006 control measure will be achieved by 2009. This column shows the emissions remaining after full implementation of the measure, which may not occur until 2012 or 2018.

Maximum Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the base emissions and the maximum control emissions).

Note: The table shows the maximum emission reduction from glass/fiberglass furnaces when the OTC 2006 control measure is fully implemented. Not all of the reduction shown will be achieved by 2009.

Table 4-16 OTC 2006 NOx Model Rule Benefits by State for 2009
ICI Boilers – Area (Minor) Source

State	ICI Boilers – Area (Minor) Sources Summer NOx Emissions (tpd)			
	2002 Actual	2009 Base	2009 Control	2009 Benefit
CT	8.9	9.4	6.5	2.8
DE	3.4	3.5	2.3	1.2
DC	1.3	1.6	1.1	0.4
ME	5.0	5.3	4.2	1.1
MD	3.5	4.0	2.9	1.2
MA	24.4	25.8	19.1	6.6
NH	21.3	24.2	20.8	3.4
NJ	20.5	15.6	15.6	0.0
NY	105.2	112.2	78.4	33.8
PA	38.0	39.8	27.6	12.2
RI	6.6	7.3	5.3	2.1
VT	2.3	2.9	1.9	0.9
NOVA	11.8	11.9	8.1	3.9
OTR	**252.0**	**263.4**	**193.9**	**69.5**

2002 Actual emissions come from the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions are the emissions forecasted in the MANEVU 2009 OTB/W Version 3.1 inventory and the VISTAS 2009 Base G inventory, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions).

Table 4-17 OTC 2006 NOx Model Rule Benefits by State for 2009 ICI Boilers – Point (Major) Source

State	ICI Boilers – Point (Major) Sources Summer NOx Emissions (tpd)			
	2002 Actual	2009 Base	2009 Control	2009 Benefit
CT	5.8	5.6	3.5	2.1
DE	7.7	7.3	7.3	0.0
DC	1.0	1.1	0.8	0.4
ME	10.2	12.8	10.1	2.8
MD	14.2	11.2	8.8	2.4
MA	13.8	15.4	8.7	6.8
NH	3.9	4.8	2.9	1.9
NJ	12.9	10.8	7.4	3.4
NY	31.4	30.8	23.8	7.0
PA	33.4	36.5	26.7	9.8
RI	4.2	4.9	4.3	0.5
VT	0.7	0.9	0.5	0.4
NOVA	0.2	0.2	0.0	0.1
OTR	**139.3**	**142.3**	**104.6**	**37.7**

2002 Actual emissions come from the MANEVU 2002 Version 3 inventory and VISTAS 2002 Base G inventory (for the 10 northern Virginia jurisdictions that are part of the OTR).

2009 Base Inventory emissions are the emissions forecasted in the MANEVU 2009 OTB/W Version 3.1 inventory and the VISTAS 2009 Base G inventory, and account for growth and any emission reductions associated with on-the-books/on-the-way controls measures.

2009 Control Inventory emissions are the emissions remaining after implementation of the beyond-on-the-way control measures described in this Section.

2009 Emission Reduction Benefit is the incremental emission reduction from the control measures described in this section (i.e., the difference between the 2009 base emissions and the 2009 control emissions).

Table 4-18 OTC 2006 NOx Model Rule Benefits by State for 2009 All Seven NOx Categories

State	All Seven NOx Categories Summer NOx Emissions (tpd)			
	2002 Actual	2009 Base	2009 Control	2009 Benefit
CT	162.7	n/a	n/a	8.4
DE	58.2	n/a	n/a	2.1
DC	18.8	n/a	n/a	1.6
ME	148.5	n/a	n/a	6.2
MD	284.4	n/a	n/a	22.7
MA	330.8	n/a	n/a	22.2
NH	94.1	n/a	n/a	7.5
NJ	380.0	n/a	n/a	19.0
NY	736.8	n/a	n/a	80.1
PA	874.9	n/a	n/a	74.9
RI	40.5	n/a	n/a	3.9
VT	42.9	n/a	n/a	2.5
NOVA	79.6	n/a	n/a	6.6
OTR	**3252.3**	**n/a**	**n/a**	**257.8**

n/a – not available due to lack of 2009 emissions data for on-road vehicles in NIF format.

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OTC 2006c: Ozone Transport Commission, "Statement of the Ozone Transport Commission Concerning Multi-Pollutant Emission Control of Electric Generating Units", June 7, 2006.

OTC 2006d: Ozone Transport Commission, "Resolution 06-03 of the Ozone Transport Commission Concerning Federal Guidance and Rulemaking for Nationally-Relevant Ozone Control Measures", June 7, 2006.

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Appendix A – Process for Identifying and Evaluating Control Measures

Background

The States of the Ozone Transport Region (OTR) are faced with the requirement to demonstrate attainment with the 8-hour ozone NAAQS 8-hour ozone National Ambient Air Quality Standards (NAAQS) by June 15, 2008. To accomplish this, most of the states will need to implement additional measures to reduce emissions that either directly impact their nonattainment status, or contribute to the nonattainment status in other states. In addition, the States are conducting attainment planning work to support development of PM2.5 and regional haze State Implementation Plans (SIPs). As such, the Ozone Transport Commission (OTC) undertook an exercise to identify a suite of additional control measures that could be used by the OTR states in attaining their goals.

In March 2005, the Ozone Transport Commission (OTC) established the Control Strategies Committee as an ad-hoc committee to assist with coordination of the attainment planning work. The Control Strategies Committee works with three other OTC committees. The Stationary and Area Source (SAS) Committee evaluates control measures for specific stationary source sectors or issues. The Mobile Source Committee examines control measures for on-road and non-road mobile sources. And the Modeling Committee develops and implements a strategic plan for SIP-quality modeling runs to support attainments demonstrations.

The SAS Committee is comprised of various workgroups that evaluate control measures for specific sectors or issues. These workgroups included:

- Control Measures Workgroup focuses on stationary area sources;
- Reasonably Available Control Technology (RACT) workgroup focuses on major point sources;
- Multi-Pollutant Workgroup focuses on electric generating units (EGUs);
- High Electric Demand Day (HEDD) examines EGU peaking units; and
- Industrial, Commercial, and Institutional (ICI) Boiler Workgroup focuses on control technologies for different fuels and boiler size ranges.

The OTC also issued a contract to MACTEC to help the SAS Committee identify and evaluate candidate control measures as well as to quantify expected emission reductions for each control measure.

Workgroup Activities

Initially, the Workgroups compiled and reviewed a list of approximately 1,000 candidate control measures. These control measures were identified through published sources such as the U.S. Environmental Protection Agency's (EPA's) Control Technique Guidelines, STAPPA/ALAPCO "Menu of Options" documents, the AirControlNET database, emission control initiatives in member states as well as other states including California, state/regional consultations, and stakeholder input. Appendix B provides the initial list of control measures that were evaluated.

Based on the review of the 1,000 candidate control measures, the Workgroups developed a short list of measures to be considered for more detailed analysis. These measures were selected to focus on the pollutants and source categories that are thought to be the most effective in reducing ozone air quality levels in the Northeastern and Mid-Atlantic States.

The Workgroups reviewed information on current emission levels, controls already in place, expected emission reductions from the control measures, when the emission reductions would occur, preliminary cost and cost-effectiveness data, and other implementation issues. Each of the candidate control measures on the short list were summarized in a series of "Control Measure Summary Sheets". The Control Measure Summary Sheets are contained in Appendix C. The Workgroups discussed the candidate control measures during a series of conference calls and workshops to further refine the emission reduction estimates, the cost data, and any implementation issues. The Workgroups also discussed comments from stakeholders. The Workgroups prioritized the control measures and made preliminary recommendations regarding which measures to move forward on.

OTC Commissioners' Recommendations

Based on the analyses by the OTC Workgroups, the OTC Commissioners made several recommendations at the Commissioner's meeting in Boston June 2006 and November 2006. The Commissioners recommended that States consider emission reductions from the following source categories:

- Consumer Products
- Portable Fuel Containers
- Adhesives and Sealants Application
- Diesel Engine Chip Reflash
- Cutback and Emulsified Asphalt Paving
- Asphalt Production Plants
- Cement Kilns
- Glass Furnaces
- Industrial, Commercial, and Institutional (ICI) Boilers
- Regional Fuels
- Electric Generating Units (EGUs)

Additionally, the Commissioners requested that EPA pursue federal regulations and programs designed to ensure national development and implementation of control measures for the following categories: architectural and maintenance coatings, consumer products, ICI boilers over 100 mmBtu/hour heat input, portable fuel containers, municipal waste combustors, regionally consistent and environmentally sound fuels, small offroad engine emission regulation, and gasoline vapor recovery. The various recommendations by the OTC Commissioners made from 2004 to 2006 are summarized in Table A-1.

Stakeholder Input

Stakeholders were provided multiple opportunities to review and comment on the Control Measure Summary Sheets. Table A-2 lists the public meetings that were held as an opportunity for stakeholders to review and respond to the Control Measure Summary Sheets and Commissioner's recommendations. Stakeholders provided written comments, as listed in Table A-3. In addition to submitting written comments, the Workgroups conducted teleconferences with specific stakeholder groups to allow stakeholders to vocalize their concerns directly to state staff and to discuss the control options. These stakeholder conference calls and meeting are listed in Table A-4. The OTC staff and state Workgroups carefully considered the verbal and written comments received during this process.

Table A-1: OTC Formal Actions, 2004-2006

Date	**Action/Synopsis**
Nov. 10, 2004	*Charge to Stationary and Area Sources Committee* Directs SAS Committee to continue to seek out innovative programs to address emissions from all stationary and area sources.
Nov. 10, 2004	*Charge to Stationary and Area Sources Committee Regarding Multi-Pollutant Emission Control for Electrical Generating Units and Large Industrial Sources* Directs the SAS Committee to develop an implementation strategy for to implement the OTC's multi—pollutant position, recommend methods for allocating NOx and SO2 caps, assess methods to advance the OTC's Multi0Pollutant position beyond the OTR, develop a program implementation structure, and present a Memorandum of Understanding for consideration by the Commission.
Nov. 10, 2004	*Charge to the Mobile Source Committee* Directs the Mobile Source Committee to identify selected scenarios to be modeled and evaluate strategies including anti-idling programs, voluntary and regulatory retrofit programs, VMT growth strategies, port and marine engine programs, national mobile source programs, California Low Emission Vehicle programs, and model incentive programs.
Nov. 10, 2004	*Statement on OTC Modeling* Directs the Modeling Committee to coordinate inventories and modeling needed for ozone, regional haze, and PM; seek input for air directors and OTC committees on regional strategies for modeling; continue to use CALGRID as a screening tool; and continue to explore application of emerging tools.
June 8, 2005	*Resolution of the States of the Ozone Transport Commission Regarding Development of a Regional Strategy for the Integrated Control of Ozone Precursors and Other Pollutants of Concern from Electrical Generating Units (EGUs) and Other Large Sources* Resolves that member States: develop a regional Multi-Pollutant program to assist in attaining and maintaining the 8-hour ozone NAAQS; seek to gain support from other states for a broader inter-regional strategy; develop an emissions budget and region-wide trading program; explore all feasible options to utilize the CAIR framework; and develop implementation mechanisms including a Memorandum of Understanding among the states.
Nov. 3, 2005	*Statement of the Ozone Transport Commission With Regard to Advancement of Potential Regional Control Measures for Emission Reduction from Appropriate Sources and State Attain Planning Purposes* Directs the staff of the OTC to continue investigation and modeling work associated with all potential regional control measures.
Feb. 23, 2006	*Action Items* Directs OTC staff to continue efforts on the following issues: Letter to EPA on Small Engines, Consumer Products, Architectural/Industrial Maintenance Coatings (AIM), Chip Reflash, Diesel Emissions Reductions, Modeling Efforts.
June 7, 2006	*Memorandum of Understanding Among the States of the Ozone Transport Commission on a Regional Strategy Concerning the Integrated Control of Ozone Precursors from Various Sources* Commits OTC States to continue to work with interested stakeholders and pursue state-specific rulemakings as

Date	Action/Synopsis
	needed and appropriate regarding the following sectors to reduce emission of ozone precursors: Consumer Products, Portable Fuel Containers, Adhesives and Sealants, and Diesel Engine Chip Reflash.
June 7, 2006	*Statement of the Ozone Transport Commission Concerning Multi-Pollutant Emission Control of Electric Generating Units* Directs OTC staff and its workgroups to continue to formulate a program beyond CAIR to address emissions from this sector and to evaluate and recommend options to address emissions associated with high electrical demand days during the ozone season.
June 7 2006	*Resolution 06-02 of the Ozone Transport Commission Concerning Coordination and Implementation of Regional Ozone Control Strategies for Certain Source Categories* Resolves that OTC States continue to work with interested stakeholders and pursue state-specific rulemakings as needed to establish emission reduction percentages, emission rates or technologies as appropriate for the following source categories: asphalt paving (cutback and emulsified), asphalt plants, cement kilns, regional fuels, glass furnaces, and ICI boilers.
June 7, 2006	*Resolution 06-03 of the Ozone Transport Commission Concerning Federal Guidance and Rulemaking for Nationally-Relevant Ozone Control Measures* Resolves that OTC States request that EPA pursue federal regulations and programs for national implementation of control measures comparable to the levels the OTC has adopted; these areas include AIM Coatings, Consumer Products, ICI Boilers over 100 MMBTU, Portable Fuel Containers, Municipal Waste Combustors, Regional Fuels, Small Engine Emission Regulation, and Gasoline Vapor Recovery.
Nov. 15, 2006	*Modified Charge of the Ozone Transport Commission to the Stationary Area Source Committee Regarding Electric Generating Units* Directs the SAS Committee and workgroups to continue work on EGU emission reduction strategies to incorporate "CAIR Plus" and High Energy Demand Day (HEDD) emission reduction strategies.
Nov. 15, 2006	*Statement of the Ozone Transport Commission Concerning Regional and State Measures to Address Emissions from Mobile Sources* Supports the aggressive implementation of a suite of controls through the OTC Clean Corridor Initiative including: diesel retrofits, the Smartways program, California Low Emission Vehicle programs, anti-idling programs, low-NOx diesel alternatives, transportation demand management to reduce the growth in VMT, and voluntary action and outreach programs.
Nov. 15, 2006	*Addendum to Resolution 06-02 of the Ozone Transport Commission Concerning Coordination and Implementation of Regional Ozone Control Strategies for Various Sources* Resolves that OTC States continue to pursue state-specific rulemakings as needed to establish emission reduction percentages, emission rates or technologies as appropriate for the following source categories: asphalt plants, glass furnaces, and ICI boilers.

OTC formal actions can be found on the OTC website at the following address: http://www.otcair.org/document.asp?fview=Formal

Table A-2: OTC Control Measures Public Meetings, 2004-2006

Date	**Meeting**	**Location**
June 8-9, 2004	OTC/MANE-VU Annual Meeting	Red Bank, NJ
Nov. 9-10, 2004	OTC Fall Meeting	Annapolis, MD
Apr. 21-22, 2005	OTC Stationary and Area Source/Mobile Source Committee Meeting	Linthicum, MD
June 7-8, 2005	OTC Annual Meeting	Burlington, VT
Oct. 5, 2005	OTC Control Strategy Committee Meeting	Linthicum, MD
Nov. 2-3, 2005	OTC Fall Meeting	Newark, DE
Jan. 24, 2006	OTC Control Strategy Committee Meeting	Linthicum, MD
Feb. 22-23, 2006	OTC Special Meeting	Washington, DC
Apr. 5-6, 2006	OTC Control Strategy Committee Meeting	Linthicum, MD
June 6-7, 2006	OTC Annual Meeting	Boston, MA
July 28, 2006	OTC/RTO/ISO Meeting	Herndon, VA
Sep. 18, 2006	OTC High Energy Demand Day Workgroup Meeting	Herndon, VA
Sep. 19, 2006	OTC Stationary and Area Source Committee Meeting	Herndon, VA
Nov. 2, 2006	OTC Control Strategies and Stationary and Area Source Committee Meeting	Linthicum, MD
Nov. 15, 2006	OTC Fall Meeting	Richmond, VA
Dec. 5-6, 2006	OTC High Energy Demand Day Workgroup Meeting	Hartford, CT

Meeting agendas and presentations can be found on the OTC website at the following address:
http://www.otcair.org/document.asp?fview=meeting

Table A-4: Stakeholder Comments on OTC Control Strategies

Stakeholder	**Source Category**
Adhesive and Sealant Council	Adhesives and Sealants
National Paint & Coatings Association (NPCA)	Adhesives and Sealants
Ameron International	AIM Coatings
McCormick Paints	AIM Coatings
National Paint and Coatings Association (NPCA)	AIM Coatings
Painting and Decorating Contractors of America (PDCA)	AIM Coatings
PROSOCO, Inc.	AIM Coatings
RUDD Company Inc.	AIM Coatings
TEX COTE	AIM Coatings
The Master Painters Institute (MPI)	AIM Coatings
The Society for Protective Coatings (SSPC)	AIM Coatings
Wank Adams Slavin and Associates, LLC (WASA)	AIM Coatings
NAPA Asphalt Production	Asphalt Production
MATRIX Systems Auto Refinishing	Auto Refinishing
Portland Cement Association (PCA)	Cement Kilns
St Lawrence Cement	Cement Kilns
Consumer Specialty Products Association (CSPA)	Consumer Products
Cosmetic, Toiletry and Fragrance Association (CTFA)	Consumer Products
National Paint & Coatings Association (NPCA)	Consumer Products
Clean Air Task Force	Diesel Retrofits
Center for Energy and Economic Development, Inc. **(**CEED)	EGUs
Chesapeake Bay Foundation	EGUs
Clean Air Task Force	EGUs
Conectiv Energy	EGUs
Dominion	EGUs
Exelon	EGUs
International Brotherhood of Electrical Workers , United Mine Workers of America, Center for Energy & Economic Development, Inc., Pennsylvania Coal Association	EGUs
NRG	EGUs
PPL Services	EGUs
The Clean Energy Group	EGUs
National Lime Association (NLA)	Lime Kilns
Debra Jacobson, Prof. Lecturer in Energy Law	NOx Sources
Flexible Packaging Association (FPA)s	Printing/Graphic Arts
Graphic Arts Coalition Flexography Air Regulations	Printing – Flexography
Graphic Arts Coalition Printing & Graphic Arts	Printing/Graphic Arts
Graphic Arts Coalition Screen Litho Air Regulations	Printing – Lithography

Stakeholder comments can be found on the OTC website at the following address:
http://www.otcair.org/projects_details.asp?FID=95&fview=stationary

Table A-4: OTC Conference Calls and Meetings with Stakeholders, 2006

Source Category	**Date(s)**	**Industry Lead**
Adhesives and Sealants	Aug. 30, 2006	Adhesives Council
Asphalt Paving	Mar. 30, 2006 Sep. 21, 2006 Sep. 28, 2006 Oct. 13, 2006	National Asphalt Paving Association (meeting) National Asphalt Paving Association Asphalt Emulation Manufacturers Association Asphalt Emulation Manufacturers Association
Asphalt Production	Oct. 25, 2006	National Asphalt Paving Association (meeting)
Consumer Products	Mar. 24, 2006 June 22, 2006 June 22, 2006 Aug. 29, 2006	Consumer Specialty Products Association American Solvents Council (meeting) Consumer Specialty Products Association Consumer Specialty Products Association
Glass Manufacturers	July 5, 2006 Aug. 16, 2006 Sep. 14, 2006 Oct. 19, 2006	North American Insulation Manufacturers Assoc. North American Insulation Manufacturers Assoc. Glass Association of North America Glass Association of North America
ICI Boilers	Mar. 14, 2006 Mar. 24, 2006 July 18, 2006 Aug. 1, 2006	Council of Industrial Boiler Owners Institute of Clean Air Companies Council of Industrial Boiler Owners (meeting) Council of Industrial Boiler Owners (conference)

Appendix B – Initial List of Control Measures

The comprehensive list of control measures can be found at:
http://www.otcair.org

Appendix C – Control Measure Worksheets

This Appendix contains the Control Measure Summary Worksheets for the following source categories:
Manufacture and Use of Adhesives and Sealants
Architectural and Industrial Maintenance Coatings
Asphalt Paving (Emulsified and Cutback)
Asphalt Production Plants
Automotive Refinish Coatings
Cement Kilns
Chip Reflash (Heavy Duty Diesel Engines)
Consumer Products
Glass and Fiberglass Furnaces
Industrial, Commercial, Institutional Boilers
Industrial Surface Coatings – Fabric Printing, Coating, and Dyeing
Industrial Surface Coatings – Large Appliances
Industrial Surface Coatings – Metal Cans
Industrial Surface Coatings – Metal Coils
Industrial Surface Coatings – Metal Furniture
Industrial Surface Coatings – Miscellaneous Metal Parts
Industrial Surface Coatings – Paper and Web Coating
Industrial Surface Coatings – Plastics Parts
Industrial Surface Coatings – Wood Building Products
Industrial Surface Coatings – All Categories
Lime Kilns
Municipal Waste Combustors
Printing and Graphic Arts
Portable Fuel Containers
Reformulated Gasoline

CONTROL MEASURE SUMMARY
Manufacture and Use of Adhesives and Sealants
(SCC- 2440020000)

Control Measure Summary

The provisions of this model rule limit emissions of volatile organic compounds (VOCs) from adhesives, sealants and primers. The model rule achieves VOC reductions through two basic components: sale and manufacture restrictions that limit the VOC content of specified adhesives, sealants and primers sold in the state; and use restrictions that apply primarily to commercial/industrial applications. By reducing the availability of higher VOC content adhesives and sealants within the state, the sales prohibition is also intended to address adhesive and sealant usage at area sources. Emissions from residential use of regulated products are addressed through the sales restrictions and simple use provisions.

A reasonably available control technology determination prepared by the California Air Resources Board (CARB) in 1998 forms the basis of this model rule. In the years 1998-2001, the provisions of the CARB determination were adopted in regulatory form in various air pollution control districts in California including the Bay Area, South Coast, Ventura County, Sacramento Metropolitan and San Joaquin Valley.

Costs and Emissions Reductions

2002 existing measure: No existing limitations for this category

Candidate measure: Approximately 75% of VOC emissions originate from solvent-based adhesives and sealants, the remaining 25% of VOC in this category are due to water-based materials. VOC content limits have been enacted by various APCD in California from 1998 to 2001.

***Emissions reductions*:** VOC content limits for the solvent-based materials can result in 64.4% reduction in total emissions from this category. (CARB RACT/BARCT for Adhesives/ Sealants, Dec 1998)

***Control costs*:** Costs for control by reformulation are estimated by the CARB at less than $2500 / ton (1999$). Many manufacturers have either reformulated solvent-based products to reduce the VOC content or have developed low-VOC water-based latex and acrylic products, or polyurethane or silicone products in response to the adoption of similar regulations in California. Thus, the actual costs in the OTC region are anticipated to be lower.

Estimated costs for add-on controls carbon and thermal oxidizers ranged from $10,000 to $100,000 per ton.

***Timing of implementation*:** 01/01/09

***Implementation area*:** Region-wide

Annual VOC

2002 Emissions: 35,489 tpy
2009 Emissions: 46,241 tpy
2009 Reduction: 29,438 tpy
2009 Remaining: 16,803 tpy

Summer VOC

2002 Emissions: 99.8 tpd
2009 Emissions: 129.8 tpd
2009 Reduction: 82.3 tpd
2009 Remaining: 47.5 tpd

Interaction with other OTC Model Rules

The products regulated in this model rule do not overlap with the products regulated by either the architectural and industrial maintenance (AIM) or consumer product rules. A "coating," as contemplated in the AIM rule, is a "material applied onto or impregnated into a substrate for protective, decorative or functional purposes." Because the coating is applied only to one substrate, it is clearly distinguished from adhesives and sealants, which are defined in both the consumer product and adhesive rules by application to two surfaces; in the case of adhesives, the two surfaces are directly bonded while in the case of sealants, a gap between two surfaces is filled.

The overlap between the consumer product and adhesive rules is addressed mainly by an exemption in the adhesive rule for adhesives and sealers subject to the state's consumer products regulation.

Reference:

California Air Resources Board. *Determination of Reasonably Available Control Technology and Best Available Retrofit Technology for Adhesives and Sealants*. December 1998. Page 18 provides the emission reduction estimates for California: the ARB emission inventory estimates 45 tons per day pre-rule; reductions will range from approximately 29 to 35 tons per day. We used the low end of this range to calculate the percent reduction of 64.4% (i.e. 29 tpd/45 tpd). Page 17 provides the cost-effectiveness information: the cost of complying with the determination reflects the cost of using alternative formulations of low-VOC or water-based adhesives, sealants, and cleanup products. Ventura County APCD staff determined that the cost-effectiveness of their adhesives rule ranges from a savings of $0.53 per pound to a cost of $1.16 per pound of VOC reduced ($1,060 to 2,320). The use of add-on control equipment to comply was $4.50 to $55.00 per pound ($9,000 to $110,000).

CONTROL MEASURE SUMMARY FOR
AIM Coatings

Control Measure Summary: VOC emission reductions can be obtained through modifying the current formulation of the coating to obtain a lower VOC content. The regulatory approach for reducing emissions is to establish VOC content limits for specific coatings that manufacturers are required to meet either through reformulating products or substituting products with compliant coatings.	**Emissions (tons/year)**
2001 existing measure: Federal AIM rules 40CFR Part 59 *Emission Reductions*: 20% reduction from uncontrolled levels *Control Cost*: $228 per ton *Timing of Implementation*: Compliance required by September 1999 *Implementation Area*: Nationwide	**VOC (with Part 59 limits)** 2002 OTR total: 124,173
2009 On-the-Way Measure: OTC Model Rule based on a model rule adopted by the California Air Resources Board (CARB) in June, 2000 for 33 air control districts. *Emission Reductions*: 31% beyond Federal AIM rule *Control Cost*: $6,400 per ton	**VOC (After OTC Model Rule)** 2009 Reduction: -25,150 2009 Remaining: 99,023
Candidate measure: Follow CARB 2007 Rulemaking. Modify rule as appropriate when complete (in time for 2009) Participate actively in CARB process. Conduct survey in 2006 for 2005 sales data. *Emission Reductions* : 6% emissions reduction For modeling purposes we split the difference between SCAQMD and OTC model rule. But we go 75% of the way toward SCAQMD on the top four sales products, and set a 250 g/l VOC limit for Industrial Maintenance coatings. The reductions are calculated using the "reg neg" spreadsheet. *Control Cost*: Cost of OTC Survey (revise with cost data from the future CARB SCM when available in 2007) SCAQMD estimated the overall cost-effectiveness for their 1999 Amendments to $13,317 per ton. For Dec. 5 2003 amendments to Rule 1113, SCAQMD estimated the cost-effectiveness to be in the range of $4,229 to $11,405 per ton *Timing of Implementation:* 01/01/09 *Implementation Area*: Throughout OTR and MRPO	**VOC (After CARB 2007 Rule)** 2009 Reduction: -5,941 2009 Remaining: 93,082

REFERENCES:

2002 Existing Measure (Federal Part 59 Rules):

E.H. Pechan & Associates, Inc., *AirControlNET Version 4.1: Documentation Report*, September 2005. Pages III-1347 and III-1348 shows the 20% reduction for the Federal Part 59 rule at a cost of $228 per ton (1990$).

2009 On-the-Books Measure (OTC Model Rule):

E.H. Pechan & Associates, Inc., *Control Measure Development Support Analysis of Ozone Transport Commission Model Rules*, March 31, 2001. Table II-6 shows 31% reduction (OTC Model Rule beyond Federal rule). Page 15 presents cost of $6,400 per ton based on CARB's 2000 Staff Report for the Suggested Control Measure for Architectural Coatings.

Candidate Measure (CARB 2007 Suggested Control Measure):

CARB is in the process of updating the 2000 Suggested Control Measure (SCM) for Architectural Coatings this year. They will be using 2004 survey data as an important resource to update the SCM, but will not begin the formal SCM update process until the survey is completed. They anticipate bringing the SCM update to our Board in mid to late 2007.

CARB is developing an analysis of costs for implementing an updated it's Suggested Control Measure. Results of the analysis will not be available until 2007.

Cost information for the South Coast Phase rules were obtained from:

South Coast Air Quality Management District. *Final Staff Report for Proposed Amended Rule 1113 – Architectural Coatings*. December 5, 2003. "estimated the cost-effectiveness to be in the range of $4,229 to $11,405 per ton of VOC reduced. The low end of the range was determined based on the retail cost of compliant coatings reported by coating manufacturers surveyed by staff. The upper end of the range was derived by estimating the increased cost at the retail level due to the increase in cost of raw materials, reformulation, testing and packaging a new product prior to commercialization." The Dec. 2003 amendments lowered the VOC limit for the following specialty coating categories: clear wood finishes including varnishes and sanding sealers, roof coatings, stains, and waterproofing sealers including concrete and masonry sealers.

South Coast Air Quality Management District. *Appendix F Addendum to Staff Report, Final Socioeconomic Impact Assessment, Proposed Amendments to Rule 1113*. May 1999. The May 1999 amendments to Rule 1113 lower VOC limits for the coating categories of industrial maintenance; non-flats; primers, sealers, and undercoaters; quick-dry enamels; quick-dry primers, sealers, and undercoaters; roof coatings; floor coatings, rust preventative coatings, stains, and waterproofing wood sealers. The overall cost-effectiveness of the proposed amendments, (total costs/total emission reductions) over the years 2002-2015, is estimated to be $13,317 per ton.

CONTROL MEASURE SUMMARY FOR EMULSIFIED AND CUTBACK ASPHALT PAVING

Control Measure Summary: OTC Regional Ban on Cutback Asphalt in Ozone Season, with lower VOC/Solvent Contents for Emulsified Asphalt.	**VOC Emissions in Ozone Transport Region**
2002 existing measures: *1. Cutback asphalt: The OTC states typically ban the use of cutback asphalt during the ozone season. States do provide various exemptions to the ban, most notably allowances may be made for cutbacks which contain less than 5% VOC.* *2. Emulsified asphalt: Ten of the OTC states regulate emulsified asphalt by providing allowable VOC content limits for the various applications. Three of the states do not address emulsified asphalts in their regulation.* *Control Cost*: According to the 1977 CTG (EPA-450/2-77-037), which formed the basis for the existing regulations, the use of emulsified asphalts (no VOC) presented a cost savings. *Timing of Implementation*: All regulations implemented in 1990s or earlier under the 1-hour ozone standard. *Implementation Area*: OTC 1-hour ozone non-attainment areas.	**Annual VOC** 2002 cutback: 9,154 tpy 2002 emulsified: 10,379 tpy 2002 total: 19,533 tpy **Summer VOC** 2002 cutback: 17.5 tpd 2002 emulsified: 38.5 tpd 2002 total: 56.0 tpd
Candidate measure: For cutback asphalt paving *Measure ID:* **BOTW09-AP-Cutback** Place a complete prohibition on the use of cutback asphalt during the ozone season. *Emission Reductions*: to be achieved from using lower VOC content emulsified asphalt products or working outside the ozone season. ***Control Cost*:** Negligible. ***Timing of Implementation*:** 01/01/09 ***Implementation Area*:** All OTC 8-hour ozone non-attainment counties or individual state-wide.	**Summer VOC** 2009 OTB: 19.9 tpd 2009 Reduction: 19.9 tpd 2009 Remaining: 0.0 tpd
Candidate measure: For emulsified asphalt paving *Measure ID:* **BOTW09-AP-Emulsified** Proposes to limit ozone season use of emulsified asphalt to that which contains not more than 0.5 ml of oil distillate from the 200 mL sample using the ASTM D244 test method regardless of application (which is 0.25% VOC by volume) *Emission Reductions*: to be achieved from using lower VOC content emulsified asphalt products or working outside the ozone season. *Control Cost*: Negligible ***Timing of Implementation***: 01/01/09 ***Implementation Area*:** All OTC 8-hour ozone non-attainment counties or individual state-wide.	**Summer VOC** 2009 OTB: 44.2 tpd 2009 Reduction: 39.9 tpd 2009 Remaining: 4.3 tpd
Control Measure Recommendation: States implement most stringent measure possible to achieve VOC reductions by 2009 from OTB projections in OTC states, with out disrupting state and county paving operations.	
Brief Rationale for Recommended Strategy: (1) Delaware already implements and complies with the most stringent proposed control strategy. (2) The control strategy is supported by the 1977 Control Techniques Document EPA-450/2-77-037.	

CONTROL MEASURE SUMMARY FOR
Asphalt Production Plants

Control Measure Summary: NOx emission reductions can be obtained through installation of low NOx burners and flue gas recirculation. SO2 can be reduced by reducing the sulfur in fuel limits for distillate oil to 500 ppm.

Emissions (tons/year) in Ozone Transport Region

2002 existing measure: No existing limitations for this specific category have been identified.

2002 NOx Base:	827
2002 SO2 Base:	847

Candidate Measure:

***Emission Reductions*:** NOx can be reduced between 35% to 50% with low NOx burners and flue gas recirculation (FGR). SO2 can be reduced 25% to 75% by reducing the sulfur in fuel limits for distillate oil to 500 ppm.

The MANEVU data for this category is incomplete. Only major point sources are typically included in the point source database. Non-major source emissions are likely lumped into the area source inventory with other industrial/commercial boilers/heaters. The point source data projects only 800+ tons per year (TPY) of both NOx and SO2 actual emissions in 2002 for the entire region. New York actual emissions are over 600 TPY of NOx and 400 TPY of SO2. Therefore, it is unknown what the actual reductions will produce as no accurate baseline exists for both major and minor facilities.

***Control Cost*:** Costs for control are similar to those of small to midsize boilers or process heaters. Low NOx burners range from $500 to $1250 per ton. While Low NOx burners in combination with FGR range from $1000 to $2000 per ton.

Projected cost increase from lowing sulfur in distillate oil is approximately 2 to 3 cents per gallon.

***Timing of Implementation*:** Similar to the NOx RACT procedures of 1994. Require a NOx compliance plan by the spring of 2008 with full implementation and compliance within one year (01/01/09).

Unknown for sulfur-in-fuel reductions.

***Implementation Area*:** Region-wide

NOx	
2009 Base:	1,276
2009 Reduction:	-549
2009 Remaining:	727

SO2	
2009 Base:	1,266
2009 Reduction:	-950
2009 Remaining:	316

Recommended Strategy: States should support rules that encourage a combination of Best Management Practices, Low NOx Burners and FGR in asphalt production plants to achieve a 20-35% reduction in NOx emissions form a 2002 base, and encourage the use of low-sulfur oil.
Area source emissions from asphalt plants are not included in this summary.

REFERENCES:

Note: The reductions estimated for this category only include emissions from point sources. Area source emissions from fuel combustion at asphalt production plants are not explicitly contained in the area source emissions. These emissions are likely lumped together in the general area source industrial and commercial fuel use category. Reductions from area source emissions at asphalt production plants are included in the ICI boiler source category.

Candidate Measure (Low NOx Burners plus FGR; low sulfur fuel oil):

The emission reduction estimates and cost-effectiveness data were provided by NYSDEC. These control efficiencies and cost-effectiveness estimates for Low NOx Burners plus FGR are generally consisten with the data presented in E.H. Pechan & Associates, Inc., *AirControlNET Version 4.1: Documentation Report*, September 2005. Information in this report for small oil-fired process heaters and ICI boilers provide similar levels of control and cost-effectiveness.

Candidate Measure (Best Management Practices)

Best Practices to Reduce Fuel Consumption and/or Lower Air Emissions: HMA industry leaders have identified a number of Best Practices that, if implemented, allow for substantial reduction in plant fuel consumption and the corresponding products of combustion including NOx. In today's business environment, there is significant incentive to reduce fuel usage. For this reason, implementing best practices to reduce fuel consumption and NOx emissions, forms the basis of a sustainable strategy.

Effective stockpile management to reduce aggregate moisture content: Current information indicates that effective stockpile management can reduce aggregate moisture content by about 25 percent, corresponding to a reduction in fuel consumption by approximately 10 - 15 percent. There are a number of ways to reduce aggregate moisture: covering stockpiles, paving under stockpiles, and sloping stockpiles are all ways that prevent aggregate from retaining moisture. Best Practices are plant- and geographic locale-specific.

Burner tune-ups: As identified in OTC Resolution 06-02 and companion control measures summaries, a burner tune-up may reduce NOx emissions by up to 10 percent. From a contractor's perspective, this also is helpful in reducing fuel consumption. In other words, there can be a direct pay-back to the business from regular burner tune-ups.

Lowering mix temperature: A Technical Working Group of FHWA is currently investigating a number of newer formulation technologies, to understand the practicality and performance of lowering mix temperatures. Substantial reductions in mix temperatures, on the order of 20 percent or more, appear to be plausible. Lowering mix temperatures, by this amount, may reduce fuel consumption, as less heat is needed to produce the mix.

Other maintenance and operational best practices: Additional practices can be employed throughout the plant to help optimize production and operations. For example, regular inspection of drum mixing flites and other measures can be taken – all in the effort to make a plant operate more efficiently, thereby using less fuel.

Plant Type	**Emission Rate (lbs NOx/ton asphalt produced)**	**% Reduction**
Area/Point Sources (State emissions option)		
Batch Mix Plant – Natural Gas	0.02	35
Batch Mix Plant – Distillate/Waste Oil	0.09	35
Drum Mix Plant – Natural Gas	0.02	35
Drum Mix Plant – Distillate/Waste Oil	0.04	35
Area/Point Sources (State technology option)		
Batch/Drum Mix Plant – Natural Gas	Low-NOx Burner Technology and/or Best Management Practices	
Batch/Drum Mix Plant – Distillate/Waste Oil	Low-NOx Burner Technology and/or Best Management Practices	

CONTROL MEASURE SUMMARY FOR
Auto Refinish Coatings – Area Source

Control Measure Summary: Limiting the concentration of solvents in Auto Refinishing Coatings in order to reduce VOC emissions. Encourage the use of high transfer-efficiency painting methods (e.g., high volume low pressure spray guns), and controls on emissions from equipment (e.g., spray gun) cleaning, housekeeping activities (e.g., use of sealed containers for clean-up rags), and operator training.	**Emissions (tons/year) in Ozone Transport Region**	
2002 existing measure: Federal Auto Body Refinishing rules 40CFR Part 59 Subpart B *Emission Reductions*: 37% reduction from Part 59 (from Pechan OTC Model Rule Report) due to Part 59 VOC content limits *Control Cost*: $118 per ton for Part 59 rules *Timing of Implementation*: Part 59 compliance required by January 1999 *Implementation Area*: Part 59 – Nationwide;	**VOC** Uncontrolled: 2002 Reduction: 2002 Base:	 50,759 -18,781 31,978
OTB Control Measure: OTC Model Rule for Mobile Equipment Repair and Refinishing *Emission Reductions*: 38% reduction from 2002 Levels in those States that adopted OTC model Rule (per Pechan March 31, 2001 OTC Model Rule Report) *Control Cost*: $1,534 per ton of VOC *Timing of Implementation*: Assuming 2007 effective date of rule, emission reductions are achieved 01/01/09. *Implementation Area*: All counties in the OTR.	**VOC:** 2009 Reduction: 2009 Remaining:	 -10,468 21,510
Candidate measure: CARB October 20, 2005 SCM Staff Report – Lowers VOC limits, combines coatings categories, simplifies recording. *Emission Reductions*: CARB estimates a 65% reduction in VOC emissions from a 2002 baseline; the OTC model rule is very similar to the CARB 2002 baseline, so a similar reduction would be expected in the OTR. *Control Cost*: $2,860 per ton *Timing of Implementation*: Assuming 2007 effective date of rule, emission reductions are achieved in beginning 01/01/09. *Implementation Area*: All counties in the OTR.	**VOC:** 2009 Reduction: 2009 Remaining:	 -13,981 7,529

REFERENCES:

2002 Existing Measure (Federal Part 59 Rules):

E.H. Pechan & Associates, Inc., *AirControlNET Version 4.1: Documentation Report*, September 2005. Pages III-1364 shows the Federal Part 59 rule at a cost of $118 per ton (1990$) and a reduction of 37 percent from uncontrolled levels.

2009 On-the-Books Measure (OTC Model Rule):

E.H. Pechan & Associates, Inc., *Control Measure Development Support Analysis of Ozone Transport Commission Model Rules*, March 31, 2001. Table II-6 shows 37% reduction for Federal Part 59 rule and 38% (OTC Model Rule beyond Federal rule). Page 17 presents cost of $1,534 per ton based on estimates used for PA Rule 129.75.

Candidate Measure (CARB 2005 Suggested Control Measure):

California Air Resources Board. *Staff Report for the Proposed Suggested Control Measure for Automotive Coatings.* October 2005. Table V-3 shows the estimated 65% reduction from 2002 baseline emissions for new automotive coatings limits. A similar reduction is expected for the OTR. Page VII-6 indicates that the cost-effectiveness of the SCM is estimated to be $1.43 per pound of VOC reduced ($2,860 per ton). The CARB SCM coating categories and VOC limits are:

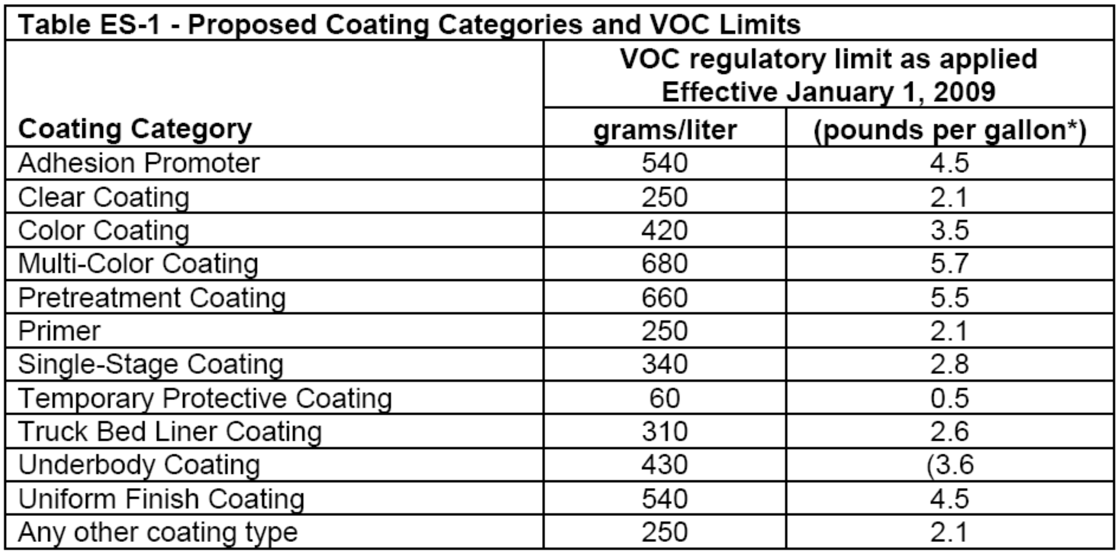

Table ES-1 - Proposed Coating Categories and VOC Limits

Coating Category	**VOC regulatory limit as applied Effective January 1, 2009**	
	grams/liter	**(pounds per gallon*)**
Adhesion Promoter	540	4.5
Clear Coating	250	2.1
Color Coating	420	3.5
Multi-Color Coating	680	5.7
Pretreatment Coating	660	5.5
Primer	250	2.1
Single-Stage Coating	340	2.8
Temporary Protective Coating	60	0.5
Truck Bed Liner Coating	310	2.6
Underbody Coating	430	(3.6
Uniform Finish Coating	540	4.5
Any other coating type	250	2.1

The OTC Model Rule coating categories and VOC limits are:

OTC Model Rule *Coating Type*	 *Grams per Liter*	*Limit* *Pounds per gallon*
Automotive pretreatment primer	780	6.5
Automotive primer-surfacer	575	4.8
Automotive primer-sealer	550	4.6
Automotive topcoat:		
single stage-topcoat	600	5.0
2 stage basecoat/clearcoat	600	5.0
3 or 4-stage basecoat/clearcoat	625	5.2
Automotive Multi-colored Topcoat	680	5.7
Automotive specialty	840	7.0

CONTROL MEASURE SUMMARY FOR
Cement Kilns

Control Measure Summary:	**Emissions (tons/year) in Ozone Transport Region**	
2002 existing measure: NSR; PSD; State RACT.	**NOx** 2002 Base:	 31,960
On the Books: NOx SIP Call *Measure ID:* NOx SIP Call *Emission Reductions*: The SIP Call requirements were estimated by EPA to result in NOx reductions of approximately 25 percent from the cement industry. *Control Cost*: $2,000 per ton *Timing of Implementation*: 2004 *Implementation Area*: OTR	**NOx** 2009 Base: 2009 Reduction: 2009 Remaining:	 31,960 -7,990 23,970
Candidate measure: Use of proven control technologies (such as SNCR) or other methods to meet recommended emission limits. *Emission Reductions*: source specific, varies from 0-63% based upon 2002 base rates. *Control Cost*: less than 2,500 per ton *Timing of Implementation*: 01/01/09 *Implementation Area:* OTR	**NOx** 2009 Base: Candidate Reduction: 2009 Remaining:	 31,960 -13,231 18,279

Policy Recommendation: It is recommended that a program be developed reduces NOx emissions from existing cement kilns by requiring existing kilns to meet a NOx emission rate of

3.88 lbs/ton clinker for wet kiln

3.44 lbs/ton clinker for long dry kiln

2.36 lbs/ton clinker for pre-heater kiln

1.52 lbs/ton clinker for pre-calciner kiln.
Trading between facilities would not be permitted, but averaging at a facility would be permissible.

Brief Rationale for Recommended Strategy: This limit is consistent with the emission reduction capabilities of SNCR. There are 18 full-scale SNCR installations in Europe.

REFERENCES

EC/R Incorporated. *NOx Control Technologies for the Cement Industry* – Final Report. September 19, 2000. This report for EPA shows data for two SNCR technologies, biosolids injection and NOXOUT®. These technologies showed average emission reductions of 50 and 40 percent, respectively. For biosolids injection, "Cost effectiveness for this kiln is based on the annualized costs of ($320,000/year), the emission reduction achieved at that facility (emissions decreased from 2.4 lb/ton of clinker to 1.2 lb/ton of clinker), a kiln capacity of 215 tons/hr, and an annual operation of 8,000 hr/yr. Cost effectiveness is a credit of ($310/ton) for installing biosolids injection on this kiln" due to tipping fee for using biosolids (dewatered sewage sludge) For NOXOUT®, "40 percent NOX reduction based on the available test data. Cost effectiveness for the two kilns, using urea as the reagent, is based on an uncontrolled emission rate of 3.8 lb NOX/ton of clinker, kiln capacities of 92 and 130 tons/hr respectively, annual operation of 8,000 hr/yr, and a NOX control efficiency of 40%. Cost effectiveness is $1,000/ton for the smaller kiln and $2,500/ton for the larger kiln."

European Commission. *Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques in the Cement and Lime Manufacturing Industries*. December 2001. These report indicates that there are 18 full-scale SNCR installation in Europe. Most SNCR installations are designed and/or operated for NOx reduction rates of 10-50% which is sufficient to comply with current legislation in some countries. Two Swedish plants installed SNCR in 1996/97 and have achieved a reduction of 80-85% at both kilns.

Emission Rates:

Table 4-5 of the EPA's *NOx Control Technologies for the Cement Industry, September 19, 2000* provides the following uncontrolled emission rates for the four types of cement kilns:

Kiln Type	Heat Input Requirement (mmBtu/ton of clinker)	Average NOx Uncontrolled Emission Rate (lb/ton of clinker)	Range of NOx Uncontrolled Emission Rate (lb/ton of clinker)
Wet	6.0	9.7	3.6 to 19.5
Long Dry	4.5	8.6	6.1 to 10.5
Preheater	3.8	5.9	2.5 to 11.7
Precalciner	3.8	3.8	0.9 to 7.0

The OTC Control Measure Summary Sheet calls for a 60% reduction from uncontrolled emissions. Using this percent reduction figure and the uncontrolled emission rates above, the following controlled emission rates were calculated:

Kiln Type	Percent Reduction from Uncontrolled	Low-End NOx Controlled Emission Rate (lb/ton of clinker)	Average NOx Controlled Emission Rate (lb/ton of clinker)	High-End NOx Controlled Emission Rate (lb/ton of clinker)
Wet	60	1.44	3.88	7.80
Long Dry	60	2.44	3.44	4.20
Preheater	60	1.00	2.36	4.68
Precalciner	60	0.36	1.52	2.80

The State/workgroup lead recommended the use of the the average NOx Controlled emission rates in the above table (expressed as lb/ton of clinker).

CONTROL MEASURE SUMMARY FOR
Chip Reflash

Control Measure Summary: Upgrade the version of software in engine electronic control module (ECM) aka "Chip Reflash". Software reprograms the vehicle's computer and reduces off-cycle NOx emissions. The installation process typically takes between one-half to one hour.	**Emissions Reductions (tons/day)**	
2002 existing measure: No existing measure in the OTR other than the EPA program resulting from the consent decrees on 7 heavy duty engine manufacturers. The results of the EPA program thus far are significantly lower than the level originally projected by the Agency (less than 10% implementation). CARB implemented a voluntary program that did not achieve its expected results, so the Board's backstop mandatory program was triggered. The CARB mandatory program is facing two separate legal challenges, alleging that CARB has breached its settlement agreement and alleging that CARB is illegally establishing different emissions standards on "new engines".		
Candidate measure: *Measure ID:* Model rule for Mandatory Chip Reflash Program in the OTR *Emission Reductions*: NOx reduction (TPD) from in-state registered vehicles *Control Cost*: Moderate – manufacturers must provide the rebuild kits free to any truck operator who requests it. The cost associated with the reflash has been estimated at $20-$30 per vehicle, which is borne by the engine manufacturer. There may be costs associated with potential downtime to the trucking firms, and record-keeping requirements on the dealer performing the reflash and the vehicle owner. For the MRPO, ENVIRON estimated cost effectiveness to be "$1,800 to $2,500 (depending on vehicle size) due to incremental "fuel penalty" of 2% increase in fuel consumption). However, in reality, no fuel penalty has been documented on vehicles that have already been reflashed. *Timing of Implementation*: The kits are currently available, so once the states adopt the rule, retrofits can begin according to the schedule. *Implementation Area*: All OTR and MRPO states (NOx reductions 109 TPD)	LADCO Northeast states Mid-Atlantic States Total OTR	46 TPD 41 TPD 22 TPD 63 TPD
Policy Recommendation of State/Workgroup Lead: Expand scope of the model rule for the Northeast states to the entire OTR and MWRPO		
Brief Rationale for Recommended Strategy: While the EPA program provides a good platform for chip reflash retrofits, the federal program is not even achieving 10% of its estimated emission reductions. The kits are available and must be given to the truckers for free; yet without additional motivation, it is unlikely that the implementation rate will improve due to fuel consumption and/or performance perceptions and the ability to extend the time to next major rebuild/overhaul. The states in the OTR do not face the prospect of breach-of-settlement allegations that CARB did in adopting a mandatory program, since they did not participate in the negotiation of the CD settlements. And there are significant emission reductions that can be achieved through a mandatory program, even though installing the kits will not result in the engines operating at the same emission levels required for the EPA engine certification test. Nevertheless, this is a relatively simple fix for a problem that our states will face if they rely on the federal program alone to produce emission reductions from these sources.		

CONTROL MEASURE SUMMARY FOR *Consumer Products*

Control Measure Summary: Consumer Products This control measure establishes limits on the VOC content of consumer products. It is based on the California Air Resources Board (CARB) consumer products rules, with some region specific modifications. It regulates categories such as hairspray, air fresheners, glass and general purpose cleaners, adhesives, anti-perspirants and deodorants, insecticides and automotive aftermarket products.	**VOC Emissions in Ozone Transport Region**	
2002 Existing Measure: The Federal Consumer Products Rule Part 59 *Emission Reductions*: 20 % reduction of the categories being regulated or 9.95 % reduction of the entire consumer products inventory (about 40 % of products were included in rule). *Control Cost*: $237 per ton of VOC reduced *Timing of Implementation*: 12/98 *Implementation Area*: Nationwide	**2002 Annual**	
	Uncontrolled:	258,537 tpy
	Reduction:	25,724 tpy
	Remaining:	232,813 tpy
	2002 Summer	
	Uncontrolled:	713.9 tpd
	Reduction:	71.0 tpd
	Remaining:	642.9 tpd
2009 On-the-Books Measure: Adopt the 2001 OTC Model Rule for Consumer Products in all OTC states (this model rule was based on a series of five CARB consumer products rules). *Emission Reductions*: 14.2 % beyond federal rule or a total of 21 % from the uncontrolled state. *Control Cost*: $800 per ton VOC reduced *Timing of Implementation*: 1/1/05 effective date of VOC limits (though some states were later and some have yet to adopt) *Implementation Area*: OTR	**2009 Annual**	
	Reduction:	22,916 tpy
	Remaining:	209,897 tpy
	2009 Summer	
	Reduction:	63.4 tpd
	Remaining:	579.5 tpd
Candidate Measure #1: Adopt the CARB amendments to their consumer products rule, adopted 7/20/05, with the exception of the 12/31/09 shaving gel, and 12/31/08 anti-static aerosol VOC limits. This rule sets new VOC limits for 11 categories, revises the existing VOC limit for 1 category and includes some additional requirements. See more detailed limits below. *Emission Reductions*: CARB estimates their rule will achieve a 6.3 ton/day reduction of VOC in California, which is equivalent to about 11.3 tons per day in the OTR or a 2% reduction beyond the on-the-books measure. *Control Cost*: $4,800 per ton of VOC reduced *Timing of Implementation*: 01/01/09 *Implementation Area* OTR	**2009 Annual**	
	Reduction:	7,453 tpy
	Remaining:	202,444 tpy
	2009 Summer	
	Reduction:	20.6 tpd
	Remaining:	558.9 tpd
Candidate Measure #2: Follow and adopt as appropriate CARB 's next round of amendments to their consumer products rule, to be developed and proposed by approximately late 2006/early 2007 with limits effective in 2010. *Emission Reductions*: The CONS-2 amendments are estimated by CARB to achieve VOC reductions of about 20-35 tpd in California by 2010 which is equivalent to about 36-63 tpd in the OTR (The mid-point of this range was used in the calculations, 49.5 tpd). *Control Cost*: Unknown at present; *Timing of Implementation*: 01/01/10 *Implementation Area OTR*	***VOC not modeled:***	
	2009 Annual	
	Reduction:	Not
	Remaining:	Available
	2009 Summer	
	Reduction:	
	Remaining:	

Summary of Candidate Measure #1: The proposed VOC limits based on CARB's 7/20/05 amendments are as follows:

Summary of Candidate Measure #1: The proposed VOC limits based on CARB's 7/20/05 amendments are as follows:

PRODUCT CATEGORY	CARB VOC CONTENT LIMIT %	OTC PROPOSED CONTENT LIMIT%	CARB EFFECTIVE DATE	OTC PROPOSED EFFECTIVE DATE
Adhesive, Contact – General purpose *	55	55	12/31/2006	1/1/2009
Special Purpose*	80	80	12/31/2006	1/1/2009
Adhesive Remover - Floor or Wall covering	5	5	12/31/2006	1/1/2009
Gasket or Thread Locking	50	50	12/31/2006	1/1/2009
General Purpose	20	20	12/31/2006	1/1/2009
Specialty	70	70	12/31/2006	1/1/2009
Anti-static - non-aerosol	11	11	12/31/2006	1/1/2009
Electrical Cleaner	45	45	12/31/2006	1/1/2009
Electronic Cleaner	75	75	12/31/2006	1/1/2009
Fabric refresher – aerosol	15	15	12/31/2006	1/1/2009
non-aerosol	6	6	12/31/2006	1/1/2009
Footware or Leather Care - aerosol	75	75	12/31/2006	1/1/2009
Solid	55	55	12/31/2006	1/1/2009
all other forms	15	15	12/31/2006	1/1/2009
Graffiti Remover –aerosol	50	50	12/31/2006	1/1/2009
non-aerosol	30	30	12/31/2006	1/1/2009
Hair Styling Products – aerosol & pump sprays	6	6	12/31/2006	1/1/2009
all other forms	2	2	12/31/2006	1/1/2009
Shaving Gel	7	7	12/31/2006	1/1/2009
Toilet/Urinal Care – aerosol	10	10	12/31/2006	1/1/2009
non-aerosol	3	3	12/31/2006	1/1/2009
Wood Cleaner – aerosol	17	17	12/31/2006	1/1/2009
non-aerosol	4	4	12/31/2006	1/1/2009
* Change to an existing category				

References:

2002 Existing Measure (Federal Part 59 Rules):

E.H. Pechan & Associates, Inc., *Control Measure Development Support Analysis of Ozone Transport Commission Model Rules*, March 31, 2001.

E.H. Pechan & Associates, Inc., *AirControlNET Version 4.1: Documentation Report*, September 2005. Pages III-1377 shows the Federal Part 59 rule at a cost of $237 per ton (1990$).

2009 On-the-Books Measure (OTC Model Rule):

E.H. Pechan & Associates, Inc., *Control Measure Development Support Analysis of Ozone Transport Commission Model Rules*, March 31, 2001. Table II-6 shows 14.2% reduction (OTC Model Rule beyond Federal rule). Page 8 presents cost of $800 per ton based on CARB's Sept. 1999 Initial Statement of Reasons for Proposed Amendments to the California Consumer Products Regulation.

Candidate Measure #1 (CARB 2005 and 2006/2007 Amendments):

California Air Resources Board. *Initial Statement of Reasons for Proposed Amendments, Volume 1: Executive Summary.* June 24, 2004. Table 2 of the Executive Summary shows that the CONS-1 amendments will achieve reductions of about 6.8 tons per day state wide (6.3 tons per day without the 12/31/09 Shaving gel, and 12/31/08 anti-static aerosol regs.. Page 21 states the cost of CONS-1 will be $2.40 per pound ($4,800 per ton). Since OTC's model rule is very similar to the CARB's rule, and emissions are proportional to population, CARB's 6.3 ton per day reduction was prorated to the OTC region based on the ratio of OTR 2002 population (63 million) to CA 2002 population (35 million) yielding approximately 11.3 tons per day in the OTR (4,139 tons per year).

Page 4 states that the estimated reductions from CONS-2 (not yet proposed) will achieve 20-35 tons per day statewide by 2010. Since OTC's model rule is very similar to the CARB's rule, and emissions are proportional to population, the mid-point of CARB's 20-35 ton per day reduction (i.e., 27.5 tons per day) was prorated to the OTC region based on the ratio of OTR 2002 population (63 million) to CA 2002 population (35 million) yielding approximately 49.5 tons per day in the OTR (18,068 tons per year).

CONTROL MEASURE SUMMARY FOR
Glass/Fiberglass Furnaces

Control Measure Summary:	**Emissions (tons/year) in Ozone Transport Region**	
2002 existing measure: NSR; PSD; State RACT.	**NOx** 2002 Base:	 18,840
Candidate measure: Use of oxyfiring or other methods to meet recommended emission limits. *Emission Reductions*: source specific, varies from 0-85% depending upon 2002 base rates. *Control Cost*: $ 924 to 2,232 per ton *Timing of Implementation*: 01/01/09 *Implementation Area*: OTR	**NOx** 2009 projected: Reduction at full implementation: Remaining after full implementation:	 21,893 -13,474 8,419

Control Measure Recommendation: Develop a control strategy that requires implementation of an "oxyfiring" program for each furnace at the next furnace rebuild. Alternatively, states may allow manufacturers to propose compliance methods based on California's San Joaquin Valley Rule 4354 which allows a mix of control options to meet specified emission limits. Prior to furnace rebuild, owners/operators may be allowed, by the state, to meet emissions limits by purchasing a state specified number of NOx allowances. Continuous emission monitoring systems would be used to determine emissions. This Measure should be modeled at 85% reduction.

Brief Rationale for Recommended Strategy: Oxyfiring is best implemented, and provides the most effective NOx emission reductions, with a complete furnace rebuild. This strategy not only reduces NOx emissions by as much as 85 percent, but reduces energy consumption, increases production rates by 10-15%, and improves glass quality by reducing defects. Oxyfiring is demonstrated technology and has penetrated into all segments of the glass industry.

REFERENCES

European Commission, Integrated Pollution Prevention and Control (IPPC) Bureau. *Reference Document on Best Available Techniques in the Glass Manufacturing Industry*. December 2001. This document reports 75 to 85% reduction in NOx and emission rates of 1.25 to 4.1 lbs NOx/ton. The cost effectiveness was determined to be $1,254 to $2,542 depending on the size of the furnace.

U.S. EPA *Alternative Control Techniques Document – NOx Emissions from Glass Manufacturing*, EPA-453/R-94-037, June 1994. Oxyfiring reduction of 85%, cost-effectiveness of $2,150 to $5,300.

Emission rates based on San Joaquin Valley Rule 4354

Type of Furnace	Block 24-hour Average	Rolling 30-day average
Container Glass	4.0 pounds of NOx per ton of glass pulled	4.0 pounds of NOx per ton of glass pulled
Fiberglass	4.0 pounds of NOx per ton of glass pulled	4.0 pounds of NOx per ton of glass pulled
Flat Glass	9.2 pounds of NOx per ton of glass pulled	7.0 pounds of NOx per ton of glass pulled

CONTROL MEASURE SUMMARY FOR

Industrial, Commercial, Institutional (ICI) Boilers – Jointly processed with MANE-VU

Addendum to OTC Resolution 06-02 Guidelines for ICI Boilers

ICI Boiler Size (mmBtu/hr)	Control Strategy/ Compliance Option	NOx Control Measure
5-25		Annual Boiler Tune-Up
25-100	Option #1	Natural Gas: 0.05 lb NOx/mmBtu #2 Fuel Oil: 0.08 lb NOx/mmBtu #4 or #6 Fuel Oil: 0.20 lb NOx/mmBtu Coal: 0.30 lb NOx/mmBtu**
	Option #2	50% reduction in NOx emissions from uncontrolled baseline
	Option #3	Purchase current year CAIR NOx allowances equal to reducted needed to acheiv the required emission rates
100-250	Option #1	Natural Gas: 0.10 lb NOx/mmBtu #2 Fuel Oil: 0.20 lb NOx/mmBtu #4 or #6 Fuel Oil: 0.20 lb NOx/mmBtu Coal: Wall-fired 0.14 lb NOx/mm Btu Tangential 0.12 lb NOx/mm Btu Stoker 0.22 lb NOx/mm Btu Fluidized Bed 0.08 lb NOx/mm Btu
	Option #2	LNB/SNCR, LNB/FGR, SCR, or some combination of these controls in conjunction with Low NOx Burner technology
	Option #3	60% reduction in NOx emissions from uncontrolled baseline
	Option #4	Purchase current year CAIR NOx allowances equal to reducted needed to acheiv the required emission rates
>250	Option #1	Purchase current year CAIR NOx allowances equal to reducted needed to acheiv the required emission rates
	Option #2	Phase I – 2009 Emission rate equal to EGUs of similar size Phase II – 2012 Emission rate equal to EGUs of similar size

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings Fabric Printing

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Fabric Printing, Coating and Dyeing - 2002 existing measures: NSPS; PSD/NSR; State RACT rules in 1-hour non-attainment counties EPA CTG RACT limit: 2.9 lbs VOC/gal coating [0.35 kg/liter] (minus H_2O & exempt solvents) Applicability: Sources 3 lbs/hour, 15 lb/day or 10 tons/year uncontrolled emissions OTC state RACT limits: MD, NJ, NH = 2.9 lbs/gal coating MA = 4.8 lbs VOC/gal of solids applied (equivalent to 2.9 lbs/gal coating)	**VOC** Actual 2002:	(not available)
Fabric Printing, Coating and Dyeing - 2009 On-the-Books measures: MACT Std. - Subpart OOOO (68 FR 32172, 5/29/03) EPA MACT limits existing sources: Coating and printing operations - 0.12 kg HAP/liter solids Dyeing and finishing operations - 0.016 kg HAP/liter solids Dyeing operations only - 0.016 kg HAP/liter solids Finishing operations only - 0.0003 kg HAP/liter solids *Emission Reductions*: *Nationwide – 60% HAP reduction from 1997 baseline* *MACT Organic HAP control efficiency option: 97% for existing sources* *MACT Estimated VOC reduction 60% (Pechan Table)* *Control Cost*: *Nationwide –$14.5 million/yr for 4,100 tons/yr = $3,537/ton* *Timing of Implementation*: Compliance Date (existing) May 29, 2006 *Implementation Area*: Nationwide	**VOC** Actual 2002: OTB 2009: Reduction from OTB:	(not available)
Fabric Printing, Coating and Dyeing Candidate measure 1: Adopt More Stringent RACT regulations; lower applicability thresholds, extend geographic coverage *Measure ID: Permanent Total Enclosure* *Emission Reductions*: *Estimated VOC reduction 95-97% (Air Control Net 3.0 Table)* *Control Cost*: *$1,459-$1,565/ton* *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*: (1) 8-hr ozone nonattainment areas, (2) 8-hr ozone nonattainment areas plus adjacent counties, or (3) all counties	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings Large Appliances

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Large Appliances - 2002 existing measures: NSPS; PSD/NSR; State RACT rules in 1-hour non-attainment counties; EPA CTG RACT limit: 2.8 lbs VOC/gal coating [0.34 kg/liter] (minus H_2O & exempt solvents)	**VOC** Actual 2002:	(not available)
Large Appliances - 2009 On-the-Books measures: MACT Std. – Subpart NNNN (67 FR 48254, 7/23/02) EPA MACT limits <u>existing sources</u>: 0.13 kg HAP/liter solids *Emission Reductions*: *Nationwide – 45% HAP reduction from 1995 baseline* *MACT Organic HAP control efficiency option: xx% for existing sources* *Estimated VOC reduction: 0% (Pechan Table) - 60%??* *Control Cost*: *Nationwide – $1.63 million/yr for 1,190 tons/yr = $1,370/ton* *Timing of Implementation*: Compliance Date (existing) July 23, 2005 *Implementation Area*: Nationwide	**VOC** Actual 2002: OTB 2009: Reduction from OTB:	(not available)
Large Appliances Candidate measure 1: Adopt More Stringent RACT regulations (e.g., ICAC letter 2/16/2001); lower applicability thresholds, extend geographic coverage *Measure ID:* *ICAC Option 1 - Nationwide – 80% HAP reduction from 1995 baseline (Additional 250 tons/per HAP)* *ICAC Option 2 - Nationwide – 98% HAP reduction from 1995 baseline (Additional 1,190 tons/per HAP)* *Emission Reductions*: *Control Cost*: *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*: (1) 8-hr ozone nonattainment areas, (2) 8-hr ozone nonattainment areas plus adjacent counties, or (3) all counties	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation of: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings Metal Cans

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Metal Can - 2002 existing measures: NSPS; PSD/NSR; State RACT rules in 1-hour non-attainment counties; EPA CTG RACT limit: lbs VOC/gal coating (minus H_2O&exempt solvents) Sheet basecoat & over varnish 2.8 [0.34 kg/l] 2 and 3-piece can interior & 2-piece can 4.2 [0.50 kg/l] 3-piece can side-seam spray 5.5 [0.66 kg/l] End sealing compound 3.7 [0.44 kg/l] Applicability: 10 tons/year uncontrolled emissions OTC state RACT limits: MD, NJ, NH same limits as CTG; MA (4.5, 9.8, 21.8, 7.7 lbs/gallon of solids applied)	**VOC** Actual 2002:	(not available)
Metal Can - 2009 On-the-Books measures: MACT Std. – Subpart KKKK (68 FR 64432 , 11/13/03) EPA MACT limits existing sources: Sheet coating 0.03 kg HAP/l solids Body Coating 2-piece beverage cans 0.07 kg HAP/l solids 2-piece food cans 0.06 kg HAP/l solids 1-piece aerosol cans 0.12 kg HAP/l solids 3-piece can assembly Inside Spray 0.29 kg HAP/l solids Aseptic side seam strips on food cans 1.94 kg HAP/l solids Nonaseptic side seam strips on food cans 0.79 kg HAP/l solids Side seam strips on non-food cans 1.18 kg HAP/l solids Side seam strips on aerosol cans 1.46 kg HAP/l solids End sealing compound Aseptic end seal compounds 1.94 kg HAP/l solids Nonaseptic end seal compounds 0.00 kg HAP/l solids Repair spray coatings 2.06 kg HAP/l solids *Emission Reductions*: *Nationwide – 70% HAP reduction from 1997 baseline* *MACT Organic HAP control efficiency option: xx% for existing sources* *Estimated VOC reduction 70% (Pechan Table)* *Control Cost*: *Nationwide – $58.7 million/yr for 6,800 tons/yr = $8,632/ton* *Timing of Implementation*: Compliance Date (existing) Nov. 13, 2006 *Implementation Area*: Nationwide	**VOC** Actual 2002: OTB 2009: Reduction from OTB:	(not available)

Metal Can (Continued) Candidate measure 1: Adopt More Stringent RACT regulations; lower applicability thresholds, extend geographic coverage *Measure ID: Permanent Total Enclosure* *Emission Reductions*: *Estimated VOC reduction 95% (Air Control Net 3.0 Table)* *Control Cost*: *$7,947/ton* *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*: (1) 8-hr ozone nonattainment areas, (2) 8-hr ozone nonattainment areas plus adjacent counties, or (3) all counties.	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings Metal Coils

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Metal Coil - 2002 existing measures: NSPS; PSD/NSR; State RACT rules in 1-hour non-attainment counties; EPA CTG RACT limit: 2.6 lbs VOC/gal coating [0.31 kg/liter] (minus H_2O & exempt solvents) Applicability: Sources 10 tons/year uncontrolled emissions OTC state RACT limits: NH - same limits as CTG	**VOC** Actual 2002:	(not available)
Metal Coil – 2009 On-the-Books measures: MACT Std. – Subpart SSSS (67 FR 39794 , 6/10/02) EPA MACT limits existing sources: 0.046 kg HAP/liter solids *Emission Reductions*: *Nationwide – 53% HAP reduction from current levels?* *MACT Organic HAP control efficiency option: xx% for existing sources* *Estimated VOC reduction 53% (Pechan Table)* *Control Cost*: *Nationwide – $7.6 million/yr for 1,316 tons/yr = $5,775/ton* *Timing of Implementation*: Compliance Date (existing) June 10, 2005 *Implementation Area*: Nationwide	**VOC** Actual 2002: OTB 2009: Reduction from OTB:	(not available)
Metal Coil Candidate measure 1: Adopt More Stringent RACT regulations; lower applicability thresholds, extend geographic coverage *Measure ID:* *Emission Reductions*: *Control Cost*: *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*: (1) 8-hr ozone nonattainment areas, (2) 8-hr ozone nonattainment areas plus adjacent counties, or (3) all counties.	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings Metal Furniture

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Metal Furniture - 2002 existing measures: NSPS; PSD/NSR; State RACT rules in 1-hour non-attainment counties EPA CTG RACT limit: 3.0 lbs VOC/gal coating [0.36 kg/liter] (minus H_2O & exempt solvents) Applicability: Sources 10 tons/year uncontrolled emissions OTC state RACT limits: NH - same limits as CTG	**VOC** Actual 2002:	(not available)
Metal Furniture – 2009 On-the-Books measures: MACT Std. – Subpart RRRR (67 FR 28606 , 5/23/03) EPA MACT limits <u>existing sources</u>: 0.10 kg HAP/liter solids *Emission Reductions*: *Nationwide – 73% HAP reduction from 1997/1998 baseline* *MACT Organic HAP control efficiency option: xx% for existing sources* *Estimated VOC reduction 0% (Pechan Table)* *Control Cost*: *Nationwide – $14.8 million/yr for 16,300 tons/yr = $908/ton* *Timing of Implementation*: Compliance Date (existing) May 23, 2006 *Implementation Area*: Nationwide	**VOC** Actual 2002: OTB 2009: Reduction from OTB:	(not available)
Metal Furniture Candidate measure 1: Adopt More Stringent RACT regulations; lower applicability thresholds, extend geographic coverage *Measure ID: Permanent Total Enclosure* *Emission Reductions*: *Estimated VOC reduction 95% (Air Control Net 3.0 Table)* *Control Cost*: *$20,115/ton* *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*: (1) 8-hr ozone nonattainment areas, (2) 8-hr ozone nonattainment areas plus adjacent counties, or (3) all counties.	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings Miscellaneous Metal Parts

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Miscellaneous Metal Parts - 2002 existing measures: NSPS; PSD/NSR; State RACT rules in 1-hour non-attainment counties EPA CTG RACT limit: <u>lbs VOC/gal coating (minus H_2O&exempt solvents)</u> Clear or transparent top coat 4.3 [0.52 kg/l] Air dries Coatings 3.5 [0.42 kg/l] Coating used in extreme environmental conditions 3.5 [0.42 kg/l] All other coatings 3.0 [0.35 kg/l] Applicability: 10 tons/year uncontrolled emissions OTC state RACT limits: NH same limits as CTG	**VOC** Actual 2002:	(not available)
Miscellaneous Metal Parts – 2009 On-the Books measures: MACT Std. – Subpart MMMM (69 FR 130 , 1/2/04) EPA MACT limits <u>existing sources:</u> General use Coating 0.31 kg HAP/l solids High Performance Coating 3.30 kg HAP/l solids Rubber-to-Metal Coating 4.50 kg HAP/l solids Extreme Performance Fluoropolymer 1.5 kg HAP/l solids *Emission Reductions*: *Nationwide – 48% HAP reduction from 1997 baseline* *MACT Organic HAP control efficiency option: xx% for existing sources* *Estimated VOC reduction 0% (Pechan Table)* *Control Cost*: *Nationwide – $57.3 million/yr for 26,000 tons/yr = $2204/ton* *Timing of Implementation*: Compliance Date (existing) Jan. 2, 2007 *Implementation Area*: Nationwide	**VOC** Actual 2002: OTB 2009: Reduction from OTB:	(not available)
Miscellaneous Metal Parts Candidate measure 1: Adopt More Stringent RACT regulations; lower applicability thresholds, extend geographic coverage *Measure ID:* *Emission Reductions*: *Control Cost*: *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*:	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings Paper and Other Web

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Paper & Other Web - 2002 existing measures: NSPS; PSD/NSR; State RACT rules in 1-hour non-attainment counties EPA CTG RACT limit: 2.9 lbs VOC/gal coating [0.35 kg/liter] (minus H_2O & exempt solvents) Applicability: Sources 3 lbs/hour, 15 lb/day or 10 tons/year uncontrolled emissions OTC state RACT limits: MD, NJ, NH = 2.9 lbs/gal coating MA = 4.8 lbs VOC/gal of solids (equivalent to 2.9 lbs/gal coating)	**VOC** Actual 2002:	
Paper & Other Web – 2009 On-the-Books measures: MACT Std. – Subpart JJJJ (67 FR 72330 , 12/4/02) EPA MACT limits <u>existing sources</u>: 0.2 kg organic HAP/kg coating solids *Emission Reductions*: *Nationwide – 80% HAP reduction from current levels??* *MACT Organic HAP control efficiency option: 95% for existing sources* *Estimated VOC reduction 80% (Pechan Table)* *Control Cost*: *Nationwide – $64 million/yr for 34,500 tons/yr = $1,855/ton* *Timing of Implementation*: Compliance Date (existing) Dec. 5, 2005 *Implementation Area*: Nationwide	**VOC** Actual 2002: OTB 2009: Reduction from OTB:	(not available)
Paper & Other Web Candidate measure 1: Adopt More Stringent RACT regulations; lower applicability thresholds, extend geographic coverage *Measure ID:* *Emission Reductions*: *Control Cost*: *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*:	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings Plastic Parts

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Plastic Parts - 2002 existing measures: NSPS; PSD/NSR; State RACT rules in 1-hour non-attainment counties EPA CTG RACT limit: <u>lbs VOC/gal coating (minus H_2O&exempt solvents)</u> <u>Auto Interior</u> <u>Auto Exterior</u> High Bake Prime 3.8 [0.46 kg/l] -- High Bake Prime - Flexible -- 5.0 [0.60 kg/l] High Bake Prime – Nonflexible -- 4.5 [0.54 kg/l] High Bake Color 4.1 [0.49 kg/l] 4.6 [0.55 kg/l] Low Bake Prime 3.5 [0.42 kg/l] 5.5 [0.66 kg/l] Low Bake Color 3.5 [0.42 kg/l] 5.6 red or black Low Bake Color -- 4.5 all others Applicability: NH - 50 tons/year uncontrolled emissions OTC state RACT limits: NH - same limits as CTG	**VOC** Actual 2002:	(not available)
Plastic Parts - 2009 On-the Books measures: MACT Std. – Subpart PPPP (69 FR 20968 , 4/19/04) EPA MACT limits <u>existing sources</u>: General Use Coating - 0.16 kg HAP/kg <u>coating solids</u> Automotive Lamp Coating - 0.45 kg HAP/kg <u>coating solids</u> Thermoplastic Olefins - 0.26 kg HAP/kg <u>coating solids</u> New Assembled On-Road Vehicles - 1.34 kg HAP/kg <u>coating solids</u> *Emission Reductions*: *Nationwide – 80% HAP reduction from 1997 baseline* *Estimated VOC reduction 0% (Pechan Table)* *Control Cost*: *Nationwide – $10.9 million/yr for 7,560 tons/yr = $1,442/ton* *Timing of Implementation*: Compliance Date (existing) April 19, 2007 *Implementation Area*: Nationwide	**VOC** Actual 2002: OTB 2009: Reduction from OTB:	(not available)
Plastic Parts Candidate measure 1: Adopt More Stringent RACT regulations; lower applicability thresholds, extend geographic coverage *Measure ID:* *Emission Reductions*: *Control Cost*: *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*:	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings Wood Building Products

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Wood Building Products - 2002 existing measures: NSPS; PSD/NSR; State RACT rules in 1-hour non-attainment counties EPA CTG RACT limit: lbs VOC/gal coating (minus H_2O&exempt solvents)	**VOC** Actual 2002:	(not available)
Wood Building Products - 2009 On-the-Books measures: MACT Std. – Subpart QQQQ (68 FR 31746 , 5/28/03) EPA MACT limits existing sources: - kg HAP/liter of solids (lb HAP/gal solids) Doors, Windows & Misc. 0.231 (1.93) Flooring 0.093 (0.78) Interior Wall Paneling & Tileboard 0.183 (1.53) Other Interior Panels 0.020 (0.17) Exterior Siding & Primed Door Skins 0.007 (0.06) *Emission Reductions*: *Nationwide – 63% HAP reduction from 1997 baseline* *MACT Organic HAP control efficiency option: xx% for existing sources* *Estimated VOC reduction 63% (Pechan Table)* *Control Cost*: *Nationwide –$22.5 million/yr for 4,900 tons/yr = $4,592/ton* *Timing of Implementation*: Compliance Date (existing) May 28, 2006 *Implementation Area*: Nationwide	**VOC** Actual 2002: OTB 2009: Reduction from OTB:	(not available)
Wood Building Products Candidate measure 1: Adopt More Stringent RACT regulations; lower applicability thresholds, extend geographic coverage *Measure ID:* *Emission Reductions*: *Control Cost*: *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*:	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation of State/Workgroup Lead: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

CONTROL MEASURE SUMMARY FOR
Industrial Surface Coatings All Categories

Control Measure Summary: This category includes several source types: Fabric, Printing, Coating and Dyeing; Large Appliances; Metal Can coating, Metal Coil coating; Metal Furniture coating; Misc. Metal Parts coating; Paper and Other Web coating; Plastic Parts coating; & Wood Building Products coating	**Emissions (tons/year) in Ozone Transport Region**	
Industrial Surface Coatings Category Total - 2002 existing measures: NSPS: PSD/NSR; State RACT rules in 1-hour non-attainment counties	**Total VOC Point &Area** Actual 2002:	164,445
Industrial Surface Coatings Category Total - 2009 On-the-Books measures: MACT Stds. – Subpart OOOO (68 FR 32172, 5/29/03) Subpart NNNN (67 FR 48254, 7/23/02) Subpart KKKK (68 FR 64432 , 11/13/03) Subpart SSSS (67 FR 39794 , 6/10/02) Subpart RRRR (67 FR 28606 , 5/23/03) Subpart MMMM (69 FR 130 , 1/2/04) Subpart JJJJ (67 FR 72330 , 12/4/02) Subpart PPPP (69 FR 20968 , 4/19/04) Subpart QQQQ (68 FR 31746 , 5/28/03) *Emission Reductions*: *OTC Regional – x,xxx from 2002 baseline* *Control Cost*: *OTC Regional –$ xx.x million/yr for x,xxx tons/yr = $4,592/ton* *Timing of Implementation*: Compliance Dates (existing) 5/29/06; (existing) 7/23/05; (existing) 11/13/06; (existing) 6/10/05; (existing) 5/23/06; (existing) 1/2/07; (existing) 12/5/05; (existing) 4/19/07; (existing) 5/28/06 *Implementation Area*: Ozone Transport Region	**Total VOC** **Point & Area** Actual 2002: OTB 2009: Reduction from OTB: **MANE-VU 2002 Point*** **MANE-VU 2002 Area* (Ed Sabo's e-mail 01/06/06)**	164,445 -175,983 **-11,448** **24,931** **139,512** **From 10/04/05 draft emission inventory**
Industrial Surface Coatings Category Total Candidate measure 1: Adopt More Stringent RACT regulations; lower applicability thresholds, extend geographic coverage *Measure ID:* *Emission Reductions*: *Control Cost*: *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*:	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	(not available)
Policy Recommendation: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy: See additional discussion in briefing paper		

Background Information

Industrial surface coatings are used during the manufacture of a wide variety of products including: fabrics, paper, large appliances, metal cans, metal coils, metal furniture, metal parts, plastic parts, and wood building materials. Surface coating is the process by which paints, inks, varnishes, adhesives or other decorative or functional coatings are applied to a substrate (e.g., fabric, metal, wood, or plastic) to protect or decorate the substrate. Industrial surface coatings can be applied by brushing, rolling, spraying, dipping, flow coating, electro-coating, or combinations and variations of these methods. The process used to coat a particular product is dependent on the composition of the coating, the substrate to which the coating is applied and the intended end use of the final product. After a coating is applied, it is dried or cured either by conventional curing through the use of thermal drying ovens, or through the use of radiation. During conventional curing, heat from thermal ovens is used to evaporate the solvents and/or water trapped in the coating and release them into the atmosphere. Two types of radiation curing processes currently in use are ultraviolet (UV) curing and electron beam (EB) curing.

Emissions are released by the evaporation of the solvents used in the coatings and the evaporation of any additional solvents used to dilute (thin) the coating prior to application and for cleaning the coating equipment after use. Emissions from surface preparation and coating applications are a function of the VOC content of product used. Emissions are also a function of the type of coating process used (rolling, dipping, spraying, etc.) and the transfer efficiency of the process. Transfer efficiency is the percentage of the coating solids that are applied (e.g., sprayed) which actually adhere to the surface being coated. Emissions from cleaning vary with the type of cleanup and the housekeeping practices used.

Industrial surface coating is estimated to account for approximately 164,000 tons per year of VOC emissions in the Mid-Atlantic/Northeast Visibility Union (MANE-VU) region in 2002 from both point and area sources. It is important to consider two aspects regarding the accuracy of this emissions estimate when assessing this category for additional controls:

1) The MANE-VU VOC emissions inventory for the industrial surface coating category includes emissions from both point and area sources. While the 2002 VOC emissions inventory for the MANE-VU region indicates that VOC emission from area sources in this category are substantial, the area source part of the emissions inventory is highly uncertain and may be substantially overestimated. The method used to estimate area source VOC emissions relies heavily on employee emission factors and employment data. These emission factors are based on data collected by EPA in the 1980s and may not accurately portray the types of coatings, the type of coating equipment, or the type of control technology currently in use.

2) At least nine types of industrial surface coating point sources are already controlled due to state specific VOC RACT regulations or will soon be controlled prior to 2009 as a result of the recently promulgated Maximum Achievable Control Technology (MACT) standards. Since the MACT standards were designed to control air toxic emissions and not necessarily VOC emissions the effectiveness of the MACT standards for controlling VOC emissions will vary with the industrial surface coating subcategory (e.g., metal cans, wood building products, etc.) and the type of coating equipment and the type of solvents used in that subcategory.

Regulatory History

Industrial surface coating processes are currently subject to multiple state and federal regulations pursuant to Titles I and III of the Clean Air Act. Title I imposes Standards of Performance for New Stationary Sources (NSPS) on new and modified large stationary sources. In the early 1990s, EPA promulgated NSPSs for various types of industrial surface coating operations. These regulations applied to surface coating operations that were constructed or modified after effective dates specified in each NSPS. In general, surface coating operations constructed or modified after 1980 are subject to NSPS requirements. The NSPS generally established VOC emission rate limits that could be complied with using either compliant coatings or add-on capture and control equipment. For certain source categories the NSPS also set transfer efficiency requirements.

New and modified large stationary sources that increase their emissions can also be subject to the New Source Review (NSR) requirements of Title I. NSR requires a control technology review for large new plants and for modifications at existing plants that result in a significant increase in emissions, subjecting these sources to Best Available Control Technology (BACT) in attainment areas and Lowest Achievable Emission Rate (LAER) in nonattainment areas. BACT and LAER control requirements are updated over time to reflect improvements in control equipment and are reviewed on a case-by-case basis during state permitting process.

Criteria pollutants, which include VOCs, nitrogen oxides (NOx), sulfur dioxide (SO_2), fine particulate matter (PM_{fine}), carbon monoxide (CO) and lead (Pb), are also regulated by the State Implementation Plans (SIPs) required by Title I. SIPs set forth the states' strategies for achieving reductions of criteria pollutants for which the state is currently out of attainment. SIPs must include requirements that all major stationary sources located in nonattainment areas must install reasonably available control technology (RACT). RACT levels must be basedon the level of emissions reduction that can be reasonably achieved at a reasonable cost. The U.S. EPA has issued a series of Control Technology Guidelines (CTGs) and Alternative Control Technologies (ACT) documents to assist states in defining RACT for a number of industrial surface coating categories. For categories not covered by a CTG or ACT document, state regulations require that a case-by-case RACT determination be made. Most of the EPA's CTGs and ACT documents for the industrial surface coating category were developed prior to 1990. While specific RACT requirements will vary from state to state, some OTC states have already adopted RACT regulations that are more stringent than the CTG/ACT requirements.

Policy Recommendation

As can be noted from the background information, the regulatory history, and the information contained in summary tables, the industrial surface coatings category includes at least nine different major source types and multiple processes for each source type with regulations and emissions limits that vary not only by major source type, but also by individual process and individual product. In addition, the industrial surface coatings category is already subject to a variety of regulations (NSPS; PSD/NSR, state RACT, MACT, state specific rules on hazardous air pollutants) that were adopted to achieve different goals. Some regulations (e.g., RACT) were designed to reduce VOC emissions. Other regulations (e.g., MACT) were designed to reduce emissions of hazardous air pollutants but have the side benefit of reducing VOC emissions as well.

Analysis of the potential benefits and costs of adopting additional VOC control measures, Beyond On-The-Way (BOTW) measures) is further complicated by the following:

1) Uncertainty as to the accuracy of the current (2002) MANE-VU VOC emissions inventory for the industrial surface coatings category;
2) Difference in current VOC RACT limits among the OTC states;
3) Difference in the estimates of the potential VOC reductions from MACT standards; and
4) Difference in the source size and geographic area covered by a specific regulation.

The most recent version of the (2002) MANE-VU VOC emissions inventory for the MANE-VU region estimates total VOC emissions from the industrial surface coatings category to be 164, 445 tons (24,931 tons of VOC from point sources and 139,512 tons from area sources). Further investigation into the amount of VOC emissions from area sources will most likely reveal that these VOC emissions are substantially overestimated due in part to the emission factors and employment data used and in part to the cutpoints used by various states for distinguishing a point source from an area source.

A quick sampling of the current VOC RACT limits in the OTC states reveals differences not only in the limits for existing sources (lbs. VOC per gallon of coating minus water and exempt solvents), but also in the size of source to which these limits apply.

Several complications arise when trying to calculate the potential VOC reductions from a particular MACT standard including the following:

1) Not all toxics regulated under the MACT are VOCs;
2) MACT standards are expressed as kg HAP/liter of solids or lbs. HAP/gallon of solids not lbs. VOC/gallon of coating minus water and exempt solvent so the MACT limit applies to all HAPs not just VOCs; and
3) The specific types of processes and coatings regulated under the MACT standards are different than the types of processes and coatings regulated under the RACT standards.

These complications have lead to widely varying estimates of the potential additional VOC reductions from the application of a particular MACT requirement (from 0% to as much as 80% VOC reduction nationwide).

RACT standards and MACT standards apply to sources located in different geographic areas throughout the Ozone Transport Region. For some OTC states RACT standards apply only to sources located in 1-hour ozone nonattainment counties while in other OTC states RACT standards apply statewide. MACT standards are applicable nationwide and only to major HAP sources (10 tons/year of individual HAP or 25 tons/year of combined HAPs).

Given all of these uncertainties the following options are available:

1) OTC states that currently have higher VOC RACT limits than the EPA CTG/ACT VOC RACT limits can adopt more stringent RACT regulations;
2) OTC states can extend the geographic coverage for RACT limits to statewide;
3) OTC states can lower the RACT applicability thresholds
4) OTC states can adopt more stringent control requirements for specific industrial surface coating categories (e.g., permanent total enclosures for metal can coating processes).

Policy recommendations:

1) Due to uncertainty in current MANE-VU VOC emissions inventory for this category, develop an improved, state specific VOC emissions inventory for point and area sources for each subcategory of industrial surface coatings before requiring additional controls beyond MACT.

CONTROL MEASURE SUMMARY FOR
Lime Kilns

Control Measure Summary: Good combustion practices and kiln operation for Lime Kilns. These kilns are used for the calcination of limestone. Lime kilns are also often associated with paper mills.	**Emissions (tons/year) in Ozone Transport Region**	
2002 existing measure: NSR; PSD; State RACT.	**NOx**	
Emission Reductions:		
Control Cost:	Uncontrolled:	4,649
Timing of Implementation:	2002 Reduction:	0
Implementation Area: OTR	2002 Base:	4,649
Candidate measure: Good combustion practices and kiln operation	**NOx**	
Emission Reductions: Under Evaluation		
Control Cost: less than $2,000 per ton	2009 Base including growth:	5,228
Timing of Implementation: 01/01/09	2009 Reduction:	TBD
Implementation Area: OTR	2009 Remaining:	

Policy Recommendation: Final recommendation not made as of June, 2006.

Recommended Strategy: See additional discussion in briefing paper

REFERENCES:

European Commission, Integrated Pollution Prevention and Control (IPPC) Bureau. *Reference Document on Best Available Techniques in the Cement and Lime Manufacturing Industries*. December 2001. “The direct transfer of low-NOx burner technology from cement kilns to lime kilns is not straightforward. In cement kilns, flame temperatures are higher and low-NOx burners have been developed for reducing high initial levels of ‘thermal NOx’. In most lime kilns the levels of NOx are lower and the ‘thermal NOx’ is probably less important.”

Northeast States for Coordinated Air Use Management. *Assessment of Control Technology Options for BART-Eligible Sources: Steam Electric Boilers, Industrial Boilers, Cement Plants, and Paper and Pulp Facilities*. March 2005. “Due to the design of the lime kiln, SNCRs and SCRs are not viable NOx reduction techniques. Installing low-NOx burners is also not a practical NOx reduction technique according to a BACT analysis conducted on a new lime kiln in 1997…combustion modification such as decreasing excess air is the best way to reduce NOx emissions”.

CONTROL MEASURE SUMMARY FOR
Municipal Waste Combustiors

(Only NOx reductions are evaluated under this strategy)

Control Measure Summary	**Emissions (tons/year) in Ozone Transport Region**	
2002 existing measure: Federal performance standards and emissions guidelines for large MWCs (40 CFR 60 Subparts Cb and Eb). No control technology is mandated to meet the emissions limitations. EPA approved state trading programs for NOx compliance are allowed as is facility-wide averaging for NOx compliance. *Emission Reductions*: 19,000 Mg NOx/yr nationally (increment over 1991 40 CFR 60 Subpart Ca standards). *Control Cost*: $7.2 per Mg municipal solid waste combusted. *Timing of Implementation*: Compliance required December 19, 2000. *Implementation Area*: Nationwide.	**NOx** 2002 Base:	26,139
	SO2: **2002 Base**	3,865
	VOC: **2002 Base**	473
Implement Federal Rules: *Measure ID:* *Emission Reductions*: Varies per state depending on the number of MWC units, incinerator technology and chosen emissions limitations. In Connecticut, this measure resulted in NOx emissions reductions of 1.6 tons/summer day and 592 tons/year. *Control Cost*: $0 to approximately $1,500/MMBtu/hr depending on whether SNCR was installed in response to the federal emissions guidelines and whether SNCR is feasible. *Timing of Implementation*: Assuming timely adoption of state rule amendments, compliance with emissions limitations could be required by May 1, 2009. *Implementation Area*: Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York and Pennsylvania report operating MWC units (assuming state NOx emissions limitations are at the level of the federal emissions guidelines).	**NOx** 2009 Reduction: 2009 Remaining:	 -3,610 22,529
	SO2	***
	VOC	***
Policy Recommendation of State/Workgroup Lead: Individual states with operating MWCs should evaluate the possible reduction of state NOx emissions limitations to produce creditable emissions reductions. At the regional level, this strategy should not be emphasized as it is state-specific in nature (depending on the MWC population, current control level and current state standards); does not require regional implementation to maximize its effectiveness; emissions from MWCs are a minor portion of the regional inventory given MACT-based standards required under Section 129 of the Clean Air Act; and EPA has proposed more stringent NOx emission limits for MWCs that states will be required to adopt and implement as of April 2009.		
Recommended Strategy: MWCs are subject to stringent MACT emissions standards, including standards for NOx, under Section 129 of the Clean Air Act. To comply with these MACT standards, many MWC owners and operators installed control technologies, including SNCR, to comply with the federal deadline of December 19, 2000. Many MWCs may be operated to reduce emissions to a level below the current federal standards. For example, Connecticut includes a state NOx emission reduction credit (ERC) trading program in its MWC rule. Recognizing that the "excess emissions" produced in Connecticut's MWC NOx ERC trading program could yield creditable emissions reductions if the required NOx emissions limits were reduced, in October 2000, the Department amended the state MWC rule to require the MWC owners and operators to meet more stringent NOx emissions limits as of May 1, 2003. The resulting emissions reductions of 1.62 tons of NOx per summer day (248 tons per ozone season) were used for compliance with the "shortfall" emission reduction obligation		

needed for EPA approval of the attainment demonstration for the 1-hour ozone national ambient air quality standard.

Other states in the OTC region have operating MWC units that now comply with MACT-based state emissions limitations. Many MWC units now operate with SNCR to control NOx emissions. For MWC units that do not now have SNCR, SNCR is likely a feasible RACT measure capable of reducing NOx emissions below the state limits. Thus, the reduction of the state MWC NOx limits may produce creditable NOx emissions reductions. Furthermore, since MWCs are not subject to the Clean Air Interstate Rule (CAIR) and may not participate in a CAIR NOx trading program, reduction of state MWC NOx emissions limitations could be considered an equity measure that places MWC owners in a position similar to the owners of large electric generating units subject to CAIR. However, the amount of creditable emissions reductions a state may obtain from this strategy is limited given EPA's December 19, 2005 proposal of reduced emissions limitations for MWCs.

BACKGROUND INFORMATION

In December 1995, EPA adopted new source performance standards (NSPS) (40 CFR 60 subpart Eb) and emission guidelines (subpart Cb) for MWC units with a combustion capacity greater than 250 tons per day. Both the NSPS and emission guidelines require compliance with emission limitations for nine pollutants including NOx that reflect the performance of maximum achievable control technology (MACT). The emission guidelines required compliance by December 2000 for all existing MWCs, while the NSPS apply to new MWCs. On December 19, 2005, EPA proposed revisions to the emissions guidelines to reflect the levels of performance achieved due to the installation of control equipment (70 FR 75348). This proposal includes reduced NOx emissions limitations that states will be required to adopt and implement by April 2009, if the proposal is finalized. Selective non-catalytic reduction (SNCR) is considered MACT for NOx under both the 1995 guidelines and the 2005 proposal.

Connecticut's MWC regulation, section 22a-174-38 of the Regulations of Connecticut State Agencies (R.C.S.A.) (Attachment A), was adopted in June 1999 with NOx emissions limits equivalent to the federal emissions guidelines (Phase I NOx limits). Owners and operators of the state's 15 MWC units were required to comply with the emissions limits no later than December 19, 2000. R.C.S.A. section 22a-174-38 was amended in October 2000 to include more stringent NOx emissions limits (Phase II NOx limits), for which compliance was required no later than May 1, 2003. The following NOx emissions reductions, relative to emissions levels under the Phase I NOx limits, are attributed to the Phase II NOx limits in Connecticut:

- 592 tons per year;
- 248 tons per ozone season; and
- 1.62 tons per day during the ozone season.[1]

EPA's December 19, 2005 proposal to update the 1995 emissions standards will substantially reduce the ability of other states to achieve the same level of emissions reductions that Connecticut achieved by implementing this measure in 2003.

Add-on NOx Control

The number of NOx-reduction technologies for MWCs are limited as these units use a heterogeneous, wet fuel; are less thermally efficient than fossil fuel-fired boilers of comparable heat input; and require larger amounts of excess air and less densely-packed heat recovery systems. Low-NOx burners, fuel switching and load curtailment are not possible control options.

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[1] Assumes 100% rule effectiveness, which is reasonable given that the MWCs are operated with continuous emissions monitoring.

The only generally applicable and feasible add-on control technology for reducing NOx emissions from MWCs is SNCR.[2] SNCR is a chemical process for removing NOx from flue gas. In the SNCR process, a reagent, typically liquid urea or anhydrous gaseous ammonia is injected within a boiler or in ducts in a region where the temperature is between 900 and 1100 degrees Celsius. The reaction converts NOx to nitrogen gas and water vapor. SNCR performance depends on factors specific to each type of combustion equipment, including flue gas temperature, residence time for the reagent and flue gas, amount of reagent injected, reagent distribution, uncontrolled NOx level and carbon monoxide and oxygen concentrations.

Some disadvantages arise from the use of SNCR including: the high operating temperatures required; ineffectiveness at high temperatures with low concentrations of NOx; the need to accommodate enough residence time to complete the chemical reaction at high temperatures; and undesirable excess ammonia and urea emissions ("ammonia slip") that arise from an incomplete chemical reaction (Thermal Energy International, 2000).

All of Connecticut's large MWC units are equipped with SNCR, including nine mass burn/waterwall units and three refuse-derived fuel units. Two tire-fired units subject to the state MWC rule also operate with SNCR.[3] Similarly, all of New Jersey's large MWC units are equipped with SCR to meet NOx emissions limitations based on the federal emissions guidelines.

Cost

The capital cost of installing SNCR on a MWC unit is approximately $1,500 MMBtu/hr (see, e.g., Institute of Clean Air Companies, 2000).[4] Most of the cost of using SNCR is in operating expenses (Institute of Clean Air Companies, 2000), which EPA estimates as falling between 680 and 1,200 $/MMBtu (1993 dollars). Thus, SNCR is well suited for seasonal control in that it may provide significant reductions in NOx emissions but incurs little cost when the system is not in use. EPA has assigned an ozone season cost effectiveness to SNCR operated on MWC units of $2,140 per ton of NOx reduced (1990 dollars)(EPA, 1999, Table 16).

Emissions reductions

In Connecticut, MWC facility owners report emissions reductions of 25 to 50% from the operation of SNCR; a typical reduction of 35-40% could be assumed from the installation and operation of SNCR/ammonia injection to MWC units of similar size and type. Other combustors of varying technologies and capacities but with similar baseline NOx emissions have reported reductions ranging from 35 - 75% from the operation of urea-based SNCR (Appendix 1, Institute of Clean Air Companies, 2000). EPA assigns a typical 45% emission reduction to the effectiveness of SNCR at MWCs (EPA, 1999, Table 16).

REFERENCES

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[2] The use of SCR to control NOx emissions from MWCs in North American is limited to very few units (see, e.g., http://www.region.peel.on.ca/pw/waste/facilities/algonquin-power.htm) because the nature of municipal solid waste requires huge SCR reactor sizes and significant actions to prevent catalyst poisoning. These factors, combined with the relatively small size of most MWCs, makes the use of SCR prohibitively expensive (EPA 2005, comment by IWSA).

[3] Connecticut also has three mass burn refractory units that are classified as small MWCs and do not use SNCR.

[4] For comparison, EPA places the capital cost of SNCR between 1,600 and 3,300 $/MMBtu (1993 dollars). In 2002, the 3-unit facility (140 MMBTU/hr per unit) owned by the Connecticut Resources Recovery Authority in Bridgeport, Connecticut installed SNCR on all three units at a capital cost of $2.1 million.

Institute of Clean Air Companies. May 2000. *Selective Non-Catalytic Reduction (SNCR) for Controlling NOx Emissions*. http://www.fueltechnv.com/pdf/TPP-534.pdf

Thermal Energy International Inc. 2000. *Thermal THERMALONOx Competitive Advantages.* http://www.thermalenergy.com/solutions/solutions.html

U.S. Environmental Protection Agency. November 1999. Nitrogen Oxides (NOx), *Why and How They are Controlled*. Clean Air Technology Center: EPA 456/F-99-006R.

U.S. Environmental Protection Agency. April 2005. *Corrected Response to Significant Public Comments on the Proposed Clean Air Interstate Rule*. Comment of IWSA.

U.S. Environmental Protection Agency. December 19, 2005. *Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Large Municipal Waste Combustors; Proposed Rule*. 70 FR 75348.

CONTROL MEASURE SUMMARY FOR
Printing and Graphic Arts

Control Measure Summary: This category includes categories of both heat set and non-heat set operations. It includes lithographic, gravure, flexographic and screen printing. It includes both point sources and area sources.	**Emissions (tons/year) in Ozone Transport Region**	
2002 existing measures: RACT, BACT, NSPS	**VOC Point** Actual 2002 **VOC Area** Actual 2002:	 5,501 31,738
2009 On-the-Books measures: MACT Std. - Subpart KK Publication rotogravure – limit organic HAP emissions to no more than 8% of volatile matter used each month. Either reformulation or 92% capture and control efficiency. Product and packaging rotogravure and wide-web flexo – limit organic HAP emissions to no more than 5% of volatile matter used each month. Either reformulation or 95% capture and control efficiency. *Emission Reductions*: *Control Cost*: *Timing of Implementation*: Compliance Date (existing) December 5, 2005 *Implementation Area*: Nationwide	**VOC Point** Actual 2002: 2009 Reduction: 2009 Remaining: **VOC Point** Actual 2002: 2009 Reduction: 2009 Remaining:	 5,501 -121 5,380 31,738 -0 31,738
Candidate measure: Adopt the requirements of SCAQMD rule 1130 and 1130.1 *Emission Reductions*: Under evaluation *Control Cost*: Under evaluation *Timing of Implementation*: Assuming 2007 or 2008 effective date of rule, emission reductions in 2009 or 2010 *Implementation Area*: OTR	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	Under review
Candidate measure: Same option as CM1, except potentially require that publication, packaging and product rotogravure and wide web flexo printers that are equipped with capture and control equipment, meet the capture and control efficiency requirement in the MACT standard for VOC reductions (this would apply to facilities not major for HAPs). *Implementation Area:* OTR	**VOC** OTB 2009: BOTW 2009: Reduction from BOTW:	Under review
Candidate measure: Adopt September 2006 CTGs. In September 2006, EPA determined that control technique guideline (CTG) documents will be substantially as effective as national regulations in reducing VOC emissions in ozone nonattainment areas from the following Group II product categories: lithographic printing materials, letterpress printing materials, and flexible packaging printing materials *Implementation Area:* OTR		Under Review
Policy Recommendation: Final recommendation not made as of June, 2006.		
Brief Rationale for Recommended Strategy:		

CONTROL MEASURE SUMMARY FOR
Portable Fuel Containers

Control Measure Summary: Portable Fuel Containers This control measure establishes design and manufacturing specifications for portable fuel containers (PFCs) based on the California Air Resources Board (CARB) rules. PFCs are used to refuel residential and commercial equipment and vehicles. PFCs are used to refuel a broad range of small off-road engines and other equipment (e.g., lawnmowers, chainsaws, personal watercraft, motorcycles, etc.).	**VOC Emissions in Ozone Transport Region**	
2002 Existing Measure: None	2002 Annual: 2002 Summer:	99,919 tpy 315.3 tpd
2009 On-the-Books Measure: Adopt the OTC Model Rule for PFCs, which is based on the 2000 CARB rule for PFCs. *Emission Reductions*: Based on a CE=65%, RE=100%, RP=based on the number of years the rule has been in place based on the assumed 10-yr turnover of the sale of the cans, and Total control = 65% when fully implemented after 10 years. *Control Cost*: $581 per ton *Timing of Implementation*: State specific with a 10% per year turnover, full reductions are achieved after 10 years. CARB, and the EPA, have estimated a 5 year turnover for the cans, but the OTC used a more conservative 10 year turnover in calculating emission reductions. *Implementation Area*: OTR	**Annual:** 2009 Reduction: 2009 Remaining: **Summer:** 2009 Reduction: 2009 Remaining:	 33,055 tpy 66,864 tpy 107.1 tpd 208.2 tpd
2009 On-the-Way Measure: Proposed Federal HAP Mobile Source Reg (Feb 28, 2006) Rule – This rule proposes to regulate PFCs similar to CARBs 2006 rule amendments and will regulate permeability to 0.3 grams of HC per gallon per day (2001 OTC Model Rule has 0.4 grams per gallon per day). It does not contain CARBs amendments regarding kerosene containers and utility jugs. *Emission Reductions*: EPA estimates about a 9% reduction nationwide in 2009 and a 61% reduction when fully implemented after 5 years. *Control Cost*: $180 per ton without fuel savings; over the long term, fuel savings outweigh costs. *Timing of Implementation*: Jan.1, 2009 effective date of rule and 20% per year turnover, full reductions are achieved after 5 years, in 2014. *Implementation Area*: Nationwide	**Annual:** 2009 Reduction: 2009 Remaining: **Summer:** 2009 Reduction: 2009 Remaining:	 negligible 66,864 tpy negligible 208.2 tpd
Candidate measure: Adopt the CARB 2006 amendments broadening PFC definition to include kerosene containers and utility jugs, increasing the permeability requirement from 0.3 grams of hydrocarbons per gallon per day to 0.4 grams of hydrocarbons per gallon per day, and other changes needed to make the OTC Model Rule consistent with CARB *Emission Reductions*: CARB estimates their amendments are expected to reduce ROG emissions by 58% after full penetration into the marketplace, assumed to be 5 years. *Control Cost*: CARB estimate is $800 to $1,400 per ton reduced *Timing of Implementation*: State specific with a 10% per year turnover, full reductions are achieved after 10 years *Implementation Area:* OTR	**Annual:** 2009 Base: 2009 Reduction: 2009 Remaining: **Summer:** 2009 Base: 2009 Reduction: 2009 Remaining:	 66,864 tpy 4,152 tpy 62,712 tpy 208.2 tpd 12.8 tpd 195.4 tpd

Summary of Candidate Measure:
The California Air Resources Board (CARB) 2000 PFC regulation establishes design and manufacturing specifications for PFCs. PFC emissions are calculated by accounting for emissions from five different components related to gas container use: permeation, diurnal, transport-spillage, refueling spillage and refueling vapor displacement emissions. The permeation, diurnal emissions (associated with storage) and transport-spillage emissions are included in the area source inventory. The equipment refueling spillage and refueling vapor displacement emissions are calculated from the non-road model and are included in the non-road inventory. After four years of implementation and a comprehensive assessment of the program, CARB staff identified some problems with the rule related to consumer acceptance and reducing anticipated emission reductions. Their 2006 amendments address these issues, as well as expanding on the regulation to increase emission reductions. The amendments include the following:

1. Eliminate the requirement for an auto shutoff.
2. Eliminate fuel flow rate and fill level standards.
3. Eliminate one opening standard.
4. Reduce pressure standard from 10 psig to 5 psig.
5. Establish a certification program for PFCs.
6. Expand the definition of a PFC to include utility jugs and kerosene containers. CARB staff determined that consumers were using these containers for gasoline.
7. Change permeability standard from 0.4 grams ROG /gallon-day to 0.3 grams/gallon-day.
8. Combine the evaporation and permeation standards into a new diurnal standard to simplify certification and compliance testing.
9. Adopt new PFC test procedures.
10. Include a voluntary Consumer Acceptance Program to support and encourage user-friendly PFC designs (i.e., allowing the use of the ARB Star Rating system to clearly identify superior designs as determined by users).

While ARB staff does not expect these changes to affect the cost of gasoline cans, the price of kerosene cans could rise to as much as $8.50 per container once the regulations are implemented. CARB also estimates the cost-effectiveness to be between $0.40 to $0.70 per pound.

Recommended Strategy: CARB, through their comprehensive history of research and multiple product surveys, have the best technical data available to create rules to regulate portable fuel containers. Most portable fuel container manufacturers market their products nationally, therefore many will be selling the new products nationally after they have produced cans than conform with the CARB rules. The CARB rule contains some revisions to their original rule to ease consumer acceptance of the cans, for states that have adopted the original OTC model rule. In addition the CARB rule amendments regulate kerosene cans and utility jugs, which the Federal rule proposal does not.

References:

2009 On-the-Books Measure (OTC Model Rule):

E.H. Pechan & Associates, Inc., *Control Measure Development Support Analysis of Ozone Transport Commission Model Rules*, March 31, 2001. Much of the analysis in this report was based on CARB's analysis for CARB's original 1999 PFC rule , which estimated a 75% reduction that would be fully achieved after 5 years (CARB's assumed life cycle for PFCs). The OTC used a more conservative 10-year turnover rate in its analysis. Table II-5 of the Pechan report shows the cost of compliance to be $581/ton.

2009 On-the-Way Measure (Proposed 2/28/06 Federal Rule):

U.S. EPA Office of Transportation and Air Quality. *Estimating Emissions Associated with Portable Fuel Containers (PFCs), Draft Report*, EPA420-D-06-003, February 2006.

U.S. EPA Office of Transportation and Air Quality. *Draft Regulatory Impact Analysis: Control of Hazardous Air Pollutants from Mobile Sources*, EPA420-D-06-004, February 2006.

Candidate Measure (CARB 2006 Amendments):

California Air Resources Board. *Final Statement of Reasons for Rulemaking, Including Summary of Comments and Agency Response: PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE PORTABLE FUEL CONTAINER REGULATIONS.* September 15, 2005.

California Air Resources Board. *Initial Statement of Reasons for Proposed Amendments to the Portable Fuel Container Regulations.* July 29, 2005. Table 5.1 shows the cost-effectiveness of the proposed amendments to be $0.40 to $0.70 per pound ($800 to $1,400 per ton)

CONTROL MEASURE SUMMARY FOR
Regional Fuel

Control Measure Summary: The OTR proposes a common fuel standard for the OTR states that does not require MTBE or Ethanol, but exhibits Environmentally Beneficial Combustion Properties.	**NOx Emissions (tons/summer day) in OTR**	
2002 existing measure: Federal program in the CAA requiring RFG in certain non-attainment areas and allowing other states with non-attainment areas to opt-in. All but two states in the OTR are participating, in whole or in part, with the federal program, however nearly 1/3 of the gasoline sold in the OTR is not RFG.		
Candidate measure: *Measure ID:* OTR-wide Regional Fuel *Emission Reductions*: *Control Cost*: unknown at this time *Timing of Implementation*: *Implementation Area*: All states in the OTR	NOx VOC	~ 4.8 tpsd ~ 139.4 tpsd
Policy Recommendation: Continue to examine the potential for a regional fuel, keeping in mind that some states like PA may have statutory/legislative constraints.		
Brief Rationale for Recommended Strategy: The Energy Policy Act of 2005 provides the opportunity for the OTR to achieve a single clean-burning gasoline without MTBE, as it also eliminates the oxygen content requirement for RFG. The authority provided in Energy Act is consistent with what states promoted through the long debate over MTBE/ethanol/RFG. Approximately one-third of the gasoline currently sold in the OTR is not RFG; most is conventional gasoline. The new authority plus the potential for emission reductions from the amount of non-RFG sold in the OTR provides an opportunity for additional emission reductions in the region as well as for a reduced number of fuels, and possibly a single fuel, to be utilized throughout the region.		

Appendix D – VOC Emissions by County for 2002 and 2009

Table D-1 Adhesives and Sealants VOC Area Source Emission Summary for 2002 and 2009 by County
Table D-2 Adhesives and Sealants VOC Point Source Emission Summary for 2002 and 2009 by County
Table D-3 Cutback and Emulsified Asphalt Paving VOC Area Source Emission Summary for 2002 and 2009 by County
Table D-4 Consumer Products VOC Area Source Emission Summary for 2002 and 2009 by County
Table D-5 Portable Fuel Containers VOC Area Source Emission Summary for 2002 and 2009 by County
Table D-6 Portable Fuel Containers VOC Nonroad Source Emission Summary for 2002 and 2009 by State
Table D-7 Reformulated Gasoline Emission Summary by State

Due to their large size, these tables are being transmitted electronically in the spreadsheet named Appendix_D_VOC_2009.xls. There are separate tabs for each of the tables listed above.

Appendix E – NOx Emissions by County for 2002 and 2009

Table E-1 Reformulated Gasoline Emission Summary by State
Table E-2 Chip Reflash Emission Summary by State
Table E-3 Asphalt Production Plant NOx Emission Summary for 2002 and 2009 by County
Table E-4 Cement Kiln NOx Emission Summary for 2002 and 2009 by County
Table E-5 Glass and Fiberglass Furnace NOx Emission Summary for 2002 and 2009 by County
Table E-6 ICI Boiler NOx Area Source Emission Summary for 2002 and 2009 by State
Table E-7 ICI Boiler NOx Point Source Emission Summary for 2002 and 2009 by State

Due to their large size, these tables are being transmitted electronically in the spreadsheet named Appendix_E_NOx_2009.xls. There are separate tabs for each of the tables listed above.

Appendix F – State ICI Boiler Regulations

Due to their large size, these tables are being transmitted electronically in the spreadsheet named Appendix F State ICI Regs.xls. There are separate tabs for each state. In the final report, these tables will be provided in electronic format

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Part II

Environmental Protection Agency

40 CFR Parts 60 and 63

National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 60 and 63

[EPA–HQ–OAR–2011–0817; FRL–9758–6]

RIN 2060–AQ93

National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: On July 18, 2012, the EPA proposed amendments to the National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry and the Standards of Performance for Portland Cement Plants. This final action amends the national emission standards for hazardous air pollutants for the Portland cement industry. The EPA is also promulgating amendments with respect to issues on which it granted reconsideration on May 17, 2011. In addition, the EPA is amending the new source performance standard for particulate matter. These amendments promote flexibility, reduce costs, ease compliance and preserve health benefits. The amendments also address the remand of the national emission standards for hazardous air pollutants for the Portland cement industry by the United States Court of Appeals for the District of Columbia Circuit on December 9, 2011. Finally, the EPA is setting the date for compliance with the existing source national emission standards for hazardous air pollutants to be September 9, 2015.

DATES: This final rule is effective on February 12, 2013. The EPA is setting the compliance date for existing open clinker storage piles to be February 12, 2014.

ADDRESSES: The EPA has established a docket for this action under Docket ID No. EPA–HQ–OAR–2011–0817. All documents in the docket are listed in the *http://www.regulations.gov* Web site. Although listed in the index, some information is not publicly available, for example, confidential business information or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the EPA Docket Center, EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Docket Center is (202) 566–1742.

FOR FURTHER INFORMATION CONTACT: For questions about this final action, contact Ms. Sharon Nizich, Office of Air Quality Planning and Standards; Sector Policies and Programs Division, Minerals and Manufacturing Group (D243–04); Environmental Protection Agency; Research Triangle Park, NC 27111; telephone number: (919) 541–2825; fax number: (919) 541–5450; email address: *nizich.sharon@epa.gov.* For information about the applicability of the NESHAP or NSPS contact Mr. Patrick Yellin, Monitoring, Assistance and Media Programs Division (2227A), Office of Enforcement and Compliance Assurance, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, Washington, DC 20460; telephone number (202) 654–2970; email address *yellin.patrick@epa.gov.*

SUPPLEMENTARY INFORMATION:

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

APCD	air pollution control devices
CAA	Clean Air Act
CBI	confidential business information
CDX	Central Data Exchange
CEMS	continuous emission monitoring systems
CEDRI	Compliance and Emissions Data Reporting Interface
CFR	Code of Federal Regulations
CISWI	commercial and industrial solid waste incinerators
CMS	continuous monitoring system
COMS	continuous opacity monitoring system
CO_2	carbon dioxide
CPMS	continuous parametric monitoring system
D/F	dioxins and furans
EPA	Environmental Protection Agency
ESP	Electrostatic Precipitators
ERT	Electronic Reporting Tool
FR	Federal Register
gr/dscf	grains per dry standard cubic foot
HAP	hazardous air pollutants
Hg	mercury
HCl	hydrogen chloride
ICR	information collection request
Lb/ton	pound per ton
MACT	maximum achievable control technology
meHg	methylmercury
NAICS	North American Industry Classification System
NAS	National Academy of Science
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHSM	Nonhazardous Secondary Materials
NO_X	Nitrogen Oxides
NRC	National Research Council
NSPS	new source performance standards
NTTAA	National Technology Transfer and Advancement Act
oHAP	Non-dioxin organic hazardous air pollutants
OMB	Office of Management and Budget
PCA	Portland Cement Association
PM	particulate matter
ppm(v) (d,w)	parts per million (by volume) (dry, wet)
RATA	Relative Accuracy Test Audit
RfD	reference dose
RIA	regulatory impact analysis
RTC	Response to Comment
RTO	regenerative thermal oxidizers
SIP	state implementation plan
SO_2	Sulphur Dioxide
THC	total hydrocarbons
tpy	tons per year
TTN	Technology Transfer Network
$\mu g/m^3$	micrograms per cubic meter
UPL	Upper Prediction Limit
UMRA	Unfunded Mandates Reform Act
TEOM	Tapered Element Oscillating Microbalance
VCS	voluntary consensus standards
WWW	worldwide web

Background Information Document. On July 18, 2012 (77 FR 42368), the EPA proposed to amend the Portland cement manufacturing industry NESHAP and the Portland cement plant new source performance standards (NSPS). In this action, we are taking final action on this proposal. A summary of the public comments on the proposal and the EPA's responses to those comments is available in Docket ID Number EPA–HQ–OAR–2011–0817.

Organization of this Document. The information presented in this preamble is organized as follows:

I. General Information

A. Executive Summary

In this action the EPA is finalizing amendments to the NESHAP for Portland cement plants and to the NSPS for Portland cement plants. These amendments respond to petitions for reconsideration filed by the Portland cement industry and to a decision by the United States Court of Appeals for the District of Columbia Circuit (D.C. Circuit). The EPA is retaining the stack emission standards for mercury, hydrogen chloride (HCl), and total hydrocarbons (THC) under the NESHAP, amending the stack emission standard for particulate matter (PM) under the NESHAP, and making a conforming amendment to the NSPS for PM. The amendments also include provisions which account for commingled HAP emissions from coal mills that are an integral part of the kiln, establish a continuous monitoring regime for parametric monitoring of PM, set work practice standards for startup and shutdown, and revise the compliance date for the PM, mercury, HCl, THC and clinker storage pile existing source standards under the NESHAP. The EPA is also retaining the affirmative defense for civil penalties for violations of emission limits occurring as a result of a malfunction.

These amendments are based on sound technical and legal justifications, and result in cost savings and compliance flexibility for the Portland cement industry. This result is consistent with Executive Order 13563.

1. Purpose of the Regulatory Action

a. Need for the Regulatory Action

The EPA is amending the NESHAP for the Portland cement source category and the NSPS for Portland cement plants issued under sections 112(d) and 111(b) of the Clean Air Act (CAA). The most significant amendment is to the NESHAP and NSPS for PM, to correct monitoring issues with the PM compliance regime as promulgated in the 2010 final rule. As a result of this amendment, the EPA is also setting a compliance date of September 9, 2015, for meeting the PM, mercury, HCl and THC existing source NESHAP.

This final action also addresses the remand by the DC Circuit in *Portland Cement Ass'n* v. *EPA,* 665 F. 3d 177 (DC Cir. 2011). In that case, the court upheld all of the EPA's methodology for establishing the Portland cement NESHAP, denied all petitions for review challenging the NSPS, but also held that the EPA had arbitrarily denied reconsideration of the NESHAP to take into account the effect of the EPA's Nonhazardous Secondary Materials (NHSM) rule on the standards. The NHSM rule, issued after the NESHAP was promulgated, had the effect of reclassifying some cement kilns as commercial and industrial solid waste incinerators (CISWI) and thus could have an effect on the standards. The court also stayed the open storage clinker pile standards.

We are also amending various implementation requirements to provide more compliance flexibility for affected sources. In addition, the amendments address the issues on which the EPA previously granted reconsideration. See 76 FR 28318 (May 17, 2011).

b. Legal Authority for the Regulatory Action

These amendments implement sections 112(d) and 111(b) of the CAA. Section 112 of the CAA establishes a regulatory process to address emissions of hazardous air pollutants (HAP) from stationary sources. After the EPA identifies categories of sources emitting one or more of the HAP listed in section 112(b) of the CAA, section 112(d) requires the EPA to promulgate technology-based NESHAP for those sources. Section 112(i)(3)(A) requires that the compliance date for existing sources shall be ''as expeditiou[s] as practicable,'' but not more than 3 years after a standard's effective date. Section 111 of the CAA requires that NSPS reflect the application of the best system of emission reductions achievable which, taking into consideration the cost of achieving such emission reductions, and any non-air quality health and environmental impact and energy requirements, the Administrator determines has been adequately demonstrated.

2. Summary of Major Provisions

a. PM Emission Standards

As proposed, the EPA is amending the existing and new source PM standards in the NESHAP to require manual stack testing in lieu of PM continuous emission monitoring systems (CEMS) for compliance determinations and requiring that a site-specific parametric operating level be established using a PM continuous parametric monitoring system (CPMS). We are changing the numeric emissions value of those standards for existing sources to 0.07 pounds per ton (lb/ton) clinker based on manual stack testing and 0.02 lb/ton clinker for new and reconstructed sources based on manual stack testing. The PM standards under the NSPS for modified sources are likewise amended to 0.07 lb/ton clinker based on manual stack testing and 0.02 lb/ton clinker for new and reconstructed sources based on manual stack testing.

b. Response to Remand

Consistent with the court's remand, the EPA has removed all of the CISWI kilns from the database used to set the 2010 existing source standards for PM, mercury, HCl and THC. This analysis informed the level of the final standards discussed immediately below.

c. Other Emissions Standards

As proposed, the EPA is changing the alternative organic HAP (oHAP) standard from 9 parts per million (ppm) to 12 ppm. The EPA is not changing the existing or new source standards for mercury, THC or HCl.

d. Standards During Startup and Shutdown

The EPA is amending the emission standards applicable during periods of startup and shutdown from numerical standards to work practice standards.

e. Compliance Dates for NESHAP

As proposed, the EPA is establishing a compliance date of September 9, 2015, for existing source standards for PM, mercury, HCl and THC. The EPA is establishing February 12, 2014, as the compliance date for the standards for existing open clinker storage piles. New source standards continue to apply to all sources which commenced construction or reconstruction after May 6, 2009.

f. Final Action on Reconsideration

The EPA is also taking final action on the remaining issues on which it granted reconsideration on May 17, 2011.

3. Cost Impacts of These Amendments

We estimate that revising the means of demonstrating compliance for the PM, alternative organic HAP standards and requiring work practices for open clinker storage piles will save industry $52 million annually.

4. Summary of Final Standards

Table 1 shows the final standards for the Portland Cement Manufacturing Industry NESHAP and the Portland Cement Plants NSPS.

TABLE 1—EXISTING AND NEW SOURCE STANDARDS

Pollutant	Existing source standard	New source standard
Mercury	55 lb/MM tons clinker	21 lb/MM tons clinker.
THC	24 ppmvd	24 ppmvd.
PM	0.07 lb/ton [a] clinker (3-run test average)	0.02 lb/ton [b] clinker (3-run test average).
HCl	3 ppmvd	3 ppmvd.
Organic HAP (alternative to Total Hydrocarbons).	12 ppmvd	12 ppmvd.

[a] Also applies to NSPS modified sources.

[b] Also applies to NSPS new and reconstructed sources.

B. Does this action apply to me?

Categories and entities potentially regulated by this final rule include:

TABLE 2—INDUSTRIAL SOURCE CATEGORIES AFFECTED BY THIS NESHAP AND NSPS FINAL ACTION

Category	NAICS code [a]	Examples of regulated entities
Industry	327310	Portland cement manufacturing plants.
Federal government		Not affected.
State/local/tribal government		Portland cement manufacturing plants.

[a] North American Industry Classification System.

Table 2 of this preamble is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. To determine whether your facility will be regulated by this action, you should examine the applicability criteria in 40 CFR 60.60 (subpart F) or in 40 CFR 63.1340 (subpart LLL). If you have any questions regarding the applicability of this final action to a particular entity, contact the appropriate person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

C. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this final action will also be available on the World Wide Web (WWW) through the EPA's Technology Transfer Network (TTN). Following signature by the EPA Administrator, a copy of this final action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg.* The TTN provides information and technology exchange in various areas of air pollution control. In addition, more information can be obtained at the following address: *http://www.epa.gov/airquality/cement.*

D. Judicial Review

Under section 307(b)(1) of the CAA, judicial review of this final action is available only by filing a petition for review in the court by April 13, 2013. Under section 307(b)(2) of the CAA, the requirements established by the final rule may not be challenged separately in any civil or criminal proceedings brought by the EPA to enforce the requirements.

Section 307(d)(7)(B) of the CAA further provides that ''[o]nly an objection to a rule or procedure which was raised with reasonable specificity during the period for public comment (including any public hearing) may be raised during judicial review.'' This section also provides a mechanism for the EPA to convene a proceeding for reconsideration, ''[i]f the person raising an objection can demonstrate to EPA that it was impracticable to raise such objection within [the period for public comment] or if the grounds for such objection arose after the period for public comment (but within the time specified for judicial review) and if such objection is of central relevance to the outcome of the rule.'' Any person seeking to make such a demonstration to us should submit a Petition for Reconsideration to the Office of the Administrator, U.S. EPA, Room 3000, Ariel Rios Building, 1200 Pennsylvania Ave. NW., Washington, DC 20460, with a copy to both the person(s) listed in the preceding **FOR FURTHER INFORMATION CONTACT** section and the Associate General Counsel for the Air and Radiation Law Office, Office of General Counsel (Mail Code 2344A), U.S. EPA, 1200 Pennsylvania Ave. NW., Washington, DC 20460.

II. Background Information

A. What is the statutory authority for these amendments?

Section 112 of the CAA establishes a regulatory process to address emissions of HAP from stationary sources. After the EPA has identified categories of sources emitting one or more of the HAP listed in section 112(b) of the CAA, section 112(d) requires us to promulgate NESHAP for those sources. For ''major sources'' that emit or have the potential to emit 10 tons per year (tpy) or more of a single HAP or 25 tpy or more of a combination of HAP, these technology-based standards must reflect the maximum reductions of HAP achievable (after considering cost, energy requirements and non-air quality health and environmental impacts) and are commonly referred to as maximum achievable control technology (MACT) standards.

The statute specifies certain minimum stringency requirements for MACT standards, which are referred to as ''floor'' requirements. See CAA section 112(d)(3). Specifically, for new sources, the MACT floor cannot be less stringent than the emission control that is achieved in practice by the best controlled similar source. The MACT standards for existing sources can be less stringent than standards for new sources, but they cannot be less stringent than the average emission limitation achieved by the best-performing 12 percent of existing sources (for which the Administrator has emissions information) in the category or subcategory (or the best-performing five sources for categories or subcategories with fewer than 30 sources).

In developing MACT, we must also consider control options that are more stringent than the floor. We may establish standards more stringent than the floor based on the consideration of the cost of achieving the emissions reductions, any non-air quality health and environmental impacts, and energy requirements. See CAA section 112(d)(2).

Under section 112(i)(3)(A), compliance dates for existing sources shall ''be as expeditiou[s] as practicable'', but in no event later than 3 years after the date of publication of the final rule in the **Federal Register**. The EPA may set a revised compliance date of a MACT standard when amending that standard, see *NRDC* v. *EPA,* 489 F. 3d 1364, 1373–74 (D.C. Cir. 2007), but any such amended compliance date must still establish ''compliance as expeditiously as practicable.''

Section 111(b) requires the EPA to set standards for emissions that ''reflect the degree of emission limitation achievable through the application of the best system of emission reduction.'' See CAA section 111(a)(1). In contrast to the NESHAP floor setting process, NSPS requires the EPA to take into account the ''cost of achieving'' emissions reductions, as well as health, environmental, and energy considerations. *Id.*

B. What actions preceded this final rule?

The history of this final rule, commencing with the 1999 standards and proceeding through the amendments issued in September 2009, is set out in detail in 75 FR 54970 (Sept 9, 2010). The Portland Cement Association (PCA) and several cement companies filed petitions for reconsideration of aspects of those amendments (copies of the petitions are in the Portland Cement Reconsideration docket, EPA–HQ–OAR–2011–0817). On May 17, 2011, the EPA granted reconsideration of various issues, and denied the petitions to reconsider as to the remaining issues. See 76 FR 28318 (May 17, 2011). On December 9, 2011, the D.C. Circuit issued an opinion upholding the NESHAP itself (as well as the section 111 NSPS), but finding that the EPA had arbitrarily failed to grant reconsideration to consider the effect of the EPA's NHSM rule on the standards (76 FR 15456 (March 21, 2011)), The NHSM rule had the effect of reclassifying some cement kilns as commercial and solid waste incinerators. See *Portland Cement Ass'n* v. *EPA,* 665 F. 3d 177, 186–189 (D.C. Cir. 2011). The court did not stay any of the numerical emission standards, but did stay the work practice standards for open clinker storage piles pending the conclusion of the reconsideration process. See 665 F. 3d at 194.

In this action, the EPA is responding to the court's remand. For existing sources, the EPA had done so by removing all kilns classified as CISWI units from the data used to establish the 2010 NESHAP standards. The EPA then recalculated each of the floors based on this dataset (the 2010 dataset minus CISWI units) and made beyond-the-floor determinations based on the recalculated floors. The EPA believes that this approach is properly responsive to the court's remand. See 665 F. 3d at 188 where the court referred favorably to this type of recalculation. For new sources, EPA used the same data as used to establish the 2010 floors—namely the performance of the best controlled similar sources as required by section 112(d)(3).

III. Summary of Final Amendments to Subpart LLL and Subpart F

As discussed in the preamble of the proposed rule, 77 FR 42368, in this final action the EPA is finalizing several amendments to Subpart LLL and Subpart F. These amendments are summarized below.

A. Reconsideration of Standards

As noted above, EPA has responded to the action of the DC Circuit by removing all CISWI cement kilns from the database used to establish the existing source standards, and recalculating existing source floors and standards from that revised database. As described in the preamble of the proposal, the EPA had determined based on the final NHSM rule that there are 24 cement kilns which combust solid waste. 77 FR 42372. During the comment period, one company provided reliable information in its comments regarding the materials it processes indicating that one of these kilns is, in fact, a cement kiln (meaning that the EPA had properly classified it as a cement kiln in the 2010 rulemaking).[1] After reviewing the information provided, the EPA agrees that this source should not be classified as a CISWI kiln and, therefore, should not be removed from the Portland cement kiln database. We received no other comments concerning the identification of cement kilns and CISWI units. There are thus now 23 kilns identified as combusting solid waste and therefore classified as CISWI units. As directed by the Court's decision, we removed these 23 kilns from the database and recalculated the floors. This calculation resulted in the same floors as proposed in the July 2012 proposal.

Consistent with this analysis, the EPA is finalizing amendments to the emission standards as follows:

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[1] The company burns dried biosolids as a fuel which are not classified as solid wastes. Refer to the Docket, No. EPA–HQ–OAR–2011–0817–0482.

1. PM Emission Standards

The EPA is revising several provisions of the emission standards for PM as follows:

- Changing the compliance basis for the PM standards from continuous monitoring with a PM CEMS to a manual three run stack test, amending the level and averaging time of the standard, and requiring a continuous parametric monitoring system using a CPMS. As a consequence, the EPA is also:
- Amending PM standards under the NESHAP for existing sources to 0.07 lb/ton clinker based on manual stack testing, and 0.02 lb/ton clinker for new and reconstructed sources based on manual stack testing;
- Amending PM standards under the NSPS for modified sources to 0.07 lb/ton clinker based on manual stack testing and 0.02 lb/ton clinker for new and reconstructed sources likewise based on manual stack testing;
- Requiring that sources establish a site-specific parametric operating limit for PM, and requiring that the parametric limit be continuously monitored using a PM CPMS;
- Requiring that sources retest once a year to reset the PM CPMS operating limit;
- Adding a provision that, if a source exceeds that site-specific parametric operating limit, it must conduct corrective action including performing a Method 5 or 5I performance test within 45 days; in addition, if the source exceeds that parametric limit four times in a calendar year, the source is presumed to be in violation of the PM emissions standard itself, subject to rebuttal by the source.

2. Mercury Standard

As proposed, the EPA is establishing a standard for mercury of 55 pounds per million (lb/MM) tons clinker for existing sources and is not changing the emission standard (21 lb/MM tons clinker) for new sources. The emission standard for existing sources is the same as the 2010 standard but is a beyond the floor standard.

3. Other Emissions Standards

As the Court requested, the EPA removed the CISWI units from the database and re-calculated the standards for THC and HCl. The standards remain the same as they were in the final 2010 rule. See also 76 FR 21149, 21152, and 21154 explaining why beyond the floor standards for THC and HCl are not justified. The 2010 rules provide an alternative to the THC standard whereby sources can meet a limit for non-dioxin organic HAP by measuring those HAP directly rather than meeting the standard for THC (a surrogate for non-dioxin organic HAP). As proposed, the EPA is changing the level of the alternative non-dioxin organic HAP standard from 9 ppm to 12 ppm. Table 3 summarizes the Final Existing and New Source Standards

TABLE 3—EXISTING AND NEW SOURCE STANDARDS[a]

Pollutant	Existing source standard	New source standard
Mercury	55 lb/MM tons clinker	21 lb/MM tons clinker.
THC	24 ppmvd	24 ppmvd.
PM	0.07 lb/ton clinker (3-run test average)	0.02 lb/ton clinker (3-run test average).
HCl	3 ppmvd	3 ppmvd.
Organic HAP[b]	12 ppmvd	12 ppmvd.

[a] Standards for mercury and THC are based on a 30-day rolling average. The standard for PM is based on a three-run test. If using a CEMS to determine compliance with the HCl standard, the floor is also a 30-day rolling average.

[b] If the source opts to comply with the THC emission limit, this standard does not apply.

B. Continuously Monitored Parameters for Alternative Organic HAP Standard (With THC Monitoring Parameter)

In addition to amending the level of the alternative oHAP standard (i.e., the standard whereby sources meet a standard for oHAP rather than for THC), the EPA is amending the provisions for the site-specific THC operating parameter for that alternative standard (where THC is a site-specific parameter monitored continuously to show compliance with the oHAP standard). The THC operating parameter is established based on THC levels measured during the successful stack test where oHAP are measured directly to demonstrate compliance. As amended, if compliance source testing of oHAP averages a value that is 75 percent or less of the emission limit for oHAP, the facility is allowed to establish a THC parametric operating level corresponding to 75 percent of the oHAP emission limit. We are adopting this provision to avoid penalizing lower-emitting sources by burdening them with the most stringent parametric operating levels. The EPA is adopting a similar provision for continuous PM parametric monitoring, for the same reason (see Section IV.A below). Sources which show oHAP emissions in compliance, but greater than 75 percent of the standard, must establish the average THC concentration measured during the 3-hour organic HAP test and use that as the site-specific THC operating level. Thus, the parametric monitoring level for THC will be the level corresponding to oHAP levels of 75 percent of the standard or the THC level of the oHAP performance test, whichever is higher.[2] Compliance with the oHAP standard will be shown as a ratio of three test runs during mill-on conditions and three test runs during mill-off conditions, with the percentage of operating time spent in each condition determining the ratio. The parametric operating level will be set according to average THC values measured during these same test runs, or to the default value of 75 percent of the standard, as just explained. In addition, the EPA will allow facilities to extend the testing time of the oHAP performance test if they believe extended testing is required to adequately capture THC variability over time. This final rule further requires that the stack test for oHAP be repeated every 30 months to establish a new site-specific THC parameter.

C. Allowing Sources With Dry Caustic Scrubbers To Comply With HCl Standard Using Performance Tests

The 2010 rule allows sources equipped with wet scrubbers to comply with the HCl standard by means of periodic performance tests rather than with continuous monitoring of HCl with a CEMS. Sources electing to comply by means of stack tests must establish continuously monitored parameters including liquid flow rate, pressure, and pH. Under this final rule, kilns with dry scrubbers may also demonstrate

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[2] If a source believes that monitoring non-methane THC rather than total THC is a more reliable indicator of its oHAP emissions, it can submit an alternative monitoring request pursuant to the requirements of 40 CFR 63.8(f).

compliance with the HCl emissions limit by means of an initial and periodic stack test rather than with continuous compliance monitoring with an HCl CEMS. If a kiln equipped with a dry scrubber chooses this alternative, this final rule requires that the sorbent injection rate used during a successful performance test be recorded and then continuously monitored to show that the injection rate remains at or above the rate used during the performance test.

Where either wet or dry scrubbers are used, owners and operators may also establish sulfur dioxide (SO_2) as an operating parameter, rather than, for example, sorbent injection rate, liquid injection rate or pressure drop. If the owner or operator of a scrubber-equipped kiln makes this choice, it must establish the SO_2 operating limit equal to the average of the HCl levels recorded during the HCl performance test, and meet that operating limit on a 30 day rolling average basis. If a source exceeds any established parameter level, it must retest for HCl in order to verify compliance with the HCl emissions standard and must verify or re-establish the parametric monitoring levels as well.

At a minimum, a repeat performance test to confirm compliance with the HCl emissions limit is required every 30 months.

D. Alternative PM Limit

The 2010 final rule established an alternative PM limit to accommodate situations where kilns combine exhaust gas from various operations. 77 FR 42382. The equation establishing the alternative limit contained certain technical errors which the EPA proposed to correct. As proposed, this final rule revises the alternative PM equation so that it includes exhaust gas flows from all sources that would potentially be combined, including exhausts from the kiln, the alkali bypass, the coal mill, and the clinker cooler, for an existing kiln. The EPA is thus finalizing the following equation:

$$PM_{alt} = 0.0060 \times 1.65 \times (Q_k + Q_c + Q_{ab} + Q_{cm})/(7000)$$

Where:

PM_{alt} = The alternative PM emission limit for commingled sources.

0.0060 = The PM exhaust concentration (grains per dry standard cubic feet (gr/dscf)) equivalent to 0.07 lb per ton clinker where clinker cooler and kiln exhaust gas are not combined.

1.65 = The conversion factor of lb feed per lb clinker.

Q_k = The exhaust flow of the kiln (dscf/ton feed).

Q_c = The exhaust flow of the clinker cooler (dscf/ton feed).

Q_{ab} = The exhaust flow of the alkali bypass (dscf/ton feed).

Q_{cm} = The exhaust flow of the coal mill (dscf/ton feed).

7000 = The conversion factor for grains (gr) per lb.

If exhaust gases for any of the sources contained in the equation are not commingled and are exhausted through a separate stack, their value in the equation would be zero. The alternative PM equation for new sources is identical to the existing source equation except the PM exhaust concentration used in the equation is 0.002 gr/dscf, which is equivalent to the new source PM limit of 0.02 lb/ton clinker.

E. Coal Mills

The EPA discussed at length in the preamble to the proposed rule a potential regulatory regime to cover situations where a portion of the kiln exhaust is ducted to the coal mill. See 77 FR 42383–85; see also the regulatory text at 77 FR 42398, 42402–06, 42408–09. To assure that cement kilns do not exhaust untreated HAP through coal mills, and to assure accurate accounting of commingled emissions so that cement kilns are not penalized for commingling emissions where it makes sense to do so, the EPA is finalizing rules applicable to kiln/coal mill emissions for two configurations. In one, a portion of the kiln exhaust is ducted to a coal mill, and then the coal mill exhaust is commingled with remaining kiln exhaust and discharged through the main kiln stack. In the other, a portion of the kiln exhaust is routed through the coal mill and discharged through the coal mill stack.

In the case of a coal mill that receives and discharges a portion of the cement kiln exhaust, this final rule requires that the sum of the mercury, THC and HCl in the kiln exhaust diverted to the coal mill, and the kiln exhaust exhausted from the main kiln stack, must not exceed the subpart LLL emission limits for each respective HAP or HAP surrogate. The facility must document the contribution of the emissions diverted to the coal mill. For mercury, the rule allows tests to be performed downstream of the coal mill to take advantage of any mercury removal that occurs in the coal mill air pollution control device, and to avoid double counting emissions from mercury that becomes re-entrained in the coal. For THC and HCl, the rule allows tests to be performed upstream of the coal mill to avoid any THC or HCl that might be emitted by the coal. For owners and operators who believe that the impact of the testing location (upstream or downstream of the coal mill) would not result in their exceeding the kiln mercury, THC or HCl emissions limits and wish to conduct all their THC, HCl and mercury testing at a single location, this final rule allows testing either upstream or downstream of the coal mill. For sources complying with the alternate organic HAP limit, the facility would not be required to test for THC emissions, but would test for the organic HAP and add that concentration to the remaining emission points to estimate their total emissions for organic HAP.

A cement kiln that commingles emissions from its coal mill with all other kiln exhaust emissions and discharges through a single stack could simply meet the kiln emission limits. In the case of PM, the additional flow from the coal mill would be accounted for in the equation used to determine PM contributions from commingled flows. See section D above. In this configuration, the source would also have the option of monitoring and/or testing kiln exhaust gases prior to the introduction of the coal mill exhaust gas, and testing the kiln gas diverted to the coal mill. In this case this final rule requires that the sum of the mercury, THC (or organic HAP if the source chooses the alternative organic HAP limit), and HCl in the kiln exhaust diverted to the coal mill plus the kiln exhaust measured in the main kiln exhaust must not exceed the subpart LLL emission limits for each respective HAP or HAP surrogate.

The same provisions for coal mills also apply to kilns equipped with an alkali bypass. The one minor exception is that for PM, the summed PM emissions from the kiln and alkali bypass must be equal to or less than the PM limit in subpart LLL. Tests for PM from the alkali bypass must be conducted downstream of the alkali bypass air pollution control devices (APCD) to account for those emission reductions.

With regard to PM, the EPA stated at proposal that where a coal mill receives and discharges a portion of the cement kiln exhaust, the kiln owner operator would have to demonstrate compliance with the 40 CFR 60 subpart Y standard for PM. Although the subpart Y standard is numerically higher than the subpart LLL PM standard, EPA assumed that control would be to the same level because the subpart Y PM standard is predicated on use of fabric filer control technology. 77 FR 42383/2. However, a commenter pointed out accurately that this proposal contravened the basic principle EPA indicated it was adopting here of not allowing diverted kiln emissions to meet a more lenient standard than required by the NESHAP, and further indicated that EPA had failed to show that these diverted PM emissions were controlled as required by section 112(d)(2) and (3) of the Act. EPA agrees with this comment, and accordingly is indicating in the final rule that commingled emissions in this situation would be required to meet the subpart LLL NESHAP for PM. Because coal mill stacks are controlled with fabric filters, we project that they can meet the subpart LLL numeric standard without further controls. See 77 FR 42383. Coal mill stacks will be required to meet annual PM performance testing and combine the measured emissions with PM emissions from the separated alkali stack, bypass stack, and/or main kiln as required in sections 60.62(b)(3), 63.1349 and 63.1350 of this rule.

This final rule also states that sources equipped with an alkali bypass stack or sources that exhaust kiln gases to a coal mill that exhausts through a separate stack are not required to install CEMS on these stacks. Instead of installing a CEMS, such sources may use the results of the initial and subsequent performance test to demonstrate compliance with the PM, THC, HCl and mercury emissions limits. Note that for the main kiln exhaust, the CEMS requirements remain.

We expand on these monitoring provisions below.

1. Mercury

Although mercury from the kiln stack is monitored using a CEMS, mercury emissions from the coal mill are based on a periodic performance test and use of the gas flow rate to the coal mill. Performance tests for mercury must be conducted annually unless and until the tested mercury levels are below the method detection limits for two consecutive years, after which tests may be conducted every 30 months. The performance test results must be summed with the emissions from the kiln stack to determine compliance. The coal mill exhaust mercury emissions are calculated on a mass basis using the measured mercury concentration and the coal mill exhaust gas flow. The coal mill exhaust flow is established using a continuous monitoring system (CMS), or the design maximum flow rate. Mass mercury emissions from the coal mill would be summed with the hourly mercury emissions from the kiln measured by the mercury CEMS. Hourly mercury emissions are then summed to calculate the rolling 30-day mass mercury emissions. This number is then divided by the corresponding 30 days of clinker production to determine the 30-day rolling average. This final rule provides equations for summing emissions from the coal mill with the mercury emissions from the kiln to determine continuous compliance. To see an example calculation, see Section 4 of the Portland Cement Reconsideration Technical Support Document (developed for the proposal), docket item EPA–HQ–OAR–2011–0817–0225.

2. THC and HCl

In this case, site specific kiln stack emission limits (to be continuously monitored) are to be calculated taking into consideration the volumetric exhaust gas flow rates and concentrations of all applicable effluent streams (kiln stack, coal mill and alkali bypass) for the kiln unit. In order to determine the flow rates and concentrations of THC and HCl in the coal mill and alkali bypass streams, the source must test every 30 months using the appropriate test method. For HCl, the performance test must be performed using Method 321 in Appendix A to 40 CFR Part 63. For measurement of THC, Method 25A in Appendix A–7 to 40 CFR Part 60 is required. With these data, the concentration of THC and HCl that must be monitored by the kiln CEMS in order to demonstrate compliance with the kiln MACT limit can be calculated using the equations in this final rule. As with mercury, the coal mill flow rate used to calculate the allowable main kiln stack THC and HCl concentrations can be based on a CMS, or on the maximum design flow rate. The sum of the kiln CEMS and the maximum emissions from the coal mill or alkali bypass must be at or below the subpart LLL limits for THC and HCl. See Section 4 of Portland Cement Reconsideration Technical Support Document (developed for the proposal), docket item EPA–HQ–OAR–2011–0817–0225, for an example calculation.

Also, as a result of these revisions, the EPA is revising the definition of kiln to include inline coal mills and adding a definition of inline coal mill.

F. NESHAP Compliance Date Extension for Existing Sources

This final rule establishes that the compliance date for the amended PM standard, and for the THC, mercury and HCl standards, for existing sources for kilns, clinker coolers and raw material dryers is September 9, 2015. This final rule also establishes February 12, 2014, as the compliance date for the existing open clinker storage pile work practice standards. A detailed discussion of these compliance dates can be found in Section V.D. below.

G. Section 112 Eligibility To Be a New Source

The EPA is not changing the date for new source eligibility under the NESHAP. Thus, a source that commenced construction or reconstruction after May 6, 2009, would remain subject to the section 112 new source standards. A more detailed discussion of this topic can be found below in Section V.E.

H. Other Testing and Monitoring Revisions

In this action we are finalizing the proposed corrections and clarifications to the 2010 rule including changes to: Equations for calculating rolling operating day emissions rates; procedures that include extraneous wording; and cross references and typographical errors in the rule.[3]

For sources that are required to monitor HCl emissions with a CEMS, we are revising the requirements for using HCl CEMS to define the span value for this source category, to include quality assurance measures for data collected under ''mill off'' conditions, and to clarify use of performance specification (PS) 15. This final rule also removes from the standard the oxygen correction factors for raw material dryers and makes minor, non-substantive changes to the sections and paragraphs below:

- Section 60.62(d).
- Section 60.63(b)(1)(i) and (ii), (b)(2), (f)(1), (2), (4), (5), (h)(1) and (6) through (9) (i).
- Section 60.64(b)(2).
- Section 60.66.
- Section 63.1340(b)(1) and (6) through (8).
- Section 63.1346(a) and (c) through (e).
- Section 63.1348(a)(2), (3)(i) through (iii), (a)(4)(i)(A), (a)(4)(ii) and (iv).
- Section 63.1348(b)(1)(i), (iii) and (iv).
- Section 63.1348(b)(3), (5), (6)(i), (8) and (c)(2)(iv).
- Section 63.1349(a), (b)(3), (d)(1) and (d)(2) and (e).
- Section 63.1350(d)(1)(i) and (ii), (f), (f)(2)(i) and (iii), (f)(3), (f)(4), (g)(1) and (2), (k), l(2), (m)(3), (m)(10) and (11), (o) and (p).
- Section 63.1352(b).
- Section 63.1356.
- In addition, we are adding requirements in section 63.1348(a), that

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[3] We note that these changes required the agency to reprint sections of regulatory text. See e.g. 63.1348(a)(3)(i). In reprinting these passages, EPA has not reopened, reconsidered, or otherwise reevaluated the substance of these provisions but rather is only making the needed technical alteration.

a cement kiln that becomes subject to the rule after having been subject to the CISWI regulations, must meet all the initial compliance testing requirements even if they were previously subject to Subpart LLL.

I. Miscellaneous Amendments

We are also finalizing amendments to clarify various requirements in this final rule including issues of applicability, treatment of multiple sources that vent to a single stack, third party certification, definitions and use of bag leak detection systems when PM CPMS are in use.

For raw material, clinker or finished product storage bins, we have clarified that the requirements of this final rule apply only at facilities that are a major source (see section 63.1340(b)(6)) and that affected sources that are subject to subpart OOO (standards for nonmetallic mineral processing) are not subject to the requirements of subpart LLL (see section 63.1340(c)).

With regard to the NSPS, to clarify the recordkeeping and reporting requirement in section 60.65(a) to submit excess emission reports, we have added to section 60.61 of the NSPS a definition of ''excess emissions'' to mean ''with respect to this subpart, results of any required measurements outside the applicable range (e.g., emissions limitations, parametric operating limits) that is permitted by this subpart. The values of measurements will be in the same units and averaging time as the values specified in this subpart for the limitations.'' To clarify what data are used in the calculation of emissions, or used in the calculation of parametric levels that are used to demonstrate continuous compliance, we added to this section a definition of ''operating day'' to mean ''a 24-hour period beginning at 12:00 midnight during which the kiln operates at any time. For calculating rolling 30-day average emissions, an operating day does not include the hours of operation during startup or shutdown.'' The definition for ''operating day'' in section 63.1341 of the NESHAP is revised to be consistent with the above definition. We also became aware that some raw material dryers may be used to dry materials other than kiln feed and we have revised the definition of ''raw material dryer'' in recognition of that fact.

J. Standards During Periods of Startup and Shutdown

In the 2010 final NESHAP, the EPA established separate standards for periods of startup and shutdown which differ from the main standards that apply during steady state operations. In this action, based on comments received and the EPA's reconsideration of several technical issues related to startup and shutdown, the EPA is adopting work practices in place of these numerical standards. The rationale and provisions for the work practice standards are discussed in detail in section IV.C.

The EPA is also clarifying the operating conditions during which these standards apply, including a definition of ''startup'' and ''shutdown''. Under the amended definition, startup begins when the kiln's induced fan is turned on and fuel combustion is occurring in the main burner of the kiln. Startup ends when feed has been continuously fed to the kiln for at least 120 minutes or when the kiln feed rate exceeds 60 percent of the kiln design limitation rate. Shutdown begins when continuous feed to the kiln is halted and ends when continuous kiln rotation ceases.

The startup and shutdown-related changes include:

- Adding a definition of startup and shutdown in section 63.1341, as described;
- Adding section 63.1346(f) describing work practice standards to be met during periods of startup and shutdown;
- Revising section 63.1347 to require that startup and shutdown procedures be included in the facility's operation and maintenance plan;
- Adding section 63.1355(f) requiring records of each startup and shutdown including the date, time and duration and the quantity of feed and fuel added to the kiln during startup and shutdown;
- Adding section 63.1348(b)(9) requiring continuous compliance by operating all air pollution control devices during periods of startup and shutdown.

K. Reporting for Malfunctions and Affirmative Defense for Violation of Emission Standards During Malfunctions

The EPA added to the September 9, 2010, final NESHAP rule an affirmative defense to civil penalties for violations of emissions limits that are caused by malfunctions. Various environmental advocacy groups, as well as the PCA, indicated that there had been insufficient notice of this provision. The EPA agreed and granted reconsideration. See 76 FR 28325 (May 17, 2011). This action finalizes the EPA's decision to retain the affirmative defense on reconsideration.

The EPA is retaining in the final NESHAP rule an affirmative defense to civil penalties for violations of emission standards that are caused by malfunctions. See 40 CFR 63.1341 (defining ''affirmative defense'' to mean, in the context of an enforcement proceeding, a response or defense put forward by a defendant, regarding which the defendant has the burden of proof, and the merits of which are independently and objectively evaluated in a judicial or administrative proceeding). We are also revising some of the regulatory provisions that specify the elements that are necessary to establish this affirmative defense as proposed with minor changes from proposal described later in this section. The source must prove by a preponderance of the evidence that it has met all of the elements set forth in section 63.1344. (See 40 CFR 22.24). The criteria are designed in part to ensure that the affirmative defense is available only where the event that causes a violation of the emission standard meets the narrow definition of malfunction in 40 CFR 63.2 (sudden, infrequent, not reasonably preventable and not caused by poor maintenance or careless operation). For example, to successfully assert the affirmative defense, the source must prove by a preponderance of the evidence that the violation ''[w]as caused by a sudden, infrequent, and unavoidable failure of air pollution control, process equipment, or a process to operate in a normal or usual manner * * *.'' The criteria also are designed to ensure that steps are taken to correct the malfunction, to minimize emissions in accordance with section 63.1344 and to prevent future malfunctions.

Similar to actions taken in several other recent NESHAP amendments (see National Emissions Standards for Hazardous Air Pollutants From Secondary Lead Smelting, 77 FR 556, January 5, 2012, National Emission Standards for Hazardous Air Pollutant Emissions for Shipbuilding and Ship Repair (Surface Coating), and National Emission Standards for Wood Furniture Manufacturing Operations, 76 FR 72050, November 21, 2011), the EPA included an affirmative defense in the 2010 final rule and is retaining it in this rule (see section 63.1344). The affirmative defense provisions give the EPA the flexibility to both ensure that its emission standards are ''continuous'' as required by 42 U.S.C. § 7602(k), and account for unplanned upsets and thus support the reasonableness of the standard as a whole. In addition to the authority cited in support of the affirmative defense in the preamble to the proposed rule, the EPA notes that a recent court decision further supports the EPA's authority to promulgate an affirmative defense. The United States Court of Appeals for the Fifth Circuit recently upheld the EPA's view that an affirmative defense provision is consistent with section 113(e) of the Clean Air Act. *Luminant Generation Co. LLC v. United States EPA,* 2012 U.S. App. LEXIS 21223 (5th Cir. Oct. 12, 2012) (upholding the EPA's approval of affirmative defense provisions in a CAA State Implementation Plan). As discussed in the preamble to the proposed rule (77 FR 42379), the EPA's view is that an affirmative defense to civil penalties for exceedances of applicable emission standards during periods of malfunction appropriately resolves an underlying tension inherent in many types of air regulation, to ensure continuous compliance while simultaneously recognizing that despite the most diligent of efforts, emission limits may be exceeded under circumstances beyond the control of the source. See generally, *Virginia v. Browner,* 80 F.3d 869, 878 (4th Cir. 1996) (the EPA's interpretation that resolved a tension within the CAA is reasonable). The EPA has used its section 301(a)(1) authority to issue regulations necessary to carry out the Act in a manner that appropriately balances these competing concerns.

We are promulgating revisions to the affirmative defense provisions in section 40 CFR 63.1344 as described at proposal (77 FR 42380) and making some minor additional revisions. The phrase ''emission limit'' was changed to ''emission standards'' to reflect that the affirmative defense could be applicable to certain work practice standards. The phrase, ''Off-shift and overtime labor were used, to the extent practicable to make these repairs'' was removed. The term ''notification'' to ''reporting'' was changed to reflect that the root cause analysis required under affirmative defense would be submitted with other periodic reporting. The term ''and monitoring'' was deleted because monitoring malfunctions are defined differently than malfunctions of process and control units and the affirmative defense is intended to apply to malfunctions to affected units that cause a failure to meet an emission standard. The word ''however'' was removed to incorporate more plain language into the regulation. The phrase ''the respondent fails'' was removed and replaced with ''you fail'' to incorporate more plain language into the regulation. The word ''its'' was replaced with ''your'' to incorporate more plain language into the regulation. The phrase ''all of the'' was replaced with ''your'' also to incorporate more plain language into the regulation. The phrase ''air pollution control practice'' was shortened to ''good practices'' to incorporate more plain language into the regulation. In addition, the written report required when asserting an affirmative defense was changed from a separate ''semiannual'' report to a report that is submitted with the first periodic compliance, deviation report or excess emission report due after the event.

We are finalizing the reporting and recordkeeping associated with violations due to malfunctions as described at proposal (77 FR 42388) and making some minor additional revisions as described below.

- Revising section 63.1354(b)(vii) for reporting and recordkeeping violations due to malfunctions. The phrase ''failure to meet a standard'' was used to replace ''deviation'' in the requirement to report violations of the standard. This was changed because the EPA is not finalizing a definition of deviation in this subpart and the term is not defined in the general provisions.
- Revising section 63.1354(c) for reporting a failure to meet a standard due to a malfunction. In addition, the phrase ''failure to meet a standard'' was used to replace ''deviation'' in the requirement to report violations of the standard. This was changed because the EPA is not finalizing a definition of deviation in this subpart and the term is not defined in the general provisions.
- Revising section 63.1355(f) addressing recordkeeping during startup and shutdown. The proposed recordkeeping requirement applicable to startup and shutdown assumed that a numerical emission standard was applicable during startup and shutdown. In finalizing the work practice standards in 63.1346(f) there will no longer be a numerical emission standard applicable during startup and shutdown. As such the recordkeeping requirement must change to reflect the content of the work practice standard. Records must be kept of the date, time and duration of the periods when the work practice is applicable, as well as the fuel and feed data to demonstrate compliance with the work practice standard.

L. What are the compliance dates of the standards?

During the comment period, comments were received that confirmed the need for additional compliance time, since the revised standards can result in different compliance strategies relative to the 2010 final rule. Thus, as proposed, this final rule establishes the compliance date for the amended existing source standards including standards for PM, mercury, HCl and THC to be September 9, 2015. The existing source compliance date for the requirements for open clinker storage piles is February 12, 2014. New sources which commenced construction or reconstruction after May 6, 2009, would remain subject to the new source standards and a compliance date of February 12, 2013, or startup, whichever is later.

M. Open Clinker Storage Piles

The EPA has added work practice requirements for open clinker storage piles that will reduce fugitive dust emissions from these sources. This final rule also contains a definition of open clinker storage piles and requires that a source's operation and maintenance plan include the steps the facility will take to minimize fugitive dust emissions from open clinker storage piles. A detailed discussion of these requirements can be found in section V.C below.

IV. Summary of Major Changes Since Proposal

A. PM Parametric Monitoring

Changes to PM Parametric Monitoring. The EPA proposed the use of PM CPMS for continuous monitoring of PM emissions as a 30-day rolling average established by identifying the average PM CPMS response corresponding to the highest 1-hour PM compliance test. Failure to meet this 30-day rolling average would result in retesting, and more than four exceedances from the parametric limit in a year would be presumed (subject to possibility of rebuttal by the source) to be a violation of the emission standard itself. See 77 FR 42377. Industry commented that this requirement would trigger unnecessary retests for many facilities, especially for the lower-emitting sources. The issue of increased compliance burden falling on the lower emitting sources is legitimate. Sources with especially low PM limits in their performance test would be most at risk of exceeding a parametric limit due to a few emission spikes, even though they would still be operating well under the actual PM compliance limit. We also received comment that the highest PM performance test run may represent, in some circumstances, a number higher than the PM emissions standard. To avoid this eventuality we have changed the final rule to require setting the PM operating limit equivalent to the average of the three PM performance tests, which constitutes the demonstration of compliance with the standard. To avoid penalizing lower emitting facilities, the EPA has modified the way PM CPMS operating limits are established. Sources whose compliance with the PM emission standard are shown to be 75 percent or below the emission limit in the PM method 5 compliance test will set their PM parametric operating limit to be a 30-day rolling average equivalent to that 75 percent level. In a recent rule (76 FR 15736, March 21, 2011), the EPA established 75 percent of the limit as a number that allows for compliance flexibility and is simultaneously protective of the emission standard, and the same technical basis is applicable here as well. Sources whose compliance with the PM emission standard are above 75 percent of the emission limit will establish their operating limit as a 30-day rolling average equal to the average PM CPMS values recorded during the PM compliance test. It should be noted that this provision affects the allowable level of the parametric limit, but does not change the PM emission limit that must be met.

B. Scaling for Continuous Parametric Monitoring of THC for Alternative OHAP Standard

As explained in section III.B above, the EPA is adopting a scaling approach for parametric monitoring of THC under the alternative organic HAP standard which is conceptually similar to the one just discussed for parametric monitoring of PM. This provision affects the allowable level of the THC parametric limit, but does not change the oHAP emission limit that must be met.

The EPA proposed the use of THC monitoring in conjunction with organic HAP compliance testing to determine a parametric operating limit option for monitoring continuous compliance with the alternative organic HAP standard. In the proposed rule the organic HAP parametric operating limit was established by correlating the highest of three organic HAP test results with the corresponding average THC concentration recorded by a parametric THC monitor. Industry commented that this requirement would trigger unnecessary retests for many facilities, especially for the best performing sources. Not wishing to penalize those sources showing good performance, and simultaneously wanting to be protective of the emission standard, the EPA is changing the way parametric THC operating levels are established. Sources whose compliance with the organic HAP emission standard are shown to be below 75 percent of the emission limit will set their operating limit to be a 30-day rolling average equivalent to that 75 percent level. Sources whose compliance with the organic HAP emission standard are at or above 75 percent of the emission limit will establish their operating limit as a 30-day rolling average equal to the average parametric THC values recorded during the organic HAP compliance test. Sources with an in-line kiln/raw mill will use the fraction of time the raw mill is on and the fraction of time that the raw mill is off, and calculate this limit as a weighted average of the THC levels measured during raw mill on and raw mill off testing.

C. Work Practice Standard in Lieu of Numerical Emissions Limits for Periods of Startup and Shutdown

Under section 112(h) of the Act, the EPA may adopt a work practice standard in lieu of a numerical emission standard only if it is ''not feasible in the judgment of the Administrator to prescribe or enforce an emission standard for control of a hazardous air pollutant''. This phrase is defined in the Act to apply to any situation ''in which the Administrator determines that * * * the application of measurement methodology to a particular class of sources is not practicable due to technological and economic limitations.'' CAA section 112(h)(1) and (2). In adopting numerical limits for startup and shutdown in the 2010 final NESHAP, the EPA rejected comments that it should adopt work practices as a standard during startup and shutdown. This was largely because the commenters had not addressed the issue of whether the requirements of section 112(h) had been met. See docket item EPA–HQ–OAR–2002–0051–3464, pp. 183–84. The EPA later denied petitions to reconsider this issue on the grounds that the agency had already provided ample opportunity for comment on the issue, which petitioners had used. See 76 FR at 28323. The DC Circuit dismissed all challenges to the startup and shutdown provisions in the NESHAP (665 F 3d at 189). The EPA granted reconsideration on several technical issues related to startup and shutdown—specifically, monitoring of mercury and PM during startup and shutdown and having an HCl limit of zero for kilns not equipped with CEMS (see 76 FR at 28325), but these issues are no longer relevant based on the approach adopted in this final rule.

In the proposed reconsideration rule, the EPA proposed to retain the numerical standards, but to use recordkeeping rather than measurements to document compliance with the numerical standard. 77 FR 42382–83. EPA further solicited comment ''on whether the numeric standards during startup and shutdown should be amended to provide work practices'', and suggested what potential work practices might be. *Id.* at 42383. Some commenters supported retention of numerical standards, stating that nothing in the record supports a decision by the EPA that numeric standards are not feasible to measure. However, these commenters provided no supporting technical data. We also received comments opposing numeric limits and supporting work practices in their stead. Commenters stated that any numeric limit should be based on actual data gathered during startup and shutdown, which the proposed limits are not, and that measurement of emissions during startup and shutdown poses significant technical problems, mainly based on CEMS calibration issues, and the duration of startups and shutdowns.

Industry has presented information specific to the cement industry to the EPA on technical issues associated with cement kilns measuring PM, mercury, THC and HCl during periods of startup and shutdown. See docket item EPA–HQ–OAR–2011–0817–0237[1] and PCA Meeting 9–15–11 monitoring presentation in the docket for this rulemaking, as well as their public comments. EPA has continued to evaluate these data. In light of all of these public comments and further evaluation of the data, the EPA has decided to establish work practice standards in lieu of numeric standards during startup and shutdown periods. The EPA is doing so because the application of measurement methodology is not practicable for technological and economic reasons. See CAA section 112(h)(2)(B).

The operation of kilns at cement manufacturing plants is different from many other sources. Kiln startups can last days, during which time fuels are switched and temperatures and moisture conditions fluctuate substantially. Also, cement kilns have two types of inputs—raw feed that is changed into clinker in the kiln, and kiln fuel. The cement kiln is sized to accommodate not just exhaust gas flow from combustion, but the gases evolved from the calcination of limestone and moisture that evaporates from the kiln feed. As a result of these factors, the difference in gas flow characteristics of a cement kiln during steady state operation and startup/shutdown is more pronounced than that for other combustion source categories. In addition, cement kilns begin introducing feed as part of the startup process which further exacerbates the transient and fluctuating nature of these operations not only because of the impact of this feed on the exhaust gases, but because raw materials and fuels are introduced at opposite ends of the kiln, which results in countercurrent flow of the solid material in the kiln and kiln exhaust gas, increasing the turbulence, transience and fluctuating conditions. The result is that conditions change constantly when cement kilns are in startup or shutdown mode. These conditions make stack measurements, both manual and continuous, for this source category unreliable because the constant shifting in conditions prevents any stack measurement from being representative of anything but conditions at that precise moment. For that reason manual stack tests, which take place over a period of a few hours, would not be presenting accurate information, since they would not be reliably measuring conditions across the duration of the test.

There is no way to craft a testing regime to compensate for these testing issues at each kiln in a manner that can produce reliable and replicable results. Such modifications would be specific to that individual startup event—i.e. *ad hoc* and therefore not of general applicability or utility in showing compliance. Continuous measurements conducted during these periods for cement kilns are also subject to inaccuracies resulting from these rapidly changing conditions. The temperature changes of greater than one thousand degrees Fahrenheit, flue gas moisture changes greater than 20 percent, and gas flow changes over several thousand cubic feet per minute, as well as other factors such as flue gas molecular weight swings, combine to create a complex matrix of measurement variables not accounted for in a cement kiln CEMS installation. That is, CEMS for PM, HCl, Hg, and THC are not able to reliably accommodate all of these transient shifting variables when measuring cement kiln startup and shutdown emissions. As noted above, these issues are further exacerbated by the fact that cement kilns have multiple inputs (fuel and feed), and the clinker production process generates higher gas flows than would be expected based on just the fuel inputs. This fact also means that flue gas flow rates cannot be accurately calculated from fuel inputs alone.

The EPA regards situations where a measurement may yield a value which is analytically suspect, which is the case for cement kilns during startup and shutdown for the reasons just described, as being a situation where measurement is not ‘‘technologically practicable’’ within the meaning of section 112(h)(2)(B) of the Act. Unreliable measurements raise issues of practicability and of feasibility and enforceability (see section 112(h)(1)).[4]

The EPA is not finalizing its proposed approach of setting numerical emission limits for startup and shutdown and requiring that sources certify compliance with those limits by keeping certain records certifying that they used certain fuels and did not introduce feed into the kiln. Under the proposal, sources would have had to certify compliance with the standards for the various organics based on assumed combustion conditions. As pointed out persuasively in the public comments, combustion conditions during startup and shutdown are too widely varying to either reliably measure or calculate emissions because combustion conditions change widely during startup and shutdown, sources indicated that they could not certify compliance based on an assumed combustion condition. See docket item EPA–HQ–OAR–2011–0817–0506, p. 11 (‘‘Until ideal combustion conditions can be met in the combustion chamber (adequate temperature and turbulence), the combustion process will be incomplete. While this should not impact fuel-derived hazardous air pollutants (chlorine and mercury), it will impact the emissions of organics and possibly PM’’). In light of the measurement issues noted above and the fact that sources could not certify compliance under the proposed approach, the EPA is not finalizing the proposed approach of setting numerical limits for startup and shutdown and allowing sources to certify compliance with the limits by maintaining certain records.

Instead, for the reasons explained above, the EPA is establishing work practice standards to demonstrate compliance with startup and shutdown. The work practices that apply during startup and shutdown are as follows:

- During startup the kiln must initially use any one or combination of the following clean fuels: Natural gas, synthetic natural gas, propane, distillate oil, synthesis gas, and ultra-low sulfur diesel until the kiln reaches a temperature of 1200 degrees Fahrenheit.
- Combustion of the primary kiln fuel may commence once the kiln temperature reaches 1200 degrees Fahrenheit.
- All air pollution control devices must be turned on and operating prior to combusting any fuel.
- You must keep records as specified in § 63.1355 during periods of startup and shutdown.

For the purpose of identifying when the kiln is in a startup/shutdown mode and subject to work practices and when the kiln is subject to numerical emission limits, we are defining the beginning and ending of startup and shutdown. At proposal we defined startup as when the kiln's induced fan is turned on and shutdown was defined as beginning when feed to the kiln is halted. Commenters noted that a kiln may have the induced draft (ID) fan operating even when the kiln is completely shutdown, no fuel is being burned, and there is no potential for emissions. Therefore, we changed the startup definition to be when a shutdown kiln turns on the ID fan and begins firing fuel in the main burner, because this is the point where the potential for emissions to occur begins. Startup ends when feed is being continuously introduced into the kiln for at least 120 minutes or until the feed rate exceeds 60 percent of the kiln design limitation rate. We added the duration/load element to the definition of startup because during startup a kiln must begin adding feed material to achieve steady state operation. After feed is first introduced it requires up to two hours or sufficient feed to achieve 60 percent of maximum operation to achieve a representative steady-state condition. (See meeting notes, PCA November 28, 2012, in the docket for this rulemaking). Shutdown begins when continuous feed to the kiln is halted and ends when the kiln rotation ceases.

We believe these work practices, which include the requirement that all air pollution control devices be operating, will ensure that emissions during startup and shutdown will be lower than the standards that apply during steady state operations, given use of cleaner fuels, minimal raw material inputs, and operation of all control devices during these periods. See 77 FR 42382 (noting that emissions during startup and shutdown would be expected to be lower than during steady state operations for these reasons).

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[4] The application of measurement methodology during cement kiln startup and shutdown would also not be ‘‘practicable due to * * * economic limitation’’ within the meaning of section 112(h)(2)(B) since it would just result in cost expended to produce analytically suspect measurements.

V. Summary of Significant Comments and Responses

A. Amendments to Existing Source and New Source Standards for PM Under CAA Sections 112(d) and 111(b)

1. Changes to Level and Averaging Time of Existing Source NESHAP

The EPA proposed to amend the existing and new source standards for PM. The floor for the existing source standards increased from 0.04 lb/ton clinker to 0.05 lb/ton clinker as a result of removing CISWI kilns from the database. See Section 8.3, Portland Cement Reconsideration Technical Support Document, June 15, 2012, Docket item EPA–HQ–OAR–2011–0817–0225; see also 77 FR 42372/3. Second, the EPA proposed to change the compliance regime for the standard from use of PM CEMS to stack testing, a consequence being that the standard would no longer be expressed as a 30-day average but rather as the average of three test runs. The EPA thus proposed to express the recalculated floor (i.e. 0.05 lb/ton clinker 30-day average resulting from the reanalysis) as .07 lb/ton of clinker (average of three test runs). The 0.07 lb/ton clinker standard expresses the recalculated floor (i.e. 0.05 lb/ton clinker) as a not-to-exceed value based on stack testing, using the Upper Prediction Limit equation to do so. See Portland Cement Reconsideration Technical Support Document, June 15, 2012, Docket item EPA–HQ–OAR–2011–0817–0225.[5]

The EPA further proposed to use CPMS for continuous parametric monitoring. This system responds to changes in PM concentration and generates a corresponding milliamp output signal. 77 FR 42376–77. The proposed PM parametric level was correlated to the highest recorded value during three test runs. A source would meet this site-specific level on a 30-day rolling average. Failure to meet this 30-day rolling average would result in retesting, and more than four deviations from the parametric level in a year would be presumed (subject to possibility of rebuttal by the source) to be a violation of the emission standard itself. See 77 FR 42377.

Our proposal to change the compliance regime from use of CEMS to stack tests reflected technical issues related to a PM CEMS' reliability with measuring the Portland cement PM standard. Specifically, the EPA discussed the reliability of measurements, obtained using PM CEMS calibrated as required by the mandated PS 11, below the level of the 2010 standard or the level of the recalculated PM floor. See 77 FR 42374–76. The EPA's judgment at proposal was that as a result of PM measurement uncertainties, ''this correlation will not be technically or practically achievable for a significant number of cement kiln sources.'' *Id.* at 42376.

One commenter challenged the necessity of amending the standard to a stack test regime (apparently not realizing that the existing source standard also changed as a result of removing CISWI kilns from the database). First, the commenter maintained that the EPA has no authority to voluntarily change a promulgated MACT standard to make the standard less stringent, based on the language of section 112(d)(7). The commenter further maintained that the EPA had not definitively shown that PM CEMS calibrated pursuant to PS 11 could not be used to reliably measure the Portland cement PM standard. Specifically, the commenter stated that the various problems identified by the EPA at proposal are amenable to resolution by testing longer and more often, and argued that the EPA essentially admitted as much at proposal. The commenter noted that other technical problems, like the difficulty of accounting for varied particle sizes, could be resolved by using a beta gauge CEMS. The commenter dismissed the EPA's technical reservations on these issues as arbitrary speculation. The commenter also stated that PM CEMS are already in successful use by cement plants both in this country and overseas. The commenter further believed that the EPA could resolve these technical issues by amending the PM CEMS Performance Specification rather than by amending the averaging time of the PM standard and changing its compliance basis.

In response, we note first that we do not accept the commenter's legal argument based on section 112(d)(7). Section 112(d)(7) states that ''[n]o other emission standard * * * under this section shall be interpreted, construed or applied to diminish or replace the requirements of a more stringent emission limitation or other applicable requirement established pursuant to section 111 of this title, part C or D of this subchapter, or other authority of this chapter or a standard issued under State authority.'' Although the commenter maintained that this provision unambiguously bars the EPA from amending the promulgated NESHAP to make it less stringent, we disagree. Indeed, it is hard to read the statutory language in such a way. On its face, the provision indicates that a section 112(d) standard does not supplant more stringent standards issued under some authority other than section 112(d). Nor does the commenter's interpretation make sense. It would bar the EPA from amending a section 112(d) standard that was technically deficient or incorrect. This cannot have been Congress' intent when adopting the technology-based section 112(d) MACT regime.[6] Moreover, when Congress adopted anti-backsliding provisions in the CAA, it did so explicitly. See CAA sections 172(e); 110(l); and 193. There is no such explicit language in section 112(d)(7). Thus, the EPA does not read section 112(d)(7) as precluding amendments to MACT standards which result in numerically less stringent standards, provided of course, that such standards are technically justified and otherwise consistent with the requirements of the Act.

The commenter is also mistaken in asserting that sources can simply utilize PM CEMS not correlated to PS 11. The PS 11 requirements apply to all PM CEMS used by a cement kiln. See sections 63.1349(b)(1)(A) and 1350 (b)(1) from the 2010 final rule (75 FR 55057, 55059).[7]

With regard to the technical issues raised by this commenter, the EPA explained in detail at proposal the problems of correlating PM CEMS under PS 11 at cement plants (see 77 FR 42374–42377). These obstacles are not resolvable simply by measuring more often and longer, as the commenter maintains. Extending the duration of the Method 5 test gives this reference method additional opportunity to collect more sample mass, but this is no guarantee that the time added to the test will collect enough particulate mass to resolve detection issues, especially when testing is conducted at the better performing (lower emitting) sources. Longer test runs inherently increase the variability of the PM CEMS data collected during the test, which may cause further difficulties with the

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[5] One commenter inaccurately stated that the proposed rule would essentially double the PM standard. As just explained, the existing source floor (and standard) increased from 0.04 30-day average to 0.05 lb/ton clinker 30-day average as a result of removing CISWI kilns. As a not-to-exceed standard, that same level is expressed as 0.07 lb/ton clinker, the higher level reflecting the greater variability involved when basing the standard on the average of the three test runs rather than on 30 days of measurements.

[6] The commenter cites no legislative history to support its reading, nor is EPA aware of any.

[7] It also makes no sense to use PM CEMS not subject to a uniform calibration protocol. The results obtained would not be comparable.

correlation between instrument and reference method. Nor does conducting a higher number of reference method tests resolve the difficulties with PS 11 correlation created by greater uncertainty in the reference method at low levels. Put another way, more tests with high uncertainty and poor correlation do not improve the likelihood of passing PS 11 as there is no expectation of improving the mathematical relationship between the reference test and the instrument. Furthermore, PS 11 section 8.6 requires a minimum number of fifteen tests to develop a correlation curve, with no limit to the maximum number. Considering more than 15 tests when developing the correlation creates much difficulty in developing a precise mathematical relationship. Sources are allowed to discard 5 runs for any reason they wish, but must present at least 15 test runs for the correlation calculation. *Id.* As a source increases the number of test runs beyond 20, any additional runs must be included in the correlation equation and at that point the ability of a source to satisfy PS 11 becomes more hampered with every test run.

The EPA noted that special problems are posed by the size and variability of cement kiln-generated particulate. The EPA also noted that the standard light-scintillation type of PM CEMS would likely encounter higher variability for the same PM concentration, and have difficulty satisfying correlation protocols as a result. The EPA noted that beta gauge CEMS could potentially resolve at least some issues related to cement particle variability but noted further that these devices were largely untested in the cement industry, and none (so far as the EPA is aware) has successfully completed a PS 11 certification. See 77 FR 42375/3. The commenter maintains that the existence of beta gauge CEMS resolves all questions as to their reliability in the cement industry, but the EPA reiterates, as it did at proposal, that there needs to be some assurance of the reliability of that methodology to certify with PS 11 at low levels (as required by this final rule). That information does not presently exist. The commenter states that the EPA is being speculative as to potential difficulties with a different CEMS technology, but relative to Portland cement sources, it would be speculative to assume that beta gauge CEMS would successfully pass a PS 11 certification to reliably and quantifiably measure compliance with the NESHAP, especially at the very low PM levels at some of the sources in the cement source category.

The commenter also maintains that Tapered Element Oscillating Microbalance (TEOM) devices could be used in place of light scintillation PM CEMS. A TEOM is a device that uses a very thin, tapered, element vibrating at a known frequency that has a first principle relationship to the measurement of mass. Particles that impact the element also impact the harmonic vibration of the sensor which can be translated to a measurement of the particle mass. This is a more direct approach to measuring the actual mass of PM in stack gas, and has shown promise to operate very consistently at low levels in laboratory conditions. Several TEOMs are currently used for monitoring ambient PM levels at several non-cement, non-domestic industry installations. TEOMs that are capable of measuring stack gas are not currently available for sale in the U.S., though this may change in future years. Even so, with a monitor capable of more direct mass measurement of PM in stack gas, using PS 11 to certify one against Method 5 may be problematic at low PM concentrations. The EPA currently has no data to assess TEOM capabilities versus Method 5 at very low PM concentrations such as those presented by the better performing sources in this category. Were TEOM instrumentation commercially available, the EPA would need to conduct a re-evaluation of PM CEMS technology that included TEOM data to determine if this instrument could overcome the challenges posed by calibration with Method 5 at the very low PM levels emitted by some of the sources in the cement source category. As just explained, it is not speculation, but rather legitimate engineering caution that makes it appropriate not to require compliance with a rule based on an untested measurement methodology.

The commenter further maintains that rather than amend the standard to change the compliance test methodology and averaging time, the EPA should revise PS 11 instead, evidently assuming that a revision can be done rapidly. The commenter's assumption is mistaken. Performance specification development is a process that takes multiple years and involves data collection on types of technologies, field testing, comparison to reference measurement methodology, workgroup and stakeholder meetings, peer review, rule proposal and public comment period, as well as comment response and final promulgation of the Performance Specification. With the development of PA 12A for Mercury CEMS, the EPA invested a budget in excess of one million dollars to conduct technology and field studies, as well as to refine the analytical techniques and work through stakeholder concerns prior to proposal of the Performance Specification. The process from inception to final promulgation took over 5 years to complete. PS 11, at issue here, was over 3 years in development, from concept to final promulgation, and involved a budget of $250,000. Based on this past history, it is likely to result in a delay of 3 years or more were the EPA to delay promulgation of this final rule until we could undertake the process to research, propose and finalize solutions to PS 11 that may ameliorate some of the issues vis-a-vis the cement industry now present. Furthermore, such a process would not address the issues relating to measurement uncertainties using Method 5 at low PM concentration levels near its detection limit (i.e. below its practical quantitation limit of 3 mg), and so there would remain significant technological hurdles to clear before the EPA could require the use of PM CEMS in respect to this final rule.

The commenter points to PM CEMS use by European cement kilns. This is a misplaced comparison. The European calibration and certification of this instrumentation is completely different than PS 11 requirements developed by the EPA. European monitoring is certified in a laboratory environment, and calibrated on site by the instrument vendor when installed. The EPA has a long history of requiring CEMS installations in the USA to meet more rigorous calibration and performance specification certification through a series of comparisons to reference Method 5 test measurements conducted on the stack with the flue gas matrix at the facility, not in a controlled laboratory. For a PM CEMS, this would be a correlation developed with Method 5 as described in PS 11. The two certification regimes differ greatly in approach and simply adapting European certification standards to USA facilities does nothing to mitigate this difference.

In summary, the EPA has carefully considered the issue and it is our engineering judgment that the PS 11 correlation will not be technically or practically achievable for a significant number of cement kiln sources. This is due to the combination of the low emissions concentrations, PM CEMS measurement uncertainty factors, the variability in composition of cement PM, and need for extraordinarily long test runs to reduce Method 5 uncertainty to a level that provides normal measurement confidence (i.e. greater than the 3 mg practical quantitation level of Method 5), plus the compounding uncertainties associated with source operational variability. The EPA further recognizes that these problems in developing PS 11 correlations are most likely to adversely affect the lowest emitting sources in the category and are more likely to result in violations of the rule more often for these sources than for sources operating with higher PM emissions. This result would obviously be environmentally counterproductive. We are therefore amending the standard to be based on stack testing, and expressing the standard as a not-to-exceed (i.e., stack test Method 5 or 5I) standard of 0.07 lb/ton clinker.[8]

Additional responses regarding these issues, including responses to issues raised in the comments from industry, are found in sections 3 and 4 of the Response to Comment document, which is found in the docket for this rulemaking.

2. Issues Related to Use of CPMS for Parametric Monitoring

To document continuous compliance with the Method 5 standard (i.e., parametric monitoring designed to monitor proper operation of PM controls), the EPA proposed that PM be monitored continuously using a CPMS. See 77 FR 42376–77. The parametric limit was to reflect the highest of the three method 5 test runs from the stack test, and would be averaged over 30-days. The EPA further proposed corrective action requirements in the event of exceeding the 30-day rolling average parametric limit, and a rebuttable presumption that four such exceedances in a calendar year showed a violation of the emission standard itself.

With respect to the use of CPMS technology, the EPA has recognized that PM CEMS technology cannot meet PS 11 requirements in all Portland cement installations, yet the EPA has also recognized that PM CEMS sensors are more sensitive and better at detecting small differences in PM concentration than other technologies such as opacity monitors (*http://www.epa.gov/ttn/emc/cem/pmcemsknowfinalrep.pdf*) In considering the use of PM CEMS at Portland cement facilities we find that while using PM CEMS technology for continuous quantitative measurement of PM concentration as correlated to Method 5 with PS 11 is frequently not achievable (as stated in the preceding subsection of this preamble), using the same technology for continuous qualitative measurement of PM emissions is practicable in every instance. Given the information we have that shows PM CEMS technology to be more sensitive to in-stack PM concentration differences than opacity monitors and nepheolmeters, the EPA sees a distinct advantage in using these technologies for continuous parametric PM monitoring, rather than measuring some other parameter.

In using a PM CEMS as a CPMS to conduct continuous qualitative monitoring of PM concentration in the stack, we are not interested in specific output information from the instrument (e.g. lbs/ton clinker). We only need to know that PM concentration increases or decreases. The signal output from the instrument need not be correlated to PM concentration through PS 11 trials to achieve this, but rather we can accept the native signal output from the instrument, as is, in milliamps, and track that signal to determine trends in PM emissions. In this final rule we are requiring PM CPMS instruments to employ a 4–20 milliamp output, which is a standard electronic signal output common to many CEMS.[9] With a PM CPMS the milliamp output would not represent an opacity value, but like an opacity analyzer, the milliamps would increase as PM concentration increases and decrease as PM concentration decreases. We can then monitor the milliamp signal while conducting a Method 5 performance test and correlate the average milliamp signal to the average PM concentration during the testing. This relationship is notably coarser in terms of understanding the precise PM concentration in the stack, but the instrument's sensitivity to changing PM concentration in the stack, and its changing milliamp signal output, does not deteriorate and may still be employed to qualitatively monitor PM emissions.

The EPA received numerous comments about our proposed PM CPMS parametric monitoring approach. Industry commenters maintained that sources would have to continually retest unnecessarily, since CPMS measure an increase in PM CPMS values. This increase in PM CPMS values would (or at least, could) denote a modest rise in PM emissions, but actual stack emissions of PM could still be well below the limit. The EPA recognizes this concern as creating additional burden for facilities exhibiting good control of their PM emissions (see section IV.A above), and, therefore, we have modified the process by which a source would establish and comply with their PM CPMS operating limit in this final rule. In doing so we considered scaling options for PM CPMS signals, as they correspond with PM emissions, that were proposed by industry but found the options presented were not protective enough of the emission standard. After extensive analysis (see S. Johnson, memo to docket number EPA–HQ–OAR–2011–0817, ''Establishing an Operating Limit for PM CPMS'', November 2012), we are promulgating a scaling factor of 75 percent of the emission limit as a benchmark. See section IV.A above. As in the proposed rule, every source will need to conduct an annual Method 5 test to determine compliance with the PM emissions limit, and during this testing will also monitor their PM CPMS milliamp output. Sources which emit PM less than 75 percent of their emission limit will be able to scale their PM CPMS milliamp output to determine where their PM CPMS would intersect 75 percent of their allowed PM emissions, and set their operating level at that milliamp output. This alleviates many re-testing concerns for sources that operate well below the emission limit and provides them with greater operational flexibility while still assuring continuous compliance with the PM stack emission standard. It also creates an incentive for sources to select high efficiency PM controls when sources are evaluating potential compliance strategies.

For sources whose Method 5 compliance tests place them at or above 75 percent of the emission standard, their operating level will be the average PM CPMS milliamp output during the three Method 5 test runs. This means their operating level is the milliamp output that correlates to their PM compliance determination, and not the highest average 1 hour run value that was in the proposed rule. Now that we are adopting a scaling factor, we no longer believe that it is also appropriate to establish the parametric limit based on the highest of the three runs (which moreover, could reflect a level higher than the level of the standard). Moreover, as noted below, we believe that on balance the 30 days of averaged

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[8] Because the EPA believes that these same issues pertain to measurements of the section 111(b) new source performance standard for modified sources, and because further controls would be both costly and not cost effective (see section V.A.3 below), the EPA is adopting the same amendment for modified new sources under the NSPS.

[9] For example, an opacity instrument uses a series of filters to calibrate the analyzer and produce a ''percent opacity'' output. Twenty five percent opacity likely correlates to a milliamp value near eight milliamps, or 4 milliamps plus 25 percent of the difference between 4 and 20 milliamps (again, 4 milliamps). Fifty percent opacity would represent a signal near 12 milliamps, and so on, with 20 milliamps representing a signal of 100 percent opacity.

CPMS measurements provides ample operating cushion.

In a recent rule (76 FR 15736, March 21, 2011), the EPA established 75 percent of the limit as a number that allows for compliance flexibility and is simultaneously protective of the emission standard. In this final rule we are utilizing that value so as not to impose unintended and costly retest requirements for the lowest emitting sources and to provide for more cost effective, continuous, PM parametric monitoring across the Portland cement sector. This approach was selected from among many considered as it provides the greatest amount of flexibility while demonstrating continuous compliance for sources which are the lower emitters in the category and is also effective in holding higher emitters to the emission standard. With this parametric monitoring approach in place we expect sources to evaluate control options that provide excellent PM emissions control and provide them greater operational flexibility below the standard.

One commenter maintained that the use of a CPMS for parametric monitoring would be ''egregious'' since the milliamp output of the CPMS allowed a source to select operational parameters of tangential relation to PM emissions and would therefore not provide useful information as to proper PM control. The commenter also stated that monitoring of opacity would be preferable. An industry commenter likewise requested that continuous opacity monitors or bag leak detectors be used rather than CPMS.

The EPA does not agree with these comments. First, the milliamp output of the CPMS reliably and sensitively indicates increasing or decreasing PM concentration in the stack. Where PM controls are failing, the PM CPMS signal will indicate the increasing concentration of PM in the stack. A source will need to monitor the trend from the PM CPMS daily reading to maintain compliance with the 30-day emission standard. Indeed, the EPA has sufficient confidence that four exceedances of the CPMS continuous measurements is a presumptive violation of the emission standard itself. Moreover, the CPMS is considerably more sensitive than an opacity monitor or bag leak detector at detecting fluctuations in PM level. An opacity monitor determines the percent of a light signal that is occluded across the stack diameter. Opacity analyzers operate on a zero to 100 percent scale, meaning they are capable of registering PM that completely occludes the far stack wall from the instrument light source. This amount of PM is roughly equivalent to a complete failure of the emission control device. A properly operating control device will emit five percent opacity or less, which is barely visible to the naked eye and on the low end of the opacity monitor capability. PM emissions that increase opacity two percent at this level may well exceed the emission standard, yet they only mildly deflect the opacity monitor output. This same 2 percent opacity increase is capable of registering changes of several milliamps on a PM CPMS when operating on the scale provided in this final rule. With several decimal fractions available between each milliamp to track signal output, and three or four milliamps representing 1 percent opacity, the PM CPMS has a clear advantage in low PM concentration measurement over continuous opacity monitoring systems. Regarding baghouse leak detectors, the EPA has no information that shows them operating on the same sensitivity level as PM CPMS technology, and we do not require baghouse leak detection systems on sources where PM CPMS are in use for this reason.

Industry commenters objected to the proposal that 4 calendar year exceedances[10] from the parametric limit would be a presumptive violation of the emission standard. Again, the EPA does not agree. First, the EPA may permissibly establish such a presumption by rule, assuming there is a reasonable factual basis to do so. See *Hazardous Waste Treatment Council* v. *EPA,* 886 F. 2d 355, 367–68 (DC Cir. 1989) explaining that such presumptions can legitimately establish the elements of the agency's *prima facie* case in an enforcement action. Second, there is a reasonable basis here for the presumption that four exceedances (i.e. increases over the parametric operating limit) in a calendar year are a violation of the emission standard. The parametric monitoring limit is established as a 30-day average of the averaged test value in the performance test, or the 75th percentile value if that is higher. In either instance, the 30-day averaging feature provides significant leeway to the owner operator not to deviate from the parametric operating level since the 30 measurements will significantly dampen variability in the single measurement (average of three test runs) that produced the parametric value. See 77 FR 42377/2 and sources there cited. The EPA acknowledges that the difference was even greater between the parametric level and the emission standard in the proposed rule (which was based on the highest measured test run). The EPA believes that the 30-day averaging feature plus the 75-percent scaling feature for the lower emitting sources now provides a sufficient operating cushion. See 77 FR 42377.

3. Existing Source Beyond the Floor Determination

The EPA proposed to use the floor levels for PM as the standard, rejecting more stringent standards on the grounds of poor cost effectiveness (after considering non-air environmental impacts and energy implications of a more stringent standard as well). See 77 FR 42376. One commenter argued that the EPA should adopt a beyond the floor standard for PM, maintaining that such a standard was justified under the factors set out in section 112 (d)(2).

The EPA disagrees, and is not adopting a beyond the floor standard. After considering the cost of the emission reductions attributable to such a standard, and the associated non-air and energy impacts of such a standard, the EPA determines that the standard is not ''achievable'' within the meaning of section 112 (d)(2). Specifically, the EPA estimates that a beyond the floor standard set at the level of the original (2010 final rule) standard would only result in 138 tpy—nationwide—of PM reduction (a value not questioned by any of the commenters). See Final Portland Cement Reconsideration Technical Support Document, December 20, 2012. We further estimate that the cost of achieving this modest incremental reduction would be approximately $37 million (the estimated cost savings attributable to the amended PM standard (including savings attributable to ancillary PM controls related to collection of PM from the control of Hg, THC, and HCl). See Final Portland Cement Reconsideration Technical Support Document, December 20, 2012, included in the rule docket, EPA–HQ–OAR–2011–0817. These total costs are high compared to the small nationwide emission reductions, and the cost effectiveness of these reductions is correspondingly high: approximately $268,000 per ton of PM removed. This is significantly higher cost effectiveness for PM than the EPA has accepted in other NESHAP

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[10] In the proposed rule, the EPA referred to a measurement higher than the parametric limit as a ''deviation'' and proposed a definition of deviation. See 77 FR 42398. The EPA is not including this terminology in this final rule. The term ''deviation'' is not in the Portland cement NESHAP rules (which date back to 1998), and has not proved necessary in practice. More important, the rule itself states what the consequences of measurements which exceed a parametric limit are (i.e. retesting, and in some instances, a presumptive violation of the emission standard itself), so that no further general regulatory provision (i.e. a generalized definition of 'deviation' or similar term) is necessary.

standards. See 76 FR 15704 (March 21, 2011) (rejecting $48,501 per ton of PM as not cost effective for PM emitted by CISWI energy recovery units); see also 72 FR 53814, 53826 (Sept. 20, 2007) (proposing (and later accepting) cost effectiveness of $10,000 per ton for PM as reasonable in determining Generally Available Control Technology, and noting that the EPA had viewed cost effectiveness only as high as approximately $31,000 per ton as reasonable under its Title II program for mobile sources). A beyond the floor standard at the level of the 2010 standard would also involve slightly higher energy use, although this is not a major factor in EPA's decision. EPA is therefore not adopting a beyond the floor standard for PM at the level of the 2010 standard. A standard even more stringent would likewise not be justified. See 76 FR 54988.[11]

4. New Source PM Standard Under Section 112(d)(3)

One commenter challenged the methodology the EPA used in the 2010 rulemaking to establish the new source floor and standard, maintaining that for new plants, the EPA's floors must reflect the emission level achieved by the single best performing kiln in the category, not the best performing kiln for which the EPA happens to have emissions information. See section 112(d)(3). The EPA did not reopen the methodology by which new source floors for this industry are determined. See 77 FR 42373 n. 3 (''The EPA will not consider comments challenging the data and methodology for the new source standards since these are unchanged from the 2010 rule and the EPA is not reexamining any of these issues.'') In any case, if the issue is (against the EPA's view) deemed to be reopened, CAA section 112(d)(3) indicates that new source floors are to be based on ''the emission control that is achieved in practice by the best controlled similar source, *as determined by the Administrator''* (emphasis supplied). This language affords considerable discretion for the agency to base the NESHAP new source floors on performance of sources for which the agency has emissions information.

B. Mercury Standard

The EPA explained at proposal that reanalysis of the mercury floor, after removing CISWI kilns, resulted in a floor of 58 lb/MM tons clinker produced—slightly higher than the previously calculated floor and standard of 55 lb/MM tons clinker produced. The EPA further proposed to adopt 55 lb/MM tons clinker produced as a beyond-the-floor standard. See 77 FR 42373. The new source standard was unchanged since the standard was based on the performance of the best performing similar source.

The EPA is adopting the standards as proposed. One commenter challenged the appropriateness of adopting a beyond-the-floor standard, not for the industry as a whole, but for itself. As to this individual plant (Ash Grove, Durkee), the commenter maintained that the cost of attaining the three additional lb/MM ton clinker produced reduction (i.e., the difference between 58 and 55 lb/MM tons clinker produced) was greater than the EPA estimated because it would require more than just additional carbon in an activated carbon injection system to achieve the incremental difference. According to the commenter, they have performed extensive testing and the addition of activated carbon per million actual cubic feet per minute of exhaust gas has little or no impact on mercury emissions. The commenter states that for plants such as Ash Grove's Durkee plant, there is no known add-on control technology at this time that will assure achievement of the standard on a continuous basis.

We note first that the commenter is somewhat over-estimating the incremental reduction of mercury actually needed. To achieve the emission standard, sources will need to operate their processes and controls so that they can achieve the average emissions level used in setting the existing source limit of 55 lb/MM ton—the so-called design level. See e.g. 77 FR 42389/3 (estimating emissions attributable to this final rule based on design levels); see also discussion of design values in section VI.B below. That level is 31.7 lb/MM ton for the standard of 55 lb/MM ton. See 75 FR 54976/3. The average for the 58 lb/MM ton is 34.1 lb/MM ton. The additional reduction needed is therefore 2.4 lb/MM tons, not 3 lb/MM tons as stated by the commenter.

As the EPA has acknowledged repeatedly, due to the high levels of mercury in their limestone, mercury emissions from the Ash Grove Durkee plant are not typical of other plants in the industry. See, e.g. 75 FR 54978–79. As a result, this plant faces a particularly great challenge in meeting the mercury standard, whether the standard is 55 or 58 lb/MM tons. Because of their unique situation, we do not believe that the difficulties this facility is having in meeting the mercury standards can be generalized to the rest of the industry. Section 112(d)(2) of the Act posits an industry-wide standard. Having said this, our cost analysis conducted for the 2009 proposal and 2010 final rule assumed that this plant would have to install multiple control systems in order to meet the limit for mercury. See Docket item EPA–HQ–OAR–2002–0051–3438. Therefore, if in this particular case the activated carbon injection (ACI) system cannot achieve the small additional reductions required, then the facility has other mercury control options available such as further dust shuttling, or treating cement kiln dust to remove mercury. Dust shuttling entails moving dust from within the kiln to other parts of the process and is considered a closed loop process, thereby not causing any waste impacts. In addition, any costs associated with dust shuttling have already been accounted for in the cost estimates the EPA has developed for this particular facility.

The commenter alluded to control performance data that it shared with the EPA. We note that the commenter has provided pilot scale data as part of the 2010 rulemaking (see Docket item EPA–HQ–OAR–2002–0051–2073), but has not provided data on the effects of increasing carbon injection on mercury emissions for a full scale facility. We note that in the electric utility industry, where there is significantly more experience with ACI, it is well established that higher carbon injection rates increase mercury removal (Sjostrom, S.; Durham, M.; Bustard, J. Martin, C.; ''Activated Carbon Injection for Mercury Control: Overview'', FUEL, 89, 6, 1320 (2010)). There is no data to indicate that ACI systems in the cement industry would behave differently than those in the utility industry. Given the lack of data on the efficacy of increasing carbon injection rates on mercury removal for full scale cement operations, we cannot conclude that increasing carbon injection is not a

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[11] The commenter's argument that section 112 (d)(2)'s requirement that the EPA consider ''the cost of achieving such emission reduction'' limits the EPA to considerations of economic achievability, and not cost effectiveness, is misplaced. See *Husqvarna AB* v. *EPA,* 254 F. 3d 195, 200 (DC Cir. 2001) (cost effectiveness properly considered in evaluating cost of compliance under CAA section 213, a technology-based provision similar to section 112 (d)(2)). The commenter's further argument that the requirement in section 112 (d)(2) for standards to result in ''the maximum degree of reduction in emissions of hazardous air pollutants * * * achievable'' considering cost and other factors constrains the EPA's ability to consider cost-effectiveness or otherwise balance the statutory factors has likewise been rejected. See *Sierra Club* v. *EPA,* 325 F. 3d 374, 378 (DC Cir. 2003) (the EPA was left with great discretion in determining how to balance such factors when considering technology-based standards which are to result in maximum reductions achievable).

reasonable approach for increasing mercury removal efficiency.

C. Standards for Fugitive Emissions From Open Clinker Storage Piles

The EPA proposed that cement kilns control fugitive emissions from open clinker storage piles, defined at proposal as ‘‘any clinker storage pile that is not completely enclosed in a building or structure’’. These piles would be controlled through the use of work practices which minimized emissions by means of (among others) partial enclosure, damping down the pile by chemical or physical means or shielding piles from wind. These work practices were drawn from permits for existing cement kilns, and every cement kiln appears to already be utilizing some type of work practice to minimize fugitive emissions from open clinker storage piles. See 77 FR 42378. Cement kiln sources were allowed to select from among the specified work practices and choose those most suitable for its operations.

For both new and existing sources, the NESHAP is amended to require that one or more of the control measures identified in the rule be used to minimize fugitive dust emissions from open clinker storage piles. The work practices would apply to open clinker storage piles regardless of the quantity of clinker or the length of time that the clinker pile is in existence.

In addition, the owner or operator must include as part of their operations and maintenance plan (required in § 63.1347) the location of their open clinker storage piles and the fugitive dust control measures as specified in this rule that will be implemented to control fugitive dust emissions from open clinker piles. We agree with comments received that the list of allowed work practices reflects all of the available practices documented in cement kiln facility operating permits to control clinker storage pile fugitive emissions. The size, type and duration of a clinker pile may warrant different types of work practices. The final rule requires that one or more of a variety of work practices need to be employed, recognizing that the source will use the work practices that will be effective for the particular piles. Thus, the EPA has revised the list of work practices to be consistent with those listed in the proposal preamble. These are: Use of partial enclosures, using a water spray or fogging system, applying appropriate dust suppression agents, using a wind barrier and using a tarp. Commenters also requested that the EPA allow other work practices if approved by the delegated authority. Our regulations already provide procedures for sources to seek approval of alternative work practices. See section 112(h)(3) as implemented by 40 CFR 63.8(f).

Several industry commenters stated that the definition of clinker pile is problematic as proposed because it was not limited by size or duration. Commenters note that it is not uncommon for small amounts of clinker to be dropped, or to fall off a front-loader onto the ground when being moved from a kiln to a storage location or from such a location to the grinding mill. Because these are small amounts of clinker, it is also not uncommon that these small quantities of clinker will remain where they were dropped and may not be picked up or removed until the necessary manpower becomes available; in some cases this could be multiple days. Another industry commenter noted that because of the short-term duration of temporary clinker stockpiles, the use of work practices similar to those proposed for clinker storage piles is not feasible. The industry trade association suggested the following definition: ‘‘Open clinker storage pile means an outdoor, unenclosed accumulation of clinker on the ground, which contains in excess of 50,000 tons of clinker, and is utilized for a continuous period in excess of 180 days.’’ Under this suggested approach, only a clinker storage pile meeting this definition would be subject to the work practice standards.

We are not adopting this approach. We believe that the potential to emit may be different at different sites for a variety of reasons such as weather and traffic conditions. Nor did the commenter provide information indicating that open clinker storage piles of less than 50,000 tons or stored for less than 180 days are unlikely to produce fugitive emissions. Indeed, as a result of weather, traffic or other conditions, smaller piles stored for shorter periods have the evident potential to emit substantial levels of fugitive emissions. Nor is any such uniformly applicable distinction based on duration evident. Clinker piles can be temporary but be replaced by a new pile at the same (or nearby) location a few days later, with no essential difference in fugitive emissions.

Nonetheless, we believe that the commenter is correct that spills are unavoidable, and that work practices designed for non-temporary piles cannot feasibly be applied in such circumstances. The commenter is also correct that work practices used for non-temporary piles would be misapplied to temporary piles attributable to cleaning storage structures. For these reasons, the definition of ‘‘open storage pile’’ excludes these types of piles. Specifically, the definition of open clinker storage pile does not include temporary piles of clinker that are the result of accidental spillage or temporary use of outdoor storage while clinker storage buildings are being cleaned. This final rule defines ‘‘temporary’’ to mean piles that remain in place for 3 days or less from their generation (3 days accommodating weekend scheduling). This is sufficient time to either pick these spills up (the applicable work practice for these spills) or to cover them to prevent fugitive emissions.

These final amendments will result in a cost savings to the industry as compared to the 2010 rule. As a result of requiring work practices instead of enclosures, we estimate that there will be a savings of $8.25 million annually. See Final Portland Cement Reconsideration Technical Support Document, December 20, 2012, in this rulemaking docket.

D. September 9, 2015, Compliance Date for the Amended Existing Source Standards

The EPA proposed to establish September 9, 2015, as the compliance date for the amended existing source NESHAP standards. The basic reason for the proposed compliance date was that the proposed change in the PM standard made possible different compliance alternatives for all of the stack emission standards, and that it could legitimately take two years from the original compliance date to implement these new compliance strategies. See 77 FR 42385–87. Further, the amended compliance date would apply to all of the stack emission standards due to the interrelatedness of the standards: the mercury, THC and HCl standards all typically involve some element of PM generation and capture and so the controls must be integrated with PM control strategies. Id. at 42386.

The record for this final rule supports the need for the September 9, 2015 compliance date. With respect to PM control, as the EPA explained at proposal, plants now have the option of retaining electrostatic precipitators (ESP) with modification or downstream polishing baghouses, rather than replacing ESP with baghouses. Plants may also size baghouses differently (with or without incorporation of upstream or downstream polishing elements). The various types of sorbent injection strategies to control organics, mercury and HCl, are affected by the PM limits (and vice versa). Based on the facts of this record for this source category, the type, size and aggressiveness of the controls for these HAP, as well as the PM controls, are not only interdependent but can all change as a result of the amended PM standard. In addition, the amended alternative oHAP standard affords additional compliance alternatives for control of non-dioxin organic HAP, including alternatives to use of Residual Thermal Oxidizers. See generally, Final Portland Cement Reconsideration Technical Support Document, section 3.1, December 2012, in the docket for this rulemaking.

Determining, developing, installing, testing and otherwise implementing a different comprehensive HAP control regime takes time. Specifically, plants will need to conduct engineering studies, determine the most cost-effective control strategy, seek contract bids, purchase equipment, install and test the new equipment. Below is an estimate of a timeline for a cement kiln to undertake these steps.

TIME NEEDED TO PREPARE FOR COMPLIANCE

[Docket item EPA–HQ–OAR–2011–0817–0505–A1]

Steps in preparing for compliance	Time period
New engineering study	January–April 2013.
Selection of technology providers	April–August 2013.
Technology procurement	August–December 2013.
Detailed technology design and final engineering	January–June 2014.
Equipment fabrication and permitting	June–December 2014.
Construction and tying into existing operation	January–May 2015.
Technology commissioning	June–August 2015.

One commenter, sharply opposing any change in compliance date, maintained that all of this reasoning is hypothetical and that such a consequential extension could not legitimately rest on speculation. The EPA disagrees that this analysis is speculative. First, the EPA's engineering judgment is that the changes in the PM standard and alternative oHAP standard, open up different compliance alternatives from those under the 2010 rule. The EPA has indicated what those alternatives can be, and the time needed to determine, purchase, install and test them. Comments from the affected industry are consistent with the EPA's engineering judgment as to the type of different compliance approaches now available for existing sources.

The EPA's engineering determinations as to the time needed for cement kilns to implement a different multi-HAP control strategy here are moreover consistent with the agency's long-standing analysis (i.e. analysis not specific to the cement industry) of the time needed to install multipollutant control systems. See US EPA, Engineering and Economic Factors Affecting the Installation of Control Technologies for Multipollutant Strategies, EPA–600/R–02/073, October 2002) (cited at 77 FR 42386). Therefore, the EPA estimated that it is normal for the development and implementation of new compliance measures to take between 15–27 months for single control systems, and longer for systems involving multiple controls for HAP and criteria pollutants, as is the case here.

The record to this rule also contains a survey of 92 of the 97 domestic cement kilns currently in operation. These survey results document, on a kiln by kiln basis, alternative engineering strategies now available to these kilns as a result of the amended PM standard and also documents the time each kiln estimates would be needed to carry out these new compliance strategies. See Comments of PCA, Appendix D (EPA–HQ–OAR–2011–0817–0505). For example, kiln B [12] has the option of modifying its ESP system using a hybrid ESP/baghouse filter system, or of using a cyclone upstream of the ESP. Steps needed to implement these possibilities include main stack evaluation, cooler stack testing, and evaluation, vendor/contractor selection, final design, equipment procurement and fabrication, startup and commissioning, and demonstrating compliance. The plant has already commenced some of these steps, but provides reasonable time estimates for why it would take until September 2015 to complete them. Kiln Q [13] expects to be able to retain its ESP system (whereas it could not under the 2010 final rule), but needs to resize its dust conveying system, upgrade the ESP, and utilize a larger activated carbon injection system differently from planned (since an ESP will not capture mercury as would a baghouse). Steps involved in developing and implementing a system include reviewing the structural integrity of the existing ESP, obtaining proposals on ESP upgrades, relocating an existing stack adjacent to the existing ESP, complete stack design, order equipment for ESP upgrades, order a new stack, contract construction, perform necessary construction, modify the ESP as needed, evaluate CEMS performance and conduct stack testing and make any adjustments to the integrated control system. Again, reasonable timelines for carrying out these steps are provided.

Neither the EPA nor the industry has said definitively what each kiln will do and how long it will take. Until the standards are finalized, no such definitive pronouncement is possible. However, the record is quite specific that additional control strategies are now possible; what the range of those new control strategies are; that the strategies are interrelated so that the standards for PM, organics, mercury and HCl are all implicated; and the time needed to carry out the various strategies. Thus, the commenter is mistaken that the record regarding the need for a compliance date of September 2015 is merely conjectural.

The EPA solicited comment on the possibility of a shorter extension for the stack emission standards, noting that by virtue of the 2010 final rule, the industry was not starting from scratch but could already undertake compliance steps. See 77 FR 42386/3. The survey results referred to above confirm that this is the case, since a number of plants (to their credit) indicated that they have taken preliminary steps toward compliance such as conducting stack testing, and testing various control strategies (e.g., survey results for kilns A, F and G). Nonetheless, many commenters made the evident point that this preliminary work could only go so far when there was uncertainty about

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[12] For competitiveness reasons, kilns in this survey are identified by letter. The survey results are consistent with the EPA's engineering understanding and judgment, and the EPA has no reason to dispute the overall survey results (although some details may be open to question).

[13] These examples were chosen at random by the EPA from the survey information provided in the comment.

the final standard and uncertainty around which standard would determine their final control strategy. Moreover, even those plants which had begun preliminary compliance steps indicated (with specific timelines provided) that the remaining work would legitimately stretch through the summer of 2015.

This same record refutes those comments maintaining that an even longer compliance extension is needed. Not only is this inconsistent with the EPA's own estimates, but the industry survey results document that no further time is needed. See CAA section 112(i)(3)(A) (compliance with CAA section 112(d) standards to be as expeditious as practicable). Therefore, the EPA is revising the compliance date for existing sources for PM, THC, HCl, and Hg to be September 9, 2015.

However, the EPA is establishing February 12, 2014, as the compliance date for the standards for existing open clinker piles. These standards are not inter-related to the stack emission standards, and so need not be on the same timeline. The work practices we are adopting as the standards reflect practices already in place throughout the entire industry. The time needed to come into compliance consequently is to establish a reporting and recordkeeping apparatus, and in some instances to obtain approval (after appropriate demonstration) to use work practices not enumerated in the standard. The EPA estimates that these various steps should not exceed twelve months. Since section 112(i)(3)(A) requires compliance to be as expeditious as practicable, the EPA is establishing a 12 month compliance period for these standards.

A compliance date for an amended standard must still be ''as expeditiou[s] as practicable'' and not more than 3 years. We believe a compliance extension is appropriate where, as here, for the stack emission standards, the amended result in a compliance regime differs from the initial rule and additional time is needed to develop, install, and implement the controls needed to meet the amended standard. The EPA has shown that to be the case here, as explained above.

The Sierra Club in its comments also argued that the EPA could not change the 2013 compliance date in the 2010 final rule as a matter of law. The commenter rests this argument on CAA sections 112(d)(7) and 112(i)(3)(A). We have responded above to the argument based on section 112(d)(7). Section 112(d)(7) simply is not an anti-backsliding provision (or, at the least, does not have to be interpreted that way).

CAA Section 112(i)(3)(A) states in relevant part:

''[a]fter the effective date of any emissions standard, limitation or regulation * * * the Administrator shall establish a compliance date or dates for each category or subcategory of existing sources, which shall provide for compliance as expeditiously as practicable, but in no event later than 3 years after the effective date of such standard''.

In *NRDC* v. *EPA (Plywood MACT*), 489 F. 3d 1364, 1373–74 (D.C. Cir. 2007) the court held that ''only the effective date of Section 112 emissions standards matters when determining the maximum compliance date.'' 489 F. 3d at 1373 (emphasis original). The EPA, therefore, lacked authority to extend the compliance date when it was only adjusting reporting terms. Id. at 1374. The opinion implies, however, that the EPA may reset the compliance date when the EPA amends the actual standard, as here. If the statute provided an absolute bar on the EPA extending an effective date, there was no reason for the court to distinguish the situation where the EPA amends some ancillary feature of the rule from the situation where the EPA amends the actual standard.[14]

The reason it makes sense for the EPA to have the authority to reestablish a compliance date when it amends a MACT standard is evident. In a technology-based regime like section 112(d), if the technology basis of the standard changes with a change of the standard, it takes time to adopt the revised controls. This result fits the statutory text.

Where the EPA has amended an existing source MACT standard, the compliance date for that amended standard must be as expeditious as practicable, and no later than 3 years from its effective date. Sierra Club argues that the original standard (the one that has been amended) must nonetheless take effect, but that standard no longer exists. It has been amended. Moreover, the result of Sierra Club's approach would force sources to install one technology and rip it out in short order to install another. Congress cannot have mandated this result. See *PCA* v. *EPA,* 655 F. 3d at 189 (staying NESHAP standards for clinker piles—that is, effectively extending their compliance date—because ''the standards could likely change substantially. Thus, industry should not have to build expensive new containment structures until the standard is finally determined.'')[15] [16] Moreover, in the extreme case where the initial standard was outright technically infeasible by any source (and was amended by the EPA to correct this defect), Sierra Club's reading would leave sources with literally no legitimate compliance option.[17] Technology-based standards simply do not work this way.

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[14] Sierra Club maintains that because the revisions to the PM standard leave that standard nearly as stringent as the 2010 standard, all that has effectively changed is the standard's averaging time. Sierra Club likens this situation to the amendments to ancillary provisions like reporting at issue in *Plywood MACT.* This is incorrect. First, as explained in section V.A. above, the standard did increase numerically as a result of removing commercial incinerators from the database. Portland Cement Reconsideration Technical Support Document, June 15, 2012, Docket item EPA–HQ–OAR–2011–0817–0225. Second, although the amended PM standard is relatively as stringent as the 2010 standard (75 FR 54988/2 and 77 FR 42389/3), it nonetheless affords different compliance options for all of the standards, as explained above and in further detail in the Response to Comment document. The standard allows flexibility for those days when emissions increase as a result of normal operating variability, without significantly affecting the long-term average performance for PM and affords different compliance opportunities as a result. Nor does the commenter consider the amendment to the alternative oHAP standard, which amendment likewise affords new compliance opportunities.

[15] In a variant of this argument, Sierra Club maintains that in a situation where the compliance date for an initial existing source MACT standard has not yet passed and the EPA amended that standard to make it more stringent, the EPA would nonetheless leave the predecessor less stringent standard in place and require compliance with it. Although this situation has not arisen, the EPA would presumably be governed by the same principle noted by the *PCA* court: is the technology basis for the standard changing in such a way as to require more time for compliance and in a way that negates the compliance strategy of the initial rule. (Of course, if the compliance date of a standard has already occurred and a standard is later amended, that compliance date would not change retroactively.)

[16] Sierra Club maintains that *PCA* is distinguishable because it involved a standard which the EPA was compelled to change. First, the comment is factually mistaken. The EPA had granted reconsideration of the clinker pile standards but had not indicated that the standards would be amended. See 76 FR 28325/1 (May 17, 2011). Nor did the court indicate that the pile standards must change. Rather, ''[b]ecause EPA will now be receiving comments for the first time, the standards *could* likely change substantially.'' 655 F. 3d at 189 (emphasis supplied). Thus, the court effectively reset the compliance date because of a potential future change in the rule which could result in a compliance regime which differed from that in the 2010 final rule. This is directly parallel to the situation now presented by the amended PM and alternative oHAP standards.

[17] An example is the startup and shutdown standard for HCl in the 2010 final rule. The EPA established this standard as zero on the mistaken assumption that no chlorine could be present in the kiln during there periods. See 76 FR 28325 (granting consideration on this basis). The commenter's approach would leave this technically infeasible standard and its compliance date in place without recourse.

E. Eligibility To Be a New Source Under NESHAP

CAA section 112(a)(4) states that a new source is a stationary source if ''the construction or reconstruction of which is commenced after the Administrator first proposes regulations under this section establishing an emissions standard applicable to such source.'' As we explained previously, there is some ambiguity in the language ''first proposes'' and such language could refer to different dates in different circumstances, such as the first time the Agency proposes any standards for the source category, the first time the Agency proposes standards under a particular rulemaking record for the source category, or the first time the Agency proposes a particular standard.

In the proposed reconsideration rule, the EPA proposed to retain May 6, 2009, as the date which determines new source eligibility and solicited comment on this issue. Industry commenters stated that we should change the date for determining new source status from May 9, 2009 to July 18, 2012, the date of the proposed reconsideration rule. In support, they asserted that they will not know what the final standards are until we finalize the reconsideration rule. We disagree with the commenters' suggestion and are retaining the May 6, 2009 date as the date that determines whether a source is a new source under CAA section 112(a)(4).

As we explained at proposal, it is reasonable to retain the May 6, 2009 date as the date the Agency ''first proposed'' standards for this source category. This is the date that EPA first proposed these standards under this particular rulemaking record. Today's action is a reconsideration action, and although it revises the particulate matter new source standard, it is premised on the same general rulemaking record. It is thus reasonable to view the date EPA ''first proposes'' standards to be the May 2009 date. Further, industry commenters essentially advocate an approach whereby any time the Agency changes a new source standard, in any way, on reconsideration, the new source trigger date would change. Such a result is not consistent with Congress' intent in defining the term ''new source'' in section 112(a)(4), to be the date the Agency ''first proposes'' standards. Furthermore, EPA notes that the new source standards finalized today are ones that will be met, in our view, using the same or similar control technologies as would be used to meet the standards issued in May 2010, and commenters have not disputed this conclusion. See 77 FR 42387.

VI. Summary of Cost, Environmental, Energy and Economic Impacts

A. What are the affected sources?

As noted in the proposed rule, the EPA estimates that by 2013 there will be 100 Portland cement manufacturing facilities located in the U.S. and Puerto Rico that are expected to be affected by this final rule, and that approximately 5 of those facilities are new greenfield facilities. All these facilities will operate 156 cement kilns and associated clinker coolers. Of these kilns, 23 are CISWI kilns. These have been removed from our data set used to establish existing source floors. Based on capacity expansion data provided by the PCA, by 2013 there will be 16 kilns and their associated clinker coolers subject to NESHAP new source emission limits for PM, mercury, HCl and THC, and 7 kilns and clinker coolers subject to the amended NSPS for nitrogen oxide and SO_2. Some of these new kilns will be built at existing facilities and some at new greenfield facilities.

B. How did the EPA evaluate the impacts of these amendments?

For these final amendments, we determined whether additional control measures, work practices and monitoring requirements would be required by cement manufacturing facilities to comply with the amended rules, incremental to the 2010 final standards (since any other comparison would result in double counting). For any additional control measure, work practice or monitoring requirement we determined the associated capital and annualized cost that would be incurred by facilities required to implement the measures. Finally, we considered the extent to which any facility in the industry would find it necessary to implement any of the additional measures in order to comply with these final amendments. Using this approach, we assessed potential impacts from the proposed revisions.

These final amendments to the 2010 rule are expected to result in lower costs for the Portland cement industry. The final amendment to the PM standard affords alternative, less costly compliance opportunities for existing sources. See section V.D above. These could be utilizing existing PM control devices rather than replacing them (for example, retaining an ESP or a smaller baghouse), or supplementing existing PM control rather than replacing it (putting polishing controls ahead of the primary PM control device, for instance). Compliance strategies for the other HAP, all of which involve some element of PM control, also may be affected. Cost savings from these alternatives could be significant. There are also potential cost savings associated with the amended oHAP alternative standard (which now may be a viable compliance alternative for some sources since issues of reliable analytic measurement have been resolved). Following proposal, industry submitted kiln specific information on likely changes in compliance strategy resulting from the proposed amendments so that we are now better able to estimate potential savings resulting from the final amendments. Based on an industry survey of 18 Portland cement facilities (20 kilns) after proposal (see Docket item EPA–HQ–OAR–2011–0817–0505, Appendix D), it appears that the amendments may have the following effects, which may result in savings in capital and annual costs associated with implementing control technologies for these pollutants:

- Regenerative thermal oxidizers (RTO) may not need to be installed due to the amended oHAP alternative.
- Carbon injection rates may be lowered or not required for THC control.
- Existing PM controls (ESP and baghouse) may not need to be replaced, but may instead be upgraded.
- Additional PM controls may not have to be implemented.
- Polishing and hybrid filter configurations may be implemented instead of total replacements.

There are also certain costs, and cost savings, associated with other provisions of the final amendments. There may be a difference in costs of stack testing for PM and use of a CPMS, rather than use of a PM CEMS. In addition, there are cost savings when changing from a PM CEMS compliance demonstration to a CPMS demonstration. For example as part of the PS 11 calibration requirements, a minimum of 15 Method 5 test runs are required to develop a correlation curve, with no limit to the maximum number of test runs. Omitting the need for these multiple test runs will save the facility a minimum of $20,000 per kiln (each Method 5 test costs $5,000). At a savings of $20,000 per kiln, nationwide savings for 133 new and existing kilns, would be $2.7 million per year. However, the CPMS is the same type of device as a PM CEMS, so the capital cost of the CPMS would not be significantly different than the CEMS device.

The final revisions to the alternative organic HAP standard (from 9 ppm to 12 ppm, reflecting the analytic method practical quantitation limit) would allow more sources to select this compliance alternative and demonstrate compliance without needing to install very expensive and energy-intensive RTO. In addition, providing parametric monitoring flexibilities (not present in the 2010 final rule) will provide lower costs for the better-performing sources in the industry. See section IV.B above. We have quantified these savings (see Final Portland Cement Reconsideration Technical Support Document, December 20, 2012, Section 3).

The revisions to the standard for open clinker storage piles codify current fugitive dust control measures already required by most states, so no impacts are expected. These final standards would be significantly less expensive than the controls for open piles in the 2010 final rule, which required enclosures in all instances. We estimate that the savings to industry over the 2010 rule will be $8.25 million annually. See Final Portland Cement Reconsideration Technical Support Document, December 20, 2012, in this rulemaking docket.

We have estimated the additional industry cost associated with the affirmative defense to civil penalties provisions. We estimate the additional cost is $3,258 per year for the entire industry. See Supporting Statement in the docket.

One of the final revisions would allow sources that control HCl with dry scrubbers to use periodic performance testing and parametric monitoring rather than monitoring compliance with an HCl CEMS. This will provide those sources with additional flexibility in complying with the HCl standard.

The revision to the alternative PM emissions limit provisions merely recognizes that sources other than the clinker cooler may combine their exhaust with the kiln exhaust gas and corrects the equation for calculating the alternative limit. Therefore, there should be no impacts from this revision.

The amendments provide for work practices rather than numerical standards during periods of startup and shutdown. The work practice standards reflect common industry practices, so there should be no costs associated with them. There should also be substantial savings associated with the work practices.

At an annual cost of about $51,000 per year ($22,800 per Method 30B test for mercury + $8,000 per year for Method 25A test for THC + $20,000 per year for Method 321 test for HCl), the final revisions for new testing and monitoring of coal mills that use kiln exhaust gases to dry coal and exhaust through a separate stack are not expected to have significant impacts.

The revisions would make existing kilns that undergo a modification, as defined by NSPS, subject to a PM standard of 0.07 lb/ton clinker, 3-run average. There may be less costly compliance alternatives under the amended standard, similar to alternatives available under the amended existing source NESHAP for PM.

C. What are the air quality impacts?

In these final amendments, emission limits for mercury, THC and HCl are unchanged from the 2010 rule. Thus, there is no change in emissions from the 2010 rule for these HAP and HAP surrogates. The alternative HAP organic standard is being amended to 12 ppm, which is the analytic method practical quantitation limit based on the performance test method detection limit of 4 ppm. The impact on emission levels due to this change is not clear since measuring below the quantitation limit does not yield a value with enough certainty to represent the actual level. Thus, a measurement below 12 ppm could very well actually be 12 ppm or something less. For PM, the limit for existing sources changes from 0.04 lb/ton clinker 30-day average to 0.07 lb/ton clinker based on stack testing. The PM limit for new sources also changed: To 0.02 lb/ton clinker stack test from 0.01 lb/ton clinker 30-day average. The final changes in the PM standards, while not significant in absolute terms, may result in a small increase in total nationwide emissions by allowing slightly more variability, although, as noted at proposal, we estimate that design values will be essentially identical under the 2010 and this final standard. 77 FR 42389. As explained in the impacts analysis for the 2010 rule (see Docket item EPA–HQ–OAR–2002–0051–3438), emission reductions were estimated by comparing baseline emissions to the long-term average emissions of the MACT floor kilns. As a practical matter, plants operate to comply with this lower average emissions level (the so-called design level), rather than the emissions limit, so that on those days where there is normal operating variability they do not exceed the emissions limit. See 77 FR 42386–87. Under the 2010 rule, the average PM emissions from the existing floor kilns were 0.02296 lb/ton clinker. Under the amended standard, the average PM emissions of the existing floor kilns is calculated to be 0.02655 lb/ton clinker although, as noted, this difference is less than the normal analytic variability in PM measurement methods and so must be viewed as directional rather than precisely quantitative. The average emissions for new kilns did not change as we believe new sources will have to adopt identical control strategies as under the promulgated standards. We, therefore, are not estimating an emission increase from new kilns. For existing kilns, with an increase in PM emissions under this final rule of 0.00359 lb/ton clinker compared to the 2010 rule, nationwide emissions of PM would increase by 138 tons per year (0.00359 × 76,664,662/2000). Thus, the EPA estimates that the main effect of this final rule for PM will be to provide flexibility for those days when emissions increase as a result of normal operating variability, but would not significantly alter long-term average performance for PM. Nonetheless, as explained in section V.D above, this change does allow for changes in compliance strategies in the form of types, sizes and sequencing of treatment trains.

Emission reductions under the 2010 rule and this final rule, in 2015, are compared in Table 4.

TABLE 4—COMPARISON OF NATIONWIDE PM EMISSIONS FROM 2010 RULE TO FINAL RULE IN 2015

	Kiln type	2010 rule	Final rule	Increment
Emissions limit (lb/ton clinker	Existing	0.04 (30-day average with a CEMS).	0.07 (3-run stack test)	NA
MACT average emissions for compliance (lb/ton clinker.	Existing	0.02296	0.02655	0.00359
2010 baseline emissions (CISWI kilns removed) (tons/yr).		11,433	11,433	NA
Nationwide emissions reduction (tons/yr)	Total	10,540	10,402	−138

One commenter noted that the compliance extension will result in two additional years of HAP emissions at pre-standard levels, noting especially the emission of PM, noting further that fine PM ($PM_{2.5}$) is causally associated with mortality and serious morbidity effects at a population level. See, e.g., 77 FR 38909 (June 29, 2012). We note first that these rules are technology-based, not risk-based, and that there are compelling reasons to amend the PM standard and to establish new compliance dates for existing sources as a result of technological limitations with the 2010 rule PM standard, and the new compliance opportunities afforded as a result of the amendment to that standard. See section V.D above. We also question the commenter's premise that all of the predicted emission reductions and benefits would accrue if the existing source CEM-based PM standards took effect in September 2013. As explained at length in section V.A above and in other comment responses, PM CEMS would not reliably measure the level of the PM standard in many instances. One cannot assume the full range of emission reductions (and consequent health benefits) would accrue in the real world if the emission measurements themselves are uncertain. Thus, in a meaningful sense, today's amendments result in a regime where the required emission reductions will be reliably measured, so that the rule's health benefits will reliably occur.

D. What are the water quality impacts?

At proposal, we believed that none of the amendments being proposed would have significant impacts on water quality and that to the extent that the revision affecting dry caustic scrubbers encourages their use, some reduction in water consumption may occur although we had no information upon which to base a quantified estimate. We received no comments questioning this assessment. Further, in reviewing the industry survey information on the impacts of the proposed changes, only 1 of the 20 kilns for which information was provided was considering the addition of a wet scrubber, although it was also evaluating a dry scrubber (see docket item EPA–HQ–OAR–2011–0817–0505, Appendix D, kiln S). Therefore, we continue to believe that these final amendments will not significantly impact water quality.

E. What are the solid waste impacts?

None of the amendments being finalized with this final rule are expected to have any solid waste impacts.[18]

F. What are the secondary impacts?

Indirect or secondary air quality impacts include impacts that will result from the increased electricity usage associated with the operation of control devices as well as water quality and solid waste impacts (which were just discussed) that will occur as a result of these amendments. Because we are finalizing revisions that slightly reduce the stringency of the existing source emission limits for PM from the promulgated 2010 limits, we project that some facilities will alter their strategy for complying with the standards for the four pollutants to achieve compliance at a lower cost than possible under the original standard. The survey results discussed in section V.D above confirm the EPA's engineering judgment. Other facilities in the survey that were not able to meet the THC limit or the alternative organic HAP limit in the 2010 rule were considering the installation of RTO. Because some of these facilities may now meet the limit without the installation of an RTO, we have estimated a reduction of 24,702 tons per year less CO_2 emissions being emitted to the atmosphere (equivalent to 2 less RTO's being installed). As a result of the organic HAP limit being revised from 9 ppm to 12 ppm, these sources responded that they now had other less costly alternatives. The additional compliance time was also cited as a factor that would gives sources the additional time they needed to consider other HAP control alternatives to RTO. As the industry survey highlights, these types of determinations will be made for each facility based on site-specific characteristics such as process type, equipment age, existing air pollution controls, raw material and fuel characteristics, economic factors and others. In general, this survey indicates that the combination of the revised limits for PM and organic HAP as well as the September 2015 compliance date will give sources the opportunity to develop less costly and less aggressive compliance strategies. We do not have enough information to quantify the impact of overall secondary impacts, (with the exception of the CO_2 reductions noted above), but we believe the impacts would in fact be reduced relative to the 2010 rule since less energy is expected to be needed for facilities that can retain and upgrade their current controls, instead of for example, installing additional controls in series.

G. What are the energy impacts?

As discussed in the preceding section, because of the final revisions to the PM emission limits, the organic HAP limits and the compliance date extension, some facilities will develop more cost effective and less energy intensive compliance strategies. For three of the facilities (five kilns) that were part of the industry survey, all five kilns required significant changes to meet the 2010 THC standard, in part because they were not pursuing the alternative organic HAP alternative standard due to analytic measurement uncertainties. See docket item EPA–HQ–OAR–2011–0817–0505, Appendix D (kilns A, C and D, and F and G). Prior to the proposed revisions, all five of the kilns were considering RTO as a control option as well as other options including catalytic ceramic filtration, a relatively new technology and as yet, not completely demonstrated technology for the cement industry. In response to the survey of what changes, if any, the facilities would make in response to the proposed revisions, all three facilities indicated that the amended organic HAP limit or the September 2015 compliance date allowed them to consider the use of less capital intensive alternatives and to continue testing alternatives for THC reduction other than the highly energy-intensive RTO for the five kilns involved. Although we cannot accurately predict for the entire industry the extent to which these site-specific compliance strategies may affect energy demands, the industry survey results indicate a trend toward less energy intensive strategies than RTO, and as noted above, we predict a reduction in CO_2 emissions due to less energy use as a result of two fewer kilns installing RTOs.

H. What are the cost impacts?

Under the cost scenario discussed above, we estimate that there could be savings of approximately $52 million associated with alternative compliance strategies for meeting amended PM standards, making corresponding adjustments in compliance strategies for the organic HAP and requiring work practice for open clinker storage piles. Table 5 summarizes the costs and emissions reductions of this final action.

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[18] Although dust shuttling is likely to be one element of mercury compliance strategy, the amount of dust shuttling would not increase incremental to the 2010 final rule since the standards for new and existing sources are the same in the 2010 final rule and these amendments. Moreover, as explained in section V.B above, even with respect to the high mercury feed source, dust shuttling entails moving dust from within the kiln to other parts of the process and is considered a closed loop process, thereby not causing any waste impacts.

TABLE 5—SUMMARY OF THE COSTS AND EMISSION REDUCTIONS OF THE FINAL AMENDMENTS TO THE PORTLAND CEMENT MANUFACTURING INDUSTRY NESHAP RELATIVE TO THE 2010 RULE [a] [b] [c] [d] [e]

Proposed amendment	Annualized cost	PM emissions reduction 2010 rule	PM emissions reduction 2012 rule	Emission change tpy
Revised PM, oHAP standard	($42.2 million) [f]	10,540 tons	10,402 tons	138 increase.
Replace PM CEMS with PM CPMS	($2.7 million)	0.		
Coal Mill Testing	$1.3 million	0.		
Open clinker storage pile work practices	($8.25 million)	0.		
Total	($51.85 million).			

[a] Parentheses indicate cost savings. All costs are in 2005 dollars.
[b] We also estimate that there will be a one-time cost of $25,000 for each facility to revise their operation and maintenance plan to include procedures to minimize emissions during periods of startup and shutdown.
[c] Emissions reductions are the total once full compliance is achieved in 2015.
[d] Full compliance costs will not occur until September 9, 2015.
[e] Note emission reductions published in the 2010 rule included CISWI kilns, but the reductions in this table reflect reductions since CISWI kilns were removed from the database.
[f] Includes cost savings due to revised PM standard.

The cost information in Table 5 is in 2005 dollars at a discount rate of 7 percent. The EPA did not have sufficient information to quantify the overall change in benefits or impacts in emissions for 2013 to 2015.

With regard to the coal mill monitoring requirements in this action, sources with integral coal mills that exhaust through a separate exhaust would potentially incur a capital cost of $36,000 to install a continuous flow meter. The annualized cost of a flow meter is $11,000. Because this final rule allows the use of maximum design flow rate instead of installing flow meters, we believe that most facilities will take advantage of this and will not incur these costs. Annual testing at these coal mills for mercury, THC and HCl will cost about $51,000 ($22,800 per Method 30B test for mercury + $8,000 per year for Method 25A test for THC + $20,000 per year for Method 321 test for HCl). Using information supplied by the industry (see docket item EPA–HQ–OAR–2011–0817–0612), approximately 26 facilities would be affected by these requirements for an annual cost of $1.3 million. Costs for coal mills to meet the PM limits for this NESHAP are not included, since all equipment and monitoring are in place to meet requirements of Subpart Y and thus are not considered additional costs.

With the final change to PM CPMS instead of CEMS, it is estimated that the elimination of the PS correlation tests will result in a savings of $20,000 per kiln.

I. What are the health effects of these pollutants?

In this section, we provide a qualitative description of benefits associated with reducing exposure to PM$_{2.5}$, HCl and mercury. Controls installed to reduce HAP would also reduce ambient concentrations of PM$_{2.5}$ as a co-benefit. Reducing exposure to PM$_{2.5}$ is associated with significant human health benefits, including avoiding mortality and morbidity from cardiovascular and respiratory illnesses. Researchers have associated PM$_{2.5}$ exposure with adverse health effects in numerous toxicological, clinical and epidemiological studies (U.S. EPA, 2009).[19] When adequate data and resources are available and a regulatory impact analysis (RIA) is required, the EPA generally quantifies several health effects associated with exposure to PM$_{2.5}$ (e.g., U.S. EPA, 2011).[20] These health effects include premature mortality for adults and infants, cardiovascular morbidities such as heart attacks, hospital admissions and respiratory morbidities such as asthma attacks, acute and chronic bronchitis, hospital and emergency department visits, work loss days, restricted activity days and respiratory symptoms. Although the EPA has not quantified certain outcomes including adverse effects on birth weight, pre-term births, pulmonary function and other cardiovascular and respiratory effects, the scientific literature suggests that exposure to PM$_{2.5}$ is also associated with these impacts (U.S. EPA, 2009). PM$_{2.5}$ also increases light extinction, which is an important aspect of visibility (U.S. EPA, 2009).

HCl is a corrosive gas that can cause irritation of the mucous membranes of the nose, throat and respiratory tract. Brief exposure to 35 ppm causes throat irritation, and levels of 50 to 100 ppm are barely tolerable for 1 hour.[21] The greatest impact is on the upper respiratory tract; exposure to high concentrations can rapidly lead to swelling and spasm of the throat and suffocation. Most seriously exposed persons have immediate onset of rapid breathing, blue coloring of the skin and narrowing of the bronchioles. Exposure to HCl can lead to RADS, a chemically- or irritant-induced type of asthma. Children may be more vulnerable to corrosive agents than adults because of the relatively smaller diameter of their airways. Children may also be more vulnerable to gas exposure because of increased minute ventilation per kilograms and failure to evacuate an area promptly when exposed. HCl has not been classified for carcinogenic effects.[22]

Mercury in the environment is transformed into a more toxic form, methylmercury (MeHg). Because mercury is a persistent pollutant, MeHg accumulates in the food chain, especially the tissue of fish. When people consume these fish, they consume MeHg. In 2000, the National

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[19] U.S. Environmental Protection Agency (U.S. EPA). 2009. *Integrated Science Assessment for Particulate Matter* (Final Report). EPA–600–R–08–139F. National Center for Environmental Assessment-RTP Division. Available on the Internet at *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546.*

[20] U.S. Environmental Protection Agency (U.S. EPA). 2011. Regulatory Impact Analysis for the Federal Implementation Plans to Reduce Interstate Transport of Fine Particulate Matter and Ozone in 27 States; Correction of SIP Approvals for 22 States. Office of Air and Radiation, Research Triangle Park, NC. Available on the Internet at *http://www.epa.gov/airtransport/pdfs/FinalRIA.pdf.*

[21] Agency for Toxic Substances and Disease Registry (ATSDR). Medical Management Guidelines for Hydrogen Chloride. Atlanta, GA: U.S. Department of Health and Human Services. Available online at *http://www.atsdr.cdc.gov/mmg/mmg.asp?id=758&tid=147#bookmark02.*

[22] U.S. Environmental Protection Agency (U.S. EPA). 1995. Integrated Risk Information System File of Hydrogen Chloride. Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available electronically at *http://www.epa.gov/iris/subst/0396.htm.*

Academy of Science (NAS) Study was issued which provides a thorough review of the effects of MeHg on human health (National Research Council (NRC), 2000).[23] Many of the peer-reviewed articles cited in this section are publications originally cited in the MeHg Study. In addition, the EPA has conducted literature searches to obtain other related and more recent publications to complement the material summarized by the NRC in 2000.

In its review of the literature, the NAS found neurodevelopmental effects to be the most sensitive and best documented endpoints and appropriate for establishing an oral reference dose (RfD) (NRC, 2000); in particular NAS supported the use of results from neurobehavioral or neuropsychological tests. The NAS report noted that studies in animals reported sensory effects as well as effects on brain development and memory functions and support the conclusions based on epidemiology studies. The NAS noted that their recommended endpoints for an RfD are associated with the ability of children to learn and to succeed in school. They concluded the following: ''The population at highest risk is the children of women who consumed large amounts of fish and seafood during pregnancy. The committee concludes that the risk to that population is likely to be sufficient to result in an increase in the number of children who have to struggle to keep up in school.''

The NAS summarized data on cardiovascular effects available up to 2000. Based on these and other studies, the NRC concluded that ''Although the data base is not as extensive for cardiovascular effects as it is for other end points (i.e. neurologic effects) the cardiovascular system appears to be a target for MeHg toxicity in humans and animals.'' The NRC also stated that ''additional studies are needed to better characterize the effect of methylmercury exposure on blood pressure and cardiovascular function at various stages of life.''

Additional cardiovascular studies have been published since 2000. The EPA did not to develop a quantitative dose-response assessment for cardiovascular effects associated with MeHg exposures, as there is no consensus among scientists on the dose-response functions for these effects. In addition, there is inconsistency among available studies as to the association between MeHg exposure and various cardiovascular system effects. The pharmacokinetics of some of the exposure measures (such as toenail mercury levels) are not well understood. The studies have not yet received the review and scrutiny of the more well-established neurotoxicity data base.

The Mercury Study[24] noted that MeHg is not a potent mutagen but is capable of causing chromosomal damage in a number of experimental systems. The NAS concluded that evidence that human exposure to MeHg caused genetic damage is inconclusive; they note that some earlier studies showing chromosomal damage in lymphocytes may not have controlled sufficiently for potential confounders. One study of adults living in the Tapajós River region in Brazil (Amorim et al., 2000) reported a direct relationship between MeHg concentration in hair and DNA damage in lymphocytes; as well as effects on chromosomes.[25] Long-term MeHg exposures in this population were believed to occur through consumption of fish, suggesting that genotoxic effects (largely chromosomal aberrations) may result from dietary, chronic MeHg exposures similar to and above those seen in the Faroes and Seychelles populations.

Although exposure to some forms of mercury can result in a decrease in immune activity or an autoimmune response (ATSDR, 1999), evidence for immunotoxic effects of MeHg is limited (NRC, 2000).[26]

Based on limited human and animal data, MeHg is classified as a ''possible'' human carcinogen by the International Agency for Research on Cancer (IARC, 1994) and in Integrated Risk Information System (IRIS) (U.S. EPA, 2002).[27] [28] The existing evidence supporting the possibility of carcinogenic effects in humans from low-dose chronic exposures is tenuous. Multiple human epidemiological studies have found no significant association between mercury exposure and overall cancer incidence, although a few studies have shown an association between mercury exposure and specific types of cancer incidence (e.g., acute leukemia and liver cancer) (NRC, 2000).

There is also some evidence of reproductive and renal toxicity in humans from MeHg exposure. However, overall, human data regarding reproductive, renal and hematological toxicity from MeHg are very limited and are based on either studies of the two high-dose poisoning episodes in Iraq and Japan or animal data, rather than epidemiological studies of chronic exposures at the levels of interest in this analysis.

VII. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action'' because it raises novel legal or policy issues. Accordingly, the EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action. An RIA was prepared for the September 2010 final rule and can be found at: *http://www.epa.gov/ttn/ecas/regdata/RIAs/portlandcementfinalria.pdf. http://www.epa.gov/ttn/ecas/regdata/RIAs/portlandcementfinalria.pdf.*

B. Paperwork Reduction Act

The information collection requirements in this final rule have been submitted for approval to the OMB under the *Paperwork Reduction Act,* 44 U.S.C. 3501, *et seq.*

The Information Collection Request (ICR) document prepared by the EPA has been assigned the EPA ICR number 1801.11 for the NESHAP; there are no additional recordkeeping and reporting requirements for the NSPS. The information requirements are based on notification, recordkeeping and reporting requirements in the NESHAP

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[23] National Research Council (NRC). 2000. *Toxicological Effects of Methylmercury.* Washington, DC: National Academies Press.

[24] U.S. Environmental Protection Agency (U.S. EPA). 1997. *Mercury Study Report to Congress,* EPA–HQ–OAR–2009–0234–3054. December. Available on the Internet at *http://www.epa.gov/hg/report.htm.*

[25] Amorim, M.I.M., D. Mergler, M.O. Bahia, H. Dubeau, D. Miranda, J. Lebel, R.R. Burbano, and M. Lucotte. 2000. Cytogenetic damage related to low levels of methyl mercury contamination in the Brazilian Amazon. An. Acad. Bras. Science. 72(4): 497–507.

[26] Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological Profile for Mercury. U.S. Department of Health and Human Services, Public Health Service, Atlanta, GA.

[27] U.S. Environmental Protection Agency (EPA). 2002. Integrated Risk Information System (IRIS) on Methylmercury. National Center for Environmental Assessment. Office of Research and Development. Available online at *http://www.epa.gov/iris/subst/0073.htm.*

[28] International Agency for Research on Cancer (IARC). 1994. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans and their Supplements: Beryllium, Cadmium, Mercury, and Exposures in the Glass Manufacturing Industry. Vol. 58. Jalili, H.A., and A.H. Abbasi. 1961. Poisoning by ethyl mercury toluene sulphonanilide. Br. J. Indust. Med. 18(Oct.):303–308 (as cited in NRC 2000).

General Provisions (40 CFR part 63, subpart A), which are mandatory for all operators subject to national emissions standards. These recordkeeping and reporting requirements are specifically authorized by CAA section 114 (42 U.S.C. 7414). All information submitted to the EPA pursuant to the recordkeeping and reporting requirements for which a claim of confidentiality is made is safeguarded according to agency policies set forth in 40 CFR part 2, subpart B.

We are finalizing new paperwork requirements for the Portland Cement Manufacturing source category in the form of a requirement to incorporate work practices for periods of startup and shutdown and fugitive dust control measures for clinker piles into their existing operations and maintenance plan.

This final rule also includes new paperwork requirements for recordkeeping of malfunctions, as described in 40 CFR 63.454(g) (conducted in support of the affirmative defense provisions, as described in 40 CFR 63.456).

When a malfunction occurs, sources must report the event according to the applicable reporting requirements of 40 CFR part 63, subpart LLL. An affirmative defense to civil penalties for violations of emission limits that are caused by malfunctions is available to a source if it can demonstrate that certain criteria and requirements are satisfied. The criteria ensure that the affirmative defense is available only where the event that causes a violation of the emission limit meets the narrow definition of malfunction in 40 CFR 63.2 (sudden, infrequent, not reasonable preventable and not caused by poor maintenance and or careless operation) and where the source took necessary actions to minimize emissions. In addition, the source must meet certain notification and reporting requirements. For example, the source must prepare a written root cause analysis and submit a written report to the Administrator documenting that it has met the conditions and requirements for assertion of the affirmative defense.

The EPA is adding the paperwork and recordkeeping associated with the affirmative defense to civil penalties for malfunctions to the estimate of burden in the ICR. To provide the public with an estimate of the relative magnitude of the burden associated with an assertion of the affirmative defense position adopted by a source, the EPA has provided administrative adjustments to the ICR that show what the notification, recordkeeping and reporting requirements associated with the assertion of the affirmative defense might entail. The EPA's estimate for the required notification, reports and records for any individual incident, including the root cause analysis, totals $3,258, and is based on the time and effort required of a source to review relevant data, interview plant employees and document the events surrounding a malfunction that has caused a violation of an emissions limit. The estimate also includes time to produce and retain the record and reports for submission to the EPA. The EPA provides this illustrative estimate of this burden because these costs are only incurred if there has been a violation and a source chooses to take advantage of the affirmative defense.

Given the variety of circumstances under which malfunctions could occur, as well as differences among sources' operation and maintenance practices, we cannot reliably predict the severity and frequency of malfunction-related excess emissions events for a particular source. It is important to note that the EPA has no basis currently for estimating the number of malfunctions that would qualify for an affirmative defense. Current historical records would be an inappropriate basis, as source owners or operators previously operated their facilities in recognition that they were exempt from the requirement to comply with emissions standards during malfunctions. Of the number of excess emissions events reported by source operators, only a small number would be expected to result from a malfunction (based on the definition above), and only a subset of violations caused by malfunctions would result in the source choosing to assert the affirmative defense. Thus, we expect the number of instances in which source operators might be expected to avail themselves of the affirmative defense will be extremely small. For this reason, we estimate no more than two such occurrences per year for all sources subject to subpart LLL over the 3-year period covered by this ICR. We expect to gather information on such events in the future and will revise this estimate as better information becomes available.

We estimate 86 facilities will be subject to all final standards. The remaining 14 facilities will only be subject to the open clinker pile standards in this action. The annual monitoring, reporting and recordkeeping cost for this source (averaged over the first three years after the effective date of the standards) for these amendments to subpart LLL is estimated to be $352,814 per year for the industry. This includes 496 labor hours per year at a total labor cost of $47,806 per year, and total non-labor capital and operation and maintenance costs of $305,008 per year. This estimate includes reporting and recordkeeping associated with the requirements for open clinker storage piles. The total burden to the federal government (averaged over the first three years after the effective date of the standard) as a result of these amendments is estimated to be 263 hours per year at a total labor cost of $11,885 per year. Burden is defined at 5 CFR 1320.3(b).

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for the EPA's regulations in 40 CFR are listed in 40 CFR part 9.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations and small governmental jurisdictions.

For purposes of assessing the impact of this rule on small entities, small entity is defined as: (1) A small business whose parent company has no more than 750 employees based on the size definition for the affected NAICS code (327310), as defined by the Small Business Administration size standards; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

We estimate that 3 of the 26 existing Portland cement entities are small entities and comprise 3 plants. After considering the economic impacts of this final rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. Of the three affected small entities, all are expected to incur an annual compliance cost of less than 1.0 percent of sales to comply with these amendments to the 2010 final rule (reflecting potential controls on piles, which are likely to have lower cost when compared to the 2010 rule requirements because these plants already have requirements for control of open clinker storage piles in their title V permits).

Although this final rule will not have a significant economic impact on a substantial number of small entities, the EPA nonetheless adopted amendments which should reduce the impact of this final rule on small entities. For example, we are expanding the provision that allows periodic HCl performance tests as an alternative to HCl CEMS for sources equipped with wet scrubbers to also apply to those sources that use dry scrubbers. This final rule also adds an option for sources using wet or dry scrubbers for HCl control to use SO_2 as a monitored parameter. If these sources already have a CEMS for SO_2, then this will provide operational flexibility.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. As discussed earlier in this preamble, there is an actual savings to the industry of $52 million per year. Thus, this final rule is not subject to the requirements of section 202 and 205 of the UMRA. This final action is also not subject to the requirements of section 203 of the UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments. This final action contains no requirements that apply to such governments, imposes no obligations upon them, and will not result in expenditures by them of $100 million or more in any one year or any disproportionate impacts on them.

E. Executive Order 13132: Federalism

This final action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the affected facilities are owned or operated by State governments. Thus, Executive Order 13132 does not apply to this action.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action may have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The EPA is aware of one tribally owned Portland cement facility currently subject to subpart LLL and that will be subject to this final rule. The provisions of this final rule are not expected to impose new substantial direct compliance costs on Tribal governments since the same control technologies that are necessary under the current NESHAP will be needed to meet the final emissions limits. The EPA has tried to reduce the impact of this final rule on Tribal owned facilities. For example, we are expanding the provision that allows periodic HCl performance tests as an alternative to HCl CEMS for sources equipped with wet scrubbers to also apply to those sources that use dry sorbent injection (i.e., dry scrubbing systems). This final rule adds an option for sources using wet or dry scrubbers for HCl control to use SO_2 as a monitored parameter. If these sources already have a CEMS for SO_2, then this will provide operational flexibility.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

The EPA interprets Executive Order 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Executive Order has the potential to influence the regulation. This action is not subject to Executive Order 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This final action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. The amendments do not require the use of additional controls as compared to the 2010 rule and may allow the industry to reduce its cost of compliance by increasing the industry's flexibility to institute different and less costly control strategies than under the 2010 rule.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law No. 104–113 (15 U.S.C. 272 note), directs the EPA to use voluntary consensus standards (VCS) in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. VCS are technical standards (e.g., materials specifications, test methods, sampling procedures and business practices) that are developed or adopted by VCS bodies. NTTAA directs the EPA to provide Congress, through OMB, explanations when the agency decides not to use available and applicable VCS.

This final rulemaking does not involve technical standards. Therefore, the EPA is not considering the use of any voluntary consensus standards.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (February 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies and activities on minority populations and low-income populations in the United States.

An analysis of demographic data was prepared for the 2010 final rule and can be found in the docket for that rulemaking (See docket item EPA–HQ–OAR–2002–0051–3415). The impacts of the 2010 rule, which assumed full compliance, are expected to be unchanged as a result of this action. Therefore, beginning from the date of full compliance, the EPA has determined that this final rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income populations. In addition, the full benefits of this final rule will not result until 2015 due to the final amended compliance date but the demographic analysis showed that the average of populations in close proximity to the sources, and thus most likely to be affected by the sources, were similar in demographic composition to national averages.

K. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801, *et seq.,* as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that, before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the

Congress and to the Comptroller General of the United States. The EPA will submit a report containing this final rule and other required information to the U.S. Senate, the U.S. House of Representatives and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. A major rule cannot take effect until 60 days after it is published in the **Federal Register**. This action is not a ''major rule'' as defined by 5 U.S.C. 804(2). This final rule will be effective on February 12, 2013.

List of Subjects in 40 CFR Part 63

Environmental protection, Air pollution control, Hazardous substances, Reporting and recordkeeping requirements.

Dated: December 20, 2012.

Lisa P. Jackson,

Administrator.

For the reasons stated in the preamble, title 40, chapter I, of the Code of Federal Regulations is amended as follows:

PART 60—[AMENDED]

■ 1. The authority citation for part 60 continues to read as follows:

Authority: 23 U.S.C. 101; 42 U.S.C. 7401–7671q.

Subpart F—[AMENDED]

■ 2. Section 60.61 is amended by adding paragraphs (e) and (f) to read as follows:

§ 60.61 Definitions.

* * * * *

(e) *Excess emissions* means, with respect to this subpart, results of any required measurements outside the applicable range (e.g., emissions limitations, parametric operating limits) that is permitted by this subpart. The values of measurements will be in the same units and averaging time as the values specified in this subpart for the limitations.

(f) *Operating day* means a 24-hour period beginning at 12:00 midnight during which the kiln operates at any time. For calculating rolling 30-day average emissions, an *operating day* does not include the hours of operation during startup or shutdown.

* * * * *

■ 3. Section 60.62 is amended by:

■ a. Removing and reserving paragraph (a)(1)(i), revising paragraph (a)(1)(ii) and adding paragraph (a)(1)(iii);

■ b. Removing and reserving paragraph (a)(2);

■ c. Revising paragraphs (b)(1)(i) and (ii);

■ d. Removing paragraph (b)(2);

■ e. Redesignating paragraphs (b)(3) and (4) as (b)(2) and (3);

■ f. Revising newly designated paragraph (b)(3); and

■ g. Revising paragraph (d).

The revisions read as follows:

§ 60.62 Standards.

(a) * * *

(1) * * *

(ii) 0.02 pound per ton of clinker if construction or reconstruction of the kiln commenced after June 16, 2008.

(iii) Kilns that have undergone a modification may not discharge into the atmosphere any gases which contain PM in excess of 0.07 pound per ton of clinker.

* * * * *

(b) * * *

(1) * * *

(i) 0.02 pound per ton of clinker if construction or reconstruction of the clinker cooler commences after June 16, 2008.

(ii) 0.07 pound per ton of clinker if the clinker cooler has undergone a modification.

* * * * *

(3) If the kiln has a separated alkali bypass stack and/or an inline coal mill with a separate stack, you must combine the PM emissions from the bypass stack and/or the inline coal mill stack with the PM emissions from the main kiln exhaust to determine total PM emissions.

* * * * *

(d) If you have an affected source subject to this subpart with a different emissions limit or requirement for the same pollutant under another regulation in title 40 of this chapter, you must comply with the most stringent emissions limit or requirement and are not subject to the less stringent requirement.

■ 4. Section 60.63 is amended by:

■ a. Revising paragraphs (b)(1)(i) and (ii);

■ b. Adding paragraph (b)(1)(iii);

■ c. Revising paragraphs (b)(2) and (3);

■ d. Removing paragraph (b)(4);

■ e. Revising paragraphs (c) through (f);

■ f. Revising paragraph (g) introductory text;

■ g. Revising paragraph (g)(2);

■ h. Revising paragraph (h) introductory text;

■ i. Revising paragraphs (h)(1) and (6);

■ j. Revising paragraph (h)(7) introductory text;

■ k. Revising paragraph (h)(8) introductory text;

■ l. Revising paragraph (h)(9);

■ m. Revising paragraph (i) introductory text; and

■ n. Revising paragraph (i)(1) introductory text and (i)(1)(i).

The revisions and addition read as follows:

§ 60.63 Monitoring of operations.

* * * * *

(b) * * *

(1) * * *

(i) Install, calibrate, maintain, and operate a permanent weigh scale system to measure and record weight rates of the amount of clinker produced in tons of mass per hour. The system of measuring hourly clinker production must be maintained within ±5 percent accuracy or

(ii) Install, calibrate, maintain, and operate a permanent weigh scale system to measure and record weight rates of the amount of feed to the kiln in tons of mass per hour. The system of measuring feed must be maintained within ±5 percent accuracy. Calculate your hourly clinker production rate using a kiln specific feed-to-clinker ratio based on reconciled clinker production rates determined for accounting purposes and recorded feed rates. This ratio should be updated monthly. Note that if this ratio changes at clinker reconciliation, you must use the new ratio going forward, but you do not have to retroactively change clinker production rates previously estimated.

(iii) For each kiln operating hour for which you do not have data on clinker production or the amount of feed to the kiln, use the value from the most recent previous hour for which valid data are available.

(2) Determine, record, and maintain a record of the accuracy of the system of measuring hourly clinker production rates or feed rates before initial use (for new sources) or by the effective compliance date of this rule (for existing sources). During each quarter of source operation, you must determine, record, and maintain a record of the ongoing accuracy of the system of measuring hourly clinker production rates or feed rates.

(3) If you measure clinker production directly, record the daily clinker production rates; if you measure the kiln feed rates and calculate clinker production, record the daily kiln feed and clinker production rates.

(c) *PM Emissions Monitoring Requirements.* (1) For each kiln or clinker cooler subject to a PM emissions limit in § 60.62, you must demonstrate compliance through an initial performance test. You will conduct your performance test using Method 5 or Method 5I at appendix A–3 to part 60 of this chapter. You must also monitor continuous performance through use of a PM continuous parametric monitoring system (PM CPMS).

(2) For your PM CPMS, you will establish a site-specific operating limit. If your PM performance test demonstrates your PM emission levels to be below 75 percent of your emission limit you will use the average PM CPMS value recorded during the PM compliance test, the milliamp equivalent of zero output from your PM CPMS, and the average PM result of your compliance test to establish your operating limit equivalent to 75 percent of the standard. If your PM compliance test demonstrates your PM emission levels to be at or above 75 percent of your emission limit you will use the average PM CPMS value recorded during the PM compliance test demonstrating compliance with the PM limit to establish your operating limit. You will use the PM CPMS to demonstrate continuous compliance with your operating limit. You must repeat the performance test annually and reassess and adjust the site-specific operating limit in accordance with the results of the performance test.

(i) Your PM CPMS must provide a 4–20 milliamp output and the establishment of its relationship to manual reference method measurements must be determined in units of milliamps.

(ii) Your PM CPMS operating range must be capable of reading PM concentrations from zero to a level equivalent to two times your allowable emission limit. If your PM CPMS is an auto-ranging instrument capable of multiple scales, the primary range of the instrument must be capable of reading PM concentration from zero to a level equivalent to two times your allowable emission limit.

(iii) During the initial performance test or any such subsequent performance test that demonstrates compliance with the PM limit, record and average all milliamp output values from the PM CPMS for the periods corresponding to the compliance test runs (e.g., average all your PM CPMS output values for three corresponding 2-hour Method 5I test runs).

(3) Determine your operating limit as specified in paragraphs (c)(4)(i) through (c)(5) of this section. If your PM performance test demonstrates your PM emission levels to be below 75 percent of your emission limit you will use the average PM CPMS value recorded during the PM compliance test, the milliamp equivalent of zero output from your PM CPMS, and the average PM result of your compliance test to establish your operating limit. If your PM compliance test demonstrates your PM emission levels to be at or above 75 percent of your emission limit you will use the average PM CPMS value recorded during the PM compliance test to establish your operating limit. You must verify an existing or establish a new operating limit after each repeated performance test. You must repeat the performance test at least annually and reassess and adjust the site-specific operating limit in accordance with the results of the performance test.

(4) If the average of your three Method 5 or 5I compliance test runs are below 75 percent of your PM emission limit, you must calculate an operating limit by establishing a relationship of PM CPMS signal to PM concentration using the PM CPMS instrument zero, the average PM CPMS values corresponding to the three compliance test runs, and the average PM concentration from the Method 5 or 5I compliance test with the procedures in (c)(4)(i)(A) through (D) of this section.

(i) Determine your PM CPMS instrument zero output with one of the following procedures.

(A) Zero point data for in-situ instruments should be obtained by removing the instrument from the stack and monitoring ambient air on a test bench.

(B) Zero point data for extractive instruments should be obtained by removing the extractive probe from the stack and drawing in clean ambient air.

(C) The zero point can also can be obtained by performing manual reference method measurements when the flue gas is free of PM emissions or contains very low PM concentrations (e.g., when your process is not operating, but the fans are operating or your source is combusting only natural gas) and plotting these with the compliance data to find the zero intercept.

(D) If none of the steps in paragraphs (c)(4)(i)(A) through (C) of this section are possible, you must use a zero output value provided by the manufacturer.

(ii) Determine your PM CPMS instrument average in milliamps, and the average of your corresponding three PM compliance test runs, using equation 1.

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} X_1 ,\bar{y} = \frac{1}{n}\sum_{i=1}^{n} Y_1 \qquad \text{(Eq. 1)}$$

Where:

X1 = The PM CPMS data points for the three runs constituting the performance test,

Y1 = The PM concentration value for the three runs constituting the performance test, and

n = The number of data points.

(iii) With your PM CPMS instrument zero expressed in milliamps, your three run average PM CPMS milliamp value, and your three run average PM concentration from your three PM performance test runs, determine a relationship of lb/ton-clinker per milliamp with equation 2.

$$\mathrm{R} = \frac{Y_1}{(X_1 - z)} \qquad \text{(Eq. 2)}$$

Where:

R = The relative lb/ton clinker per milliamp for your PM CPMS.

Y1 = The three run average PM lb/ton clinker.

X1 = The three run average milliamp output from you PM CPMS.

z = the milliamp equivalent of your instrument zero determined from (c)(4)(i) of this section.

(iv) Determine your source specific 30-day rolling average operating limit using the lb/ton-clinker per milliamp value from Equation 2 above in Equation 3, below. This sets your operating limit at the PM CPMS output value corresponding to 75 percent of your emission limit.

$$O_l = z + (0.75(L)) / R \qquad \text{(Eq. 3)}$$

Where:

O_l = The operating limit for your PM CPMS on a 30-day rolling average, in milliamps.

L = Your source emission limit expressed in lb/ton clinker.

z = Your instrument zero in milliamps, determined from (1)(i).

R = The relative lb/ton-clinker per milliamp for your PM CPMS, from Equation 2.

(5) If the average of your three PM compliance test runs is at or above 75 percent of your PM emission limit you must determine your operating limit by averaging the PM CPMS milliamp output corresponding to your three PM performance test runs that demonstrate compliance with the emission limit using Equation 4.

$$\mathbf{O_h} = \frac{1}{n}\sum_{i=1}^{n} X_1 \qquad \text{(Eq. 4)}$$

Where:

X1 = The PM CPMS data points for all runs i.

n = The number of data points.

O_h = Your site specific operating limit, in milliamps.

(6) To determine continuous compliance, you must record the PM CPMS output data for all periods when the process is operating, and use all the PM CPMS data for calculations when the source is not out-of-control. You must demonstrate continuous compliance by using all quality-assured hourly average data collected by the PM CPMS for all operating hours to calculate the arithmetic average operating parameter in units of the operating limit (milliamps) on a 30 operating day rolling average basis, updated at the end of each new kiln operating day. Use Equation 5 to determine the 30 kiln operating day average.

$$\text{30kiln operating day average} = \frac{\sum_{i=1}^{n} Hpv_i}{n} \qquad \text{(Eq. 5)}$$

Where:

Hpvi = The hourly parameter value for hour i.

n = The number of valid hourly parameter values collected over 30 kiln operating days.

(7) Use EPA Method 5 or Method 5I of appendix A to part 60 of this chapter to determine PM emissions. For each performance test, conduct at least three separate runs under the conditions that exist when the affected source is operating at the highest load or capacity level reasonably expected to occur. Conduct each test run to collect a minimum sample volume of 2 dscm for determining compliance with a new source limit and 1 dscm for determining compliance with an existing source limit. Calculate the average of the results from three consecutive runs to determine compliance. You need not determine the particulate matter collected in the impingers (‘‘back half’’) of the Method 5 or Method 5I particulate sampling train to demonstrate compliance with the PM standards of this subpart. This shall not preclude the permitting authority from requiring a determination of the ’’back half’’ for other purposes.

(8) For PM performance test reports used to set a PM CPMS operating limit, the electronic submission of the test report must also include the make and model of the PM CPMS instrument, serial number of the instrument, analytical principle of the instrument (e.g. beta attenuation), span of the instruments primary analytical range, milliamp value equivalent to the instrument zero output, technique by which this zero value was determined, and the average milliamp signals corresponding to each PM compliance test run.

(d) You must install, operate, calibrate, and maintain a CEMS continuously monitoring and recording the concentration by volume of NO_X emissions into the atmosphere for any kiln subject to the NO_X emissions limit in § 60.62(a)(3). If the kiln has an alkali bypass, NO_X emissions from the alkali bypass do not need to be monitored, and NO_X emission monitoring of the kiln exhaust may be done upstream of any commingled alkali bypass gases.

(e) You must install, operate, calibrate, and maintain a CEMS for continuously monitoring and recording the concentration by volume of SO_2 emissions into the atmosphere for any kiln subject to the SO_2 emissions limit in § 60.62(a)(4). If you are complying with the alternative 90 percent SO_2 emissions reduction emissions limit, you must also continuously monitor and record the concentration by volume of SO_2 present at the wet scrubber inlet.

(f) The NO_X and SO_2 CEMS required under paragraphs (d) and (e) of this section must be installed, operated and maintained according to Performance Specification 2 of appendix B of this part and the requirements in paragraphs (f)(1) through (5) of this section.

(1) The span value of each NO_X CEMS monitor must be set at 125 percent of the maximum estimated hourly potential NO_X emission concentration that translates to the applicable emissions limit at full clinker production capacity.

(2) You must conduct performance evaluations of each NO_X CEMS monitor according to the requirements in § 60.13(c) and Performance Specification 2 of appendix B to this part. You must use Methods 7, 7A, 7C, 7D, or 7E of appendix A–4 to this part for conducting the relative accuracy evaluations. The method ASME PTC 19.10–1981, ‘‘Flue and Exhaust Gas Analyses,’’ (incorporated by reference—see § 60.17) is an acceptable alternative to Method 7 or 7C of appendix A–4 to this part.

(3) The span value for the SO_2 CEMS monitor is the SO_2 emission concentration that corresponds to 125 percent of the applicable emissions limit at full clinker production capacity

and the expected maximum fuel sulfur content.

(4) You must conduct performance evaluations of each SO_2 CEMS monitor according to the requirements in § 60.13(c) and Performance Specification 2 of appendix B to this part. You must use Methods 6, 6A, or 6C of appendix A–4 to this part for conducting the relative accuracy evaluations. The method ASME PTC 19.10–1981, ''Flue and Exhaust Gas Analyses,'' (incorporated by reference—see § 60.17) is an acceptable alternative to Method 6 or 6A of appendix A–4 to this part.

(5) You must comply with the quality assurance requirements in Procedure 1 of appendix F to this part for each NO_X and SO_2 CEMS, including quarterly accuracy determinations for monitors, and daily calibration drift tests.

(g) For each CPMS or CEMS required under paragraphs (c) through (e) of this section:

* * * * *

(2) You may not use data recorded during the monitoring system malfunctions, repairs associated with monitoring system malfunctions, or required monitoring system quality assurance or control activities in calculations used to report emissions or operating levels. A monitoring system malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring system to provide valid data. Monitoring system failures that are caused in part by poor maintenance or careless operation are not malfunctions. An owner or operator must use all the data collected during all other periods in reporting emissions or operating levels.

* * * * *

(h) You must install, operate, calibrate, and maintain instruments for continuously measuring and recording the stack gas flow rate to allow determination of the pollutant mass emissions rate to the atmosphere for each kiln subject to the PM emissions limits in § 60.62(a)(1)(ii) and (iii) and (b)(1)(i) and (ii), the NO_X emissions limit in § 60.62(a)(3), or the SO_2 emissions limit in § 60.62(a)(4) according to the requirements in paragraphs (h)(1) through (10), where appropriate, of this section.

(1) The owner or operator must install each sensor of the flow rate monitoring system in a location that provides representative measurement of the exhaust gas flow rate at the sampling location of the NO_X and/or SO_2 CEMS, taking into account the manufacturer's recommendations. The flow rate sensor is that portion of the system that senses the volumetric flow rate and generates an output proportional to that flow rate.

* * * * *

(6) The flow rate monitoring system must be designed to measure a minimum of one cycle of operational flow for each successive 15-minute period.

(7) The flow rate sensor must be able to determine the daily zero and upscale calibration drift (CD) (see sections 3.1 and 8.3 of Performance Specification 2 in appendix B to this part for a discussion of CD).

* * * * *

(8) You must perform an initial relative accuracy test of the flow rate monitoring system according to section 8.2 of Performance Specification 6 of appendix B to this part, with the exceptions noted in paragraphs (h)(8)(i) and (ii) of this section.

* * * * *

(9) You must verify the accuracy of the flow rate monitoring system at least once per year by repeating the relative accuracy test specified in paragraph (h)(8) of this section.

* * * * *

(i) *Development and Submittal (Upon Request) of Monitoring Plans.* To demonstrate compliance with any applicable emissions limit through performance stack testing or other emissions monitoring (including PM CPMS), you must develop a site-specific monitoring plan according to the requirements in paragraphs (i)(1) through (4) of this section. This requirement also applies to you if you petition the EPA Administrator for alternative monitoring parameters under § 60.13(3)(i). If you use a bag leak detector system (BLDS), you must also meet the requirements specified in paragraph § 63.1350(m)(10) of this chapter.

(1) For each continuous monitoring system (CMS) required in this section, you must develop, and submit to the permitting authority for approval upon request, a site-specific monitoring plan that addresses paragraphs (i)(1)(i) through (iii) of this section. You must submit this site-specific monitoring plan, if requested, at least 30 days before the initial performance evaluation of your CMS.

(i) Installation of the CMS sampling probe or other interface at a measurement location relative to each affected process unit such that the measurement is representative of control of the exhaust emissions (e.g., on or downstream of the last control device);

* * * * *

■ 5. Section 60.64 is revised to read as follows:

§ 60.64 Test methods and procedures.

(a) In conducting the performance tests and relative accuracy tests required in § 60.8, you must use reference methods and procedures and the test methods in appendix A of this part or other methods and procedures as specified in this section, except as provided in § 60.8(b).

(b)(1)You must demonstrate compliance with the PM standards in § 60.62 using EPA method 5 or method 5I.

(2) Use Method 9 and the procedures in § 60.11 to determine opacity.

(3) Any sources other than kilns (including associated alkali bypass and clinker cooler) that are subject to the 10 percent opacity limit must follow the appropriate monitoring procedures in § 63.1350(f), (m)(1)through (4), (10) and (11), (o), and (p) of this chapter.

(c) Calculate and record the rolling 30 kiln operating day average emission rate daily of NO_X and SO_2 according to the procedures in paragraphs (c)(1) and (2) of this section.

(1) Calculate the rolling 30 kiln operating day average emissions according to equation 6:

$$E_{30D} = k \frac{\sum_{i=1}^{n} C_i Q_i}{P} \qquad \text{(Eq. 6)}$$

Where:

E_{30D} = 30 kiln operating day average emission rate of NO_X or SO_2, lb/ton of clinker.
C_i = Concentration of NO_X or SO_2 for hour i, ppm.
Q_i = Volumetric flow rate of effluent gas for hour i, where
C_i and Q_i are on the same basis (either wet or dry), scf/hr.
P = 30 days of clinker production during the same time period as the NO_X or SO_2 emissions measured, tons.
k = Conversion factor, 1.194×10^{7} for NO_X and 1.660×10^{7} for SO_2, lb/scf/ppm.
n = Number of kiln operating hours over 30 kiln operating days.

(2) For each kiln operating hour for which you do not have at least one valid 15-minute CEMS data value, use the average emissions rate (lb/hr) from the most recent previous hour for which valid data are available.

(d)(1) Within 60 days after the date of completing each performance test (see § 60.8) as required by this subpart you must submit the results of the performance tests conducted to demonstrate compliance under this subpart to the EPA's WebFIRE database by using the Compliance and Emissions Data Reporting Interface (CEDRI) that is accessed through the EPA's Central Data Exchange (CDX) (*http://www.epa.gov/cdx*). Performance test data must be submitted in the file format generated through use of the EPA's Electronic Reporting Tool (ERT) (see *http://www.epa.gov/ttn/chief/ert/index.html*). Only data collected using test methods on the ERT Web site are subject to this requirement for submitting reports electronically to WebFIRE. Owners or operators who claim that some of the information being submitted for performance tests is confidential business information (CBI) must submit a complete ERT file including information claimed to be CBI on a compact disk, flash drive or other commonly used electronic storage media to the EPA. The electronic media must be clearly marked as CBI and mailed to U.S. EPA/OAPQS/CORE CBI Office, Attention: WebFIRE Administrator, MD C404–02, 4930 Old Page Rd., Durham, NC 27703. The same ERT file with the CBI omitted must be submitted to the EPA via CDX as described earlier in this paragraph. At the discretion of the delegated authority, you must also submit these reports, including the CBI, to the delegated authority in the format specified by the delegated authority. For any performance test conducted using test methods that are not listed on the ERT Web site, you must submit the results of the performance test to the Administrator at the appropriate address listed in § 63.13.

(2) Within 60 days after the date of completing each CEMS performance evaluation test as defined in § 63.2, you must submit relative accuracy test audit (RATA) data to the EPA's CDX by using CEDRI in accordance with paragraph (d)(1) of this section. Only RATA pollutants that can be documented with the ERT (as listed on the ERT Web site) are subject to this requirement. For any performance evaluations with no corresponding RATA pollutants listed on the ERT Web site, you must submit the results of the performance evaluation to the Administrator at the appropriate address listed in § 63.13.

(3) For PM performance test reports used to set a PM CPMS operating limit, the electronic submission of the test report must also include the make and model of the PM CPMS instrument, serial number of the instrument, analytical principle of the instrument (e.g. beta attenuation), span of the instruments primary analytical range, milliamp value equivalent to the instrument zero output, technique by which this zero value was determined, and the average milliamp signals corresponding to each PM compliance test run.

(4) All reports required by this subpart not subject to the requirements in paragraphs (d)(1) and (2) of this section must be sent to the Administrator at the appropriate address listed in § 63.13. The Administrator or the delegated authority may request a report in any form suitable for the specific case (e.g., by commonly used electronic media such as Excel spreadsheet, on CD or hard copy). The Administrator retains the right to require submittal of reports subject to paragraph (d)(1) and (2) of this section in paper format.

■ 6. Section 60.65 is revised to read as follows:

§ 60.65 Recordkeeping and reporting requirements.

(a) Each owner or operator required to install a CPMS or CEMS under sections § 60.63(c) through (e) shall submit reports of excess emissions. The content of these reports must comply with the requirements in § 60.7(c). Notwithstanding the provisions of § 60.7(c), such reports shall be submitted semiannually.

(b) Each owner or operator of facilities subject to the provisions of § 60.63(c) through (e) shall submit semiannual reports of the malfunction information required to be recorded by § 60.7(b). These reports shall include the frequency, duration, and cause of any incident resulting in deenergization of any device controlling kiln emissions or in the venting of emissions directly to the atmosphere.

(c) The requirements of this section remain in force until and unless the Agency, in delegating enforcement authority to a State under section 111(c) of the Clean Air Act, 42 U.S.C. 7411, approves reporting requirements or an alternative means of compliance surveillance adopted by such States. In that event, affected sources within the State will be relieved of the obligation to comply with this section, provided that they comply with the requirements established by the State.

■ 7. Section 60.66 is amended by revising paragraph (b) introductory text to read as follows:

§ 60.66 Delegation of authority.

* * * * *

(b) In delegating implementation and enforcement authority to a State, local, or tribal agency, the approval authorities contained in paragraphs (b)(1) through (4) of this section are retained by the Administrator of the U.S EPA and are not transferred to the State, local, or tribal agency.

* * * * *

PART 63—NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES

■ 8. The authority citation for part 63 continues to read as follows:

Authority: 42 U.S.C. 7401, *et seq.*

Subpart LLL—[Amended]

■ 9. Section 63.1340 is amended by revising paragraphs (b)(1), (b)(6) through (9), and (c) to read as follows:

§ 63.1340 What parts of my plant does this subpart cover?

* * * * *

(b) * * *:

(1) Each kiln including alkali bypasses and inline coal mills, except for kilns that burn hazardous waste and are subject to and regulated under subpart EEE of this part;

* * * * *

(6) Each raw material, clinker, or finished product storage bin at any portland cement plant that is a major source;

(7) Each conveying system transfer point including those associated with coal preparation used to convey coal from the mill to the kiln at any portland cement plant that is a major source;

(8) Each bagging and bulk loading and unloading system at any portland cement plant that is a major source; and

(9) Each open clinker storage pile at any portland cement plant.

(c) Onsite sources that are subject to standards for nonmetallic mineral processing plants in subpart OOO, part 60 of this chapter are not subject to this subpart. Crushers are not covered by this subpart regardless of their location.

* * * * *

■ 10. Section 63.1341 is amended by:

■ a. Removing definitions of ''Enclosed storage pile,'' and ''Inactive clinker pile'';

■ b. Adding a definition for ''In-line coal mill,'' ''Open clinker storage pile,'' ''Startup,'' and ''Shutdown'' in alphabetical order; and

■ c. Revising definitions for ''Kiln,'' ''New source,'' ''Operating day,'' ''Raw material dryer,'' and ''Total organic HAP,''.

The additions and revisions read as follows:

§ 63.1341 Definitions.

* * * * *

In-line coal mill means those coal mills using kiln exhaust gases in their process. Coal mills with a heat source other than the kiln or coal mills using exhaust gases from the clinker cooler are not an in-line coal mill.

* * * * *

Kiln means a device, including any associated preheater or precalciner devices, inline raw mills, inline coal mills or alkali bypasses that produces clinker by heating limestone and other materials for subsequent production of portland cement. Because the inline raw mill and inline coal mill are considered an integral part of the kiln, for purposes of determining the appropriate emissions limit, the term kiln also applies to the exhaust of the inline raw mill and the inline coal mill.

* * * * *

New source means any source that commenced construction or reconstruction after May 6, 2009, for purposes of determining the applicability of the kiln, clinker cooler and raw material dryer emissions limits for mercury, PM, THC, and HCl.

* * * * *

Open clinker storage pile means a clinker storage pile on the ground for more than three days that is not completely enclosed in a building or structure.

Operating day means any 24-hour period beginning at 12:00 midnight during which the kiln operates for any time. For calculating the rolling 30-day average emissions, kiln operating days do not include the hours of operation during startup or shutdown.

* * * * *

Raw material dryer means an impact dryer, drum dryer, paddle-equipped rapid dryer, air separator, or other equipment used to reduce the moisture content of feed or other materials.

* * * * *

Shutdown means the cessation of kiln operation. Shutdown begins when feed to the kiln is halted and ends when continuous kiln rotation ceases.

* * * * *

Startup means the time from when a shutdown kiln first begins firing fuel until it begins producing clinker. Startup begins when a shutdown kiln turns on the induced draft fan and begins firing fuel in the main burner. Startup ends when feed is being continuously introduced into the kiln for at least 120 minutes or when the feed rate exceeds 60 percent of the kiln design limitation rate, whichever occurs first.

* * * * *

Total organic HAP means, for the purposes of this subpart, the sum of the concentrations of compounds of formaldehyde, benzene, toluene, styrene, m-xylene, p-xylene, o-xylene, acetaldehyde, and naphthalene as measured by EPA Test Method 320 or Method 18 of appendix A to this part or ASTM D6348–03 [1] or a combination of these methods, as appropriate. If measurement results for any pollutant are reported as below the method detection level (e.g., laboratory analytical results for one or more sample components are below the method defined analytical detection level), you must use the method detection level as the measured emissions level for that pollutant in calculating the total organic HAP value. The measured result for a multiple component analysis (e.g., analytical values for multiple Method 18 fractions) may include a combination of method detection level data and analytical data reported above the method detection level. The owner or operator of an affected source may request the use of other test methods to make this determination under paragraphs 63.7(e)(2)(ii) and (f) of this part.

* * * * *

■ 11. Section 63.1343 is revised to read as follows:

§ 63.1343 What standards apply to my kilns, clinker coolers, raw material dryers, and open clinker storage piles?

(a) *General.* The provisions in this section apply to each kiln and any alkali bypass associated with that kiln, clinker cooler, raw material dryer, and open clinker storage pile. All D/F, HCl, and total hydrocarbon (THC) emissions limit are on a dry basis. The D/F, HCl, and THC limits for kilns are corrected to 7 percent oxygen. All THC emissions limits are measured as propane. Standards for mercury and THC are based on a rolling 30-day average. If using a CEMS to determine compliance with the HCl standard, this standard is based on a rolling 30-day average. You must ensure appropriate corrections for moisture are made when measuring flow rates used to calculate mercury emissions. The 30-day period means 30 consecutive kiln operating days excluding periods of startup and shutdown. All emissions limits for kilns, clinker coolers, and raw material dryers currently in effect that are superseded by the limits below continue to apply until the compliance date of the limits below, or until the source certifies compliance with the limits below, whichever is earlier.

(b) *Kilns, clinker coolers, raw material dryers, raw mills, and finish mills.* (1) The emissions limits for these sources are shown in Table 1 below. PM limits for existing kilns also apply to kilns that have undergone a modification as defined in subpart A of part 60 of title 40.

---

[1] When using ASTM D6348–03, the following conditions must be met:

(1) The test plan preparation and implementation in the Annexes to ASTM D6348–03, Sections A1 through A8 are mandatory; (2) For ASTM D6348–03 Annex A5 (Analyte Spiking Technique), the percent R must be determined for each target analyte (see Equation A5.5); (3) For the ASTM D6348–03 test data to be acceptable for a target analyte percent R must be 70 percent ≥ R ≤ 130 percent; and (4) The percent R value for each compound must be reported in the test report and all field measurements corrected with the calculated percent R value for that compound using the following equation: Reported Result = The measured concentration in the stack divided by the calculated percent R value and then the whole term multiplied by 100.

TABLE 1—EMISSIONS LIMITS FOR KILNS, CLINKER COOLERS, RAW MATERIAL DRYERS, RAW AND FINISH MILLS

	If your source is a (an):	And the operating mode is:	And if is located at a:	Your emissions limits are:	And the units of the emissions limit are:	The oxygen correction factor is:
1.	Existing kiln	Normal operation	Major or area source	PM[1] 0.07 D/F[2] 0.2 Mercury 55 THC[3] [4] 24	lb/ton clinker ng/dscm (TEQ) lb/MM tons clinker ppmvd	NA. 7 percent. NA. 7 percent.
2.	Existing kiln	Normal operation	Major source	HCl 3	ppmvd	7 percent.
3.	Existing kiln	Startup and shutdown.	Major or area source	Work practices (63.1346(f))	NA	NA.
4.	New kiln	Normal operation	Major or area source	PM 0.02 D/F[2] 0.2 Mercury 21 THC[3] [4] 24	lb/ton clinker ng/dscm (TEQ) lb/MM tons clinker ppmvd	NA. 7 percent. NA 7 percent.
5.	New kiln	Normal operation	Major source	HCl 3	ppmvd	7 percent.
6.	New kiln	Startup and shutdown.	Major or area source	Work practices (63.1346(f))	NA	NA.
7.	Existing clinker cooler.	Normal operation	Major or area source	PM 0.07	lb/ton clinker	NA.
8.	Existing clinker cooler.	Startup and shutdown.	Major or area source	Work practices (63.1348(b)(9))	NA	NA.
9.	New clinker cooler	Normal operation	Major or area source	PM 0.02	lb/ton clinker	NA.
10.	New clinker cooler	Startup and shutdown.	Major or area source	Work practices (63.1348(b)(9))	NA	NA.
11.	Existing or new raw material dryer.	Normal operation	Major or area source	THC[3] [4] 24	ppmvd	NA.
12.	Existing or new raw material dryer.	Startup and shutdown.	Major or area source	Work practices (63.1348(b)(9))	NA	NA.
13.	Existing or new raw or finish mill.	All operating modes	Major source	Opacity 10	percent	NA.

[1] The initial and subsequent PM performance tests are performed using Method 5 or 5I and consist of three 1-hr tests.

[2] If the average temperature at the inlet to the first PM control device (fabric filter or electrostatic precipitator) during the D/F performance test is 400 °F or less this limit is changed to 0.40 ng/dscm (TEQ).

[3] Measured as propane.

[4] Any source subject to the 24 ppmvd THC limit may elect to meet an alternative limit of 12 ppmvd for total organic HAP.

(2) When there is an alkali bypass and/or an inline coal mill with a separate stack associated with a kiln, the combined PM emissions from the kiln and the alkali bypass stack and/or the inline coal mill stack are subject to the PM emissions limit. Existing kilns that combine the clinker cooler exhaust and/or coal mill exhaust with the kiln exhaust and send the combined exhaust to the PM control device as a single stream may meet an alternative PM emissions limit. This limit is calculated using Equation 1 of this section:

$$PM_{alt} = (0.0060 \times 1.65)(Q_k + Q_c + Q_{ab} + Q_{cm})/(7000) \quad \text{(Eq. 1)}$$

Where:

PM_{alt} = Alternative PM emission limit for commingled sources.

0.006 = The PM exhaust concentration (gr/dscf) equivalent to 0.070 lb per ton clinker where clinker cooler and kiln exhaust gas are not combined.

1.65 = The conversion factor of ton feed per ton clinker.

Q_k = The exhaust flow of the kiln (dscf/ton feed).

Q_c = The exhaust flow of the clinker cooler (dscf/ton feed).

Q_{ab} = The exhaust flow of the alkali bypass (dscf/ton feed).

Q_{cm} = The exhaust flow of the coal mill (dscf/ton feed).

7000 = The conversion factor for grains (gr) per lb.

For new kilns that combine kiln exhaust and clinker cooler gas the limit is calculated using the Equation 2 of this section:

$$PM_{alt} = (0.0020 \times 1.65)(Q_k + Q_c + Q_{ab} + Q_{cm})/(7000) \quad \text{(Eq. 2)}$$

Where:

PM_{alt} = Alternative PM emission limit for commingled sources.

0.002 = The PM exhaust concentration (gr/dscf) equivalent to 0.020 lb per ton clinker where clinker cooler and kiln exhaust gas are not combined.

1.65 = The conversion factor of ton feed per ton clinker.

Q_k = The exhaust flow of the kiln (dscf/ton feed).

Q_c = The exhaust flow of the clinker cooler (dscf/ton feed).

Q_{ab} = The exhaust flow of the alkali bypass (dscf/ton feed).

Q_{cm} = The exhaust flow of the coal mill (dscf/ton feed).

7000 = The conversion factor for gr per lb.

(c) *Open clinker storage pile.* The owner or operator of an open clinker storage pile must prepare, and operate in accordance with, the fugitive dust emissions control measures, described in their operation and maintenance plan (see § 63.1347 of this subpart), that is appropriate for the site conditions as specified in paragraphs (c)(1) through

(3) of this section. The operation and maintenance plan must also describe the measures that will be used to minimize fugitive dust emissions from piles of clinker, such as accidental spillage, that are not part of open clinker storage piles.

(1) The operation and maintenance plan must identify and describe the location of each current or future open clinker storage pile and the fugitive dust emissions control measures the owner or operator will use to minimize fugitive dust emissions from each open clinker storage pile.

(2) For open clinker storage piles, the operations and maintenance plan must specify that one or more of the following control measures will be used to minimize to the greatest extent practicable fugitive dust from open clinker storage piles: Locating the source inside a partial enclosure, installing and operating a water spray or fogging system, applying appropriate chemical dust suppression agents, use of a wind barrier, compaction, use of tarpaulin or other equally effective cover or use of a vegetative cover. You must select, for inclusion in the operations and maintenance plan, the fugitive dust control measure or measures listed in this paragraph that are most appropriate for site conditions. The plan must also explain how the measure or measures selected are applicable and appropriate for site conditions. In addition, the plan must be revised as needed to reflect any changing conditions at the source.

(3) Temporary piles of clinker that result from accidental spillage or clinker storage cleaning operations must be cleaned up within 3 days.

(d) Emission limits in effect prior to September 9, 2010. Any source defined as an existing source in § 63.1351, and that was subject to a PM, mercury, THC, D/F, or opacity emissions limit prior to September 9, 2010, must continue to meet the limits shown in Table 2 to this section until September 9, 2015.

■ 12. Section 63.1344 is revised to read as follows:

§ 63.1344 Affirmative Defense for Violation of Emission Standards During Malfunction.

In response to an action to enforce the standards set forth in § 63.1343(b) and (c) and § 63.1345 and you may assert an affirmative defense to a claim for civil penalties for violations of such standards that are caused by malfunction, as defined at 40 CFR 63.2. Appropriate penalties may be assessed if you fail to meet your burden of proving all of the requirements in the affirmative defense. The affirmative defense shall not be available for claims for injunctive relief.

(a) *Assertion of affirmative defense.* To establish the affirmative defense in any action to enforce such a standard, you must timely meet the reporting requirements in paragraph (b) of this section, and must prove by a preponderance of evidence that:

(1) The violation:

(i) Was caused by a sudden, infrequent, and unavoidable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner; and

(ii) Could not have been prevented through careful planning, proper design or better operation and maintenance practices; and

(iii) Did not stem from any activity or event that could have been foreseen and avoided, or planned for; and

(iv) Was not part of a recurring pattern indicative of inadequate design, operation, or maintenance; and

(2) Repairs were made as expeditiously as possible when a violation occurred; and

(3) The frequency, amount, and duration of the violation (including any bypass) were minimized to the maximum extent practicable; and

(4) If the violation resulted from a bypass of control equipment or a process, then the bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and

(5) All possible steps were taken to minimize the impact of the violation on ambient air quality, the environment, and human health; and

(6) All emissions monitoring and control systems were kept in operation if at all possible, consistent with safety and good air pollution control practices; and

(7) All of the actions in response to the violation were documented by properly signed, contemporaneous operating logs; and

(8) At all times, the affected source was operated in a manner consistent with good practices for minimizing emissions; and

(9) A written root cause analysis has been prepared, the purpose of which is to determine, correct, and eliminate the primary causes of the malfunction and the violation resulting from the malfunction event at issue. The analysis shall also specify, using best monitoring methods and engineering judgment, the amount of any emissions that were the result of the malfunction.

(b) *Report.* The owner or operator seeking to assert an affirmative defense shall submit a written report to the Administrator with all necessary supporting documentation, that it has met the requirements set forth in paragraph (a) of this section. This affirmative defense report shall be included in the first periodic compliance, deviation report or excess emission report otherwise required after the initial occurrence of the violation of the relevant standard (which may be the end of any applicable averaging period). If such compliance, deviation report or excess emission report is due less than 45 days after the initial occurrence of the violation, the affirmative defense report may be included in the second compliance, deviation report or excess emission report due after the initial occurrence of the violation of the relevant standard.

■ 13. Section 63.1345 is revised to read as follows:

§ 63.1345 Emissions limits for affected sources other than kilns; clinker coolers; new and reconstructed raw material dryers.

The owner or operator of each new or existing raw material, clinker, or finished product storage bin; conveying system transfer point; bagging system; bulk loading or unloading system; raw and finish mills; and each existing raw material dryer, at a facility which is a major source subject to the provisions of this subpart must not cause to be discharged any gases from these affected sources which exhibit opacity in excess of 10 percent.

■ 14. Section 63.1346 is amended by:

■ a. Revising paragraph (a) introductory text;

■ b. Revising paragraph (a)(1);

■ c. Revising paragraphs (c) through (f); and

■ d. Adding paragraph (g)

The revisions read as follows:

§ 63.1346 Operating limits for kilns.

(a) The owner or operator of a kiln subject to a D/F emissions limitation under § 63.1343 must operate the kiln such that the temperature of the gas at the inlet to the kiln PM control device (PMCD) and alkali bypass PMCD, if applicable, does not exceed the applicable temperature limit specified in paragraph (b) of this section. The owner or operator of an in-line kiln/raw mill subject to a D/F emissions limitation under § 63.1343 must operate the in-line kiln/raw mill, such that:

(1) When the raw mill of the in-line kiln/raw mill is operating, the applicable temperature limit for the main in-line kiln/raw mill exhaust, specified in paragraph (b) of this section and established during the performance test when the raw mill was operating, is not exceeded, except during periods of startup and shutdown when the

temperature limit may be exceeded by no more than 10 percent.

* * * * *

(c) For an affected source subject to a D/F emissions limitation under § 63.1343 that employs sorbent injection as an emission control technique for D/F control, you must operate the sorbent injection system in accordance with paragraphs (c)(1) and (2) of this section.

(1) The rolling three-hour average activated sorbent injection rate must be equal to or greater than the sorbent injection rate determined in accordance with § 63.1349(b)(3)(vi).

(2) You must either:

(i) Maintain the minimum activated carbon injection carrier gas flow rate, as a rolling three-hour average, based on the manufacturer's specifications. These specifications must be documented in the test plan developed in accordance with § 63.7(c), or

(ii) Maintain the minimum activated carbon injection carrier gas pressure drop, as a rolling three-hour average, based on the manufacturer's specifications. These specifications must be documented in the test plan developed in accordance with § 63.7(c).

(d) Except as provided in paragraph (e) of this section, for an affected source subject to a D/F emissions limitation under § 63.1343 that employs carbon injection as an emission control technique you must specify and use the brand and type of sorbent used during the performance test until a subsequent performance test is conducted, unless the site-specific performance test plan contains documentation of key parameters that affect adsorption and the owner or operator establishes limits based on those parameters, and the limits on these parameters are maintained.

(e) For an affected source subject to a D/F emissions limitation under § 63.1343 that employs carbon injection as an emission control technique you may substitute, at any time, a different brand or type of sorbent provided that the replacement has equivalent or improved properties compared to the sorbent specified in the site-specific performance test plan and used in the performance test. The owner or operator must maintain documentation that the substitute sorbent will provide the same or better level of control as the original sorbent.

(f) No kiln may use as a raw material or fuel any fly ash where the mercury content of the fly ash has been increased through the use of activated carbon, or any other sorbent, unless the facility can demonstrate that the use of that fly ash will not result in an increase in mercury emissions over baseline emissions (i.e., emissions not using the fly ash). The facility has the burden of proving there has been no emissions increase over baseline. Once the kiln is in compliance with a mercury emissions limit specified in § 63.1343, this paragraph no longer applies.

(g) During periods of startup and shutdown you must meet the requirements listed in (g)(1) through (4) of this section.

(1) During startup you must use any one or combination of the following clean fuels: natural gas, synthetic natural gas, propane, distillate oil, synthesis gas (syngas), and ultra-low sulfur diesel (ULSD) until the kiln reaches a temperature of 1200 degrees Fahrenheit.

(2) Combustion of the primary kiln fuel may commence once the kiln temperature reaches 1200 degrees Fahrenheit.

(3) All air pollution control devices must be turned on and operating prior to combusting any fuel.

(4) You must keep records as specified in § 63.1355 during periods of startup and shutdown.

■ 15. Section 63.1347 is amended by revising paragraph (a)(1) to read as follows:

§ 63.1347 Operation and maintenance plan requirements.

(a) * * *

(1) Procedures for proper operation and maintenance of the affected source and air pollution control devices in order to meet the emissions limits and operating limits, including fugitive dust control measures for open clinker piles, of §§ 63.1343 through 63.1348. Your operations and maintenance plan must address periods of startup and shutdown;

* * * * *

■ 16. Section 63.1348 is amended by:
■ a. Revising paragraphs (a) introductory text and (a)(1) and (2);
■ b. Adding two sentences to paragraph (a)(3)(i);
■ c. Revising paragraph (a)(3)(ii);
■ d. Revising paragraphs (a)(3)(iii) and (iv);
■ e. Revising paragraphs (a)(4) through (8);
■ f. Revising paragraph (b); and
■ g. Revising paragraph (c)(2)(iv).

The revisions and additions read as follows:

§ 63.1348 Compliance requirements.

(a) *Initial Performance Test Requirements.* For an affected source subject to this subpart, you must demonstrate compliance with the emissions standards and operating limits by using the test methods and procedures in §§ 63.1349 and 63.7. Any cement kiln that has been subject to the requirements of subpart CCCC or subpart DDDD of 40 CFR Part 60, and is now electing to cease burning nonhazardous solid waste and become subject to this subpart, must meet all the initial compliance testing requirements each time it becomes subject to this subpart, even if it was previously subject to this subpart.

NOTE to paragraph (a): The first day of the 30 operating day performance test is the first day after the compliance date following completion of the field testing and data collection that demonstrates that the CPMS or CEMS has satisfied the relevant CPMS performance evaluation or CEMS performance specification (e.g., PS 2, 12A, or 12B) acceptance criteria. The performance test period is complete at the end of the 30th consecutive operating day. See § 63.1341 for definition of operating day and § 63.1348(b)(1) for the CEMS operating requirements. The source has the option of performing the compliance test earlier then the compliance date if desired.

(1) *PM Compliance.* If you are subject to limitations on PM emissions under § 63.1343(b), you must demonstrate compliance with the PM emissions standards by using the test methods and procedures in § 63.1349(b)(1).

(2) *Opacity Compliance.* If you are subject to the limitations on opacity under § 63.1345, you must demonstrate compliance with the opacity emissions standards by using the performance test methods and procedures in § 63.1349(b)(2). Use the maximum 6-minute average opacity exhibited during the performance test period to determine whether the affected source is in compliance with the standard.

(3) * * *

(i) * * * The owner or operator of a kiln with an in-line raw mill must demonstrate compliance by conducting separate performance tests while the raw mill is operating and while the raw mill is not operating. Determine the D/F TEQ concentration for each run and calculate the arithmetic average of the TEQ concentrations measured for the three runs to determine continuous compliance.

(ii) If you are subject to a D/F emissions limitation under § 63.1343(b), you must demonstrate compliance with the temperature operating limits specified in § 63.1346 by using the performance test methods and procedures in § 63.1349(b)(3)(ii) through (b)(3)(iv). Use the arithmetic average of the temperatures measured during the three runs to determine the applicable temperature limit.

(iii) If activated carbon injection is used and you are subject to a D/F emissions limitation under § 63.1343(b), you must demonstrate compliance with the activated carbon injection rate operating limits specified in § 63.1346 by using the performance test methods and procedures in § 63.1349(b)(3)(v).

(iv) If activated carbon injection is used, you must also develop a carrier gas parameter (either the carrier gas flow rate or the carrier gas pressure drop) during the initial performance test and updated during any subsequent performance test conducted under § 63.1349(b)(3) that meets the requirements of § 63.1349(b)(3)(vi). Compliance is demonstrated if the system is maintained within +/- 5 percent accuracy during the performance test determined in accordance with the procedures and criteria submitted for review in your monitoring plan required in section 63.1350(p).

(4)(i) *THC Compliance.* If you are subject to limitations on THC emissions under § 63.1343(b), you must demonstrate compliance with the THC emissions standards by using the performance test methods and procedures in § 63.1349(b)(4)(i). You must use the average THC concentration obtained during the first 30 kiln operating days after the compliance date of this rule to determine initial compliance.

(ii) *Total Organic HAP Emissions Tests.* If you elect to demonstrate compliance with the total organic HAP emissions limit under § 63.1343(b) in lieu of the THC emissions limit, you must demonstrate compliance with the total organic HAP emissions standards by using the performance test methods and procedures in § 63.1349(b)(7.

(iii) If you are demonstrating initial compliance, you must conduct the separate performance tests as specified in § 63.1349(b)(7) while the raw mill of the inline kiln/raw mill is operating and while the raw mill of the inline kiln/raw mill is not operating.

(iv) The average total organic HAP concentration measured during the separate initial performance test specified by § 63.1349(b)(7) must be used to determine initial compliance.

(v) The average THC concentration measured during the initial performance test specified by § 63.1349(b)(4) must be used to determine the site-specific THC limit. Using the fraction of time the inline kiln/raw mill is on and the fraction of time that the inline kiln/raw mill is off, calculate this limit as a weighted average of the THC levels measured during raw mill on and raw mill off testing using one of the two approaches in § 63.1349(b)(7)(vii) or (viii) depending on the level of organic HAP measured during the compliance test.

(5) *Mercury Compliance.* If you are subject to limitations on mercury emissions in § 63.1343(b), you must demonstrate compliance with the mercury standards by using the performance test methods and procedures in § 63.1349(b)(5). You must demonstrate compliance by operating a mercury CEMS or a sorbent trap based CEMS. Compliance with the mercury emissions standard must be determined based on the first 30 operating days you operate a mercury CEMS or sorbent trap monitoring system after the compliance date of this rule.

(i) In calculating a 30 operating day emissions value using an integrating sorbent trap CEMS, assign the average Hg emissions concentration determined for an integrating period (e.g., 7 day sorbent trap monitoring system sample) to each relevant hour of the kiln operating days spanned by each integrated sample. Calculate the 30 kiln operating day emissions rate value using the assigned hourly Hg emissions concentrations and the respective flow and production rate values collected during the 30 kiln operating day performance test period. Depending on the duration of each integrated sampling period, you may not be able to calculate the 30 kiln operating day emissions value until several days after the end of the 30 kiln operating day performance test period.

(ii) For example, a sorbent trap monitoring system producing an integrated 7-day sample will provide Hg concentration data for each hour of the first 28 kiln operating days (i.e., four values spanning 7 days each) of a 30 operating day period. The Hg concentration values for the hours of the last 2 days of the 30 operating day period will not be available for calculating the emissions for the performance test period until at least five days after the end of the subject period.

(6) *HCl Compliance.* If you are subject to limitations on HCl emissions under § 63.1343(b), you must demonstrate initial compliance with the HCl standards by using the performance test methods and procedures in § 63.1349(b)(6).

(i) For an affected source that is equipped with a wet scrubber, tray tower or dry scrubber, you may demonstrate initial compliance by conducting a performance test as specified in § 63.1349(b)(6)(i). You must determine the HCl concentration for each run and calculate the arithmetic average of the concentrations measured for the three runs to determine compliance. You must also establish appropriate site-specific operational parameter limits.

(ii) For an affected source that is not equipped with a wet scrubber, tray tower or dry scrubber, you must demonstrate initial compliance by operating a CEMS as specified in § 63.1349(b)(6)(ii). You must use the average of the hourly HCl values obtained during the first 30 kiln operating days that occur after the compliance date of this rule to determine initial compliance.

(7) *Commingled Exhaust Requirements.* If the coal mill exhaust is commingled with kiln exhaust in a single stack, you may demonstrate compliance with the kiln emission limits by either:

(i) Performing required emissions monitoring and testing on the commingled coal mill and kiln exhaust, or

(ii) Perform required emission monitoring and testing of the kiln exhaust prior to the reintroduction of the coal mill exhaust, and also testing the kiln exhaust diverted to the coal mill. All emissions must be added together for all emission points, and must not exceed the limit per each pollutant as listed in S63.1343(b).

(b) *Continuous Monitoring Requirements.* You must demonstrate compliance with the emissions standards and operating limits by using the performance test methods and procedures in §§ 63.1350 and 63.8 for each affected source.

(1) *General Requirements.* (i) You must monitor and collect data according to § 63.1350 and the site-specific monitoring plan required by § 63.1350(p).

(ii) Except for periods of startup and shutdown, monitoring system malfunctions, repairs associated with monitoring system malfunctions, and required monitoring system quality assurance or quality control activities (including, as applicable, calibration checks and required zero and span adjustments), you must operate the monitoring system and collect data at all required intervals at all times the affected source is operating.

(iii) You may not use data recorded during monitoring system malfunctions, repairs associated with monitoring system malfunctions, or required monitoring system quality assurance or control activities in calculations used to report emissions or operating levels. A monitoring system malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring system to provide valid data. Monitoring system failures that are caused in part by poor maintenance or careless operation are not malfunctions. You must use all the data collected during all other periods in assessing the operation of the control device and associated control system.

(iv) *Clinker Production.* If you are subject to limitations on mercury emissions (lb/MM tons of clinker) under § 63.1343(b), you must determine the hourly production rate of clinker according to the requirements of § 63.1350(d).

(2) *PM Compliance.* If you are subject to limitations on PM emissions under § 63.1343(b), you must use the monitoring methods and procedures in § 63.1350(b) and (d).

(3) *Opacity Compliance.* If you are subject to the limitations on opacity under § 63.1345, you must demonstrate compliance using the monitoring methods and procedures in § 63.1350(f) based on the maximum 6-minute average opacity exhibited during the performance test period. You must initiate corrective actions within one hour of detecting visible emissions above the applicable limit.

(i) *COMS.* If you install a COMS in lieu of conducting the daily visible emissions testing, you must demonstrate compliance using a COMS such that it is installed, operated, and maintained in accordance with the requirements of § 63.1350(f)(4)(i).

(ii) Bag leak determination system (*BLDS).* If you install a BLDS on a raw mill or finish mill in lieu of conducting the daily visible emissions testing, you must demonstrate compliance using a BLDS that is installed, operated, and maintained in accordance with the requirements of § 63.1350(f)(4)(ii).

(4) *D/F Compliance.* If you are subject to a D/F emissions limitation under § 63.1343(b), you must demonstrate compliance using a CMS that is installed, operated and maintained to record the temperature of specified gas streams in accordance with the requirements of § 63.1350(g).

(5)(i) *Activated Carbon Injection Compliance.* If you use activated carbon injection to comply with the D/F emissions limitation under § 63.1343(b), you must demonstrate compliance using a CMS that is installed, operated, and maintained to record the rate of activated carbon injection in accordance with the requirements § 63.1350(h)(1).

(ii) If you use activated carbon injection to comply with the D/F emissions limitation under § 63.1343(b), you must demonstrate compliance using a CMS that is installed, operated and maintained to record the activated carbon injection system gas parameter in accordance with the requirements of § 63.1350(h)(2).

(6) THC Compliance. (i) If you are subject to limitations on THC emissions under § 63.1343(b), you must demonstrate compliance using the monitoring methods and procedures in § 63.1350(i) and (j).

(ii) THC must be measured either upstream of the coal mill or in the coal mill stack.

(7) Mercury Compliance. (i) If you are subject to limitations on mercury emissions in § 63.1343(b), you must demonstrate compliance using the monitoring methods and procedures in § 63.1350(k). If you use an integrated sorbent trap monitoring system to determine ongoing compliance, use the procedures described in § 63.1348(a)(5) to assign hourly mercury concentration values and to calculate rolling 30 operating day emissions rates. Since you assign the mercury concentration measured with the sorbent trap to each relevant hour respectively for each operating day of the integrated period, you may schedule the sorbent trap change periods to any time of the day (i.e., the sorbent trap replacement need not be scheduled at 12:00 midnight nor must the sorbent trap replacements occur only at integral 24-hour intervals).

(ii) Mercury must be measured either upstream of the coal mill or in the coal mill stack.

(8) *HCl Compliance.* If you are subject to limitations on HCl emissions under § 63.1343(b), you must demonstrate compliance using the performance test methods and procedures in § 63.1349(b)(6).

(i) For an affected source that is not equipped with a wet scrubber, tray tower or a dry sorbent injection system, you must demonstrate compliance using the monitoring methods and procedures in § 63.1350(l)(1).

(ii) For an affected source that is equipped with a wet scrubber, tray tower or a dry sorbent injection system, you may demonstrate compliance using the monitoring methods and procedures in § 63.1350(l)(2).

(iii) HCl may be measured either upstream of the coal mill or in the coal mill stack.

(iv) As an alternative to paragraph (b)(8)(ii) of this section, you may use an SO_2 CEMS to establish an SO_2 operating level during your initial and repeat HCl performance tests and monitor the SO_2 level using the procedures in § 63.1350(l)(3).

(9) Startup and Shutdown Compliance. In order to demonstrate continuous compliance during startup and shutdown, all air pollution control devices must be operating.

(c) * * *

(2) * * *

(iv) The performance test must be completed within 360 hours after the planned operational change period begins.

* * * * *

■ 17. Section 63.1349 is amended by:

■ a. Revising paragraph (a) introductory text;

■ b. Revising paragraph (b)(1);

■ c. Revising paragraph (b)(3) introductory text;

■ d. Revising paragraphs (b)(3)(v) and (vi);

■ e. Revising paragraphs (b)(4), (5), and (6);

■ f. Adding paragraph (b)(7) and (8); and

■ g. Revising paragraphs (c), (d)(1) introductory text, (d)(1)(ii), (d)(2), and (e).

The revisions and additions read as follows:

§ 63.1349 Performance testing requirements.

(a) You must document performance test results in complete test reports that contain the information required by paragraphs (a)(1) through (10) of this section, as well as all other relevant information. As described in § 63.7(c)(2)(i), you must make available to the Administrator prior to testing, if requested, the site-specific test plan to be followed during performance testing. For purposes of determining exhaust gas flow rate to the atmosphere from an alkali bypass stack or a coal mill stack, you must either install, operate, calibrate and maintain an instrument for continuously measuring and recording the exhaust gas flow rate according to the requirements in paragraphs § 63.1350(n)(1) through (10) of this subpart or use the maximum design exhaust gas flow rate. For purposes of determining the combined emissions from kilns equipped with an alkali bypass or that exhaust kiln gases to a coal mill that exhausts through a separate stack, instead of installing a CEMS on the alkali bypass stack or coal mill stack, you may use the results of the initial and subsequent performance test to demonstrate compliance with the relevant emissions limit.

* * * * *

(b)(1) *PM emissions tests.* The owner or operator of a kiln subject to limitations on PM emissions shall demonstrate initial compliance by conducting a performance test using Method 5 or Method 5I at appendix A–3 to part 60 of this chapter. You must also monitor continuous performance through use of a PM continuous parametric monitoring system (PM CPMS).

(i) For your PM CPMS, you will establish a site-specific operating limit. If your PM performance test demonstrates your PM emission levels to be below 75 percent of your emission limit you will use the average PM CPMS value recorded during the PM compliance test, the milliamp equivalent of zero output from your PM CPMS, and the average PM result of your compliance test to establish your operating limit. If your PM compliance test demonstrates your PM emission levels to be at or above 75 percent of your emission limit you will use the average PM CPMS value recorded during the PM compliance test to establish your operating limit. You will use the PM CPMS to demonstrate continuous compliance with your operating limit. You must repeat the performance test annually and reassess and adjust the site-specific operating limit in accordance with the results of the performance test.

(A) Your PM CPMS must provide a 4–20 milliamp output and the establishment of its relationship to manual reference method measurements must be determined in units of milliamps.

(B) Your PM CPMS operating range must be capable of reading PM concentrations from zero to a level equivalent to three times your allowable emission limit. If your PM CPMS is an auto-ranging instrument capable of multiple scales, the primary range of the instrument must be capable of reading PM concentration from zero to a level equivalent to three times your allowable emission limit.

(C) During the initial performance test or any such subsequent performance test that demonstrates compliance with the PM limit, record and average all milliamp output values from the PM CPMS for the periods corresponding to the compliance test runs (e.g., average all your PM CPMS output values for three corresponding 2-hour Method 5I test runs).

(ii) Determine your operating limit as specified in paragraphs (b)(1)(iii) through (iv) of this section. If your PM performance test demonstrates your PM emission levels to be below 75 percent of your emission limit you will use the average PM CPMS value recorded during the PM compliance test, the milliamp equivalent of zero output from your PM CPMS, and the average PM result of your compliance test to establish your operating limit. If your PM compliance test demonstrates your PM emission levels to be at or above 75 percent of your emission limit you will use the average PM CPMS value recorded during the PM compliance test to establish your operating limit. You must verify an existing or establish a new operating limit after each repeated performance test. You must repeat the performance test at least annually and reassess and adjust the site-specific operating limit in accordance with the results of the performance test.

(iii) If the average of your three Method 5 or 5I compliance test runs is below 75 percent of your PM emission limit, you must calculate an operating limit by establishing a relationship of PM CPMS signal to PM concentration using the PM CPMS instrument zero, the average PM CPMS values corresponding to the three compliance test runs, and the average PM concentration from the Method 5 or 5I compliance test with the procedures in (a)(1)(iii)(A) through (D) of this section.

(A) Determine your PM CPMS instrument zero output with one of the following procedures.

(*1*) Zero point data for in-situ instruments should be obtained by removing the instrument from the stack and monitoring ambient air on a test bench.

(*2*) Zero point data for extractive instruments should be obtained by removing the extractive probe from the stack and drawing in clean ambient air.

(*3*) The zero point may also be established by performing manual reference method measurements when the flue gas is free of PM emissions or contains very low PM concentrations (e.g., when your process is not operating, but the fans are operating or your source is combusting only natural gas) and plotting these with the compliance data to find the zero intercept.

(*4*) If none of the steps in paragraphs (a)(1)(iii)(A)(*1*) through (*3*) of this section are possible, you must use a zero output value provided by the manufacturer.

(B) Determine your PM CPMS instrument average in milliamps, and the average of your corresponding three PM compliance test runs, using equation 3.

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} X_1 , \bar{y} = \frac{1}{n}\sum_{i=1}^{n} Y_1 \qquad \text{(Eq. 3)}$$

Where:

X_1 = The PM CPMS data points for the three runs constituting the performance test.

Y_1 = The PM concentration value for the three runs constituting the performance test.

n = The number of data points.

(C) With your instrument zero expressed in milliamps, your three run average PM CPMS milliamp value, and your three run PM compliance test average, determine a relationship of lb/ton-clinker per milliamp with Equation 4.

$$R = \frac{Y_1}{(X_1 - z)} \qquad \text{(Eq. 4)}$$

Where:

R = The relative lb/ton-clinker per milliamp for your PM CPMS.

Y_1 = The three run average lb/ton-clinker PM concentration.

X_1 = The three run average milliamp output from you PM CPMS.

z = The milliamp equivalent of your instrument zero determined from (b)(1)(iii)(A).

(D) Determine your source specific 30-day rolling average operating limit using the lb/ton-clinker per milliamp value from Equation 4 in Equation 5, below. This sets your operating limit at the PM CPMS output value corresponding to 75 percent of your emission limit.

$$O_l = z + \frac{0.75(L)}{R} \qquad \text{(Eq. 5)}$$

Where:

O_l = The operating limit for your PM CPMS on a 30-day rolling average, in milliamps.
L = Your source emission limit expressed in lb/ton clinker.
z = Your instrument zero in milliamps, determined from (1)(i).
R = The relative lb/ton-clinker per milliamp for your PM CPMS, from Equation 4.

(iv) If the average of your three PM compliance test runs is at or above 75 percent of your PM emission limit you must determine your operating limit by averaging the PM CPMS milliamp output corresponding to your three PM performance test runs that demonstrate compliance with the emission limit using Equation 6.

$$O_h = \frac{1}{n}\sum_{i=1}^{n} X_1 \qquad \text{(Eq. 6)}$$

Where:

X_1 = The PM CPMS data points for all runs i.
n = The number of data points.
O_h = Your site specific operating limit, in milliamps.

(v) To determine continuous operating compliance, you must record the PM CPMS output data for all periods when the process is operating, and use all the PM CPMS data for calculations when the source is not out-of-control. You must demonstrate continuous compliance by using all quality-assured hourly average data collected by the PM CPMS for all operating hours to calculate the arithmetic average operating parameter in units of the operating limit (milliamps) on a 30 operating day rolling average basis, updated at the end of each new kiln operating day. Use Equation 7 to determine the 30 kiln operating day average.

$$30\text{kiln operating day} = \frac{\sum_{i=1}^{n} Hpv_i}{n} \qquad \text{(Eq. 7)}$$

Where:

Hpvi = The hourly parameter value for hour i.
n = The number of valid hourly parameter values collected over 30 kiln operating days.

(vi) For each performance test, conduct at least three separate test runs under the conditions that exist when the affected source is operating at the highest load or capacity level reasonably expected to occur. Conduct each test run to collect a minimum sample volume of 2 dscm for determining compliance with a new source limit and 1 dscm for determining compliance with an existing source limit. Calculate the average of the results from three consecutive runs, including applicable sources as required by (D)(viii), to determine compliance. You need not determine the particulate matter collected in the impingers (''back half'') of the Method 5 or Method 5I particulate sampling train to demonstrate compliance with the PM standards of this subpart. This shall not preclude the permitting authority from requiring a determination of the ''back half'' for other purposes.

(vii) For PM performance test reports used to set a PM CPMS operating limit, the electronic submission of the test report must also include the make and model of the PM CPMS instrument, serial number of the instrument, analytical principle of the instrument (e.g. beta attenuation), span of the instruments primary analytical range, milliamp value equivalent to the instrument zero output, technique by which this zero value was determined, and the average milliamp signals corresponding to each PM compliance test run.

(viii) When there is an alkali bypass and/or an inline coal mill with a separate stack associated with a kiln, the main exhaust and alkali bypass and/or inline coal mill must be tested simultaneously and the combined emission rate of PM from the kiln and alkali bypass and/or inline coal mill must be computed for each run using Equation 8 of this section.

$$E_c = \frac{E_K + E_B + E_C}{P} \qquad \text{(Eq. 8)}$$

Where:

E_C = Combined hourly emission rate of PM from the kiln and bypass stack and/or inline coal mill, lb/ton of kiln clinker production.
E_K = Hourly emissions of PM emissions from the kiln, lb.
E_B = Hourly PM emissions from the alkali bypass stack, lb.
E_C = Hourly PM emissions from the inline coal mill stack, lb.
P = Hourly clinker production, tons.

(ix) The owner or operator of a kiln with an in-line raw mill and subject to limitations on PM emissions shall demonstrate initial compliance by conducting separate performance tests while the raw mill is under normal operating conditions and while the raw mill is not operating.

* * * * *

(3) *D/F Emissions Tests.* If you are subject to limitations on D/F emissions under this subpart, you must conduct a performance test using Method 23 of appendix A–7 to part 60 of this chapter. If your kiln or in-line kiln/raw mill is equipped with an alkali bypass, you must conduct simultaneous performance tests of the kiln or in-line kiln/raw mill exhaust and the alkali bypass. You may conduct a performance test of the alkali bypass exhaust when the raw mill of the in-line kiln/raw mill is operating or not operating.

* * * * *

(v)(A) If sorbent injection is used for D/F control, you must record the rate of sorbent injection to the kiln exhaust, and where applicable, the rate of sorbent injection to the alkali bypass exhaust, continuously during the period of the Method 23 test in accordance with the conditions in § 63.1350(m)(9), and include the continuous injection rate record(s) in the performance test report. Determine the sorbent injection rate parameters in accordance with paragraphs (b)(3)(vi) of this section.

(B) Include the brand and type of sorbent used during the performance test in the performance test report.

(C) Maintain a continuous record of either the carrier gas flow rate or the carrier gas pressure drop for the duration of the performance test. If the carrier gas flow rate is used, determine, record, and maintain a record of the accuracy of the carrier gas flow rate monitoring system according to the procedures in appendix A to part 75 of this chapter. If the carrier gas pressure drop is used, determine, record, and maintain a record of the accuracy of the carrier gas pressure drop monitoring system according to the procedures in § 63.1350(m)(6).

(vi) Calculate the run average sorbent injection rate for each run and determine and include the average of the run average injection rates in the performance test report and determine the applicable injection rate limit in accordance with § 63.1346(c)(1).

(4) *THC emissions test.* (i) If you are subject to limitations on THC emissions, you must operate a CEMS in accordance with the requirements in § 63.1350(i). For the purposes of conducting the accuracy and quality assurance evaluations for CEMS, the THC span value (as propane) is 50 ppmvd and the reference method (RM) is Method 25A of appendix A to part 60 of this chapter.

(ii) Use the THC CEMS to conduct the initial compliance test for the first 30 kiln operating days of kiln operation after the compliance date of the rule. See 63.1348(a).

(iii) If kiln gases are diverted through an alkali bypass or to a coal mill and exhausted through a separate stack, you must calculate a kiln-specific THC limit using Equation 9:

$$Cks = \frac{(MACT\ Limit \times (Qab + Qcm + Qks)) - (Qab \times Cab) - (Qcm \times Ccm)}{Qks} \qquad \text{((Eq. 9)}$$

Where:

Cks = Kiln stack concentration (ppmvd).
Qab = Alkali bypass flow rate (volume/hr).
Cab = Alkali bypass concentration (ppmvd).
Qcm = Coal mill flow rate (volume/hr).
Ccm = Coal mill concentration (ppmvd).
Qks = Kiln stack flow rate (volume/hr).

(iv) THC must be measured either upstream of the coal mill or the coal mill stack.

(v) Instead of conducting the performance test specified in paragraph (b)(4)of this section, you may conduct a performance test to determine emissions of total organic HAP by following the procedures in paragraphs (b)(7) of this section.

(5) *Mercury Emissions Tests.* If you are subject to limitations on mercury emissions, you must operate a mercury CEMS or a sorbent trap monitoring system in accordance with the requirements of § 63.1350(k). The initial compliance test must be based on the first 30 kiln operating days in which the affected source operates using a mercury CEMS or a sorbent trap monitoring system after the compliance date of the rule. See § 63.1348(a).

(i) If you are using a mercury CEMS or a sorbent trap monitoring system, you must install, operate, calibrate, and maintain an instrument for continuously measuring and recording the exhaust gas flow rate to the atmosphere according to the requirements in § 63.1350(k)(5).

(ii) Calculate the emission rate using Equation 10 of this section:

$$E_{30D} = k \frac{\sum_{i=1}^{n} C_i Q_i}{P} \qquad \text{(Eq. 10)}$$

Where:

E_{30D} = 30-day rolling emission rate of mercury, lb/MM tons clinker.
C_i = Concentration of mercury for operating hour i, μg/scm.
Q_i = Volumetric flow rate of effluent gas for operating hour i, where C_i and Q_i are on the same basis (either wet or dry), scm/hr.
k = Conversion factor, 1 lb/454,000,000 μg.
n = Number of kiln operating hours in a 30 kiln operating day period.
P = 30 days of clinker production during the same time period as the mercury emissions measured, million tons.

(6) *HCl emissions tests.* For a source subject to limitations on HCl emissions you must conduct performance testing by one of the following methods:

(i)(A) If the source is equipped with a wet scrubber, tray tower or dry scrubber, you must conduct performance testing using Method 321 of appendix A to this part unless you have installed a CEMS that meets the requirements § 63.1350(l)(1). For kilns with inline raw mills, testing should be conducted for the raw mill on and raw mill off conditions.

(B) You must establish site specific parameter limits by using the CPMS required in § 63.1350(l)(1). For a wet scrubber or tray tower, measure and record the pressure drop across the scrubber and/or liquid flow rate and pH in intervals of no more than 15 minutes during the HCl test. Compute and record the 24-hour average pressure drop, pH, and average scrubber water flow rate for each sampling run in which the applicable emissions limit is met. For a dry scrubber, measure and record the sorbent injection rate in intervals of no more than 15 minutes during the HCl test. Compute and record the 24-hour average sorbent injection rate and average sorbent injection rate for each sampling run in which the applicable emissions limit is met.

(ii)(A) If the source is not controlled by a wet scrubber, tray tower or dry sorbent injection system, you must operate a CEMS in accordance with the requirements of § 63.1350(l)(1). See § 63.1348(a).

(B) The initial compliance test must be based on the 30 kiln operating days that occur after the compliance date of this rule in which the affected source operates using a HCl CEMS. Hourly HCl concentration data must be obtained according to § 63.1350(l).

(iii) As an alternative to paragraph (b)(6)(i)(B) of this section, you may choose to monitor SO_2 emissions using a CEMS in accordance with the requirements of § 63.1350(l)(3). You must establish an SO_2 operating limit equal to the highest 1 hour average recorded during the HCl stack test. This operating limit will apply only for demonstrating HCl compliance.

(iv) If kiln gases are diverted through an alkali bypass or to a coal mill and exhausted through a separate stack, you must calculate a kiln-specific HCl limit using Equation 11:

$$Cks = \frac{(MACT\ Limit \times (Qab + Qcm + Qks)) - (Qab \times Cab) - (Qcm \times Ccm)}{Qks} \quad \text{(Eq. 11)}$$

Where:

Cks = Kiln stack concentration (ppmvd).
Qab = Alkali bypass flow rate (volume/hr).
Cab = Alkali bypass concentration (ppmvd).
Qcm = Coal mill flow rate (volume/hr).
Ccm = Coal mill concentration (ppmvd).
Qks = Kiln stack flow rate (volume/hr).

(7) *Total Organic HAP Emissions Tests.* Instead of conducting the performance test specified in paragraph (a)(4) of this section, you may conduct a performance test to determine emissions of total organic HAP by following the procedures in paragraphs (a)(7)(i) through (v) of this section.

(i) Use Method 320 of appendix A to this part, Method 18 of Appendix A of part 60, ASTM D6348–03 or a combination to determine emissions of total organic HAP. Each performance test must consist of three separate runs under the conditions that exist when the affected source is operating at the representative performance conditions in accordance with § 63.7(e). Each run must be conducted for at least 1 hour.

(ii) At the same time that you are conducting the performance test for total organic HAP, you must also determine a site-specific THC emissions limit by operating a THC CEMS in accordance with the requirements of § 63.1350(j). The duration of the performance test must be at least 3 hours and the average THC concentration (as calculated from the 1-minute averages) during the 3-hour test must be calculated. You must establish your THC operating limit and determine compliance with it according to paragraphs (a)(7)(vii)through (viii)of this section. It is permissible to extend the testing time of the organic HAP performance test if you believe extended testing is required to adequately capture THC variability over time.

(iii) If your source has an in-line kiln/raw mill you must use the fraction of time the raw mill is on and the fraction of time that the raw mill is off and calculate this limit as a weighted average of the THC levels measured during raw mill on and raw mill off testing.

(iv) If your organic HAP emissions are below 75 percent of the organic HAP standard and you determine your operating limit with paragraph (b)(7)(vii) of this section your THC CEMS must be calibrated and operated on a measurement scale no greater than 180 ppmvw, as carbon, or 60 ppmvw as propane.

(v) Your THC CEMS measurement scale must be capable of reading THC concentrations from zero to a level equivalent to two times your highest THC emissions average determined during your performance test, including mill on or mill off operation. **Note:** This may require the use of a dual range instrument to meet this requirement and paragraph (b)(7)(iv) of this section.

(vi) Determine your operating limit as specified in paragraphs (a)(7)(vii) and (viii) of this section. If your organic HAP performance test demonstrates your average organic HAP emission levels are below 75 percent of your emission limit (9 ppmv) you will use the average THC value recorded during the organic HAP performance test, and the average total organic HAP result of your performance test to establish your operating limit. If your organic HAP compliance test results demonstrate your average organic HAP emission levels are at or above 75 percent of your emission limit, your operating limit is established as the average THC value recorded during the organic HAP performance test. You must establish a new operating limit after each performance test. You must repeat the performance test no later than 30 months following your last performance test and reassess and adjust the site-specific operating limit in accordance with the results of the performance test.

(vii) If the average organic HAP results for your three Method 18 and/or Method 320 performance test runs are below 75 percent of your organic HAP emission limit, you must calculate an operating limit by establishing a relationship of THC CEMS signal to the organic HAP concentration using the average THC CEMS value corresponding to the three organic HAP compliance test runs and the average organic HAP total concentration from the Method 18 and/or Method 320 performance test runs with the procedures in (a)(7)(vii)(A) and (B) of this section.

(A) Determine the THC CEMS average values in ppmvw, and the average of your corresponding three total organic HAP compliance test runs, using Equation 12.

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} X_i\ ,\bar{y} = \frac{1}{n}\sum_{i=1}^{n} Y_i \quad \text{(Eq. 12)}$$

Where:

$\bar{x}$ = The THC CEMS average values in ppmvw.
Xi= The THC CEMS data points for all three runs i.
Yi= The sum of organic HAP concentrations for test runs i. and
n = The number of data points.

(B) You must use your three run average THC CEMS value, and your three run average organic HAP concentration from your three Method 18 and/or Method 320 compliance tests to determine the operating limit. Use equation 13 to determine your operating limit in units of ppmvw THC, as propane.

$$T_l = \left(\frac{9}{Y_1}\right) * X_1 \quad \text{(Eq. 13)}$$

Where:

T_l = The 30-day operating limit for your THC CEMS, ppmvw.

Y_1 = The average organic HAP concentration from Eq. 12, ppmv.

X_1 = The average THC CEMS concentration from Eq. 12, ppmvw.

(viii) If the average of your three organic HAP performance test runs is at or above 75 percent of your organic HAP emission limit, you must determine your operating limit using Equation 14 by averaging the THC CEMS output values corresponding to your three organic HAP performance test runs that demonstrate compliance with the emission limit. If your new THC CEMS value is below your current operating limit, you may opt to retain your current operating limit, but you must still submit all performance test and THC CEMS data according to the reporting requirements in paragraph (d)(1) of this section.

$$T_h = \frac{1}{n}\sum_{i=1}^{n} X_1 , \qquad \text{(Eq. 14)}$$

Where:

X1 = The THC CEMS data points for all runs i.

Y1 = The organic HAP total value for runs i.

n = The number of data points.

T_h = Your site specific operating limit, in ppmvw THC.

(ix) If your kiln has an inline kiln/raw mill, you must conduct separate performance tests while the raw mill is operating (''mill on'') and while the raw mill is not operating (''mill off''). Using the fraction of time the raw mill is on and the fraction of time that the raw mill is off, calculate this limit as a weighted average of the THC levels measured during raw mill on and raw mill off compliance testing with Equation 15.

$$R=(y*t)+(x*(1-t)) \qquad \text{(Eq.15)}$$

Where:

R = Operating limit as THC, ppmvw.

y = Average THC CEMS value during mill on operations, ppmvw.

t = Percentage of operating time with mill on.

x = Average THC CEMS value during mill off operations, ppmvw.

(1-t) = Percentage of operating time with mill off.

(x) To determine continuous compliance with the THC operating limit, you must record the THC CEMS output data for all periods when the process is operating and the THC CEMS is not out-of-control. You must demonstrate continuous compliance by using all quality-assured hourly average data collected by the THC CEMS for all operating hours to calculate the arithmetic average operating parameter in units of the operating limit (ppmvw) on a 30 operating day rolling average basis, updated at the end of each new kiln operating day. Use Equation 16 to determine the 30 kiln operating day average.

$$\text{30kiln operating day} = \frac{\sum_{i=1}^{n} Hpv_i}{n} \qquad \text{(Eq. 16)}$$

Where:

Hpvi = The hourly parameter value for hour i, ppmvw.

n = The number of valid hourly parameter values collected over 30 kiln operating days.

(xi) Use EPA Method 18 or Method 320 of appendix A to part 60 of this chapter to determine organic HAP emissions. For each performance test, conduct at least three separate runs under the conditions that exist when the affected source is operating at the highest load or capacity level reasonably expected to occur. If your source has an in-line kiln/raw mill you must conduct three separate test runs with the raw mill on, and three separate runs under the conditions that exist when the affected source is operating at the highest load or capacity level reasonably expected to occur with the mill off. Conduct each Method 18 test run to collect a minimum target sample equivalent to three times the method detection limit. Calculate the average of the results from three runs to determine compliance.

(xii) If the THC level exceeds by 10 percent or more your site-specific THC emissions limit, you must

(A) As soon as possible but no later than 30 days after the exceedance, conduct an inspection and take corrective action to return the THC CEMS measurements to within the established value; and

(B) Within 90 days of the exceedance or at the time of the annual compliance test, whichever comes first, conduct another performance test to determine compliance with the organic HAP limit and to verify or re-establish your site-specific THC emissions limit.

(8) HCl Emissions Tests with SO_2 Monitoring. If you choose to monitor SO_2 emissions using a CEMS to demonstrate HCl compliance, follow the procedures in (b)(8)(i) through (ix) of this section and in accordance with the requirements of § 63.1350(l)(3). You must establish an SO_2 operating limit equal to the average of the SO_2 emissions recorded during the HCl stack test. This operating limit will apply only for demonstrating HCl compliance.

(i) Use Method 321 of appendix A to this part to determine emissions of HCl. Each performance test must consist of three separate runs under the conditions that exist when the affected source is operating at the representative performance conditions in accordance with § 63.7(e). Each run must be conducted for at least one hour.

(ii) At the same time that you are conducting the performance test for HCl, you must also determine a site-specific SO_2 emissions limit by operating an SO_2 CEMS in accordance with the requirements of § 63.1350(l). The duration of the performance test must be three hours and the average SO_2 concentration (as calculated from the 1-minute averages) during the 3-hour test must be calculated. You must establish your SO_2 operating limit and determine compliance with it according to paragraphs (b)(8)(vii) and (viii)of this section.

(iii) If your source has an in-line kiln/raw mill you must use the fraction of time the raw mill is on and the fraction of time that the raw mill is off and calculate this limit as a weighted average of the SO_2 levels measured during raw mill on and raw mill off testing.

(iv) Your SO_2 CEMS must be calibrated and operated according to the requirements of § 60.63(f).

(v) Your SO_2 CEMS measurement scale must be capable of reading SO_2 concentrations consistent with the requirements of § 60.63(f), including mill on or mill off operation.

(vi) If your kiln has an inline kiln/raw mill, you must conduct separate performance tests while the raw mill is operating (''mill on'') and while the raw mill is not operating (''mill off''). Using the fraction of time the raw mill is on and the fraction of time that the raw mill is off, calculate this limit as a weighted average of the THC levels measured during raw mill on and raw mill off compliance testing with Equation 17.

$$R=(y*t)+x*(t-1) \qquad \text{(Eq. 17)}$$

Where:

R = Operating limit as SO_2, ppmvw.
y = Average SO_2 CEMS value during mill on operations, ppmvw.
t = Percentage of operating time with mill on, expressed as a decimal.
x = Average SO_2 CEMS value during mill off operations, ppmvw.
$t-1$ = Percentage of operating time with mill off, expressed as a decimal.

(vii) To determine continuous compliance with the SO_2 operating limit, you must record the SO_2 CEMS output data for all periods when the process is operating and the SO_2 CEMS is not out-of-control. You must demonstrate continuous compliance by using all quality-assured hourly average data collected by the SO_2 CEMS for all operating hours to calculate the arithmetic average operating parameter in units of the operating limit (ppmvw) on a 30 operating day rolling average basis, updated at the end of each new kiln operating day. Use Equation 18 to determine the 30 kiln operating day average.

$$30\text{kiln operating day} = \frac{\sum_{i=1}^{n} Hpv_i}{n} \qquad \text{(Eq. 18)}$$

Where:

Hpvi = The hourly parameter value for hour i, ppmvw.
n = The number of valid hourly parameter values collected over 30 kiln operating days.

(viii) Use EPA Method 321 of appendix A to part 60 of this chapter to determine HCl emissions. For each performance test, conduct at least three separate runs under the conditions that exist when the affected source is operating at the highest load or capacity level reasonably expected to occur. If your source has an in-line kiln/raw mill you must conduct three separate test runs with the raw mill on, and three separate runs under the conditions that exist when the affected source is operating at the highest load or capacity level reasonably expected to occur with the mill off.

(ix) If the SO_2 level exceeds by 10 percent or more your site-specific SO_2 emissions limit, you must

(A) As soon as possible but no later than 30 days after the exceedance, conduct an inspection and take corrective action to return the SO_2 CEMS measurements to within the established value. and

(B) Within 90 days of the exceedance or at the time of the annual compliance test, whichever comes first, conduct another performance test to determine compliance with the HCl limit and to verify or re-establish your site-specific SO_2 emissions limit.

(c) *Performance Test Frequency.* Except as provided in § 63.1348(b), performance tests are required at regular intervals for affected sources that are subject to a dioxin, organic HAP or HCl emissions limit and must be repeated every 30 months except for pollutants where that specific pollutant is monitored using CEMS. Tests for PM are repeated every 12 months.

(d) *Performance Test Reporting Requirements.* (1) You must submit the information specified in paragraphs (d)(1) and (2) of this section no later than 60 days following the initial performance test. All reports must be signed by a responsible official.

* * * * *

(ii) The values for the site-specific operating limits or parameters established pursuant to paragraphs (b)(1), (3), (6), and (7) of this section, as applicable, and a description, including sample calculations, of how the operating parameters were established during the initial performance test.

(2) As of December 31, 2011 and within 60 days after the date of completing each performance evaluation or test, as defined in § 63.2, conducted to demonstrate compliance with any standard covered by this subpart, you must submit the relative accuracy test audit data and performance test data, except opacity data, to the EPA by successfully submitting the data electronically to the EPA's Central Data Exchange (CDX) by using the Electronic Reporting Tool(ERT) (see *http://www.epa.gov/ttn/chief/ert/ert_tool.html/*).

(e) *Conditions of performance tests.* Conduct performance tests under such conditions as the Administrator specifies to the owner or operator based on representative performance of the affected source for the period being tested. Upon request, you must make available to the Administrator such records as may be necessary to determine the conditions of performance tests.

■ 18. Section 63.1350 is amended by:
■ a. Revising paragraphs (a) through (d);
■ b. Revising paragraph (f) introductory text;

■ c. Revising paragraphs (f)(1)(iv) through (f)(1)(vi);
■ d. Revising paragraphs (f)(2)(i) and (f)(2)(iii);
■ e. Revising paragraphs (f)(3) and (f)(4);
■ f. Revising paragraph (g)(1) introductory text;
■ g. Revising paragraphs (g)(2) and (g)(4);
■ h. Revising paragraph (h)(1)(ii);
■ i. Revising paragraphs (i)(1) and (i)(2);
■ j. Revising paragraph (k);
■ k. Revising paragraph (l);
■ l. Revising paragraph (m) introductory text;
■ m. Revising paragraphs (m)(3) and (m)(7)(i);
■ n. Revising introductory text for paragraphs (m)(9) and (m) (10);
■ o. Revising paragraph (m)(10)(i) through (m)(10)(vii), and paragraph (m)(11)(v);
■ p. Revising introductory text for paragraphs (n), (o), and (p);
■ q. Removing and reserving paragraph (n)(3); and
■ r. Revising introductory text for paragraphs (p)(1), (p)(2), and (p)(5).

The revisions and additions read as follows:

§ 63.1350 Monitoring requirements.

(a)(1) Following the compliance date, the owner or operator must demonstrate compliance with this subpart on a continuous basis by meeting the requirements of this section.

(2) All continuous monitoring data for periods of startup and shutdown must be compiled and averaged separately from data gathered during other operating periods.

(3) For each existing unit that is equipped with a CMS, maintain the average emissions or the operating parameter values within the operating parameter limits established through performance tests.

(4) Any instance where the owner or operator fails to comply with the continuous monitoring requirements of this section is a violation.

(b) *PM monitoring requirements.* (1)(i) *PM CPMS.* You will use a PM CPMS to establish a site-specific operating limit corresponding to the results of the performance test demonstrating compliance with the PM limit. You will conduct your performance test using Method 5 or Method 5I at appendix A–3 to part 60 of this chapter. You will use the PM CPMS to demonstrate continuous compliance with this operating limit. You must repeat the performance test annually and reassess and adjust the site-specific operating limit in accordance with the results of the performance test using the procedures in § 63.1349(b)(1) (i) through (vi) of this subpart. You must also repeat the test if you change the analytical range of the instrument, or if you replace the instrument itself or any principle analytical component of the instrument that would alter the relationship of output signal to in-stack PM concentration.

(ii) To determine continuous compliance, you must use the PM CPMS output data for all periods when the process is operating and the PM CPMS is not out-of-control. You must demonstrate continuous compliance by using all quality-assured hourly average data collected by the PM CPMS for all operating hours to calculate the arithmetic average operating parameter in units of the operating limit (milliamps) on a 30 operating day rolling average basis, updated at the end of each new kiln operating day.

(iii) For any exceedance of the 30 process operating day PM CPMS average value from the established operating parameter limit, you must:

(A) Within 48 hours of the exceedance, visually inspect the APCD;

(B) If inspection of the APCD identifies the cause of the exceedance, take corrective action as soon as possible and return the PM CPMS measurement to within the established value; and

(C) Within 30 days of the exceedance or at the time of the annual compliance test, whichever comes first, conduct a PM emissions compliance test to determine compliance with the PM emissions limit and to verify or re-establish the PM CPMS operating limit within 45 days. You are not required to conduct additional testing for any exceedances that occur between the time of the original exceedance and the PM emissions compliance test required under this paragraph.

(iv) PM CPMS exceedances leading to more than four required performance tests in a 12-month process operating period (rolling monthly) constitute a presumptive violation of this subpart.

(2) [Reserved]

(c) [Reserved]

(d) *Clinker production monitoring requirements.* In order to determine clinker production, you must:

(1) Determine hourly clinker production by one of two methods:

(i) Install, calibrate, maintain, and operate a permanent weigh scale system to measure and record weight rates in tons-mass per hour of the amount of clinker produced. The system of measuring hourly clinker production must be maintained within ±5 percent accuracy, or

(ii) Install, calibrate, maintain, and operate a permanent weigh scale system to measure and record weight rates in tons-mass per hour of the amount of feed to the kiln. The system of measuring feed must be maintained within ±5 percent accuracy. Calculate your hourly clinker production rate using a kiln-specific feed to clinker ratio based on reconciled clinker production determined for accounting purposes and recorded feed rates. Update this ratio monthly. Note that if this ratio changes at clinker reconciliation, you must use the new ratio going forward, but you do not have to retroactively change clinker production rates previously estimated.

(iii) [Reserved]

(2) Determine, record, and maintain a record of the accuracy of the system of measuring hourly clinker production (or feed mass flow if applicable) before initial use (for new sources) or by the effective compliance date of this rule (for existing sources). During each quarter of source operation, you must determine, record, and maintain a record of the ongoing accuracy of the system of measuring hourly clinker production (or feed mass flow).

(3) If you measure clinker production directly, record the daily clinker production rates; if you measure the kiln feed rates and calculate clinker production, record the hourly kiln feed and clinker production rates.

(4) Develop an emissions monitoring plan in accordance with paragraphs (p)(1) through (p)(4) of this section.

* * * * *

(f) *Opacity Monitoring Requirements.* If you are subject to a limitation on opacity under § 63.1345, you must conduct required opacity monitoring in accordance with the provisions of paragraphs (f)(1)(i) through (vii) of this section and in accordance with your monitoring plan developed under § 63.1350(p). You must also develop an opacity monitoring plan in accordance with paragraphs (p)(1) through (4) and paragraph (o)(5), if applicable, of this section.

(1) * * *

(iv) If visible emissions are observed during any Method 22 performance test, of appendix A–7 to part 60 of this chapter, you must conduct 30 minutes of opacity observations, recorded at 15-second intervals, in accordance with Method 9 of appendix A–4 to part 60 of this chapter. The Method 9 performance test, of appendix A–4 to part 60 of this chapter, must begin within 1 hour of any observation of visible emissions.

(v) Any totally enclosed conveying system transfer point, regardless of the location of the transfer point is not required to conduct Method 22 visible emissions monitoring under this paragraph. The enclosures for these transfer points must be operated and maintained as total enclosures on a continuing basis in accordance with the facility operations and maintenance plan.

(vi) If any partially enclosed or unenclosed conveying system transfer point is located in a building, you must conduct a Method 22 performance test, of appendix A–7 to part 60 of this chapter, according to the requirements of paragraphs (f)(1)(i) through (iv) of this section for each such conveying system transfer point located within the building, or for the building itself, according to paragraph (f)(1)(vii) of this section.

* * * * *

(2)(i) For a raw mill or finish mill, you must monitor opacity by conducting daily visible emissions observations of the mill sweep and air separator PM control devices (PMCD) of these affected sources in accordance with the procedures of Method 22 of appendix A–7 to part 60 of this chapter. The duration of the Method 22 performance test must be 6 minutes.

* * * * *

(iii) If visible emissions are observed during the follow-up Method 22 performance test required by paragraph (f)(2)(ii) of this section from any stack from which visible emissions were observed during the previous Method 22 performance test required by paragraph (f)(2)(i) of the section, you must then conduct an opacity test of each stack from which emissions were observed during the follow up Method 22 performance test in accordance with Method 9 of appendix A–4 to part 60 of this chapter. The duration of the Method 9 test must be 30 minutes.

(3) If visible emissions are observed during any Method 22 visible emissions test conducted under paragraphs (f)(1) or (2) of this section, you must initiate, within one-hour, the corrective actions specified in your operation and maintenance plan as required in § 63.1347.

(4) The requirements under paragraph (f)(2) of this section to conduct daily Method 22 testing do not apply to any specific raw mill or finish mill equipped with a COMS or BLDS.

(i) If the owner or operator chooses to install a COMS in lieu of conducting the daily visible emissions testing required under paragraph (f)(2) of this section, then the COMS must be installed at the outlet of the PM control device of the raw mill or finish mill and the COMS must be installed, maintained, calibrated, and operated as required by the general provisions in subpart A of this part and according to PS–1 of appendix B to part 60 of this chapter.

(ii) If you choose to install a BLDS in lieu of conducting the daily visible emissions testing required under paragraph (f)(2) of this section, the requirements in paragraphs (m)(1) through (m)(4), (m)(10) and (m)(11) of this section apply.

(g) * * *

(1) You must install, calibrate, maintain, and continuously operate a CMS to record the temperature of the exhaust gases from the kiln and alkali bypass, if applicable, at the inlet to, or upstream of, the kiln and/or alkali bypass PMCDs.

* * * * *

(2) You must monitor and continuously record the temperature of the exhaust gases from the kiln and alkali bypass, if applicable, at the inlet to the kiln and/or alkali bypass PMCD.

* * * * *

(4) Calculate the rolling three-hour average temperature using the average of 180 successive one-minute average temperatures. See § 63.1349(b)(3).

* * * * *

(h) * * *

(1) * * *

(ii) Each hour, calculate the three-hour rolling average activated carbon injection rate for the previous three hours of process operation. See § 63.1349(b)(3).

* * * * *

(i) * * *

(1) You must install, operate, and maintain a THC continuous emission monitoring system in accordance with Performance Specification 8A of appendix B to part 60 of this chapter and comply with all of the requirements for continuous monitoring systems found in the general provisions, subpart A of this part. The owner or operator must operate and maintain each CEMS according to the quality assurance requirements in Procedure 1 of appendix F in part 60 of this chapter.

(2) Performance tests on alkali bypass and coal mill stacks must be conducted using Method 25A in appendix A to 40 CFR part 60 and repeated annually.

* * * * *

(k) *Mercury Monitoring Requirements.* If you have a kiln subject to an emissions limitation on mercury emissions, you must install and operate a mercury continuous emissions monitoring system (Hg CEMS) in accordance with Performance Specification 12A (PS 12A) of appendix B to part 60 of this chapter or an integrated sorbent trap monitoring system in accordance with Performance Specification 12B (PS 12B) of appendix B to part 60 of this chapter. You must monitor mercury continuously according to paragraphs (k)(1) through (5) of this section. You must also develop an emissions monitoring plan in accordance with paragraphs (p)(1) through (4) of this section.

(1) You must use a span value for any Hg CEMS that represents the mercury concentration corresponding to approximately two times the emissions standard and may be rounded up to the nearest multiple of 5 $\mu g/m^3$ of total mercury or higher level if necessary to include Hg concentrations which may occur (excluding concentrations during in-line raw ‘‘mill off’’ operation). As specified in PS 12A, Section 6.1.1, the data recorder output range must include the full range of expected Hg concentration values which would include those expected during ‘‘mill off’’ conditions. Engineering judgments made and calculations used to determine the corresponding span concentration from the emission standard shall be documented in the site-specific monitoring plan and associated records.

(2) In order to quality assure data measured above the span value, you must use one of the two options in paragraphs (k)(2)(i) and (ii) of this section.

(i) Include a second span that encompasses the Hg emission concentrations expected to be encountered during ‘‘mill off’’ conditions. This second span may be rounded to a multiple of 5 $\mu g/m^3$ of total mercury. The requirements of PS 12A, shall be followed for this second span with the exception that a RATA with the mill off is not required.

(ii) Quality assure any data above the span value established in paragraph (k)(1) of this section using the following procedure. Any time two consecutive one-hour average measured concentration of Hg exceeds the span value you must, within 24 hours before or after, introduce a higher, ‘‘above span’’ Hg reference gas standard to the Hg CEMS. The ‘‘above span’’ reference gas must meet the requirements of PS 12A, Section 7.1, must be of a concentration level between 50 and 150 percent of the highest hourly concentration measured during the period of measurements above span, and must be introduced at the probe. Record and report the results of this procedure as you would for a daily calibration. The ‘‘above span’’ calibration is successful if the value measured by the Hg CEMS is within 20 percent of the certified value of the reference gas. If the value measured by the Hg CEMS exceeds 20 percent of the certified value of the reference gas, then you must normalize the one-hour average stack gas values measured above the span during the 24-hour period preceding or following the ''above span'' calibration for reporting based on the Hg CEMS response to the reference gas as shown in equation 19:

$$\frac{\text{Certified reference gas value}}{\text{Measured value of reference gas}} \times \text{Measured stack gas result} = \text{Normalized stack gas result} \qquad \text{(Eq. 19)}$$

Only one 'above span' calibration is needed per 24 hour period.

(3) You must operate and maintain each Hg CEMS or an integrated sorbent trap monitoring system according to the quality assurance requirements in Procedure 5 of appendix F to part 60 of this chapter. During the RATA of integrated sorbent trap monitoring systems required under Procedure 5, you may apply the appropriate exception for sorbent trap section 2 breakthrough in (k)(3)(i) through (iv) of this section:

(i) For stack Hg concentrations >1 µg/dscm, ≤10% of section 1 mass;

(ii) For stack Hg concentrations ≤1 µg/dscm and >0.5 µg/dscm, ≤20% of section 1 mass;

(iii) For stack Hg concentrations ≤0.5 µg/dscm and >0.1 µg/dscm, ≤50% of section 1 mass; and

(iv) For stack Hg concentrations ≤0.1 µg/dscm, no breakthrough criterion assuming all other QA/QC specifications are met.

(4) Relative accuracy testing of mercury monitoring systems under PS 12A, PS 12B, or Procedure 5 must be conducted at normal operating conditions. If a facility has an inline raw mill, the testing must occur with the raw mill on.

(5) If you use a Hg CEMS or an integrated sorbent trap monitoring system, you must install, operate, calibrate, and maintain an instrument for continuously measuring and recording the exhaust gas flow rate to the atmosphere according to the requirements in paragraphs (n)(1) through (10) of this section. If kiln gases are diverted through an alkali bypass or to a coal mill and exhausted through separate stacks, you must account for the mercury emitted from those stacks by following the procedures in (k)(5)(i) through (iv) of this section:

(i) Develop a mercury hourly mass emissions rate by conducting annual performance tests using Method 29, or Method 30B, to measure the concentration of mercury in the gases exhausted from the alkali bypass and coal mill.

(ii) On a continuous basis, determine the mass emissions of mercury in lb/hr from the alkali bypass and coal mill exhausts by using the mercury hourly emissions rate, the exhaust gas flow rate and hourly mercury emission rate to calculate hourly mercury emissions in lb/hr.

(iii) Sum the hourly mercury emissions from the kiln, alkali bypass and coal mill to determine total mercury emissions. Using hourly clinker production, calculate the hourly emissions rate in pounds per ton of clinker to determine your 30 day rolling average.

(iv) If mercury emissions from the coal mill are below the method detection limit for two consecutive annual performance tests, you may reduce the frequency of the performance tests of coal mills to once every 30 months. If the measured mercury concentration exceeds the method detection limit, you must revert to testing annually until two consecutive annual tests are below the method detection limit.

(6) If you operate an integrated sorbent trap monitoring system conforming to PS 12B, you may use a monitoring period at least 24 hours but no longer than 168 hours in length. You should use a monitoring period that is a multiple of 24 hours (except during relative accuracy testing as allowed in PS 12B).

(l) *HCl Monitoring Requirements.* If you are subject to an emissions limitation on HCl emissions in § 63.1343, you must monitor HCl emissions continuously according to paragraph (l)(1) or (2) and paragraphs (m)(1) through (4) of this section or, if your kiln is controlled using a wet or dry scrubber or tray tower, you alternatively may parametrically monitor SO_2 emissions continuously according to paragraph (l)(3) of this section. You must also develop an emissions monitoring plan in accordance with paragraphs (p)(1) through (4) of this section.

(1) If you monitor compliance with the HCl emissions limit by operating an HCl CEMS, you must do so in accordance with Performance Specification 15 (PS 15) of appendix B to part 60 of this chapter, or, upon promulgation, in accordance with any other performance specification for HCl CEMS in appendix B to part 60 of this chapter. You must operate, maintain, and quality assure a HCl CEMS installed and certified under PS 15 according to the quality assurance requirements in Procedure 1 of appendix F to part 60 of this chapter except that the Relative Accuracy Test Audit requirements of Procedure 1 must be replaced with the validation requirements and criteria of sections 11.1.1 and 12.0 of PS 15. If you install and operate an HCl CEMS in accordance with any other performance specification for HCl CEMS in appendix B to part 60 of this chapter, you must operate, maintain and quality assure the HCl CEMS using the procedure of appendix F to part 60 of this chapter applicable to the performance specification. You must use Method 321 of appendix A to part 63 of this chapter as the reference test method for conducting relative accuracy testing. The span value and calibration requirements in paragraphs (l)(1)(i) and (ii) of this section apply to HCl CEMS other than those installed and certified under PS 15.

(i) You must use a span value for any HCl CEMS that represents the intended upper limit of the HCl concentration measurement range during normal inline raw ''mill on'' operation. The span value should be a concentration equivalent to approximately two times the emissions standard and it may be rounded to the nearest multiple of 5 ppm of HCl. The HCl CEMS data recorder output range must include the full range of expected HCl concentration values which would include those expected during ''mill off'' conditions. Engineering judgments made and calculations used to determine the corresponding span concentration from the emission standard shall be documented in the site-specific monitoring plan and associated records.

(ii) In order to quality assure data measured above the span value, you must use one of the two options in paragraphs (l)(1)(ii)(A) and (B) of this section.

(A) Include a second span that encompasses the HCl emission concentrations expected to be encountered during ''mill off'' conditions. This second span may be rounded to a multiple of 5 μg/m³ of total HCl. The requirements of the appropriate HCl monitor performance specification, shall be followed for this second span with the exception that a RATA with the mill off is not required.

(B) Quality assure any data above the span value established in paragraph (1)(1)(i) of this section using the following procedure. Any time the average measured concentration of HCl exceeds or is expected to exceed the span value for greater than two hours you must, within a period 24 hours before or after the 'above span' period, introduce a higher, 'above span' HCl reference gas standard to the HCl CEMS. The 'above span' reference gas must meet the requirements of the applicable performance specification and be of a concentration level between 50 and 100 percent of the highest hourly concentration measured during the period of measurements above span, and must be introduced at the probe. Record and report the results of this procedure as you would for a daily calibration. The 'above span' calibration is successful if the value measured by the HCl CEMS is within 20 percent of the certified value of the reference gas. If the value measured by the HCl CEMS is not within 20 percent of the certified value of the reference gas, then you must normalize the stack gas values measured above span as described in paragraph (l)(1)(ii)(C) below. If the 'above span' calibration is conducted during the period when measured emissions are above span and there is a failure to collect the required minimum number of data points in an hour due to the calibration duration, then you must determine the emissions average for that missed hour as the average of hourly averages for the hour preceding the missed hour and the hour following the missed hour.

(C) In the event that the 'above span' calibration is not successful (i.e., the HCl CEMS measured value is not within 20 percent of the certified value of the reference gas), then you must normalize the one-hour average stack gas values measured above the span during the 24-hour period preceding or following the 'above span' calibration for reporting based on the HCl CEMS response to the reference gas as shown in Equation 20:

$$\frac{\text{Certified reference gas value}}{\text{Measured value of reference gas}} \times \text{Measured stack gas result} = \text{Normalized stack gas result} \qquad \text{(Eq. 20)}$$

Only one 'above span' calibration is needed per 24-hour period.

(2) Install, operate, and maintain a CMS to monitor wet scrubber or tray tower parameters, as specified in paragraphs (m)(5) and (7) of this section, and dry scrubber, as specified in paragraph (m)(9) of this section.

(3) If the source is equipped with a wet or dry scrubber or tray tower, and you choose to monitor SO_2 emissions, monitor SO_2 emissions continuously according to the requirements of § 60.63(e) through (f) of part 60 subpart F of this chapter. If SO_2 levels increase above the 30-day rolling average SO_2 operating limit established during your performance test, you must:

(i) As soon as possible but no later than 48 hours after you exceed the established SO_2 value conduct an inspection and take corrective action to return the SO_2 emissions to within the operating limit; and

(ii) Within 60 days of the exceedance or at the time of the next compliance test, whichever comes first, conduct an HCl emissions compliance test to determine compliance with the HCl emissions limit and to verify or re-establish the SO_2 CEMS operating limit.

(m) *Parameter Monitoring Requirements.* If you have an operating limit that requires the use of a CMS, you must install, operate, and maintain each continuous parameter monitoring system (CPMS) according to the procedures in paragraphs (m)(1) through (4) of this section by the compliance date specified in § 63.1351. You must also meet the applicable specific parameter monitoring requirements in paragraphs (m)(5) through (11) that are applicable to you.

* * * * *

(3) Determine the 1-hour block average of all recorded readings.

* * * * *

(7) * * *

(i) Locate the pH sensor in a position that provides a representative measurement of wet scrubber or tray tower effluent pH.

* * * * *

(9) *Mass Flow Rate (for Sorbent Injection) Monitoring Requirements.* If you have an operating limit that requires the use of equipment to monitor sorbent injection rate (*e.g.,* weigh belt, weigh hopper, or hopper flow measurement device), you must meet the requirements in paragraphs (m)(9)(i) through (iii) of this section. These requirements also apply to the sorbent injection equipment of a dry scrubber.

* * * * *

(10) *Bag leak detection monitoring requirements.* If you elect to use a fabric filter bag leak detection system to comply with the requirements of this subpart, you must install, calibrate, maintain, and continuously operate a BLDS as specified in paragraphs (m)(10)(i) through (viii) of this section.

(i) You must install and operate a BLDS for each exhaust stack of the fabric filter.

(ii) Each BLDS must be installed, operated, calibrated, and maintained in a manner consistent with the manufacturer's written specifications and recommendations and in accordance with the guidance provided in EPA–454/R–98–015, September 1997.

(iii) The BLDS must be certified by the manufacturer to be capable of detecting PM emissions at concentrations of 10 or fewer milligrams per actual cubic meter.

(iv) The BLDS sensor must provide output of relative or absolute PM loadings.

(v) The BLDS must be equipped with a device to continuously record the output signal from the sensor.

(vi) The BLDS must be equipped with an alarm system that will alert an operator automatically when an increase in relative PM emissions over a preset level is detected. The alarm must be located such that the alert is detected and recognized easily by an operator.

(vii) For positive pressure fabric filter systems that do not duct all compartments of cells to a common stack, a BLDS must be installed in each baghouse compartment or cell.

* * * * *

(11) * * *

(v) Cleaning the BLDS probe or otherwise repairing the BLDS; or

* * * * *

(n) *Continuous Flow Rate Monitoring System.* You must install, operate, calibrate, and maintain instruments, according to the requirements in paragraphs (n)(1) through (10) of this section, for continuously measuring and recording the stack gas flow rate to allow determination of the pollutant mass emissions rate to the atmosphere from sources subject to an emissions limitation that has a pounds per ton of clinker unit.

* * * * *

(o) *Alternate Monitoring Requirements Approval.* You may submit an application to the Administrator for approval of alternate monitoring requirements to demonstrate compliance with the emission standards of this subpart, except for emission standards for THC, subject to the provisions of paragraphs (o)(1) through (6) of this section.

* * * * *

(p) *Development and Submittal (Upon Request) of Monitoring Plans.* If you demonstrate compliance with any applicable emissions limit through performance stack testing or other emissions monitoring, you must develop a site-specific monitoring plan according to the requirements in paragraphs (p)(1) through (4) of this section. This requirement also applies to you if you petition the EPA Administrator for alternative monitoring parameters under paragraph (o) of this section and § 63.8(f). If you use a BLDS, you must also meet the requirements specified in paragraph (p)(5) of this section.

(1) For each CMS required in this section, you must develop, and submit to the permitting authority for approval upon request, a site-specific monitoring plan that addresses paragraphs (p)(1)(i) through (iii) of this section. You must submit this site-specific monitoring plan, if requested, at least 30 days before your initial performance evaluation of your CMS.

* * * * *

(2) In your site-specific monitoring plan, you must also address paragraphs (p)(2)(i) through (iii) of this section.

* * * * *

(5) *BLDS Monitoring Plan.* Each monitoring plan must describe the items in paragraphs (p)(5)(i) through (v) of this section. At a minimum, you must retain records related to the site-specific monitoring plan and information discussed in paragraphs (m)(1) through (4), (m)(10) and (11) of this section for a period of 5 years, with at least the first 2 years on-site;

* * * * *

■ 19. Section 63.1351 is amended by revising paragraphs (c) and (d) and adding paragraph (e) to read as follows:

§ 63.1351 Compliance dates.

* * * * *

(c) The compliance date for existing sources for all the requirements that became effective on February 12, 2013, except for the open clinker pile requirements will be September 9, 2015.

(d) The compliance date for new sources is February 12, 2013, or startup, whichever is later.

(e) The compliance date for existing sources with the requirements for open clinker storage piles in § 63.1343(c) is February 12, 2014.

■ 20. Section 63.1352 is amended by revising paragraph (b) to read as follows:

§ 63.1352 Additional test methods.

* * * * *

(b) Owners or operators conducting tests to determine the rates of emission of specific organic HAP from raw material dryers, and kilns at Portland cement manufacturing facilities, solely for use in applicability determinations under § 63.1340 of this subpart are permitted to use Method 320 of appendix A to this part, or Method 18 of appendix A to part 60 of this chapter.

■ 21. Section 63.1353 is amended by adding paragraph (b)(6) to read as follows:

§ 63.1353 Notification Requirements.

* * * * *

(b) * * *

(6) Within 48 hours of an exceedance that triggers retesting to establish compliance and new operating limits, notify the appropriate permitting agency of the planned performance tests. The notification requirements of §§ 63.7(b) and 63.9(e) do not apply to retesting required for exceedances under this subpart.

■ 22. Section 63.1354 is amended by:

■ a. Removing and reserving paragraphs (b)(4) and (5);

■ b. Revising paragraph (b)(9)(vi);

■ c. Adding paragraph (b)(9)(vii); and

■ d. Revising paragraph (c).

The revisions read as follows:

§ 63.1354 Reporting requirements.

* * * * *

(b) * * *

(9) * * *

(vi) For each PM, HCl, Hg, and THC CEMS or Hg sorbent trap monitoring system, within 60 days after the reporting periods, you must submit reports to the EPA's WebFIRE database by using the Compliance and Emissions Data Reporting Interface (CEDRI) that is accessed through the EPA's Central Data Exchange (CDX) (*www.epa.gov/cdx*). You must use the appropriate electronic reporting form in CEDRI or provide an alternate electronic file consistent with the EPA's reporting form output format. For each reporting period, the reports must include all of the calculated 30-operating day rolling average values derived from the CEMS or Hg sorbent trap monitoring systems.

(vii) In response to each violation of an emissions standard or established operating parameter limit, the date, duration and description of each violation and the specific actions taken for each violation including inspections, corrective actions and repeat performance tests and the results of those actions.

* * * * *

(c) Reporting a failure to meet a standard due to a malfunction. For each failure to meet a standard or emissions limit caused by a malfunction at an affected source, you must report the failure in the semi-annual compliance report required by § 63.1354(b)(9). The report must contain the date, time and duration, and the cause of each event (including unknown cause, if applicable), and a sum of the number of events in the reporting period. The report must list for each event the affected source or equipment, an estimate of the volume of each regulated pollutant emitted over the emission limit for which the source failed to meet a standard, and a description of the method used to estimate the emissions. The report must also include a description of actions taken by an owner or operator during a malfunction of an affected source to minimize emissions in accordance with § 63.1348(d), including actions taken to correct a malfunction.

■ 23. Section 63.1355 is amended by revising paragraphs (f) and (g)(1) and adding paragraph (h) to read as follows:

§ 63.1355 Recordkeeping Requirements.

* * * * *

(f) You must keep records of the date, time and duration of each startup or shutdown period for any affected source that is subject to a standard during startup or shutdown that differs from the standard applicable at other times, and the quantity of feed and fuel used during the startup or shutdown period.

(g)(1) You must keep records of the date, time and duration of each malfunction that causes an affected source to fail to meet an applicable standard; if there was also a monitoring malfunction, the date, time and duration of the monitoring malfunction; the record must list the affected source or equipment, an estimate of the volume of each regulated pollutant emitted over the standard for which the source failed to meet a standard, and a description of the method used to estimate the emissions.

* * * * *

(h) For each exceedance from an emissions standard or established operating parameter limit, you must keep records of the date, duration and description of each exceedance and the specific actions taken for each exceedance including inspections, corrective actions and repeat performance tests and the results of those actions.

■ 24. Section 63.1356 is revised to read as follows:

§ 63.1356 Sources with multiple emissions limit or monitoring requirements.

If an affected facility subject to this subpart has a different emissions limit or requirement for the same pollutant under another regulation in title 40 of this chapter, the owner or operator of the affected facility must comply with the most stringent emissions limit or requirement and is exempt from the less stringent requirement.

■ 25. Section 63.1357 is amended by revising paragraphs (a)(1) and (2) to read as follows:

§ 63.1357 Temporary, conditioned exemption from particulate matter and opacity standards.

(a) * * *

(1) Any PM and opacity standards of part 60 or part 63 of this chapter that are applicable to cement kilns and clinker coolers.

(2) Any permit or other emissions or operating parameter or other limitation on workplace practices that are applicable to cement kilns and clinker coolers to ensure compliance with any PM and opacity standards of this part or part 60 of this chapter.

* * * * *

■ 26. Table 3 to Subpart LLL of Part 63 is revised by revising the entries for 63.6(e)(3), 63.7(b), and 63.9(e) to read as follows:

TABLE 3—TO SUBPART LLL OF PART 63—APPLICABILITY OF GENERAL PROVISIONS

Citation	Requirement	Applies to Subpart LLL	Explanation
*	*	*	* * * *
63.6(e)(3)	Startup, Shutdown Malfunction Plan	No	Your operations and maintenance plan must address periods of startup and shutdown. See § 63.1347(a)(1).
*	*	*	* * * *
63.7(b)	Notification period	Yes	Except for repeat performance test caused by an exceedance. See § 63.1353(b)(6)
*	*	*	* * * *
63.9(e)	Notification of performance test	Yes	Except for repeat performance test caused by an exceedance. See § 63.1353(b)(6)
*	*	*	* * * *

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