NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Performance Standards for Boilers Serving Electric Generating Units (EGUs)

Updated: 01/28/09

Brief description of the measure being considered:

What sector does the measure address? Boilers serving EGUs.

For the purpose of this discussion, a "Boiler serving an EGU" means a steam generating unit used for generating electricity, including a unit serving a cogeneration facility. Boilers typically use coal, oil, or gas as fuel.

What control technology or method is being considered?

The suggested control strategy involves a multi-pollutant approach to reduce allowable particle and SO_2 emissions from coal-fired EGU boilers, and to lower the maximum allowable emission rates of NO_x from all boilers serving EGUs.

The available control devices to achieve lower NO_x, PM and SO_2 emission rates from coal-fired boilers include Selective Catalytic Reduction (SCR), baghouses, and wet/dry scrubbers and wet scrubbers, respectively. These are demonstrated control options that are reasonably available given their extensive use.

For all other boilers serving EGUs, the proposed NO_x rates identified in Table 1 below can be achieved by installing low NO_x burners and/or a selective non-catalytic reduction system on existing boilers. These control devices are used widely in industry throughout the United States.

What performance standard or emission level is being considered?

Refer to Tables 1 and 2 below.

The following NO_x emission rates are based on "fuel" and not "boiler type." Existing NO_x control technology is capable of providing high emission control rate efficiency for all sources, regardless of boiler type and fuel firing method.

Table 1. Proposal for NO_x Emission Limits for Boilers serving EGUs

Source	Type of Fuel	NO_x Emission Rate (lb/MWh)	Compliance Period
Boilers serving EGUs	Natural Gas	1.00	24-hour daily average
	No. 2 and lighter Oil	1.00	24-hour daily average
	Heavier than No. 2 Oil	2.00	24-hour daily average
	Coal	1.50	24-hour daily average

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Table 2. Proposal for PM and SO_2 Emission Rates for Coal-fired EGU Boilers

Coal-fired Boilers Only	Existing Sources (lb/MMBtu)	New, Modified or Reconstructed Sources (lb/MMBtu)	Compliance Period
Particulate Matter	0.0300	0.0150	Average of three stack test runs
SO_2	0.150	0.150	30-day rolling average
	0.250	0.250	24-hour daily

Previous programs, model programs or historical significance:

Is this an update to a previous measure effective the OTR?

No, this control strategy proposal is based on performance standards, not cap and trade.

Is there a similar measure currently in effect in another region, state, or county?

Yes. This control strategy proposal is identical to performance standards proposed by NJDEP on August 4, 2008. These performance standards are consistent with the emission rates included in the multi-pollutant provisions of the mercury rule for coal-fired boilers in New Jersey at existing N.J.A.C. 7:27- 27.7(d)[1] and comparable to Delaware Regulation Number 1146[2] and possibly Maryland 26.11.27[3].

What is the history of regulation in this sector?

See Table 3 below.

[1] http://www.state.nj.us/dep/aqm/Sub27.pdf

[2] http://regulations.delaware.gov/AdminCode/title7/1000/1100/1146.shtml#TopOfPage

[3] http://www.dsd.state.md.us/comar/subtitle_chapters/26_Chapters.htm#Subtitle11

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Table 3. Federal Maximum Allowable Emission Limits of NO_x, PM and SO_2 for Boilers

Federal Regulations	40 CFR 60.40Da NSPS Subpart Da (Effective After 2/28/05)		
Pollutant	NO_x[1]	PM (coal-fired only)	SO_2[1] (coal-fired only)
Performance Standards	Construction: 1.0 lb/MWh Reconstruction: 1.0 lb/MWh or 0.11 lb/MMBtu Modification: 1.4 lbs/MWh or 0.15 lbs/MMBtu	Construction or Reconstruction: 0.14 lb/MWh or 0.015 lb/MMBtu or 0.03 lb/MMBtu & 99.9% reduction Modification: 0.14 lb/MWh or 0.015 lb/MMBtu or 0.03 lb/MMBtu & 99.8% reduction	Construction: 1.4 lbs/MWh or 95% reduction Reconstruction: 1.4 lbs/MWh or 0.15 lb/MMBtu or 95% reduction Modification: 1.4 lbs/MWh or 0.15 lb/MMBtu or 90% reduction

[1] 30 day rolling average basis

Major Issues:

Does opposition exist to this measure?

No. The proposed RACT standards are based, in part, on adopted mercury rules that contain multi-pollutant emission limits and compliance requirements negotiated through enforcement actions.

What significant hurdles may impact its adoption or implementation?

If a unit has no existing controls, the time required to design, appropriate funding and install new control devices could require about 3 – 4 years to completion.

Emissions reduction benefit:

What available methods exist to estimate emissions reductions for AQ modeling?

Estimated emission reductions are based on particulate, SO_2 and NO_x inventory emissions, the control efficiencies of the reasonably available control technologies, and whether or not existing controls are in place and operable. estimates of the potential NOx, SO2, and PM emissions reductions that could be expected from implementing the EGU boiler performance standards.

For all of the estimates, the subject units were fossil-fuel fired Acid Rain boiler EGUs located in the OTC states. The year 2007 Acid Rain data was utilized as the comparison base, and the 2007 heat inputs were used to estimate emissions resulting from the attachment's performance standards. For NOx estimations, oil-fired, natural gas-fired, and coal-fired EGU boilers were included consistent with the performance standards identified in the attachment's Table 1. For the SO2 and PM estimations, only coal-fired EGU boilers were included as those were the only performance standards identified in the attachment's Table 2.

With regards to the attachment's Table 1 performance standards for NOx, the standards are in the form of lb/MWh. For a few units, the Acid Rain database did not include electric generation to easily facilitate the estimates. For these units, EIA data (from 2007 EIA-906 and EIA-920 databases)was used to supplement the Acid Rain data for generation. A limitation of the EIA database for this purpose is that it is in the form of net MWh and is reported on a facility basis. Since there were only a few units that fell into this category, and they tended to be small units, and the difference in gross-to-net generation is likely 10% or less, it is believed that the discrepancies introduced using this methodology are minimal.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

As PM emissions monitoring is not required, there are no comprehensive databases of 2007 PM emissions for the subject coal-fired units. In order to estimate 2007 PM emissions from the subject coal-fired units, EIA data was again consulted for the reported "typical" PM emissions (in lb/MMBTU) from each of the subject coal fired units. The data source was the 2005 EIA-767 database. The 2005 database is the latest version of the data available on the EIA website, as the EIA Form 767 has been discontinued. The PM emission rates identified in the EIA-767 database were used for the 2007 base PM emissions estimates.

2007 Emissions (tons)	Est Emissions w/Performance Standards (tons)	Est Reduction (tons)	Est Reduction (%)
Annual NOx Emissions			
356,848	205,846	151,101	42
Ozone Season NOx Emissions			
113,300	69,177	44,128	39
Annual SO2 Emissions			
1,621,323	161,767	1,459,556	90
Annual PM Emissions			
51,427	27,423	24,003	53

Assumptions:

- 2007 Acid Rain data is basis for 2007 NOx and SO2 mass emissions.
- 2007 Acid Rain data is basis for unit heat inputs.
- EIA-767 (2005) is basis for 2007 PM emissions estimation (from unit specific "typical" PM emissions in lb/MMBTU).
- 2007 Acid Rain database, supplemented by EIA-906 and 920 database where necessary, are the basis for electric generation (MWh) data required to calculate NOx mass emissions using performance standards in the form of lb/MWh. Units that showed no heat input or generation in the ozone season or annual periods were excluded from the respective estimates.
- Per the attachment's Table 1 performance standards, the NOx emissions estimations are related to EGU boilers firing natural gas, fuel oil (any grade), or coal (listed as their primary fuel) in the OTC states. Units that showed no heat inputs were excluded from the estimates.
- Per the attachment's Table 2 performance standards, the SO2 and PM emissions estimates are related to coal-fired (coal, coal refuse, coal/wood, etc listed as their primary fuel) EGU boilers in the OTC states. Units that showed no heat inputs were excluded from the estimates.

What previous emissions reductions estimates exist?
Possibly as a result of the OTC Multi-P Workgroup efforts.

Control Cost Estimate:
What available methods exist to estimate costs, and economic analysis?
Previous analyses done by MACTEC and NESCAUM. See references below.
What previous cost estimates exist?

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

For a coal-fired boiler, the expected cost-effectiveness of installing a scrubber is less than $4,600 per ton of SO_2 reduced in 2007 dollars (MACTEC Report July 2007). An existing coal-fired boiler, which already has a scrubber installed, may need to increase the amount of reagent that is used by the scrubber in order to ensure continuous compliance with the emission rates. Increased maintenance and operation costs (including disposal costs) to add extra reagent will be small, approximately $50.00 per ton of SO_2 emissions reduced, compared to the cost of installing a new scrubber. The use of extra reagent will likely cause an increase in scrubber by-product, the slurry or solid formed when the reagent reacts with the gaseous SO_2, of approximately one percent. The owner or operator may sell or give away the slurry by-product from a wet scrubber to be used as a raw material in the cement industry, for manufacturing wallboard, or for agricultural use. The owner or operator may dispose of the solid by-product from a dry scrubber in a landfill at a cost of approximately $12.00 per dry ton. For NO_x control on a coal-fired boiler, the cost-effectiveness of installing, maintaining and operating a new selective catalytic reduction (SCR) system can be expected to be less than $1,250 per ton of NO_x emission reductions in 2007 dollars (NESCAUM Report).

The oil and gas-fired boilers may require a control apparatus, such as a low NO_x burner (LNB) or a Selective Non-Catalytic Reduction (SNCR) system, installed on them in order to comply with the proposed maximum allowable NO_x emission rates. The cost-effectiveness of installing, maintaining and operating a LNB or SNCR system is expected to be in the range of $600.00 per ton to $18,000 per ton of NO_x emissions reduced, with an approximate average of $5,000 per ton of NO_x emissions reduced (See MACTEC report February 2007, page 4-22).

Benefit for other pollutants:
Does this measure offer other benefits by reducing other pollutants like PM, GHG, or air toxins? How?
Yes, this proposal is a multi-pollutant control strategy for NO_x, PM and SO_2.

National program possibilities:
Is this measure applicable on a national basis?
Yes, if this proposal is implemented by OTC states, it can reasonably be implemented across the country.

Other Comments:

Information sources, reports, rules, or presentations

ACD: Amendment to Consent Decree, United States of America, State of New Jersey v. PSEG Fossil LLC, Civ. No. 02-CV-340, United States District Court for the District of New Jersey, Newark Division (May 2, 2007).

ACO: Administrative Consent Order "In the Matter of Atlantic City Electric Company, Conectiv, and Pepco Holdings, Inc, 800 King Street, Wilmington, Delaware, 19801" (January 24, 2006).

MACTEC Report July 2007: Assessment of Reasonable Progress for Regional Haze in MANE-VU Class I Areas, MACTEC Federal Programs, Inc., 5001 South Miami Boulevard, Suite 300, PO Box 12077, Research Triangle Park, North Carolina 27709, July 9, 2007.

MACTEC Report February 2007: Identification of Evaluation of Candidate Control Measures Final Technical Support Document, MACTEC Federal Programs, Inc., 560 Herndon Parkway, Suite 200, Herndon, VA 20170, February 28, 2007.

NESCAUM Report: "A Basis for Control of BART Eligible Sources," Northeast States for Coordinated Air Use Management. http://www.nescaum.org.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Ultra Low NOx Burners (ULNBs) for natural gas-fired industrial, commercial, and institutional (ICI) boilers, steam generators, process heaters, and water heaters
Date updated: 3/13/09

Brief description of the measure being considered:

What sector does the measure address?
Natural gas-fired ICI boilers, steam generators, process heaters, and water heaters
What control technology or method is being considered?
Ultra Low NOx Burners (ULNBs)
What performance standard or emission level is being considered?

1) The standard separates small boilers, steam generators, process heaters, and water heaters by size as follows:
    a. Type 1 unit - maximum rated heat input capacity greater than or equal to 75,000 Btu/hr but no more than 400,000 Btu/hr;
    b. Type 2 unit - maximum rated heat input capacity greater than 400,000 Btu/hr but less than 2.0 million Btu/hr; and
    c. Type 3 unit - maximum rated heat input capacity of 2.0 million Btu/hr up to and including 5.0 million Btu/hr

2) For Type 1 units and Type 2 units, the standard applies to any person who supplies, sells, offers for sale, installs, or solicits the installation of, any new or replacement natural gas-fired boiler, steam generator, process heater, or water heater with a maximum rated heat input capacity greater than or equal to 75,000 Btu/hr and up to but less than 2.0 million Btu/hr.

    For Type 3 units the standard applies to any new or replacement natural gas-fired boiler, steam generator, or process heater with a maximum rated heat input capacity of 2.0 million Btu/hr up to and including 5.0 million Btu/hr

3) The standard <u>doesn't apply to</u>:
    a. Units using a fuel other than natural gas;
    b. Units used in recreational vehicles;
    c. Units installed in manufactured homes;
    d. Humidifiers, where the products of combustion come into direct contact with the material to be heated;
    e. Units located in residential dwellings designed for 4 or fewer families;
    f. Units burning less than 9,000 therms of gas per calendar year based on gas bills; or
    g. Units intended for shipment and use outside of state X

4) The NOx limits for <u>natural gas-fired</u> boilers, steam generators, process heaters, or water heaters supplied, sold, offered for sale, installed, or solicited for installation within State XX are as follows:
    a. Type 1 units
        i. manufactured on or after 1/1/2013: 0.093 lbs NOx/mmBtu heat input at 3 % stack oxygen by volume on a dry basis

b. Type 2 units
   i. manufactured on or after 1/1/2013: 0.036 lbs NOx/mmBtu heat input at 3% stack oxygen by volume on a dry basis

c. Type 3 units
   Upon installation of a new or replacement unit on or after 1/1/2013:

   i. For Atmospheric Units: 0.014 lb/MMBtu heat input or 12 ppmv at 3% stack oxygen by volume on a dry basis

   ii. For Non-Atmospheric Units: 0.011 lb/MMBtu heat input or 9 ppmv at 3% stack oxygen by volume on a dry basis

Previous programs, model programs, or historical significance:

Is this an update to a previous measure effective in the OTR?
This is an update to part of the OTC Addendum to Resolution 06-02.

Is there a similar measure currently in effect in another region, state, or county?
San Joaquin Valley Air Pollution Control District Rule 4308 (Adopted October 20, 2005)
San Joaquin Valley Air Pollution Control District Rule 4307 (Adopted October 16, 2008)
Texas Air Control Board Regulations
California Air Resources Board Regulations

What is the history of regulation in this sector?
As indicated above, the San Joaquin Valley Air Pollution Control District has adopted Rule 4308 for boilers, steam generators, process heaters and water heaters with maximum rated heat input capacity equal to or greater than 75, 000 Btu/hr and up to but less than 2.0 million Btu/hr. In addition, the San Joaquin Valley Air Pollution Control District has adopted amendments to Rule 4307 for gas-fired and liquid fuel-fired boilers, steam generators, and process heaters with maximum rated capacity of 2.0 million Btu/hr up to and including 5.0 million Btu/hr. Two states, Texas and California, have already adopted similar rules controlling NOx emissions from small natural gas-fired, industrial, commercial, and institutional (ICI) boilers, process heaters, and water heaters.

Major Issues:

Does opposition exist to this measure?
It is too early to tell what the level of opposition will be since the size of the potentially affected units is small and in many OTC states these smaller units may not currently be subject to air pollution control regulations.

What significant hurdles may impact its adoption or implementation?

- The current NOx emissions inventory is limited. In many OTC states smaller units may not currently be subject to air pollution control regulations.
- The approach to enforcing the proposed new limits requires development. Manufacturer certification testing requirement? Individual unit testing? Labeling requirements for certified units? How/whether to issue certificates or permits (e.g., permits by rule)?

Emissions reduction benefit:

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

What available methods exist to estimate emissions reductions for AQ modeling?

On October 20, 2005, the San Joaquin Valley Air Pollution Control District adopted Rule 4308 for boilers, steam generators, process heaters, and water heaters equal to or greater than 75,000 Btu/hr but less than 2.0 million Btu/hr (Type 1 and Type 2 units) and estimated that there were approximately 15,000 units subject to Rule 4308 and that emission control would result in 2.0 tons per day of NOx reductions. One method for estimating potential NOx reductions for the OTC states would be to compare the population in the San Joaquin Valley to the population in the OTC states and calculate the proportional NOx reductions.

On October 16, 2008, the San Joaquin Valley Air Pollution Control District adopted amendments to Rule 4307 for boilers, steam generators, and process heaters of 2.0 million Btu/hr up to and including 5.0 million Btu/hr (Type 3 units). The San Joaquin Valley Air Pollution Control District included an emissions reduction analysis for proposed Rule 4307 in Appendix B to the rule. The District staff report indicated that additional NOx reductions could be achieved by the retrofit and replacement of boilers, steam generators and process heaters not covered by San Joaquin Valley Air Pollution Control District Rule 4308. District staff estimated that there were a total of 469 units affected by the amendments to Rule 4307 and that the amendments to Rule 4307 would achieve 1.15 tons per day of NOx reductions. One method for estimating potential NOx reductions for the OTC states is to compare the population in the San Joaquin Valley to the population in the OTC states and calculate the proportional NOx reductions.

The results from using a population-based method for estimating potential NOx reductions if these rules were adopted in the OTC states are shown in the following table:

Potential NOx Reductions (tons/day)

OTC State	If Rule 4308 Adopted	If Rule 4307 Adopted	If Full Control Measure Adopted
Connecticut	1.84	1.06	2.89
Delaware	0.45	0.26	0.70
D.C.	0.30	0.18	0.48
Maine	0.69	0.40	1.09
Maryland	2.94	1.69	4.64
Massachusetts	3.37	1.94	5.31
New Hampshire	0.69	0.40	1.09
New Jersey	4.57	2.63	7.20
New York	10.12	5.82	15.94

Pennsylvania	**6.52**	**3.75**	**10.27**
Rhode Island	**0.56**	**0.32**	**0.88**
Vermont	**0.33**	**0.19**	**0.52**
Virginia*	**1.14**	**0.66**	**1.80**
OTR Total	**33.53**	**19.28**	**52.81**

* For Virginia the NOx emission reduction estimate includes only: the City of Alexandria, Arlington County, Fairfax City, Fairfax County, Falls Church City, Loudoun County, Manassas City, Manassas Park City, Prince William County and Stafford County.

What previous emissions reductions estimates exist?

Since in many OTC states these smaller units may not currently be subject to air pollution control regulations, it is likely that previous emission reduction estimates do not exist for these smaller units.

Control Cost Estimate:

What available methods exist to estimate costs and economic analysis?

A revised MACTEC method has been previously used to estimate the NOx control costs for Ultra Low NOx Burners (ULNB) on ICI boilers as small as 25 million Btu/hr heat input. However this method has not previously been applied to individual, smaller ICI boilers, process heaters, or water heaters. Cost data from the San Joaquin Valley Air Pollution Control District Cost Effectiveness analyses described below could be used in the MACTEC method in order to derive updated NOx control cost estimates for ULNB for these smaller units.

What previous cost estimates exist?

In October 2005, the San Joaquin Valley Air Pollution Control District performed a cost effectiveness analysis for Rule 4308, which can be found in Appendix C of the Final Draft Staff report for this rule. District staff found that the technology to reduce NOx emissions from this category of boilers, steam generators, and process heaters was currently available and that most small boiler manufacturers offer at least one model that meets the limits in Rule 4308. The estimated cost effectiveness ranged from a savings of $1,108 to $2,775 per ton NOx reduced for larger units and the cost effectiveness for smaller units ranged from $187 to $5,385 per ton of NOx reduced.

The San Joaquin Valley Air Pollution Control District has performed a cost effectiveness analysis for proposed amendments to Rule 4307 which can be found in Appendix C for the proposed rule. In that analysis, District staff found that the average cost effectiveness for Low NOx burners was from $12,000/ton to $18,000/ton and the absolute cost effective range was $10,000/ton to $23,000/ton.

District staff also found that the average cost effectiveness for a new Ultra Low NOx burner (30 ppmv to 9 ppmv) was $100,000/ton and the absolute cost effectiveness range was $58,000/ton to $130,000/ton. For a retrofit Ultra Low NOx burner (30 ppmv to 9 ppmv) District staff found that the average cost effectiveness was $7,700/ton and that the absolute cost effectiveness range was $3,300/ton to $16,000/ton. The Average Value is the average for the range of units with the spread indicating the different fuel usages that were analyzed. The Absolute Value is the lowest and the highest values calculated for a given compliance scenario and typically represent the cost for larger, high use units and smaller low use units.

Benefit for other pollutants:

Does this measure offer other benefits by reducing other pollutants like PM, GHG, or air toxins? How?
PM and GHG emissions might be reduced due to increased burner combustion efficiencies resulting in less pollution and/or decreased fuel usage.

National program possibilities:

Is this measure applicable on a national basis?
Since two states, Texas and California, have already adopted similar rules it is possible that this rule could be applied on a national basis.

Other Comments:

Information sources reports, rules or presentations

San Joaquin Valley Unified Air Pollution Control District Rule 4308 adopted October 20, 2005 including Appendix C of the Final Draft Staff Report.

San Joaquin Valley Unified Air Pollution Control District Rule 4307 adopted October 16, 2008 including Appendix B Emissions Reduction Analysis dated March 17, 2008 and Appendix C on Cost Effectiveness dated September 18, 2008

Texas Air Control Board rules, reports, and/or technical support documents

California Air Resources Board rules, reports, and/or technical support documents

NESCAUM report titled: “Applicability and Feasibility of NOx, SO_2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers”, November, 2008

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Performance Standards for Municipal Solid Waste Incinerators

Updated: 04/20/09

Brief description of the measure being considered:

What sector does the measure address? Municipal Solid Waste Incinerators (MSW)

What control technology or method is being considered?

Selective non-catalytic reduction (SNCR) systems are being considered, with focus on improving the control performance of existing units. SNCR is a reagent-based chemical process for removing NO_x from flue gas. In the SNCR process, a reagent, typically liquid urea, or anhydrous gaseous ammonia, is injected within a furnace, boiler or flue gas duct in a region where the gas temperature is between 900 and 1100 degrees Celsius. The reaction converts NO_x to nitrogen gas and water vapor. SNCR performance depends on factors specific to each type of combustion equipment. The factors include flue gas temperature, residence time for the reagent and flue gas, amount of reagent injected, reagent distribution and mixing, uncontrolled NO_x level, and carbon monoxide and oxygen concentrations. Control optimization of SNCR systems, already in place at many locations in the Ozone Transport Region (OTR), would result in substantial NO_x emission reductions at relatively low incremental capital cost. Control optimization may include the application of computational fluid dynamic modeling to determine additional and better distribution of reagent, and/or addition of reagent injection ports. Converting from ammonia-based SNCR to urea-based SNCR may allow droplets to be projected farther into the gas stream from the nozzle than is possible with ammonia, ensuring better distribution and, therefore, more effective NO_x control.

What performance standard or emission level is being considered?

Nitrogen oxides: Subsequent to optimization of SNCR, a concentration limit within the range of 90 – 150 parts per million by volume, dry basis (ppmvd) at 7% oxygen is being considered for each MSW unit within the OTR. The exact standard within this range appropriate for any particular unit will be determined by the permitting state.

Ammonia: 10 ppmv is under consideration.

Previous programs, model programs or historical significance:

Is this an update to a previous measure effective in the OTR?

Yes. The Environmental Protection Agency published revisions to Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Large Municipal Waste Combustors on May 10, 2006 (71 FR 27324). This revision did not change the NO_x emission limit from the 1995 emission guidelines for existing units. Also, the OTC considered this source category in 2006 as a potential regional control strategy for NO_x reductions to attain the 0.080 ppm 8-hour ozone standard.

Is there a similar measure currently in effect in another region, state, or county?

Yes. New Jersey Department of Environmental Protection (NJDEP) adopted a new NO_x rule at N.J.A.C. 7:27-19.12, to be published in the April 20, 2009, New Jersey Register, which requires any size municipal solid waste incinerator comply with a maximum allowable emission concentration of 150 ppmvd at seven percent oxygen by July 17 (60 days after the operative date of May 19, 2009). For existing incinerators that must install a new air pollution control device, or require physical modification, the compliance date is May 1, 2011.

What is the history of regulation in this sector?

MSW incinerators are subject to MACT emissions standards, including standards for NO_x of 180 to 250 ppmdv, under Section 129 of the Clean Air Act. To comply with these MACT standards, many MSW incinerator owners and operators installed control technologies, including SNCR, to comply with the federal deadline of December 19, 2000. Many MSW incinerators are operating to reduce emissions to a level below the federal standards. NJDEP

reevaluated the facility-specific emission limits for the MSW incinerators in New Jersey, and determined that air pollution control technologies have advanced sufficiently over the past several years to justify further cost-effective NO_x emission reductions. Based upon the ability of SNCR systems to achieve additional emissions reductions, NJDEP concluded that a maximum allowable NO_x emission concentration of 150 parts per million by volume, dry basis (ppmvd) at seven percent oxygen for MSW incinerators is achievable.
Other states in the OTC region are operating MSW units that now comply with MACT-based state emissions limitations. Many MSW units now operate with SNCR to control NO_x emissions. For MSW units that do not now have SNCR, SNCR is likely a feasible RACT measure capable of reducing NO_x emissions below the existing OTC states' limits.

Major Issues:
Does opposition exist to this measure?
There may be resistance to this measure from some existing SNCR operations. MSW incinerator owners and operators have expressed concern that a NO_x limit that is set too low without unit-by-unit review would adversely impact furnace and boiler components as result of the tertiary combustion of air and reagents. Adverse impacts could include boiler tube corrosion and increased natural gas and reagent usage.

Ammonia slip is also an environmental concern if NO_x limitations are set low and without regard for ammonia emissions. Ammonia slip may be accounted for in a SNCR optimization.

SNCR vendors, based on technical knowledge gained from field experience with operational SNCR systems, are likely to be supportive of this potential strategy.

What significant hurdles may impact its adoption or implementation?
If sufficient time is provided for installation of SNCR on facilities with no existing air pollution control for NO_x, there should be no significant hurdles that impact implementation of this control strategy.

Emissions reduction benefit:
Based on a NO_x limit of 90 ppm, NO_x reductions are estimated to be at least 5,000 tons per year from MSW incinerators OTR-wide for which data are available. [Please see attached Excel Spread sheet]

What available methods exist to estimate emissions reductions for AQ modeling?
[Please see attached Excel Spread sheet]

What previous emissions reductions estimates exist?
[Please see attached Excel Spread sheet]

Control Cost Estimate:

What available methods exist to estimate costs, and economic analysis?
The capital cost of installing a selective non-catalytic reduction system (SNCR) on a MSW incinerator is approximately $1,500 per MMBtu/hr (Institute of Clean Air Companies, 2000, page 7). The primary cost of using a SNCR is in operating expenses (Institute of Clean Air Companies, 2000, page 7). The Northeast States for Coordinated Air Use Management (NESCAUM) estimates cost of NO_x control per ton for an ICI boiler from $300.00 to $3,700 and the capital cost is about $2,000 per MMBTU/hr for ICI units larger than 400 MMBTU/hr (See Fig.2-8 NESCAUM report November 2008), which would be the approximate cost for operating a SNCR

system on a MSW incinerator boiler. EPA estimates the cost-effectiveness of operating a SNCR system on a MSW incinerator boiler to be $2,140 per ton of NO_x emissions reduced in 1990 dollars (See Table 16 in EPA 1999). The capability exists, through optimization of existing SNCRs, for a SNCR system to obtain greater NO_x emission reductions than many MSW incinerators are currently achieving. NJDEP estimates the cost-effectiveness to optimize a SNCR system by switching from an ammonia-based system to a urea-based system to be approximately $2,500 per ton NO_x reduced (Institute of Clean Air Companies, letter dated March 12, 2007).

What previous cost estimates exist?

Reference: Institute of Clean Air Companies, 2000: Appendix 1 of "White Paper, Selective Non-Catalytic Reduction (SNCR) for Controlling NO_x Emissions," prepared by SNCR Committee, Institute of Clean Air Companies, Inc. May 2000 revised February 2008. Institute of Clean Air Companies, 1730 M Street NW, Suite 206, Washington, DC 20036-4535. http://www.icac.com.

EPA 1999: "Nitrogen Oxides (NO_x), Why and How They Are Controlled," prepared by Clean Air Technology Center (MD-12), Information Transfer and Program Integration Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, EPA-456/F-99-006R, November 1999. http://www.epa.gov/ttncatc1/dir1/fnoxdoc.pdf.

Applicability and Feasibility of NO_x, SO_2, and PM Emissions Control Technologies for Industrial, Commercial, and Institutional (ICI) Boilers Northeast States for Coordinated Air Use Management (NESCAUM) November 2008 (revised January 2009).

Benefit for other pollutants:
Does this measure offer other benefits by reducing other pollutants like PM, GHG, or air toxins?
Yes
How?
NO_x and ammonia are precursors of $PM_{2.5}$. Additionally, ozone is a Greenhouse Gas (GHG).

National program possibilities:
Is this measure applicable on a national basis?
Yes. EPA is pursuing a parallel effort to reconsider the NO_x emissions limitations in the emissions guidelines and NSPS.

Other Comments:
Potential stakeholder contacts
Please contact Seth Barna (sbarna@otcair.org) to be added to the contact list for this measure.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Performance Standards for High Electric Demand Day (HEDD) Electric Generating Units (EGUs)
Updated: 01/28/09

Brief description of the measure being considered:
What sector does the measure address?
Fossil-fuel fired Power Plants – HEDD units. For the purpose of this discussion, High Electric Demand Days (HEDD) units are assumed to be EGUs that are capable of generating 15 Megawatts (MW) or more and have been operated less than or equal to an average of 50 percent of the time on an annual basis.

What control technology or method is being considered?
Performance Standards
The suggested control strategy reduces the maximum allowable emission rates of NO_x from all HEDD units, including turbines and boilers. For HEDD boilers, the proposed NO_x rates identified in Table 1 below can be achieved by installing low NO_x burners and/or a selective non-catalytic reduction system on existing boilers. These control devices are used widely in industry throughout the United States. For HEDD turbines, the maximum allowable NO_x emission rates listed in Table 2 can be achieved by natural gas-fired turbines with dry low NO_x combustors and fuel oil-fired turbines with water injection. Alternative compliance scenarios that achieve comparable results may also be presented and considered.

What performance standard or emission level is being considered?
Refer to Tables 1 and 2 below.

Table 1. Proposal for NO_x Emission Limits for Boilers serving EGUs

Source	Type of Fuel	NO_x Emission Rate (lb/MWh)	Compliance Period
Boilers serving EGUs	Natural Gas	1.00	24- hour daily average
	No. 2 and lighter Oil	1.00	24- hour daily average
	Heavier than No. 2 Oil	2.00	24- hour daily average
	Coal	1.50	24- hour daily average

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Table 2. Proposal for NO_x Emission Limits for High Electric Demand Day Units

Type of Turbine	Type of Fuel	NO_x Emission Rate (lb/MWh)	Compliance Period
Combined Cycle or Regenerative Cycle	Natural Gas	0.75	24- hour daily average
	No. 2 and lighter Oil	1.20	24- hour daily average
Simple cycle	Natural Gas	1.00	24- hour daily average
	No. 2 and lighter Oil	1.60	24- hour daily average

Previous programs, model programs or historical significance:
Is this an update to a previous measure effective the OTR?
Yes. OTC MOU on HEDD sources
Is there a similar measure currently in effect in another region, state, or county?
Yes. This control strategy proposal is based on the performance standards proposed by NJDEP on August 4, 2008. NJDEP also proposed, on August 4, 2008, a short term NO_x emission reduction program that will require owners or operators of high emitting HEDD units to obtain NO_x emission reductions on high electric demand days[3] beginning in 2009 and until all of the owner's or operator's HEDD units comply with the performance standards listed above. These emission reductions can be obtained by installing NO_x emission controls on existing EGUs, replacing high emitting HEDD units with new low emitting units, reducing the operation of high emitting HEDD units on HEDDs, combusting a lower emitting fuel, implementing an energy efficiency measure, implementing a demand response measure, implementing a renewable energy measure, or another measure that provides NO_x reductions and ozone air quality benefits and is real, quantifiable, enforceable, surplus and is not required to comply with any State or Federal permit, regulation, enforceable agreement, or high electric demand day emission reduction program.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

What is the history of regulation in this sector?

See Table 3 below for applicable Federal Regulations.

Table 3. Federal Maximum Allowable Emission Limits of NO_x for Boilers

Federal Regulations	40 CFR 60.40Da NSPS Subpart Da (Effective After 2/28/05)
Pollutant	NO_x
Performance Standards[1]	Construction: 1.0 lb/MWh Reconstruction: 1.0 lb/MWh or 0.11 lb/MMBtu Modification: 1.4 lbs/MWh or 0.15 lbs/MMBtu

[1] 30 day rolling average basis

Major Issues:

Does opposition exist to this measure?

Yes, some companies own several HEDD units that will need to be controlled or replaced in order to comply with the proposed emission rates. These companies feel that the high emissions from HEDD units are insignificant because the units operate infrequently, though usually on high ozone days.

What significant hurdles may impact its adoption or implementation?

If a unit has no existing controls, the time required to design, appropriate funding and install new control devices or replace an existing EGU may require about 3 – 4 years to completion. Some companies own several high emitting HEDD units and therefore will need more time to control or replace all of their affected units.

Emissions reduction benefit:

What available methods exist to estimate emissions reductions for AQ modeling?

Estimated emission reductions are based on actual NO_x emissions from HEDD units operated on July 26, 2005 and an assumption that those same HEDD units will emit at the rule limit after controls are installed.

What previous emissions reductions estimates exist?

Control Cost Estimate:

What available methods exist to estimate costs, and economic analysis?

Previous analyses done by MACTEC. See reference below.

What previous cost estimates exist?

The HEDD boilers may require a control apparatus, such as a low NO_x burner (LNB) or a Selective Non-Catalytic Reduction (SNCR) system, installed on them in order to comply with the proposed maximum allowable NO_x emission rates. The cost-effectiveness of installing, maintaining and operating a LNB or SNCR system is expected to be in the range of \$600.00 per ton to \$18,000 per ton of NO_x emissions reduced, with an approximate average of \$5,000 per ton of NO_x emissions reduced (See MACTEC report February 2007, page 4-22).

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

The proposed emission limits may require HEDD turbines to either have a control apparatus, such as water injection, installed on them or require the turbine to be replaced entirely in order to comply with these emission rates. The cost-effectiveness of installing water injection is approximately $44,000 per ton of NO_x emission reductions for a peaking turbine with low capacity factor. The total replacement cost, including maintenance and operation, for a simple cycle combustion turbine ranges from $0.5 to 0.8 million per MW.

Benefit for other pollutants:
Does this measure offer other benefits by reducing other pollutants like PM, GHG, or air toxins? No *How?*

National program possibilities:
Is this measure applicable on a national basis?
Yes, if this proposal is implemented by OTC states, it can reasonably be implemented across the country.

Other Comments:
Potential stakeholder contacts
Please contact Seth Barna (sbarna@otcair.org) to be added to the contact list for this measure.

Information sources, reports, rules, or presentations
MACTEC Report February 2007: Identification of Evaluation of Candidate Control Measures Final Technical Support Document, MACTEC Federal Programs, Inc., 560 Herndon Parkway, Suite 200, Herndon, VA 20170, February 28, 2007.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Stationary Generator Regulation / Distributed Generation
Updated: 3/09/09

Brief description of the measure being considered:
Fossil fuel-fired generators powered by reciprocating internal combustion engines emit very high rates of air contaminants per kilowatt hour, and contribute to the formation of ground-level ozone and fine particulate matter. Among other things, the purpose of a stationary generator regulation is to help ensure that the air emissions from new and existing stationary generators do not cause or contribute to these existing air quality problems; on either a rate, TPD, or TPY basis. A stationary generator regulation would require emissions standards, recordkeeping, reporting, operating, and notification requirements for stationary generators, both for emergency and non-emergency uses. Delaware currently has such a rule, Regulation No. 1144, "Control of Stationary Generator Emissions". The regulation also allows non-emergency generators to take credit for fuels that would otherwise be flared, combined heat and power applications, and the use of non-emitting resources.

What sector does the measure address?
The sector being addressed is the Area Source Sector.
What control technology or method is being considered?
No specific control technology is being recommended, since the regulation would be technology and fuel neutral.
What performance standard or emission level is being considered?

- EPA Nonroad standards or NSPS standards for new, emergency generators are required.
- For new, non-emergency generators, the emissions standards would be:

Pollutant	Emission Standards (lbs/MWh)	
	Installed On or After January 1, 2008	Installed On or After January 1, 2012
Nitrogen Oxides	1.0	0.6
Nonmethane Hydrocarbons	0.5	0.3
Particulate Matter (liquid-fueled reciprocating engines only)	0.7	0.07
Carbon Monoxide	10.0	2.0
Carbon Dioxide	1,900	1,650

- For all new, non-emergency generators fueled by waste or landfill gases, the emissions standards would be:

Pollutant	Emission Standards (lbs/MWh)
Nitrogen Oxides	2.2
Nonmethane Hydrocarbons	0.7
Carbon Monoxide	10.0
Carbon Dioxide	1,900

- For existing, non-emergency generators, the emissions standard would be:

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Pollutant	**Emission Standard (lbs/MWh)**
Nitrogen Oxides	4.0
Nonmethane Hydrocarbons	1.9
Particulate Matter (liquid-fueled reciprocating engines only)	0.7
Carbon Monoxide	10.0
Carbon Dioxide	1,900

Previous programs, model programs or historical significance:
Is this an update to a previous measure effective the OTR?
Yes, the OTC's "Model Rule for Additional Nitrogen Oxides (NOx) Control Measures" as it relates to emergency generators and load shaving units.

Is there a similar measure currently in effect in another region, state, or county?
Yes. Other states in the Northeast have similar "distributed generation" regulations, which may have been based upon the same model rule which DE used (Regulatory Assistance Project's model rule for DG).

OTC State	**Generator Regulation?**	**Website?**
CONNECTICUT	Yes	http://www.ct.gov/dep/lib/dep/air/regulations/mainregs/sec42.pdf
DELAWARE	Yes	http://regulations.delaware.gov/AdminCode/title7/1000/1100/1144.shtml#TopOfPage
DISTRICT OF COLUMBIA	Unknown	
MAINE	Yes	http://www.maine.gov/sos/cec/rules/06/096/096c148.doc
MARYLAND	Proposed	
MASSACHUSETTS	Yes	http://www.mass.gov/dep/air/laws/etregs.pdf
NEW HAMPSHIRE	Yes	http://des.nh.gov/organization/commissioner/legal/rules/documents/env-a3700.pdf
NEW JERSEY	Yes	http://www.state.nj.us/dep/aqm/Sub19.pdf
NEW YORK	Proposed	
PENNSYLVANIA	Unknown	
RHODE ISLAND	Yes	http://www.dem.ri.gov/pubs/regs/regs/air/air43_07.pdf
VERMONT	Unknown	
VIRGINIA	Unknown	

What is the history of regulation in this sector?
Stationary generators typically emit higher rates of air contaminants per kilowatt-hour of power than larger units. *They also typically operate on the hottest days of summer, when ozone levels and electric demand are high.* For example, a local electric cooperative in Delaware operates a demand response program consisting of about 225 participants' generators. When called upon to operate, they have the potential to emit about <u>1.6 TPD of NOx in a</u>

three hour period. These emissions are greater than the 2002 TPD NOx emissions of 33 of DE's 43 EGUs. Thus, DE initiated development of a regulation to control the air emissions from all generators. A Regulation Development Workgroup was formed in the Fall of 2003 to develop an initial draft of a regulation, and a public hearing was held in August 2005 on the proposed regulation. Regulation No. 1144 "Control of Stationary Generator Emissions" became effective on January 11, 2006.

Major Issues:
Does opposition exist to this measure?
In Delaware, there was opposition to the regulation from all types of organizations, including individuals, small and large businesses, and industries. For example, in Delaware's Regulation No. 1144 allows existing, non-emergency generators on poultry farms to meet alternative emissions standards, due to opposition to the regulation from the poultry industry.

What significant hurdles may impact its adoption or implementation?
The cost of add-on pollution control equipment could be a major hurdle to overcome, depending on what audience is being targeted (such as individuals, farmers, small businesses).

The definition of what constitutes an "emergency" could also be a major hurdle. Delaware's regulation defines an emergency as an electric power outage or when there is a specified deviation of voltage or frequency from the electric provider to the premises. Within the NSPS's for CI or SI engines, EPA defines an emergency as follows:

> *"Stationary SI ICE used for peak shaving are not considered emergency stationary ICE. Stationary ICE used to supply power to an electric grid or that supply power as part of a financial arrangement with another entity are not considered to be emergency engines."*

Other states incorporate provisions into their definition to allow the regional ISO to call upon an emergency demand response program and allow it to still be considered an emergency. Specifically, ISO-NE calls OP 4, Action 12, (which is when the ISO implements a voltage reduction of five percent (5%) of normal operating voltage requiring more than 10 minutes to implement) for its emergency demand response. Although DE's regulation does not allow for a similar procedure in PJM's Emergency Manual to be considered an emergency, a 5% deviation in voltage would be an acceptable emergency condition for an emergency generator to operate in Delaware.

Additionally, a major hurdle could be present if CO_2 standards are included within any sort of model rule.

Emissions reduction benefit:
What available methods exist to estimate emissions reductions for AQ modeling? The regulation would require new, emergency generators to meet emissions standards set by EPA, which would ensure that all new installations would at least be meeting a minimum level of control. For existing, non-emergency generators, each generator would be required to make an approximate 90% reduction in its NOx emissions. Each new, non-emergency generator would be required to make an approximate 90% reduction in their NOx emissions beyond the emissions standards which the EPA requires the manufacturer to build a generator to. As for estimating emission reductions from non-emergency generators, the number of units in a state would have to be known in order to estimate total reductions from the amount of NOx emissions reduced per generator.

NESCAUM's "Stationary Diesels in the Northeast" lists the estimated number of diesel engines in the NESCAUM region by number and capacity. Below is the list from the report:

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Number Totals	Emergency	Peak	Baseload	Total	Capacity Totals (MW)	Emergency	Peak	Baseload	Total
25-50 kW	1,768	0	0	**1,768**	25-50 kW	59	0	0	**59**
50-100 kW	5,798	1,375	107	**7,280**	50-100 kW	462	114	9	**584**
100-250 kW	9,226	2,236	95	**11,557**	100-250 kW	1,564	371	14	**1,949**
250-500 kW	5,918	1,231	7	**7,156**	250-500 kW	2,126	443	3	**2,572**
500-750 kW	1,296	316	47	**1,659**	500-750 kW	801	196	29	**1,026**
750-1000 kW	1,164	292	51	**1,507**	750-1000 kW	921	230	40	**1,191**
1000-1500 kW	641	677	39	**1,357**	1000-1500 kW	769	837	48	**1,654**
1500+ kW	1,073	284	37	**1,394**	1500+ kW	2,053	615	68	**2,736**
Total	**26,884**	**6,411**	**383**	**33,678**	Total	**8,756**	**2,805**	**211**	**11,772**

The report does not estimate emissions for all of these engines because of the enormous uncertainties associated with the more general estimates of engine population and because information on actual engine operation is simply not available for the broader region. Since the existing emergency engines would not have any emissions standards applied to them, there would be no reduction benefit if Delaware's regulation were applied region wide. For the peak and baseload engines, their combined capacity would have the potential to emit about 48 tons of NOx for every hour of operation (based upon the assumption of no controls on the engine and an average emission factor of 32 lb/MWh NOx, per AP-42). If these peak and baseload engines were controlled, their emissions could be reduced by approximately 90%, which would result in a reduction of about 43 tons of NOx for every hour of operation.

What previous emissions reductions estimates exist? In Delaware, there were 7 existing, non-emergency generators operating in 2002, which emitted a combined total of 1.06 TPD NOx. Two generators chose to shutdown as opposed to retrofitting their generators, and the other five reverted to emergency only use. Numerous other emergency only generators were kept as emergency only units as a result of the regulation, thus negating any potential growth in usage or emissions the units may have had.

Control Cost Estimate:
What available methods exist to estimate costs, and economic analysis?
What previous cost estimates exist?
Based upon one case in DE, the estimated cost to retrofit a 1-2 MW, 1950's diesel generator with selective catalytic reduction (SCR) technology ranged from $39,700 to $79,700 on a $/TPD basis for NOx. As for system costs, estimates from Boulden Energy Systems in PA run between $145,000 to $165,000 for SCR systems designed for generators between 1750 kW and 2500 kW. Another SCR retrofit on a 1MW generator in Delaware had an estimate of $180,000 for a complete installation.

Control costs can be estimated using the NESCAUM information above on the number of units and capacity totals along with the estimated costs for an SCR installation of generators around 1-2MW. The number of baseload or peaking units that are greater than 1MW from the NESCAUM report is 1,037. If each of these units were retrofitted with an SCR system, the cost would range between $150.4 million and $171.1 million. As for their emissions, these 1,037 units emit a combined total of 25.1 tons per hour of NOx. At an efficiency of 90%, the SCR installations would reduce approximately 22.6 tons per hour of NOx. This yields a range of control costs between $6.6 million and $7.6 million tons per hour of NOx. If each of these units ran for 3 hours in a single day, the control costs would be further reduced to between $2.2 million and $2.5 million TPD of NOx. However, if a generator is retrofitted with SCR and is classified to be used for any non-emergency purpose, it could operate for any number of hours in a day, including all day long!

Benefit for other pollutants:
Does this measures offer other benefits by reducing other pollutants like PM, GHG, or air toxins? How?

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Yes. Regulation No. 1144 includes emission standards for NOx, NMHC, PM, CO, and CO_2 for non-emergency generators. Additionally, the Nonroad & NSPS standards (which would apply to new, emergency generators) would include NOx, NMHC, CO, and PM standards.

National program possibilities:
Is this measure applicable on a national basis?
Yes, this measure could be applied within any state.

Other Comments:
Potential stakeholder contacts:
Please contact Seth Barna (sbarna@otcair.org) to be added to the contact list for this measure.

Information sources reports, rules or presentations:
http://www.awm.delaware.gov/Info/Regs/Pages/AQMReg1144.aspx

NESCAUM. *Stationary Diesel Engines in the Northeast.* June 2003
http://www.nescaum.org/documents/rpt030612dieselgenerators.pdf/

The Regulatory Assistance Project. *Model Regulations for the Output of Specified Air Emissions from Smaller Scale Electric Generation Resources.* October 2002. Available at:
http://www.raponline.org/showpdf.asp?PDF_URL=%22/projdocs/dremsrul/collfile/modelemissionsrule.pdf%22

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Minor Source Review

Updated: 09-01-16

Brief description of the measure being considered:

What sector does the measure address?

What control technology or method is being considered?

What performance standard or emission level is being considered?

Control measure will address VOC and NO_x emissions from newly constructed or modified sources below nominal major new source review (NSR) thresholds (which vary due to area designation). Minor NSR also reduces emissions when old sources are replaced with new sources which are subject to minor NSR. Although this measure will not reduce current emission levels, it will seek to control the growth in emissions as new facilities are constructed.

Previous programs, model programs or historical significance:

Is this an update to a previous measure effective in the OTR?

Is there a similar measure currently in effect in another region, state, or county?

What is the history of regulation in this sector?

Although the Clean Air Act mentions minor sources, the Act does not generally require the installation of controls unless the reviewing agency believes the proposed facility will adversely impact attainment status. Several states, including DE and NJ, have rules which require the installation of BAT (DE) or state-of-the-art controls (NJ) for below NSR threshold emission facilities with uncontrolled emissions (among others) of VOC and NO_x. Also, there is a 2003 survey of state minor source permitting programs that indicates TX and UT have MNSR programs requiring the installation of controls.

Major Issues:

Does opposition exist to this measure? What significant hurdles may impact its adoption or implementation?

Likely not a problem as NJ and DE were successful in promulgating MNSR rules.

Emissions reduction benefit:

What available methods exist to estimate emissions reductions for AQ modeling?

What previous emissions reductions estimates exist?

This measure will not reduce current emission levels but will significantly reduce the growth of emissions in a growing economy by regulating the growth of uncontrolled emissions from sub-major NSR facilities. In promoting the DE rule, a survey was made of emissions growth over a three-year period prior to the introduction of the MNSR rule to determine the potential for reduction if the MNSR rule had been in effect over that period. Based on 1999 and 2002 emissions data we determined that approximately 600 tons per year VOC and 1300 tons per year of NO_x could have been subject to controls if the MNSR rule had been in effect during that period.

Control Cost Estimate:

What available methods exist to estimate costs, and economic analysis?

What previous cost estimates exist?

Costs are a case-by-case situation and will be determined at the time a project to install or modify facilities is developed much as is true for major NSR.

Benefit for other pollutants:

Does this measures offer other benefits by reducing other pollutants like PM, GHG, or air toxins? How?

Individual states may insert language in the model rule to control other pollutants in a similar manner. The DE MNSR directs the control of SO_2, $PM_{2.5}$, and HAP's as well as VOC and NO_x.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

National program possibilities:
Is this measure applicable on a national basis? Yes

Other Comments:
Potential stakeholder contacts
Please contact Seth Barna (sbarna@otcair.org) to be added to the contact list for this measure.

Information sources reports, rules or presentations
Information available from states with similar MNSR rules.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Energy Security, Energy Efficiency, Renewable Energy, other GHG – including criteria pollutant co-benefits in state implementation plans

Date updated: 01/15/09

Brief description of the measure being considered:

What sector does the measure address? The measure addresses multiple sectors, including electricity generation and use, fuels, motor vehicles and other mobile sources, engines, boilers and process heaters, heating and cooling equipment and others.

What control technology or method is being considered? A variety of technologies and methods are encompassed in this measure

What performance standard or emission level is being considered? Because of the breadth of this measure, there is no single performance standard or emission level associated with it. Regarding motor vehicles, for example, fuel efficiency standards can be set. For electricity use, as in appliances, lighting and heating/cooling, energy efficiency targets or benchmarks may be set against which you can measure performance. Therefore the metric for performance can/may be different depending on the specific measure.

Previous programs, model programs or historical significance:

Is this an update to a previous measure effective in the OTR? This measure could be considered an update to a previous effort in the OTR, building on the work done by Synapse in developing "The OTC Emission Reduction Workbook 2.1: Description and User's Manual." This project provided a methodology for assessing the emissions impacts of a range of different energy policies affecting the electric industry, and focused on the three northeastern electricity control areas: Pennsylvania/New Jersey/Maryland (PJM), the New York Independent System Operator (NY ISO) and the Independent System Operator New England(ISO NE).

Is there a similar measure currently in effect in another region, state, or county? Some similar or related measures/programs exist or are in effect. One is the Regional Greenhouse Gas Initiative, or RGGI, in which ten states in the OTR (CT, DE, ME, MD, MA, NH, NJ, NY, RI and VT) are engaged to implement the first mandatory cap-and-trade program in the United States to reduced greenhouse gas emissions. Many of the measures put in place by these states to reduce greenhouse gases will also have the benefit of reducing criteria pollutants, which should be accounted for in states' air quality planning. Other states in the OTR, including PA, have implemented programs to reduce energy use and promote clean energy, which are also reducing criteria pollutants as a co-benefit.

What is the history of regulation in this sector? The most recent example of regulation in this sector are the regulations that the states participating in RGGI have put in place to institute a CO2 cap-and-trade program in the region. To date there are no regulations concerning the inclusion of criteria pollutant co-benefits in state air quality plans in the OTR.

Major Issues:

Does opposition exist to this measure? Uncertain

What significant hurdles may impact its adoption or implementation? There are barriers to the measure, including how to accurately measure the change in energy use or displacement, how to avoid double-counting the emission reductions, and what emission factor(s) to use in calculating the co-benefit reductions, among others.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Emissions reduction benefit:
What available methods exist to estimate emissions reductions for AQ modeling? Sources for this include EPA's guidance, the OTC Emission Reduction Workbook 2.1, and a model developed by the National Association of Clean Air Agencies (NACAA). Specific citations of these and other resources will be provided in a future version of this paper.

What previous emissions reductions estimates exist?

- Case studies by the International Council for Local Environmental Initiatives (ICLEI)
- NACAA's "Menu of Harmonized Options for Reducing GHG and Air Pollution"
- Case studies by the National Association of State Energy Officials and their members
- EPA's Climate Leaders and Energy Star programs
- Individual state programs and case studies, within and outside the OTR

Control Cost Estimate:
What available methods exist to estimate costs, and economic analysis? (to be completed)

What previous cost estimates exist? (to be completed)

Benefit for other pollutants:
Does this measures offer other benefits by reducing other pollutants like PM, GHG, or air toxins? How? That is the key mechanism of these measures, which directly impact the amount of fossil fuel-fired energy used and results in reductions of other pollutants. These co-benefits include reductions in GHG, NOx, PM and other pollutants, depending on the type of fuel, the combustion process and/or other factors.

National program possibilities:

Is this measure applicable on a national basis? This measure is applicable on a national basis. Several years ago EPA developed guidance on including emission reductions from energy efficiency and renewable energy measures in state implementation plans, but its scope and use have been very limited. With greater attention on climate change and the need for reductions in CO2 in the last few years, it is time to revisit the issue of accounting for the co-benefits of these measures on a much larger scale.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Architectural and Industrial Maintenance (AIM) Coatings
Updated: 03/11/2009

Brief description of the measure being considered:
The OTC developed its 2002 Architectural and Industrial Maintenance (AIM) Coatings Model Rule based upon the 2000 CARB Suggested Control Measure (SCM). In 2007, CARB proposed an updated SCM for Architectural Coatings, which generally lowers VOC emissions through product reformulation and improves definitions of many categories from the 2000 SCM. Of the 47 coating categories regulated in the 2000 SCM, 15 categories have been eliminated (replaced by new categories or deemed unnecessary), 10 categories were added, and 19 have stricter VOC limits. The updated SCM also contains some revised compliance and reporting requirements. The OTC intends to review these changes and use them as a basis for updating its own model rule.

What sector does the measure address?
Area Source Sector
What control technology or method is being considered?
Reformulation of coatings to meet revised VOC limits for various categories.
What performance standard or emission level is being considered?
2007 CARB SCM (linked below) contains VOC limits for each coating category which will serve as a basis for this model rule.

Previous programs, model programs or historical significance:
Is this an update to a previous measure effective in the OTR?
Yes – This is an update of the 2002 OTC AIM Model Rule, which many states have adopted.

Is there a similar measure currently in effect in another region, state, or county?
A control measure with these specific VOC limits is not currently in effect. The 2007 CARB Suggested Control Measure, which will serve as the basis for this model rule, has compliance dates of 1/1/2010 for 40 of 42 categories, and 1/1/2012 for the remaining 2 (though some of these limits have not changed from the 2000 SCM).

What is the history of regulation in this sector?
CARB originally approved an SCM for architectural coatings in 1977 and has amended it in 1985, 1989 and 2000.

On August 14, 1998, EPA issued the final version of their National Volatile Organic Compound Emission Standards for Architectural Coatings under Section 183(e) of the Clean Air Act. This final rule applied only to manufacturers and importers of architectural coatings, and set VOC content limits for 61 coating categories. This rule specifically allowed states or local governments to adopt more stringent coating limits.

The OTC adopted an AIM Model Rule in 2002—more stringent than the national rule, and based primarily on the 2000 CARB SCM. This model rule has presently been adopted by nearly every OTC state.

EPA plans to finalize an updated national AIM regulation in 2009, which is expected to incorporate the limits of the 2002 OTC Model Rule.

Major Issues:
Does opposition exist to this measure?
There will likely be opposition to these more stringent VOC limits. Based on comments received during the implementation of the current AIM coating regulation, it is likely that AIM manufacturers will question the technical or economic feasibility of reformulating their coatings, or the capability of lower-VOC coatings in the

northeastern climate. Staff at CARB has already performed a technical assessment of each coating category to ensure there are compliant formulations available. The OTC will work with stakeholders to address areas in which the OTC model rule may need to deviate from CARB's proposed limits.
What significant hurdles may impact its adoption or implementation?
Unknown

Emissions reduction benefit:
What available methods exist to estimate emissions reductions for AQ modeling?
What previous emissions reductions estimates exist?
CARB performed an emissions reductions estimate to go along with its proposed SCM. The estimations were based on survey data of 2004 sales in California. CARB estimates that its proposed SCM will result in a 28 percent VOC emission reduction in the architectural coatings sector in areas of California that are affected by the SCM. Ninety-five percent of these VOC reductions result from more stringent limits on the nine largest coating categories (flat; non-flat; non-flat high gloss; concrete/masonry sealer; dry fog; primer/sealer/undercoater; rust preventative; specialty primer/sealer/undercoater; and wood coatings).

The 28 percent VOC emission reduction predicted by CARB equates to a reduction of 15.2 tons of VOC per day in California. By assuming a similar per-capita reduction, the adoption of these VOC limits throughout the OTR would yield reductions of approximately 50.3 tons per day.

The OTC will also consider lowering the VOC limit of the Industrial Maintenance (IM) coating category. CARB proposed a strengthened limit of 250 g/L in its 2000 SCM, but the OTC has retained the previous limit of 340 g/L due to concerns about the ability to comply in the colder northeast. Because of the success of implementing the revised limit throughout California and the advent of t-butyl acetate as a delisted solvent, OTC believes a 250 g/L VOC limit is now feasible. Incorporating this 250 g/L limit would yield a VOC reduction of approximately 10 tons per day in the OTR, in addition to the previously discussed 50.3 tons per day. This estimated 60.3 ton per day overall VOC reduction equates to a per-capita reduction of 0.68 lbs on an annual basis.

Control Cost Estimate:
What available methods exist to estimate costs, and economic analysis?
What previous cost estimates exist?
For the proposed SCM, CARB did a study of affected businesses to determine the control costs that would be incurred. CARB estimates a per-limit cost-effectiveness ranging from a net savings to $13.90 per pound of VOC reduced, with an overall cost-effectiveness of $1.12 per pound of VOC reduced (2007 dollars). These values were based on the assumption that companies absorbed all costs (i.e., none were passed down to consumers) and may therefore be slightly inflated. CARB computed an average 2.1 percent decline in return on owner's equity (ROE—calculated by dividing net profit by net worth), and used this to gauge economic impact. CARB felt that this should not significantly impact the profitability of most businesses, although it may have serious effects on the smallest operations. Overall, business profitability and job opportunities would not be significantly affected.

In addition to CARB's estimated costs related to the 2007 SCM, companies that sell coatings in OTC states will incur costs associated with lowering the VOC limit of the IM coating category. The 2000 CARB SCM calculated the cost-effectiveness of lowering the IM coating VOC limit from 340 g/L to 240 g/L to be $5.59 per pound of VOC reduced. Because companies have had to reformulate their IM coatings to comply with this standard in California, however, costs to reformulate in OTC states can be expected to be lower.

For the OTC, costs may be slightly minimized since companies with nationwide sales will have already reformulated their products to meet the standards in California. It is possible that certain limits proposed in the

2007 SCM will prove infeasible for the OTR due to climatic variation; this would also affect the overall cost-effectiveness stated above.

Benefit for other pollutants:
Does this measure offer other benefits by reducing other pollutants like PM, GHG, or air toxins? How?
VOC emissions are a precursor to PM. Some VOCs can also be categorized as toxic air contaminants.

National program possibilities:
Is this measure applicable on a national basis?
This measure could potentially be applied on a national basis. CARB ensured that the VOC content limits would be feasible in different regions due to the high climate variability within California. CARB notes, however, that revised VOC limits may be necessary for some coating categories in regions with significantly higher precipitation or significantly lower temperatures.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Consumer Products 2006 CARB Amendments:

Updated: 02/24/09

Brief description of the measure being considered:

What sector does the measure address?

The revised proposed model rule for consumer products would apply to anyone who sells, supplies, offer for sale, or manufactures identified consumer products for use in an OTC member state.

What control technology or method is being considered?

What performance standard or emission level is being considered?

The proposed OTC revised model rule for consumer products should be based on the California Air Resources Board's (CARB) 2006 consumer products regulatory amendments that were adopted by CARB on November 17, 2006. The majority of the 2006 amendments had an effective date of December 31, 2008, while the remainder will have an effective date of December 31, 2010.

The CARB 2006 amendments have more restrictive VOC limits for 12 existing consumer product categories (including subcategories)[1] and three new categories (disinfectant, sanitizer and temporary hair color; including subcategories)[2] will be regulated for the first time with VOC limits.

Previous programs, model programs or historical significance:

Is this an update to a previous measure effective in the OTR?

Is there a similar measure currently in effect in another region, state, or county?

What is the history of regulation in this sector? The amendments clarified or modified previously defined or regulated categories including prohibiting the use of chlorinated toxic compounds in certain consumer product categories (Construction, Panel, and Floor Covering, Oven Cleaner, General Purpose Cleaner, and Bathroom and Tile Cleaner)[3].

The revised model rule would achieve VOC reductions through reformulation of the affected product categories by the manufacturers. Reformulation may take the form of a water-based formulation, using an exempt solvent, increasing product solids, or formulating with a non-VOC propellant. Manufacturers can still comply with the propose model rule through the use of the Innovative Products Exemption (IPE) or the Alternate Control Plan (ACP).

Major Issues:

Does opposition exist to this measure? What significant hurdles may impact its adoption or implementation?

Problems that might come up for the OTC member states in their rulemaking concerns the following categories: Brake Cleaner (formerly Automotive Brake Cleaner), Carburetor or Fuel-Injection Air Intake Cleaner, Engine Degreaser and aerosol General Purpose Degreaser. After a public hearing, CARB changed the effective date of the new 10 percent VOC limit for these four categories from December 31, 2008 to December 31, 2010. Interim 20 percent VOC limits were added for three of the four categories (Brake Cleaner (formerly Automotive Brake Cleaner), Carburetor or Fuel-Injection Air Intake Cleaner, and aerosol General Purpose Degreaser) with an effective date of December 31, 2008[4].

Emissions Reduction Benefit:

What available methods exist to estimate emissions reductions for AQ modeling?

What previous emissions reductions estimates exist?

CARB's 2006 amendments partially fulfill CARB's commitment for CONS-2 and will achieve an 11.5 tons per day (tpd) (23,000 lbs/day) in VOC emission reductions in California by 2010. The Ozone Transport Region's

(OTR) VOC emission reductions in 2010 would be estimated at 0.0006 lbs./day/person and is based on the projected population for California in 2010 by the U. S. Census Bureau.[5]

Control Cost Estimate:
What available methods exist to estimate costs, and economic analysis?
What previous cost estimates exist?
CARB estimated the cost effectiveness of the proposed VOC limits to be about $2.35 per pound of VOC reduced and the total cost incurred by industry to comply with this regulation to be about $20 million per year. CARB expects most manufacturers to be able to absorb the added costs without an adverse impact on their profitability and the estimated average increase in cost per unit to the manufacturer to be about $0.06.

Benefit for Other Pollutants:
CARB's 2006 amendments include prohibitions on certain toxic compounds in certain products, which would be an optional component of the OTC requirements.

Other Comments:
Potential stakeholder contacts
Please contact Seth Barna (sbarna@otcair.org) to be added to the contact list for this measure.

Additional Information:
Information sources reports, rules or presentations
[1] Proposed Amendments To The California Consumer Products Regulation And The Aerosol Coatings Regulation; September 29, 2006: Tables 3 and 4; Pages: Executive Summary-9 and 11:
[2] Ibid:
[3] Proposed Amendments To The California Consumer Products Regulation And The Aerosol Coatings Regulation; September 29, 2006: Pages: Executive Summary-8 thru 14:
[4] State of California Air Resources Board; Final Statement of Reasons for Rulemaking, Including Summary of Comments and Agency Responses: November 17, 2006; Page 8:
[5] http://www.census.gov/population/projections/SummaryTabA1.pdf
Proposed Amendments To The California Consumer Products Regulation And The Aerosol Coatings Regulation; September 29, 2006: http://www.arb.ca.gov/consprod/regact/regact.htm

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Consumer Products/2008 CARB Amendments

Date updated: 01/07/09

Brief description of the measure being considered:

What sector does the measure address?

The revised proposed model rule for consumer products would apply to anyone who sells, supplies, offer for sale, or manufactures consumer products for use in an OTC member state

What control technology or method is being considered?

What performance standard or emission level is being considered?

The proposed OTC revised model rule for consumer products should not be based, for the present, on the California Air Resources Board's (CARB) 2008 Consumer Products Regulatory Amendments because they have only been proposed and have not been adopted. Once the amendments are adopted by CARB, then the OTC member states can then decide whether to include them into the propose revision to the OTC model rule for consumer products. The proposed 2008 amendments have effective dates ranging from December 31, 2010 to December 31, 2015.

The proposed amendments do have a more restrictive VOC limit for 10 existing consumer product categories and eight new categories will be regulated for the first time with VOC limits.[1] The proposed amendments would also reduce the global warming potential (GWP) of greenhouse gas (GHG) compounds used in consumer products and prohibit the use of toxic compounds in certain products.

Previous programs, model programs or historical significance:

Is this an update to a previous measure effective in the OTR?

Is there a similar measure currently in effect in another region, state, or county?

What is the history of regulation in this sector?

The proposed amendments would achieve VOC and GWP reductions through reformulation of the affected product categories by the manufacturers. Manufacturers can still comply with the propose model rule through the use of the Innovative Products Exemption (IPE) or the Alternate Control Plan (ACP).

Major Issues:

Does opposition exist to this measure? What significant hurdles may impact its adoption or implementation?

Emissions Reduction Benefit:

What available methods exist to estimate emissions reductions for AQ modeling?

What previous emissions reductions estimates exist?

CARB estimated a 5.8 tons per day (tpd) VOC emissions reduction would be achieved by the proposed amendments. The proposed reductions with high GWP is equivalent to reducing carbon dioxide emissions by 0.20 million metric tons (MMT CO_{2e}) per year. CARB estimates that the proposal to prohibit the use of methylene chloride, perchloroethylene, and trichloroethylene in six additional consumer product categories would result in a reduction of 0.2 tpd for the three chlorinated toxic air contaminants (TAC).[4]

Control Cost Estimate:

What available methods exist to estimate costs, and economic analysis?

What previous cost estimates exist?

CARB estimated the cost effectiveness (CE) of the proposed VOC limits to be about $6.23 per pound of VOC reduced, which is higher than most other consumer product regulations. The CE is higher because VOC reductions from consumer products are becoming more difficult to achieve since a number of smaller emitting categories are being proposed for regulation with resulting small reductions. Several categories are relatively costly due to the large number of products that need to be reformulated to achieve fairly low emission reduction totals. CARB expects most manufacturers to be able to absorb the added costs without an adverse impact on their profitability and the estimated average increase in cost per unit to the manufacturer to be about $0.03.[5]

Other Comments:
Potential stakeholder contacts
Please contact Seth Barna (sbarna@otcair.org) to be added to the contact list for this measure.

Additional Information:
[1] CARB's Initial Statement of Reasons For Proposed Amendments To The California Consumer Products Regulation; Dated May 9, 2008; Table ES-2; Page Exective Summary-10:
[2] CARB's Initial Statement of Reasons For Proposed Amendments To The California Consumer Products Regulation; Dated May 9, 2008; Page Exective Summary-11:
[3] CARB's Initial Statement of Reasons For Proposed Amendments To The California Consumer Products Regulation; Dated May 9, 2008; Page Exective Summary-10:
[4] CARB's Initial Statement of Reasons For Proposed Amendments To The California Consumer Products Regulation; Dated May 9, 2008; Page Exective Summary-1:
[5] CARB's Initial Statement of Reasons For Proposed Amendments To The California Consumer Products Regulation; Dated May 9, 2008; Pages Exective Summary-18 thru 20:
CARB's Initial Statement of Reasons For Proposed Amendments To The California Consumer Products Regulation; Dated May 9, 2008: http://www.arb.ca.gov/consprod/regact/regact.htm

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Solvent Cleaning

Date updated: 03/13/09

Name of potential measure: Solvent Cleaning

Brief description of the measure being considered: Control measure will address VOC emissions from cold cleaning machines (the major source of VOC emissions), open-top vapor degreasers, all types of conveyorized degreasers and air-tight and airless cleaning systems that carry out solvent degreasing operations with a solvent containing volatile organic compounds (VOC) [and the issue of including NESHAP halogenated solvents as practiced under 2004 California rules must be considered]. Cleaning operations will use solvent with a material VOC content of 25 g/l or less. The former vapor pressure limit (1.0 mmHg) is no longer used.

Previous programs, model programs or historical significance: The SCAQMD has had a solvent cleaning rule since 1979 that has been amended and tightened many times to attain ever lower VOC emissions. They also have a companion rule, 1171 (Solvent Cleaning Operations), that treats the use of solvents and solvent waste generated during production, repair, maintenance, or servicing of products, tools, machinery and general work areas which usually runs in tandem with rule 1122. Dropping the use of vapor pressure to set VOC limits started with rule 1171 when material VOC calculations were introduced late in 1999 and then was adopted into 1122 using the same 50 g/l VOC limits.

Major Issues: Likely not a problem as the SCAQMD rule 1122 went into effect mainly in 2005 with some portions effective in 2006. However, without close attention to special exemptions for small but critical operations such as aerospace, medical, specialized electronics, etc, significant resistance will be encountered. Exemptions for specialized operations tend to be higher than in other rules and are somewhat state specific (that is, the OTC model rule cannot include specialized operations that may be peculiar to only a few states, thus each state may be required to search out these specialized operations).

Emissions reduction benefit: Difficult to say and more discussions with CA representatives are required to determine the reductions . Anticipated to be 13.0 tons per day across the OTR

Control Cost Estimate: $1400 per ton VOC reduced.

Benefit for other pollutants: The current SCAQMD rule includes halogenated solvents such as perchloroethylene, which are a health concern; included due to many stakeholder comments to add such coverage. SCAQMD also was concerned that users could be tempted to substitute non-VOC solvents that pose a health risk to avoid the solvent cleaning rule. OTC must give this issue careful consideration as these are exempt solvents which pose no ground-level ozone problem but do pose a health risk to employees operating the equipment.

National program possibilities: Yes, but it is unlikely that EPA would be interested in developing a national solvent cleaning rule more stringent than already exists for halogenated solvents.

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

Stage I & II Upgrades
Updated: 03/09/09

Brief description of the measure being considered:
What sector does the measure address? Gasoline dispensing facilities and automobile refueling operations
What control technology or method is being considered? What performance standard or emission level is being considered?
This measure would address emissions from area sources, specifically from gasoline dispensing facilities (GDFs). States that currently have Stage I and II vapor recovery controls in place can potentially capture additional emission reduction benefits by implementing some upgrades which are based on some provisions enacted in California to increase the VOC capture efficiency and performance of the Stage I and Stage II equipment.

For the states in the OTR, two upgrades are provided for the OTC states' consideration: (1) upgrading Stage I and II equipment installations to increase capture/collection efficiency to 98%; and (2) requiring installation of ORVR compatible equipment to ensure that no fugitive emissions occur as a result of ORVR-equipped vehicles fueling at Stage II equipped GDFs.

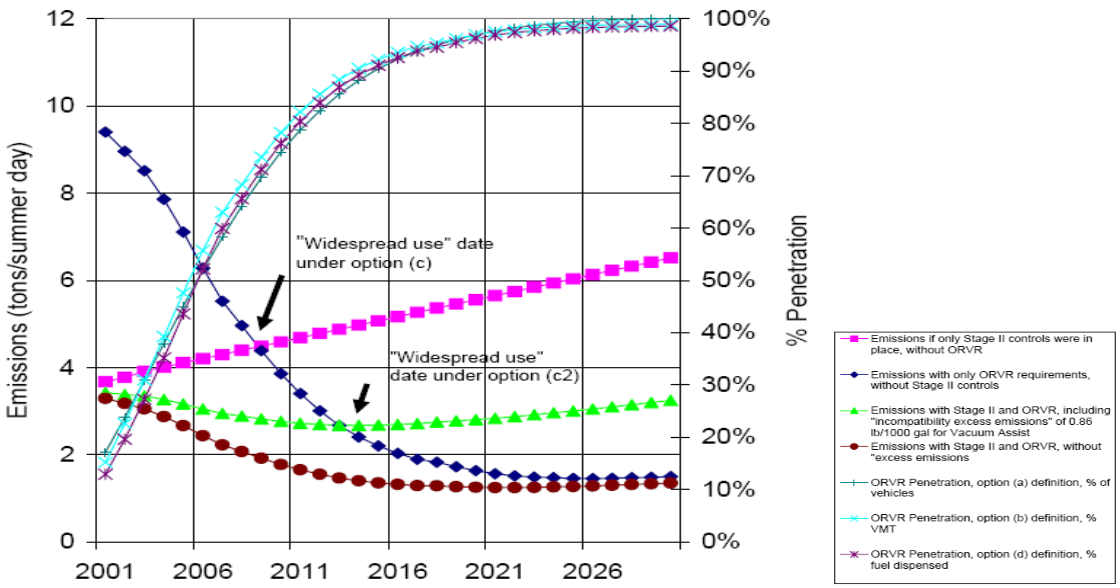
Phase I/II Increased Capture Efficiency and Performance
In addition to comparing existing vapor recovery programs at gasoline dispensing facilities to the newly adopted NESHAP, this control measure would be based on CARB EVR 2000 to adopt enhancements to components in the vapor recovery system specifications to get additional emission reductions. Proposed changes include:

- For Stage I certification, an increase in the efficiency requirement from 95% to 98%, a new specification for Stage I couplers to reduce leaks, new performance specifications for drain valves in spill containment boxes, and other improved Stage I equipment specifications;
- For Stage II vapor recovery system certification requirements, application of new standards to all Stage II systems and balance systems, and new requirements for assist systems, including assist systems with processors, and amended new and repealed test procedures for Stage II vapor recovery (specifics are outlined in CP-201, "Certification Procedure for Vapor Recovery Systems for Gasoline Dispensing Facilities")'; and
- A requirement that the Stage II vapor recovery system not exceed the emission factor of 0.38 lbs/1000 gallons and pressure-related fugitive emissions shall not exceed 50 percent of the emission factor.

ORVR Compatibility - Stage I/II Vent Pipe Off-Gas Collection System
The measure would require gasoline dispensing facilities to install Phase II vapor recovery system compatible with Onboard Refueling Vapor Recovery (ORVR) systems. The Phase II system shall meet the hydrocarbon emission factor and/or efficiency criteria of 95% efficiency and ≤ 0.38 lbs/1,000 gallons. A list of the Executive Orders for all CARB certified ORVR Compatible Phase II systems can be found at http://www.arb.ca.gov/vapor/eo-ORVR.htm.

Previous programs, model programs or historical significance:
The vapor recovery program was established as a requirement of the Clean Air Act (CAA). States in the Ozone Transport Region (OTR) must comply with two Stage II related requirements: CAA § 182(b)(3) and CAA § 184(b)(2). CAA § 182(b)(3) mandates the installation of Stage II in moderate, serious, severe and extreme non-attainment areas. In CAA § 202(a)(6) EPA also required automobile manufacturers to implement on-board refueling vapor recovery (ORVR) systems. Additionally, this section of the CAA provides the EPA Administrator the authority to waive, by rule, the Stage II program requirement under CAA § 182(b)(3) when ORVR equipped vehicles are in "widespread use." However, CAA § 202(a)(6) does not make any provision to waive the Stage II

requirement for areas affected by the §184(b)(2) requirement. EPA has indicated that they intend to provide guidance to OTR states on this issue and will develop a method for eliminating their Stage II program, if OTR states wish to do so. It is important to note that an analysis by the Northeast States for Coordinated Air Use Management (NESCAUM) indicates that keeping Stage II beyond the widespread use date with adopting the use of ORVR equipment will result in an environmental disbenefit. This analysis also suggests that areas that require the use of ORVR equipment could reap additional VOC reductions. Installing the remainder of the CARB program will likely result in additional VOC reductions. The chart below highlights the different scenarios. The dark blue line represents VOC emissions for ORVR. The bright pink line represents VOC emissions from Stage II alone. The lime green line represents VOC emissions with the current Stage II program and ORVR vehicles (current scenario), while the brown line represents Stage II with ORVR compatible equipment and ORVR vehicles. While the NESCAUM analysis focused primarily on the widespread use issue and ORVR compatability, it is likely that the adoption of the full CARB program would further reduce VOC emissions.[4]



Is this an update to a previous measure effective in the OTR? Is there a similar measure currently in effect in another region, state, or county? What is the history of regulation in this sector?

Stage I is installed in many locations throughout the OTR Stage II vapor recovery systems are required in 275 counties in the US. Those areas are primarily in serious and severe non-attainment areas and in the Ozone Transport Region (OTR). The map below shows the areas of the country with Stage II programs.

Figure 1. Areas with Stage II programs

[4] Detailed information on this analysis can be found in NESCAUM's report on Widespread Use available at: http://www.nescaum.org/topics/vapor-recovery

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

California Air Resources Board (CARB) adopted the EVR rules in ____ . Stage I EVR went into effect in April 2005, and Stage II EVR is going into effect in April 2009. ORVR compatibility systems were required by March 2006, and ISD requirements will be in effect by April 2010.

Major Issues:
Does opposition exist to this measure? What significant hurdles may impact its adoption or implementation? The petroleum industry, including API and the marketer associations will likely have concerns about the new requirements, especially about their cost. There may also be opposition by the gasoline station owners in regards to the cost of retrofitting existing stations.

For the ORVR compatibility upgrade, some systems may only be compatible with balance Stage II systems while others may only be compatible with vacuum-assist systems, depending on the technology. See the list of CARB certified ORVR Compatible Phase II systems at http://www.arb.ca.gov/vapor/eo-ORVR.htm to determine which technologies are compatible with vacuum or balance systems.

Emissions reduction benefit:

What available methods exist to estimate emissions reductions for AQ modeling? What previous emissions reductions estimates exist?

Generally, for all enhancements, CARB developed emission reduction estimates of 25.1 tons per day of reactive organic gases statewide, which are outlined in its "Staff Report: Initial Statement of Reasons for Proposed Amendments to the Vapor Recovery Certification and Test Procedures for Gasoline Loading and Motor Vehicle Gasoline Refueling at Service Stations," released February 4, 2000. NESCAUM conducted an analysis for their states using this spreadsheet in 2000 and the results can be found at the end of this report. Additionally, NESCAUM conducted widespread use analysis for five OTR states, which highlights potential widespread use dates as well as emission benefits for maintaining Stage II with enhancements beyond the widespread use date.

Control Cost Estimate:
What available methods exist to estimate costs, and economic analysis? What previous cost estimates exist?

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

As ORVR penetrates the market the cost per ton of VOC is reduced. NESCAUM analysis identified the following costs for a typical system without enhanced controls:

Costs per ton to Maintain Existing non-enhanced Stage II systems as ORVR penetrates the market

%ORVR in fleet	Emission increase associated with removing Stage II (tons per year per average station)	$/ton cost to maintain Stage II 95% control efficiency	$/ton cost to maintain Stage II 80% control efficiency
20	3.54	-$136 – 126	-$2-310
30	3.09	-$33 – 266	$120 – 475
40	2.65	$103 – 452	$281 – 696
50	2.21	$292 – 712	$507 – 1,005
60	1.77	$579 – 1,103	$847 – 1,469
70	1.33	$1,055 – 1,754	$1,412 – 2,242
80	0.88	$2,008 – 3,056	$2,544 – 3,788
90	0.44	$4,866 – 6,961	$5,937 – 8,436

Implementing enhancements to the existing program will add to the costs above. The table below provides estimated costs per station to upgrade an existing GDF to the CARB requirements. These figures are based on 2008 CARB estimates:[5]

	Number of Dispensers			
	2	4	6	12
Stage II Enhancements	$17,240	$24,925	$32,765	$56,285
Dispenser Equipment	*$7,240*	*$14,480*	*$21,720*	*$43,440*
*Dispenser Equipment Install**	*$600*	*$1,200*	*$1,800*	*$3,600*
Clean Air Separator (CAS)	*$7,245*	*$7,245*	*$7,245*	*$7,245*
*CAS Install**	*$2,000*	*$2,000*	*$2,000*	*$2,000*
In Station Diagnostics	$13,600	$16,500	$19,700	$28,900
TOTAL** (rounded to nearest $100)	$30,800	$41,400	$52,500	$85,200

*Assumes installation labor cost of $75/hr

**Does not include cost to replace dispensers, obtain permits, install electrical lines or conduct start-up tests

Cost to Install New ORVR compatible non EVR Stage II Systems

Years to widespread use date	Emission reduced per station over phase-out period (tons VOC)	Amortized cost per ton of VOC removed
10	10.2 - 12.8	$3,436 – 4,322
9	8.0 – 10.2	$4,178 – 5,310
8	6.2 – 8.0	$4,782 – 6,154
7	4.6 – 6.1	$6,015- 7,860
6	3.4 – 4.5	$7,812 – 10,410

[5] http://www.arb.ca.gov/vapor/arbevrtalk120507.pdf

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

5	2.3 – 3.2	$10,371 - 14,168
4	1.5 – 2.2	$13,338 – 18,770
3	1.0 -1.4	$19,663 – 28,653
2	0.5 – 0.8	$32,623 – 49,642
1	0.2 – 0.3	$78,664 – 130,841

* Calculations based on a station having throughput of 1,300,000 gallons of gasoline annually
* Cost to install a new station was determined to be $24,750. Costs for various vac-assist or balance stations may be less or more depending on the type of system installed.

Benefit for other pollutants:
Does this measures offer other benefits by reducing other pollutants like PM, GHG, or air toxins? How?
It is likely to result in a reduction in benzene emissions. The ORVR Compatibility component can reduce VOCs and other HAPs emitted from gasoline by ensuring that only air is released from gasoline storage tanks.

National program possibilities:
Is this measure applicable on a national basis? Yes but this is unlikely. This measure is essentially an amendment to existing requirements, and so could be done nationally.

Other Comments:
Potential stakeholder contacts
Please contact Seth Barna (sbarna@otcair.org) to be added to the contact list for this measure.

Information sources reports, rules or presentations

- "Staff Report: Initial Statement of Reasons for Proposed Amendments to the Vapor Recovery Certification and Test Procedures for Gasoline Loading and Motor Vehicle Gasoline Refueling at Service Stations," released February 4, 2000.
- NESCAUM Vapor Recovery reports and letters: http://www.nescaum.org/topics/vapor-recovery
- http://www.evrhome.org/
- http://www.arb.ca.gov/vapor/vapor.htm

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

VOC Stationary Above-Ground Storage Tanks
Date updated: 02/24/09

Name of potential measure: VOC Stationary Above-Ground Storage Tanks—Deck fittings and Rim Seals, Domes, Roof Landing Controls, Cleaning and Degassing Controls, and Inspections.

Brief description of the measure being considered:
What sector does the measure address? –High vapor pressure volatile organic compounds (VOCs), such as gasoline, are often stored in large aboveground stationary storage tanks, which are typically located at refineries, terminals and pipeline breakout stations.

What control technology or method is being considered?
The available control measures can be grouped into five categories: deck fittings and seals, domes, roof landings, degassing and cleaning, and inspection and maintenance. These are described below:

- Deck fittings— Evaporative losses can occur from deck fittings, particularly slotted guidepoles, and rim seal systems. Control measures include gasketing deck fittings, installing pole sleeves and floats on slotted guidepoles, and gap requirements for rim seals.

- Domes— Wind blowing across external floating roof tanks causes evaporative losses. The proposed control measure is to install domes on external floating roof tanks that have contents with vapor pressure greater than 3 psia, excluding crude oil, slop oil, and wastewater.

- Roof landing Controls— When enough liquid is removed from a floating roof tank such that the roof is lowered to the height at which it is lowered no further (i.e., the roof rests on its legs or suspended by cables or hangers), the contact between the floating roof and the liquid VOC is broken as the remaining liquid is removed. This is referred to as a "roof landing." A vapor space is created between the floating roof and the liquid surface, which enables vapors from the VOC remaining in the tank to accumulate. These vapors escape from the vapor space as the tank is sitting idle and when they are displaced during refilling. Also, some of the liquid VOC being used to refill the tank may evaporate and be expelled from the tank during refilling. For gasoline storage tanks, emissions generally range from 0.25 tons to 3 tons or more per roof landing. Control options include requiring use of lowest lander height setting for in-service roof landings (to minimize the vapor space) and, for tanks with landing emissions over 5 tons/year, installation of vapor recovery/control for use when roof is landed or modifying the tank to reduce the landed height less than one foot (implemented over 10-year period).

- Degassing and Cleaning— VOC stationary storage tanks must be cleaned periodically. Before a tank is cleaned, it must be degassed (which is the removal of gases, such as gasoline vapor) so personnel can safely enter to clean the tank and remove accumulated sludge. The sludge removed from the tank can contain residual VOC liquid that may evaporate when exposed to the atmosphere. Measures include control of emissions during degassing and controlling exhaust from sludge receiving vessels (such as vacuum trucks). In New Jersey's proposed rule, the measures will only be required during ozone season (beginning 2010).

NOTE: The measures discussed in this document represent possible controls the OTC is evaluating for potential NOx and VOC emission reductions. No decision has yet been made by the OTC states to pursue these measures for inclusion in a state implementation plan.

- Inspection and Maintenance—An inspection and maintenance program to reduce VOC emissions by assuring that tank components are in good condition and operating properly.

What performance standard or emission level is being considered?

- Deck fittings, seals—Gap width requirements for deck fitting gaskets and rim seals, pole sleeves and floats on slotted guidepoles (based on SCAQMD Rule 1178, similar to MACT WW). Can result in up to 80% reduction in standing loss emissions on external floating roof tanks.

- Domes—Installing domes on external floating roof tanks can result in about 60% reduction of emissions remaining after deck fittings upgraded.

- Roof Landing Controls—Options include use of a vapor recovery and control system for roof landings, or minimizing the vapor space by reducing the lander height to one foot or less. The vapor recovery/control option in New Jersey's proposed rule requires 90% control until the floating roof is within 90% by volume of being refloated for a total of 81% control. Lowering landing height to one foot or less can result in 60% to 100% reduction in roof landing cycle emissions, depending on how tank is operated (drained dry or heal remaining).

- Cleaning and Degassing— New Jersey's proposed rule requires 95 percent control of emissions during degassing, until concentration level in tank is 5,000 ppm as methane, and control of exhaust from receiving vessel (e.g. vacuum truck). In New Jersey, the control measures will only be required during ozone season, beginning in 2010.

- Inspection and Maintenance—For external floating roof tanks, New Jersey's proposed rule includes full inspection of gap widths for deck fittings and secondary seals annually, and of primary seals every five years. For internal floating roof tanks, New Jersey's proposed rule includes annual visual inspection (without entering tank) and full inspection of deck fitting and seal gaps each time the tank is emptied and degassed (no less than every 10 years).

Previous programs, model programs or historical significance:

Is this an update to a previous measure effective in the OTR?

Prior measures included CTGs containing seal requirements for floating roof storage tanks. These potential measures go beyond those CTGs.

Is there a similar measure currently in effect in another region, state, or county?

California's South Coast Air Quality Management District (SCAQMD) Rule 1149 addresses degassing, cleaning, and roof landings. SCAQMD Rule 1178 addresses deck fittings, seals, domes, and inspections. California's San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) Rule 4623 addresses deck fittings, seals, degassing and cleaning. Texas Council on Environmental Quality (TCEQ) Chapter 115 regulations address deck fittings, seals, inspections, degassing, and roof landings. Some requirements from these rules are similar to MACT Subpart WW.

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What is the history of regulation in this sector?
Degassing controls requirements date back to 1987 in SCAQMD. Roof landing controls were used in SCAQMD as early as 1991. TCEQ regulations for roof landings were promulgated after a study done in 2005 identified over 7,000 tons per year for VOC emissions from roof landings were identified in the Houston Ship Channel.

Major Issues:
Does opposition exist to this measure?
Yes—based on comments received for New Jersey's proposed rule, refineries oppose the requirement to install domes on external floating roof tanks, and independent terminals and pipeline breakout stations expressed concerns about the proposed roof landing measures.

What significant hurdles may impact its adoption or implementation?
Implementation of some of the measures requires removal of tanks from service. For this reason, New Jersey's proposed rule allows control measures to be implemented over 10 years, to minimize operational disruption. Also, control contractors for degassing/cleaning have to establish operations in the northeast.

Emissions reduction benefit:
What available methods exist to estimate emissions reductions for AQ modeling?
AP-42 (TANKS) can estimate reductions from deck fitting, seal, and doming requirements. The methodology in AP-42 Chapter 7.1.3.2.2 (added November 2006) is used to estimate losses from uncontrolled floating roof landings.

What previous emissions reductions estimates exist?
Estimated reductions for New Jersey total approximately 2,000 tons per year by 2020. Projected reductions include 1,400 tons per year from roof landings, 265 tons per year from controlling tank cleaning and degassing, 187 tons per year from the deck fitting and seal measures, and 130 tons per year from installing domes on external floating roof tanks. (Roof landing emissions in New Jersey totaled over 2,000 tons in 2006. Some facilities did not report roof landing emissions prior to that year.)

Control Cost Estimate:
What available methods exist to estimate costs, and economic analysis?
Costs analysis can be conducted by using cost data from other jurisdictions, particularly SCAQMD.

What previous cost estimates exist?
The New Jersey Rule proposal available at http://www.nj.gov/dep/rules/proposals/080408a.pdf contains cost estimates. The costs for the various measures ranges from $2,288 to $29,000 per ton of VOC reduced. Also, the Final Staff Report for SCAQMD Rule 1178 contains cost data for deck fittings, seals, and doming requirements. The Staff Report for SCAQMD Rule 1149 (available at http://www.aqmd.gov/hb/2008/May/080534a.htm -click on "Attachments" to download) contains cost data for degassing, cleaning, and roof landing controls.

Benefit for other pollutants:
Does this measures offer other benefits by reducing other pollutants like PM, GHG, or air toxins? How?

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Measures will reduce VOC HAPs such as benzene.

National program possibilities:

Is this measure applicable on a national basis?

VOC emissions contain HAP, so measures such as controlling cleaning and degassing as well controlling roof landing emissions could be incorporated into MACT.