6.0 CONTROL MEASURES

This section is divided into five sections: Point Source Measures; Area Source Measures; Nonroad Source Measures; Mobile Measures; and Voluntary Measures.

6.1 POINT SOURCE MEASURES

6.1.1 Non-CTG VOC RACT (federal and state regulation)

This measure involves extending emission standards to point sources with the potential to emit in excess of 25 tons per year (tpy) of VOCs.

Control Strategy

The Washington, D.C. metropolitan area, when designated as severe nonattainment for the one-hour ozone standard, was obligated under the CAAA to implement RACT for major sources (25 tpy) not covered by EPA's Control Technique Guidance (CTG) documents. Under the 15% VOC Reduction Plan, Maryland and the District of Columbia developed and implemented new regulations for point sources with the potential to emit between 25 and 50 tpy not already regulated or required to be regulated under the previous major source definition (50 tpy). This control measure included two parts: extension of non-CTG RACT rules to point sources emitting over 25 tpy, and extension of other state regulations applicable to major sources. The latter reductions were found only in Maryland.

As a moderate nonattainment area for the 8-hour ozone standard, "reasonably available" control technologies must be determined and implemented for industry sources with the potential to emit greater than 50 tpy. States have recertified RACT for point sources with the potential to emit greater than 50 tpy.

RACT consists of a variety of control techniques that are generally available and cost-effective. Usually the EPA will issue a CTG, which documents the cost per ton of the control method and the size of the source that can best benefit from the control based on cost and technological feasibility. A CTG can include add-on equipment as well as emissions limits. If a CTG is not issued for a category that contains a major source, the state must develop a RACT regulation for that category.

Maryland's RACT implementation involved three types of standards: 1) identification of major source categories and establishment of RACT for both major and non major sources in those categories; 2) RACT for categories that did not have major sources but together with all small sources were above major source threshold; and 3) specific RACT for sources that emitted more than 20 lbs of VOC day.

Source Type Affected

This measure affects point sources with the potential to emit 25 tpy or more of VOCs. In Maryland, it affects both major and non major sources that together constitute emissions above 25 tons per day, small sources that together emit greater than 25 tons and point sources that emit more than 20 lbs of VOCs per day.

Control Strategy

Point sources are regulated through a state permit process in Maryland, Virginia and D.C. The states were required to develop and implement new RACT regulations for all non-CTG point sources emitting more than 25 tpy, which had not been previously regulated. All three states recertified RACT for the point sources emitting more than 50 tpy in the region.

Implementation

District of Columbia – Department of Environment
Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality

Projected Reductions and Emission Benefit Calculations

The benefits of requiring RACT to point sources with potential to emit greater than 25 tpy is already reflected in the 2002 baseline inventory. There are no emission benefits of RACT recertification.

References

Staff engineers at the Virginia Department of Environmental Quality, the Maryland Department of the Environment, and the District of Columbia Department of Environment supplied reduction potential estimates.

6.1.2 NOx RACT and Regional NOx Transport Requirements (federal and state regulation)

This section documents credit for NOx emissions reductions attributable to federal and regional NOx requirements on point sources. These credits include:

- Reasonably Available Control Technology ("RACT"), as required under 42 U.S.C. § 7511a (f) (read in conjunction with §§ 7511a (b)(2) and (c));
- "NOx Budget" rules that required a second phase of stationary source NOx reductions as part of a coordinated regulatory initiative by the Ozone Transport Region (OTR) states to further reduce NOx emissions in the Northeast;
- the "NOx SIP Call" to reduce ozone transport in the Eastern United States;
- EPA's Clean Air Interstate Rule (CAIR); and
- Maryland's Healthy Air Act.

Control Strategy

RACT

Major point sources of NOx are subject to RACT requirements created by D.C., Maryland and Virginia in response to §7511a (f). In the Washington DC region, NOx reduction controls must be applied to sources that have the potential to emit 25 tons per year or more of NOx.

Maryland, Virginia, and DC completed the requirements of RACT under the 1-hour ozone standard in the late 1990's. EPA is requiring that the states review and recertify RACT under the 8-hour ozone standard. This recertification is due to EPA by September 15, 2006. In this process, each state is reviewing existing RACT rules, existing sources and potentially new source categories to ensure RACT requirements are being met. Additional emission reductions from this recertification process are expected to be small and the exact quantity of additional reductions is uncertain at this time.

NOx OTC Phase II Budget Rules

In the late 1990's Maryland and the District adopted "NOx Budget" rules to require a second phase of stationary source NOx reductions as part of a coordinated regulatory initiative by the OTR states to further reduce NOx emissions in the Northeast. The rules required large stationary sources to reduce summertime NOx emissions by approximately 65% from 1990 levels. The regulation also included provisions allowing sources to comply by trading "allowances." This regulation required affected sources to reduce their emissions to meet these requirements by May 2001.

NOx SIP Call

In late 1998, the U.S. EPA adopted a rule called the "NOx SIP Call" to reduce ozone transport in the Eastern United States. This regional NOx reduction program required 22 states, including Maryland and Virginia, and the District of Columbia, to further reduce large point source NOx emissions to EPA identified state emission budget levels by 2007. State regulation adoption timelines notwithstanding the majority of the 22 SIP call states had these regulations in place by 2003/2004.

Clean Air Interstate Rule (CAIR)

In 2004, the U.S. EPA promulgated the Clean Air Interstate Rule, which requires reductions in emissions of NOx and SO2 from large fossil fuel-fired electric generating units. The rule is set up in several phases with the first phase of NOx reductions to come by 2009. The rule sets up both an annual emissions budget and an ozone season emissions budget. The rule requires that units with nameplate capacity greater than 25 megawatts emit no more NOx than their allocations determined by the state either through emission controls or banking and trading.

Virginia CAIR

Virginia has adopted state regulations codifying the requirements of the Clean Air Interstate Rule. Virginia does not allow trading of NOx allowances for facilities that operate in ozone nonattainment areas.

Maryland Healthy Air Act

In April of 2006 the Maryland General Assembly and Governor Ehrlich adopted the Healthy Air Act (HAA), a law that requires reductions in NOx, SO2, and Mercury emissions from Maryland's largest and oldest coal fired power plants. Maryland implements the HAA through regulation. The regulation requires reductions in NOx emissions from coal-fired electric generating units (excluding fluidized bed combustion units) starting in 2009. By 2009 Maryland expects an approximate 70% reduction in NOx emissions from these regulations when compared to 2002 emissions. To meet the requirements of Maryland's regulations a company's "system" (covered units owned by the same company) must meet a system-wide cap by 2009. Compliance cannot be achieved through the purchase of allowances under the HAA.

District of Columbia CAIR

The District of Columbia is currently drafting its Clean Air Interstate Rule (CAIR). The District of Columbia's CAIR regulations do not allow trading of NOx allowances for achieving the reductions for the facilities within its jurisdiction.

Summary

The point source NOx controls are a phased approach to controlling emissions of NOx from power plants and other large fuel combustion sources. The programs resulting in emission reductions from point sources in the region include:

- The NOx SIP Call rule
- EPA's Clean Air Interstate Rule
- Maryland's Healthy Air Act

NOx reductions resulting from these controls are presented by source for Maryland in Tables 6-1 and 6-2, for Virginia in Tables 6-3 and 6-4, and for the District in Tables 6-5 and 6-6. Table 6-7 summarizes emission reductions by jurisdiction and for the region for each of the NOx point source controls listed in Tables 6-1 through 6-6.

In Maryland, the expected emission reductions for 2008 and 2009 were calculated using the emissions estimates consistent with annual allocations under the Healthy Air Act implementing regulation. The program does not allow trading of NOx allowances. The expected emissions

reductions are listed in Tables 6-4 and 6-5.

In Virginia, the expected emission reductions for 2008 and 2009 from electric generating utilities were calculated using knowledge of historical NOx emission rates, adjusted by the expected control efficiencies achieved from various control devices that have been installed, or by estimating the amount of allowances the facility would receive under the Virginia CAIR rule. The expected emissions reductions are listed in Tables 6-3 and 6-4.

In the District, the expected emission reductions for 2008 and 2009 were calculated using the listed allowances within the Clean Air Interstate Rule. The expected emissions reductions are listed in Tables 6-5 and 6-6.

See Appendix C for further point source documentation.

Table 6-1
2008 NOx Point Source Reductions for Maryland (tons per day)

Facility	2008 Uncontrolled Emissions	Reductions			Total Emission Red.
		RACT	NOx SIP Call	Healthy Air Act	
Dickerson	25.613	0	0	0	0
Chalk Point	50.586	0	0	0	0
Morgantown	78.512	0	0	0	0
Total 2008 Reductions		**0**	**0**	**0**	**0**

Table 6-2
2009 NOx Point Source Reductions for Maryland (tons per day)

Facility	2009 Uncontrolled Emissions	Reductions			Total Emission Red.
		RACT	NOx SIP Call	Healthy Air Act[1]	
Dickerson	25.902	0	0	18.813	18.813
Chalk Point	50.525	0	0	34.836	34.836
Morgantown	78.207	0	0	51.025	51.025
Total 2009 Reductions	**154.634**	**0**	**0**	**104.674**	**104.674**

[1] Healthy Air Act emission reduction estimates based on a regulation that imposes ozone season limits on the affected sources.

Table 6-3
2008 NOx Point Source Reductions for Virginia (tons per day)

Facility ID	Facility Name	2008 Baseline Emissions Tons/day	Reductions Tons/day			Total Emission Reductions Tons/day	2008 Estimated Emissions Tons/day
			NSR	RACT	NOx SIP Call		
51-153-0002 70225	Dominion Possum Point Power Station	16.217	3.435[(1)]			3.435	12.782
51-510-0003 70228	Mirant-Potomac River Power Plant	20.158			4.194	4.194	15.964
51-153-0139 72340	Prince William County Department of Public Works	0.115		0.01		0.01	0.105
						7.639	28.851

[(1)]70225 went through a PSD netting exercise resulting in a permit that required emission reductions of NOx. See permit dated 10/5/01.

Table 6-4
2009 NOx Point Source Reductions for Virginia (tons per day)

Facility ID	Facility Name	2009 Baseline Emissions Tons/day	Reductions Tons/day				Total Emission Reduced Tons/day	2009 Estimated Emissions Tons/day
			NSR	RACT	NOx SIP Call	CAIR		
51-153-0002 70225	Dominion Possum Point Power Station	16.240	3.435			0.937[(1)]	4.372[(1)]	11.868
51-510-0003 70228	Mirant-Potomac River Power Plant	20.415			4.194	10.402[(1)]	14.596	5.819[(1)]
51-153-0139 72340	Prince William County Department of Public Works	0.115		0.01			0.01	0.105
							18.978	17.792

(1)Actual CAIR allocations have not yet been calculated by VA staff. These reductions and emission rates are estimates based on past heat input rates and the draft CAIR analysis.

Table 6-5
2008 NOx Point Source Reductions for the District of Columbia (tpd)

Facility	2008 Uncontrolled Emissions	Reductions			Total Emission Red.
		RACT	NOx SIP Call	CAIR	
Pepco - Benning	4.04	-	2.61	N/A	2.61
Pepco - Buzzard	2.82	-	0	N/A	0
Capitol Power Plant	0.51	-	0	0	0
GSA West & Central Heating	0.26	-	0.10	0	0.10
Georgetown Univ. Power Plant	0.08	-	0	0	0
U.S. Soldiers Home	0.03	-	0	0	0
Total 2008 Reductions		**0**	**2.71**	**0**	**2.71**

Table 6-6
2009 NOx Point Source Reductions for the District of Columbia (tpd)

Facility	2009 Uncontrolled Emissions	Reductions			Total Emission Red.
		RACT	NOx SIP Call	CAIR	
	6.28	-	0	2.94	2.94
		-			
Pepco - Benning	3.69	-	0	0	0
Pepco - Buzzard	2.58	-	0	0	0
Capitol Power Plant	0.51	-	0	0	0030
GSA West & Central Heating	0.27	-	0.11	0	0.11
Georgetown Univ. Power Plant	0.08	-	0	0	0
U.S. Soldiers Home	0.03	-	0	0	0
Total 2009 Reductions		**0**	**0.11**	**2.94**	**3.05**

The CAIR reductions reflect the allotted allowances for the District of Columbia (85% of 112 tps).

Table 6-7
Point Source NOx Reductions Summary (tons per day)

Control	District of Columbia	Maryland	Virginia	Total
2008				
NSR	-	0	3.435	3.435
NOx RACT	-	0	0.01	0.01
NOx SIP Call	2.71	0	4.194	7.064
CAIR	-	0	0	
Healthy Air Act	-	0	0	
Total 2008 Reductions	**2.71**	**0**	**7.639**	**10.35**
2009				
NSR	-	0	3.435	3.435
NOx RACT	-	0	0.01	0.01
NOx SIP Call	0.11	0	4.194	8.644
CAIR	2.94	0	11.399	12.579
Healthy Air Act	-	104.674	0	104.674
Total 2009 Reductions	**3.05**	**104.674**	**18.978**	**126.70**

Implementation

District Department of the Environment
Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality

Projected Reductions

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2008 NOx Reductions	2.71	0	7.639	10.35
2009 NOx Reductions	3.05	104.674	21.038	126.70

Emission Benefit Calculations

The emission reductions associated with the state NOx requirements on point sources were supplied by the staffs of the Maryland Air and Radiation Management Administration, the District Department of the Environment, and the Virginia Department of Environmental Quality Air Division.

References

1990 Clean Air Act Amendments, 42 U.S.C. §§7511a (f), (b)(2), and (c).

6.2 AREA SOURCE MEASURES

6.2.1 Reformulated Surface Coatings (federal rule)

This measure involved adopting the federal rule resulting from the National Regulatory Negotiation for Architectural and Industrial Maintenance (AIM) Coatings, which restricts the VOC content of architectural, industrial maintenance, special industrial, and highway markings surface coatings sold and used in the Washington, D.C. ozone nonattainment area. This rule was adopted on September 11, 1998 (63 FR 48819), corrected on June 30, 1999 (64 FR 34997) and amended on February 16, 2000 (65 FR 7736). Compliance was required by September 13, 1999, or March 10, 2000.

Source Type Affected

This measure affects makers of architectural, industrial maintenance, special industrial, and highway markings surface coatings.

Control Strategy

The measure is based on the national regulatory negotiation for AIM coatings. According to EPA guidance, the final rule yields a 20% reduction in VOC emissions from AIM coating sources. This estimate includes consideration of rule effectiveness and rule penetration.

Reductions for AIM coatings are achievable through product reformulations, product substitution, and consumer education. Reformulations include altering the components of the coating to achieve a lower VOC content, replacing VOC solvents with water or alternative non-VOC solvents, and increasing the solids content of the coating thereby reducing the volume applied. Product substitution is accomplished by replacing higher-VOC coatings with currently available lower-VOC coatings. Consumer education will provide information on the relative cost of lower-VOC coatings and encourage careful, efficient use of such products.

Implementation

This program is implemented by the EPA under 42 U.S.C. §7511 (b).

Projected Reductions and Emission Benefit

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

References

National Volatile Organic Compound Emission Standards for Architectural, Preamble Section IV.A.1 (63 FR 48819), September 11, 1998.

U.S. Environmental Protection Agency, "Credit for the 15% rate-of-progress Plans for Reductions from Architectural and Industrial Maintenance Coating Rule ", Memorandum from John S. Seitz, Director, to directors of Air Divisions of EPA Regional Offices, March 22, 1995.

U.S. Environmental Protection Agency, "Credit for the 15% rate-of-progress Plans for Reductions from Architectural and Industrial Maintenance Coating Rule and the Autobody Refinishing Rule", Memorandum from John S. Seitz, Director, to directors of Air Divisions of EPA Regional Offices, November 21, 1994.

Meeting the 15-Percent Rate-of-Progress Requirement Under the Clean Air Act: A Menu of Options, STAPPA/ALAPCO, September 1993.

6.2.2 Reformulated Consumer Products (federal rule)

This measure required that certain consumer products sold in the Washington, D.C. ozone nonattainment area be reformulated to reduce their VOC content. The measure is based upon regulations that EPA was required to publish by November 15, 1995 under 42 U.S.C. 7511b(e)(3). The final regulation was adopted on September 11, 1998 (63 FR 48848).

Source Type Affected

The measure affects manufacturers of the various specialty chemicals that EPA selected, after conducting a study consistent with 42 U.S.C. 7511b(e)(2).

Control Strategy

The measure relies upon federal implementation of a rule mandating reformulation of certain "consumer or commercial products" (as that term is defined under 42 U.S.C. 7511b(e)(1)(B)). Under §7511b(e)(3), EPA was required to create by November 15, 1995, regulations to require reformulation of one-fourth of the "consumer or commercial products" that are responsible for at least 80% of photochemically reactive VOC emissions from such products.

EPA guidance from John Seitz specifies a 10% total reduction of emissions from a regulated subset of consumer products. EPA estimated the regulated subset to be approximately 3.9 pounds per capita annually. Consequently, a total of 10% of the "commercial or consumer products" were expected to be subject to reformulation requirements by November 15, 1999. EPA guidance also allows states to retain emission reduction estimates for consumer and commercial product reformulations in their 15% Plans.

Implementation

This measure was federally implemented under a federal regulatory calendar initially issued in *60 Federal Register 15264*, finalized in *63 Federal Register 48791* and amended in *64 Federal Register 13422* (March 18, 1999). This program is implemented by the EPA under 42 U.S.C. §7511 (b).

Projected Reductions and Emission Benefit

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

References

National Volatile Organic Compound Emission Standards for Consumer Products, Preamble Section III.A. (63 FR 48848), September 11, 1998.

1990 Clean Air Act Amendments, 42 U.S.C. 7511b(e).

U.S. Environmental Protection Agency, "Regulatory Schedule for Consumer and Commercial

Products under Section 183 (e) of the Clean Air Act", Memorandum from John S. Seitz, Director, to directors of Air Divisions of EPA Regional Offices, June 21, 1995.

Commercial and Consumer Products: Schedule for Regulation (64 FR 13422), March 18, 1999.

6.2.3 Reformulation of Industrial Cleaning Solvents (federal rule)

This measure required that certain industrial cleaning solvents sold in the Washington, D.C. ozone nonattainment area be reformulated to reduce their VOC content. The measure is based upon regulations that, under 42 U.S.C. 7511b(e)(3), EPA was required to publish by November 15, 1995. The industrial cleaning solvent standards were adopted in 2001.

Source Type Affected
The measure affects manufacturers of the various specialty chemicals that EPA will select, after conducting a study consistent with 42 U.S.C. § 7511b(e)(2).

Control Strategy

The measure relies upon federal implementation of a rule mandating reformulation of certain "consumer or commercial products" (as that term is defined under 42 U.S.C. § 7511b(e)(1)(B)). Under § 7511b(e)(3), EPA must create by November 15, 1995, regulations to require reformulation of one-fourth of the "consumer or commercial products" that are responsible for at least 80% of photochemically reactive VOC emissions from such products.

EPA guidance from John Seitz specifies a 10% total reduction of emissions from a regulated subset of consumer products. This is used as a benchmark for estimating reductions in industrial cleaning solvents.

Implementation
This program was implemented by the EPA in 2001 under a schedule adopted on March 18, 1999. The program is implemented under 42 U.S.C. §7511 (b).

Projected Reductions and Emission Benefit

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

References

1990 Clean Air Act Amendments, 42 U.S.C. 7511b(e).

U.S. Environmental Protection Agency, "Regulatory Schedule for Consumer and Commercial Products under Section 183 (e) of the Clean Air Act", Memorandum from John S. Seitz, Director, to directors of Air Divisions of EPA Regional Offices, June 21, 1995.

Federal Register Vol. 64 No. 52, Thursday, March 18, 1999 (AD FLR-6311-9) p. 13422 – 13424

6.2.4 Surface Cleaning and Degreasing for Machinery and Automobiles Repair (state rule)

This measure amended regulations for surface cleaning (often called "cold cleaning and degreasing") devices and operations, to require more stringent emissions control techniques, and to require, where possible, the use of low- or no-VOC solvents.

Source Type Affected

All cold cleaning and degreasing equipment and operations.

Control Strategy

Maryland has regulations on cold cleaning and degreasing equipment and operations (COMAR 26.11.19.09). The regulations require a decrease in vapor pressure of degreasing material for cold degreasers, installation of a condenser or air pollution control device, and good operating practices to minimize VOC losses.

The District of Columbia and Virginia have adopted regulations on cold cleaning and degreasing equipment and operations. Credit is taken for two types of control measures. (1) The first measure proposes the following equipment controls: solvent tank evaporation controls, carry-out emission controls, and enclosure/add-on controls; and the following operational controls: proper equipment use, and reduced disturbance of solvent-air interface. (2) The second measure will require the use, where feasible, of alternative solvents.

Implementation

District of Columbia - Department of Environment
Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality

Projected Reductions and Emission Benefit

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

6.2.5 Landfill Regulations (state rule)

Landfills emit gases as a result of decomposition of materials buried in them. While most of these gases are methane, which is not photochemically reactive, landfills do contribute to VOC emissions, and, thus, ozone formation. A federal rule for the control of new landfills and guidelines for existing landfills has been proposed under Section 111 of the Clean Air Act Amendments.

Source Type Affected
Municipal landfills are those that receive primarily household and/or commercial waste.

Control Strategy

The 15% VOC Reduction Plan required adoption of the federal guidelines for municipal landfills (see 56 *Federal Register* 24468). The proposed guidelines require installation of gas collection systems followed by flares, to either destroy the VOCs or burn them for fuel. The rule requires capture and control systems to capture at least 80% of the VOC emissions and route them to a 98% destruction efficiency control device.

Implementation

Federal standards for existing landfills will be promulgated under Section 111 of the Clean Air Act Amendments. The following state agencies will have to independently adopt regulations consistent with the federal standards:

Maryland - Air and Radiation Management Administration - MD 26.11.19.20, 3/9/98
Virginia - Department of Environmental Quality – 9 VAC 5-40-5800, 4/1/96

Projected Reductions and Emission Benefit

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

References

U.S. Environmental Protection Agency, *Standards of Performance for New Stationary Sources and Guidelines for Existing Sources: Municipal Solid Waste Landfills*, 56 *Federal Register* 24468, May 30, 1991.

U.S. Environmental Protection Agency, *Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines*, EPA-450/3-90-011a, March 1991.

6.2.6 Seasonal Open Burning Restrictions (state rule)

This measure involves amending and/or adopting state regulations to ban the open burning of such items as trees, shrubs, and brush from land clearing, trimmings from landscaping, and household or business trash, during the peak ozone season. The measure is authorized by state regulations, but is enforced by the local governments.

Source Type Affected

The measure affects all citizens and businesses that burn solid waste.

Control Strategy

Under the 15% VOC Reduction Plan, Maryland and Virginia adopted state regulations to prohibit open burning during peak ozone season in the Washington, D.C. ozone nonattainment area. The emissions benefits will remain constant through 2009.

Implementation

District of Columbia - Department of Environment.
Maryland - Air and Radiation Management Administration; local government enforcement.
Virginia - Department of Environmental Quality; local government enforcement.

Projected Reductions and Emission Benefit

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

References:

"Open Burning in Residential Areas, Emissions Inventory Development Report," E.H. Pechan & Associates, Inc., January 31, 2003. Prepared for the Mid-Atlantic/Northeast Visibility Union.

"Northern Virginia Open Burning Rule Effectiveness Evaluation," E.H. Pechan & Associates, Inc., December 8, 2003. Prepared for the County of Fairfax.

6.2.7 Stage I Vapor Recovery System Expansion (state rule)

This measure involves applying the federal Control Technique Guideline's "balanced submerged" underground storage tank refilling method at gas stations located in newly designated nonattainment counties.

Source Type Affected

All filling of underground storage tanks not controlled were affected.

Control Strategy

In the 15% VOC Reduction Plan, balanced submerged fill requirements were extended to Calvert, Charles and Frederick counties in Maryland and Stafford counties in Virginia. All other counties in the nonattainment area already were required to use balanced submerged fills. Note that Stafford County is not part of the Washington, DC-MD-VA 8-hour ozone nonattainment area.

Implementation

Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality

Projected Reductions and Emission Benefit

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

References

Maryland Department of the Environment, Air Management Administration, *Stage I Vapor Recovery Inspection Program*, (Beth Murray, September 30, 1991).

6.2.8 Stage II Vapor Recovery

As a serious ozone nonattainment area, Washington was required, under 42 U.S.C. § 7511a(b)(3) and 7511a(c), to install stage II vapor recovery systems at gasoline pumps.

Source Type Affected

This measure affects gasoline service stations and will reduce vehicle refueling emissions. Refueling emissions are attributed to the evaporation of gasoline-rich vapors displaced from the storage tank during refueling. The system is composed of a nozzle covering the fill-pipe and a vapor line returning from the fill-pipe to the storage tank. The stage II system captures the fuel rich vapors from the vehicle fill-pipe and returns them to the storage tank. Returning saturated vapors to the storage tank reduces emissions by maintaining liquid/vapor equilibrium in the storage tank, thereby decreasing the evaporation potential. Recovered vapors are then collected by tanker trucks and returned to the terminal for recovery or destruction.

Control Strategy

Stage II nozzles have been in place in the District of Columbia since 1977. Implementation of stage II is required in the Washington nonattainment regions of Maryland and Virginia by operation of the Clean Air Act Amendments of 1990, 42 U.S.C. § 7511a(b)(3) and 7511a(c). Those sections require adherence to a schedule of implementation, and set forth a standard for applicability (i.e., to stations of what size or what amount of gasoline sold per month). Maryland and Virginia adopted stage II regulations as a part of their November 15, 1992 SIP revisions.

Projected Reductions

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

Emission Benefit Calculations

Not applicable.

References

U.S. Environmental Protection Agency, *Technical Guidance -- Stage II Vapor Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispersing Facilities*, Volume 1, EPA-450/3-91-022a, November 1991.

1990 Base Year Emissions Inventory for Stationary, Anthropogenic, Biogenic Sources and Highway Vehicle Emissions of Ozone Precursors in the Washington, DC-MD-VA Metropolitan Statistical Nonattainment Area, Prepared for The District of Columbia, Maryland, and Virginia by the Metropolitan Washington Council of Governments, September 22, 1993.

6.2.9 Graphic Arts Controls (state rule/CTG)

Controls for offset lithography have been adopted as a new CTG. These controls apply to small printers and sources. VOCs are emitted from the inks used for printing, fountain solutions, and from the solvents used to clean the printing equipment.

Source Type Affected

This regulation affects small printers not currently regulated under RACT measures. Lithographic printing facilities include heatset web, non-heatset web, non-heatset sheet-fed, and newspaper non-heatset web sources.

Control Strategy

The 15% VOC Reduction Plan contained measures based on the draft CTG, which included the following controls:

Emission Source	Recommended Control
Inks	90% control (condenser filters) for heatset plants
Fountain Solution	1.6% isopropyl alcohol (IPA) for heatset plants (90% reduction) alcohol substitution for non-heatset (99% reduction) 5% IPA for sheet-fed (50% reduction)
Cleaning Solutions	30% VOC content limit (70% reduction)

Implementation

District of Columbia - Department of Environment: 20 DCMR Sec. 716, 5/1/99
Maryland - Air and Radiation Management Administration: 26.11.19.11 & .18, 6/5/95 & 11/7/94
Virginia - Department of Environmental Quality: 9 VAC 5-40-7800, 4/1/96

Projected Reductions and Emission Benefit

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

References

U.S. Environmental Protection Agency, *Control Techniques Guideline for Offset Lithographic Printing*, Draft, December 14, 1992.

6.2.10 Auto Body Refinishing (state rule/CTG)

EPA has crafted a national rule for emissions from auto body refinishing. The rule requires reformulated auto body coatings. This source category was originally targeted as a new Control Technique Guideline (CTG), and a draft CTG is available for use in creating a state rule.

Source Type Affected

EPA expects all auto body refinishing facilities to be affected. This category includes the application of base coats, primer coats, finish coats, and sealer/clear coats.

Control Strategy

The 15% VOC Reduction Plan contained a measure that required reduced-solvent coatings for precoats, primer surfaces, primer sealers, and topcoats. The measure also required the use of spray gun cleaners that recycle solvents, and the use of high-volume, low- pressure application equipment.

Implementation

EPA adopted a National Rule for Autobody Refinishing on August 14, 1998.
Maryland - Air and Radiation Management Administration

Projected Reductions and Emission Benefit

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

References

U.S. Environmental Protection Agency, Chemicals and Petroleum Branch, Research Triangle Park, North Carolina, *Automobile Refinishing Control Techniques Guideline*, Final

EPA Reference Docket Number A-95-18

Maryland Department of the Environment, Air and Radiation Management Administration, Baltimore, Maryland, *Summary and Economic Impact of New Regulation .23 under COMAR 26.11.19, Control of VOC Emissions from Vehicle Refinishing* (October 18, 1994)

6.2.11 Mobile Repair and Refinishing Rule (state rule/OTC model rule)

This rule establishes VOC limits for paints using in mobile repair and refinishing. The VOC limits are consistent with federal limits for mobile equipment refinishing materials. The rule also requires improved transfer efficiency application equipment, enclosed spray gun cleaning, and minimal training.

Source Type Affected

All manufacturers of paints used in mobile repair and refinishing and operators of mobile repair and refinishing facilities.

Control Strategy

Virginia adopted the Ozone Transport Commission (OTC) Model Rule for Mobile Repair and Refinishing in November 2003. This rule became effective in the District of Columbia in February 2004. The rule applies to all counties in the nonattainment area. The State of Maryland had rules in place by 1996 that contain limits comparable to the OTC model rule.

Implementation

District of Columbia - Department of Environment
Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 VOC Reductions	0	0	0.08	0.08
2009 VOC Reductions	0	0	0.08	0.08

Emission Benefit Calculations

Projected reductions are based on an emission reduction factor of 38 percent, based on Pechan (2001).

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

6.2.12 Portable Fuel Containers Rule: Phase I (state rule/OTC model rule)

This measure introduces performance standards for portable fuel containers and spouts. The standards are intended to reduce emissions from storage, transport and refueling activities. The rule also included administrative and labeling requirements. Compliant containers must have: only one opening for both pouring and filling, an automatic shut-off to prevent overfill, an automatic sealing mechanism when not dispensing fuel and specified fuel flow rates, permeation rates and warranties.

Source Type Affected

Any person or entity selling, supplying or manufacturing portable fuel containers, except containers with a capacity of less than or equal to one quart, rapid refueling devices with capacities greater than or equal to four gallons, safety cans and portable marine fuel tanks operating with outboard motors, and products resulting in cumulative VOC emissions below those of a representative container or spout.

Control Strategy

Maryland adopted phase I of the Ozone Transport Commission (OTC) Model Rule for Portable Fuel Containers in January 2002.

Virginia adopted phase I of the Ozone Transport Commission (OTC) Model Rule for Portable Fuel Containers on November 2003.

The rule was adopted in the District of Columbia in April 2004.

The rule applies to all counties in the nonattainment area.

Reductions from this rule increase annually beginning with implementation in the State of Maryland on January 1, 2004.

The District of Columbia and the Commonwealth of Virginia required compliance with this rule as of January 1, 2005.

Implementation

Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality
District of Columbia - Department of Environment

Projected Reductions

Reductions are shown under phase II of the Portable Fuel Container Rule.

Emission Benefit Calculations

Projected reductions are based on an emission reduction factor of 75% after full implementation after 10 years. Implementation began in 2005. In 2008, the emission reduction factor is 30%. In 2009, the emission reduction factor is 37.5%.

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

6.2.13 Architectural and Industrial Maintenance Coatings Rule (state rule/OTC model rule)

This rule requires manufacturers to reformulate various types of coatings to meet VOC content limits. Affected products include architectural coatings, traffic markings, high-performance maintenance coatings and other special-purpose coatings. It uses more stringent VOC content limits than the existing Federal consumer products rule.

Source Type Affected

The measure affects all manufacturers of affected coatings.

Control Strategy

Virginia adopted the Ozone Transport Commission (OTC) Model Rule for Architectural and Industrial Maintenance Coatings in November 2003.

Maryland adopted this rule on March 29, 2004.

The rule became effective in the District of Columbia in February 2004.

The rule will apply to all counties in the nonattainment area.

The VOC content limits in this rule are based on a Suggested Control Measure (SCM) adopted by the California Air Resources Board (CARB) and a State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Officials (STAPPA/ALAPCO) model rule or OTC coatings. Manufacturers are expected to comply with this rule using primarily EPA Test Method 24.

Implementation

District of Columbia - Department of Environment
Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 VOC Reductions	0.72	6.12	3.28	10.12
2009 VOC Reductions	0.73	6.24	3.37	10.34

Note: The District's OTC VOC rules on all the applicable area source categories have been submitted to EPA and they are federally enforceable measures. However, the emission reductions arising from this measure in the District are not applied to the emissions inventories, RFP, attainment, or contingency plan presented in this Washington DC-MD-VA regional SIP. The District of Columbia's measures are expected to provide additional enhancements to the air quality improvement in the region.

Emission Benefit Calculations

Projected reductions are based on an emission reduction factor of 31 percent, based on Pechan (2001).

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

6.2.14 Consumer Products Rule: Phase I (state rule/OTC model rule)

Phase I of the Consumer Products Rule required reformulation of approximately 80 types of consumer products to reduce their VOC content. It uses more stringent VOC content limits than the existing Federal consumer products rule. The rule also contains requirements for labeling and reporting.

Source Type Affected

Manufacturers of various specialty chemicals named in the rule, such as aerosol adhesives, floor wax strippers, dry cleaning fluids and general purpose cleaners.

Control Strategy

Phase I of the Ozone Transport Commission (OTC) Model Rule for Reformulated Consumer Products became effective in the District of Columbia in February 2004.

The State of Maryland adopted phase I of the Ozone Transport Commission (OTC) Model Rule for Reformulated Consumer Products on August 18, 2003.

The Commonwealth of Virginia adopted phase I of the Ozone Transport Commission (OTC) Model Rule for Reformulated Consumer Products on March 9, 2005.

Manufacturers are expected to demonstrate compliance with the rule primarily through a California Air Resources Board (CARB) test method. If complying with the VOC contents becomes difficult, flexibility options are provided.

Implementation

Maryland - Air and Radiation Management Administration
District of Columbia - Department of Environment
Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 VOC Reductions	0.75	3.21	3.39	7.35
2009 VOC Reductions	0.76	3.24	3.47	7.47

Note: The District's OTC VOC rules on all the applicable area source categories have been submitted to EPA and they are federally enforceable measures. However, the emission reductions arising from this measure in the District are not applied to the emissions inventories, RFP, attainment, or contingency plan presented in this Washington DC-MD-VA regional SIP. The District of Columbia's measures are expected to provide additional enhancements to the air quality improvement in the region.

Emission Benefit Calculations

Projected reductions are based on an emission reduction factor of 14.2 percent, based on Pechan (2001).

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

6.2.15 Solvent Cleaning Operations Rule (state rule/OTC model rule)

This rule establishes hardware and operating requirements and alternative compliance options for vapor cleaning machines used to clean metal parts. These machines are used in manufacturing operations to clean grease, wax, oil and other contaminants from parts when a high level or cleanliness is necessary. The rule also affects cold cleaners, which are used in automobile and maintenance facilities and industrial maintenance shops.

Source Type Affected

Manufacturers and operators of vapor cleaning or cold cleaning machines

Control Strategy

Virginia adopted the Ozone Transport Commission (OTC) Model Rule for Solvent Cleaning Operations in November 2003. The rule applies to all counties in the nonattainment area.

The rule became effective in the District of Columbia in February 2004.

The State of Maryland had rules in place by 1996 that contain limits comparable to the OTC model rule. Therefore the OTC model rule will not be implemented in Maryland.

Standards for vapor cleaning machines are based on Federal Maximum Available Control Technology (MACT) standards for chlorinated solvent vapor degreasers. Cold cleaner solvent volatility provisions are based on regulatory programs in place in several states, primarily Maryland and Illinois.

Implementation

District of Columbia - Department of Environment
Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 VOC Reductions	0.32	0	3.12	3.44
2009 VOC Reductions	0.32	0	3.20	3.52

Note: The District's OTC VOC rules on all the applicable area source categories have been submitted to EPA and they are federally enforceable measures. However, the emission reductions arising from this measure in the District are not applied to the emissions inventories, RFP, attainment, or contingency plan presented in this Washington DC-

MD-VA regional SIP. The District of Columbia's measures are expected to provide additional enhancements to the air quality improvement in the region.

Emission Benefit Calculations

Projected reductions are based on an emission reduction factor of 66 percent, based on Pechan (2001).

References

E.H. Pechan, "Control Measure Development Support Analysis for the Ozone Transport Commission Model Rules", March 31, 2001.

6.2.16 Industrial Adhesives and Sealants Rule (state rule/OTC model rule)

This rule establishes VOC content limitations for industrial and commercial application of solvent-based adhesives and sealants. Controls will cover adhesives, sealants, adhesive primers, sealer primers, adhesive application to substrates, and aerosol adhesives. VOC content limits are similar to those contained in the CARB Reasonably Available Control Technology (RACT) or Best Available Control Technology (BACT) document for adhesives and sealants (Dec. 1998).

Source Type Affected

Manufacturers and distributors of industrial adhesives and sealants.

Control Strategy

The District of Columbia adopted the Ozone Transport Commission (OTC) Model Rule for Industrial Adhesives and Sealants on [date to be provided].

The State of Maryland adopted the Ozone Transport Commission (OTC) Model Rule for Industrial Adhesives and Sealants on [date to be provided].

The Commonwealth of Virginia adopted the Ozone Transport Commission (OTC) Model Rule for Industrial Adhesives and Sealants on [date to be provided].

The rule will be effective in all jurisdictions no later than May 1, 2009.

Implementation

District of Columbia - Department of Environment
Virginia - Department of Environmental Quality
Maryland - Air and Radiation Management Administration

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 VOC Reductions	0	0	0	0
2009 VOC Reductions	0.16	1.19	1.23	2.58

Note: The District's OTC VOC rules on all the applicable area source categories have been submitted to EPA and they are federally enforceable measures. However, the emission reductions arising from this measure in the District are not applied to the emissions inventories, RFP, attainment, or contingency plan presented in this Washington DC-

MD-VA regional SIP. The District of Columbia's measures are expected to provide additional enhancements to the air quality improvement in the region.

Emission Benefit Calculations

Emission reductions are based on a 64 percent reduction in emissions of VOC from the baseline. Further details are available from OTC (2006).

References

[OTC 2006. *Identification and Evaluation of Candidate Control Measures: Draft Technical Support Document.* Prepared by MACTEC Federal Programs, Inc., Herndon, Virginia for the Ozone Transport Commission. August 4, 2006]

6.2.17 Portable Fuel Containers Rule: Phase II (state rule/OTC model rule)

This measure expands existing performance standards for portable gasoline containers and spouts to kerosene containers. The standards are intended to reduce emissions from storage, transport and refueling activities. The rule also included administrative and labeling requirements. Compliant containers must have: only one opening for both pouring and filling, an automatic shut-off to prevent overfill, an automatic sealing mechanism when not dispensing fuel and specified fuel flow rates, permeation rates and warranties.

Source Type Affected

Any person or entity selling, supplying or manufacturing portable fuel containers, except containers with a capacity of less than or equal to one quart, rapid refueling devices with capacities greater than or equal to four gallons, safety cans and portable marine fuel tanks operating with outboard motors, and products resulting in cumulative VOC emissions below those of a representative container or spout.

Control Strategy

Maryland adopted phase II of the Ozone Transport Commission (OTC) Model Rule for Portable Fuel Containers on [date].

Virginia adopted phase II of the Ozone Transport Commission (OTC) Model Rule for Portable Fuel Containers on [date].

The District of Columbia adopted phase II of the Ozone Transport Commission (OTC) Model Rule for Portable Fuel Containers on [date].

The rule will be effective in all jurisdictions no later than May 1, 2009.

The rule will apply to all counties in the nonattainment area.

Reductions from this rule will increase annually beginning with implementation in 2009.

Implementation

Maryland - Air and Radiation Management Administration
Virginia - Department of Environmental Quality
District of Columbia - Department of Environment

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 VOC Reductions (Phase I rule only)	0.75	5.17	2.17	8.09
2009 VOC Reductions	1.09	6.95	3.11	11.15

Includes reductions from Phase I and Phase II.

Note: The District's OTC VOC rules on all the applicable area source categories have been submitted to EPA and they are federally enforceable measures. However, the emission reductions arising from this measure in the District are not applied to the emissions inventories, RFP, attainment, or contingency plan presented in this Washington DC-MD-VA regional SIP. The District of Columbia's measures are expected to provide additional enhancements to the air quality improvement in the region.

Emission Benefit Calculations

Phase I: Projected reductions are based on an emission reduction factor of 75% after full implementation after 10 years. Implementation began in 2005. In 2008, the emission reduction factor is 30%. In 2009, the emission reduction factor is 37.5%.

Phase II: Emission reductions are based on a 4 percent reduction in emissions of VOC. Further details are available from OTC (2006).

References

[OTC 2006. *Identification and Evaluation of Candidate Control Measures: Draft Technical Support Document.* Prepared by MACTEC Federal Programs, Inc., Herndon, Virginia for the Ozone Transport Commission. August 4, 2006]

6.2.18 Consumer Products Rule: Phase II (state rule/OTC model rule)

Phase II of the Consumer Products Rule involves adopting the CARB 7/20/05 Amendments which sets new or revises existing limits on 13 consumer product categories. It uses more stringent VOC content limits than the existing federal consumer products rule. The rule also contains requirements for labeling and reporting.

Source Type Affected

Manufacturers of various specialty chemicals named in the rule, such as aerosol adhesives, floor wax strippers, dry cleaning fluids and general purpose cleaners.

Control Strategy

The District of Columbia adopted phase II of the Ozone Transport Commission (OTC) Model Rule for Reformulated Consumer Products on [dates to be provided].

The State of Maryland adopted phase II of the Ozone Transport Commission (OTC) Model Rule for Reformulated Consumer Products on [dates to be provided].

The Commonwealth of Virginia adopted phase II of the Ozone Transport Commission (OTC) Model Rule for Reformulated Consumer Products on [dates to be provided].

The rule will be effective in all jurisdictions no later than May 1, 2009.

Manufacturers are expected to demonstrate compliance with the rule primarily through a California Air Resources Board (CARB) test method. If complying with the VOC contents becomes difficult, flexibility options are provided.

Implementation

Maryland - Air and Radiation Management Administration
District of Columbia - Department of Environment
Virginia - Department of Environmental Quality

Projected Reductions

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 VOC Reductions	0	0	0	0
2009 VOC Reductions	0.11	0.46	0.49	1.06

Note: The District's OTC VOC rules on all the applicable area source categories have been submitted to EPA and they are federally enforceable measures. However, the emission reductions arising from this measure in the District are not applied to the emissions inventories, RFP, attainment, or contingency plan presented in this Washington DC-MD-VA regional SIP. The District of Columbia's measures are expected to provide additional enhancements to the air quality improvement in the region.

Emission Benefit Calculations

Emission reductions are based on a 2 percent reduction in emissions of VOC. Further details are available from OTC (2006).

References

[OTC 2006. *Identification and Evaluation of Candidate Control Measures: Draft Technical Support Document.* Prepared by MACTEC Federal Programs, Inc., Herndon, Virginia for the Ozone Transport Commission. August 4, 2006]

6.3 NON-ROAD MEASURES

The following non-road emission reduction measures that are discussed in this section are calculated using the NONROAD2005 emission factor model:

- EPA Non-road Gasoline Engines Rule, 6.3.1
- EPA Non-road Diesel Engines Rule, 6.3.2
- Emissions Standards For Spark Ignition Marine Engines, 6.3.3
- Emissions Standards for Large Spark Ignition Engines, 6.3.4
- Reformulated Gasoline for Off-Road Applications, 6.3.5
- Emission Standards for Locomotives, 6.3.6, are calculated using the Area Source spreadsheet but emission benefits are included in the nonroad sector totals.

Projected Reductions and Emission Benefit Calculations

Past SIP documents for the Washington region have presented the emission reductions from each of the above measures individually, and then summed the reductions to create a controlled on road inventory for each milestone year. NONROAD2005, the current non-road emissions model approved for use by the EPA, is not designed to calculate the benefits of each of the above control measures individually. As a result, this and future SIP revisions will not enumerate the benefits of individual non-road control measures. The table below summarizes the combined benefits from the above control measures by jurisdiction.

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 VOC Reductions	1.50	17.77	17.69	36.96
2009 VOC Reductions	1.78	20.53	20.19	42.50

	NOx Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 NOx Reductions	1.62	6.01	6.60	14.23
2009 NOx Reductions	2.03	7.38	8.09	17.50

6.3.1 Phase I and Phase II Emissions Standards for Gasoline-Powered Non-Road Utility Engines (federal rule)

This measure takes credit for VOC emissions reductions attributable to emissions standards promulgated by the EPA for small non-road, spark-ignition (i.e., gasoline-powered) utility engines, as authorized under 42 U.S.C. §7547. The measure affects gasoline-powered (or other spark-ignition) lawn and garden equipment, construction equipment, chain saws, and other such utility equipment as chippers and stump grinders, wood splitters, etc., rated at or below 19 kilowatts (an equivalent of 25 or fewer horsepower). Phase 2 of the rule applied further controls on handheld and non-handheld outdoor equipment.

Control Strategy

Federal emissions standards promulgated under §7547 (a) apply to spark-ignition non-road utility engines. The EPA's Phase 1 Spark Ignition Nonroad final rule on such emissions standards was published in 60 *Federal Register 34581* (July 3, 1995), and was effective beginning August 2, 1995. Compliance was required by the 1997 model year. The Phase 2 final rule for handheld nonroad equipment was published in 65 *Federal Register* 24267 (April 25, 2000). The Phase 2 final rule for non-handheld equipment was published in 64 *Federal Register* 15207 (March 30, 1999).

Implementation

This program is implemented by the EPA, under 42 U.S.C. §7547 (a).

References

EPA Guidance Memorandum, "Future Nonroad Emission Reduction Credits for Court-Ordered Nonroad Standards" from Emission Planning and Strategies Division, Memorandum from Phil Lorang, Director, Emission Planning and Strategies Division, November 28, 1994.

U.S. Environmental Protection Agency, "Emission Standards for New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts", Final Rule, 60 *Federal Register* 34581 (July 3, 1995).

U.S. Environmental Protection Agency, "Phase 2 Emission Standards for New Nonroad Spark-Ignition Nonhandheld Engines At or Below 19 Kilowatts", Final Rule, 64 *Federal Register* 15207, (March 30, 1999); correction published 64 *Federal Register* 36423 (July 6, 1999)

U.S. Environmental Protection Agency, "Phase 2 Emission Standards for New Nonroad Spark-Ignition Handheld Engines at or Below 19 Kilowatts", Final Rule, 65 Federal Register 24267 (April 25, 2000)

1990 Clean Air Act Amendments, 42 U.S.C. §7547 (a).

6.3.2 Emissions Standards for Diesel-Powered Non-Road Utility Engines of 50 or More Horsepower (federal rule)

This measure takes credit for NOx emissions reductions attributable to emissions standards promulgated by the EPA for non-road, compression-ignition (i.e., diesel-powered) utility engines, as authorized under 42 U.S.C. § 7547. The measure affects diesel-powered (or other compression-ignition) construction equipment, industrial equipment, etc., rated at or above 37 kilowatts (37 kilowatts is approximately equal to 50 horsepower).

Control Strategy

Federal emissions standards applicable to compression-ignition non-road utility engines are promulgated under §7547 (a).

EPA's first rule on such emissions standards was published in 59 Federal Register 31306 (June 17, 1994), and was effective on July 18, 1994.

Tier 2 and Tier 3 Emission Standards were promulgated in 1998. This program includes the first set of standards for nonroad diesel engines less than 37 kW (phasing in between 1999 and 2000), including marine engines in this size range. It also phases in more stringent "Tier 2" emission standards from 2001 to 2006 for all engine sizes and adds yet more stringent "Tier 3" standards for engines between 37 and 560 kW (50 and 750 hp) from 2006 to 2008.

EPA adopted a comprehensive national program to greatly reduce emissions from future nonroad diesel engines by integrating engine and fuel controls as a system to gain the greatest air quality benefits. This rule was published June 29, 2004. The requirement to reduce sulfur levels in nonroad diesel fuel by more than 99 percent will allow for the first time advanced emission control systems to be used on the engines used in construction, agricultural, industrial, and airport service equipment.

Implementation

This program is implemented by the EPA under 42 U.S.C. § 7547 (a).

References

1990 Clean Air Act Amendments, 42 U.S.C. §7547 (a).

U.S. Environmental Protection Agency, "Control of Emissions of Air Pollution from Nonroad Diesel Engines; Final Rule." 63 Federal Register 56967, October 23, 1998.

U.S. Environmental Protection Agency, "Control of Emissions of Air Pollution from Nonroad Diesel Engines and Fuel; Final Rule." 69 Federal Register Vol. 69, No. 124, June 29, 2004

EPA Guidance Memorandum, "Future Nonroad Emission Reduction Credits for Court-Ordered Nonroad Standards" from Emission Planning and Strategies Division, Memorandum from Phil Lorang, Director, Emission Planning and Strategies Division, November 28, 1994.

U.S. Environmental Protection Agency," Determination of Significance for Nonroad Sources and Emission Standards for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts", Final Rule, 59 *Federal Register* 31306 (June 17, 1994).

6.3.3 Emissions Standards for Spark Ignition Marine Engines (federal rule)

This EPA measure controls exhaust VOC emissions from new spark-ignition (SI) gasoline marine engines, including outboard engines, personal watercraft engines, and jet boat engines. Of nonroad sources studied by EPA, gasoline marine engines were found to be one of the largest contributors of hydrocarbon (HC) emissions (30% of the nationwide nonroad total).

Control Strategy

EPA is imposing emission standards for 2 – stroke technology, outboard and personal watercraft engines. This will involve increasingly stringent HC control over the course of a nine-year phase-in period beginning in model year 1998. By the end of the phase-in, each manufacturer must meet an HC and NOx emission standard that represents a 75% reduction in HC compared to unregulated levels. These standards do not apply to any currently owned engines or boats.

Implementation

This program is implemented by the EPA under 42 U.S.C. § 7547 (a).

References

1990 Clean Air Act Amendments, 42 U.S.C. §7547 (a).

U.S. Environmental Protection Agency, "Control of Air Pollution; Final Rule for New Gasoline Spark-Ignition Marine Engines; Exemptions for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts and New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts", 61 Federal Register 52087, October 4, 1996.

Regulatory Impact Analysis "Control of Air Pollution Emission Standards for New Nonroad Spark-Ignition Marine Engines", U.S. EPA, June 1996

6.3.4 Emissions Standards for Large Spark Ignition Engines (federal rule)

This EPA measure controls VOC and NOx emissions from several groups of previously unregulated nonroad engines, including large industrial spark-ignition engines.

Control Strategy

The EPA requirements vary depending upon the type of engine or vehicle, taking into account environmental impacts, usage rates, the need for high performance models, costs and other factors. The emission standards apply to all new engines sold in the United States and any imported engines manufactured after these standards began.

Controls on the category of large industrial spark-ignition engines were first required in 2004. Controls on the other engine categories began in years after 2005. Large industrial spark-ignition engines are those rated over 19 kW used in a variety of commercial applications; most use liquefied petroleum gas, with others operating on gasoline or natural gas.

EPA adopted two tiers of emission standards for Large SI engines. The first tier of standards, which started in 2004, are based on a simple laboratory measurement using steady-state procedures. The Tier 1 standards are the same as those adopted earlier by the California Air Resources Board for engines used in California. Tier 2 standards became effective in 2007.

Implementation

This program is implemented by the EPA under 42 U.S.C. § 7547 (a).

References

1990 Clean Air Act Amendments, 42 U.S.C. §7547 (a).

U.S. Environmental Protection Agency, "Control of Emissions From Nonroad Large Spark-Ignition Engines, and Recreational Engines (Marine and Land-Based)," Final Rule, 67 Federal Register 68241 (November 8, 2002).

U.S. Environmental Protection Agency, Final Regulatory Support Document: Control of Emissions from Unregulated Nonroad Engines," EPA420-R-02-022, September 2002.

6.3.5 Reformulated Gasoline Use in Non-Road Motor Vehicles and Equipment (state opt-in to federal rule)

This measure involves taking credit for reductions due to the use of federally reformulated gasoline in non-road mobile sources. The reformulated gasoline will be available as a result of Virginia's, Maryland's, and the District of Columbia's "opting-in" on delivery of reformulated gasoline in the Washington, D.C. ozone nonattainment area. Areas that opted-in on delivery of reformulated gasoline began receiving such gasoline beginning in 1995.

Source Types Affected

This measure affects the various non-road mobile sources that burn gasoline.

Control Strategy

Federal reformulated gasoline has been sold in the Washington, DC-MD-VA ozone nonattainment area since January 1, 1995.

Implementation

District of Columbia - Implemented by EPA via mayor's formal request to opt-in to federal program.
Maryland - Implemented by EPA via governor's formal request to opt-in to federal program.
Virginia - Implemented by EPA via governor's formal request to opt-in to federal program.

References

U.S. Environmental Protection Agency, "Regulation of Fuels and Fuel Additives: Standards for Reformulated Gasoline", Proposed Rule, 58 *Federal Register* 11722, February 26, 1993.

"VOC Emission Benefits for Non-Road Equipment with the Use of Federal Phase I Reformulated Gasoline", memorandum from Phil Lorang, U.S. EPA Office of Mobile Sources to Air Directors, EPA Regions 1-10, August 18, 1993.

6.3.6 Standards for Locomotives (federal rule)

This sets NOx standards for locomotive engines remanufactured and manufactured after 2001.

Source Type Affected

This program includes all locomotives originally manufactured from 2002 through 2004. It also applies to the remanufacture of all engines built since 1973. Regulation of the remanufacturing process is critical because locomotives are generally remanufactured 5 to 10 times during their total service lives, which are typically 40 years or more.

Control Strategy

Three separate sets of emissions standards have been adopted, with the applicability of the standards dependent on the date a locomotive is first manufactured. The first set of standards (Tier 0) applies to locomotives and locomotive engines originally manufactured from 1973 through 2001, any time they are manufactured or remanufactured. The second set of standards (Tier 1) apply to locomotives and locomotive engines originally manufactured from 2002 through 2004. These locomotives will be required to meet the Tier 1 standards at the time of manufacture and at each subsequent remanufacture. The final set of standards (Tier 2) apply to locomotives and locomotive engines originally manufactured in 2005 and later. Electric locomotives, historic steam-powered locomotives and locomotives manufactured before 1973 do not significantly contribute to the emissions problem and, therefore, are not included in the regulation.

Implementation

This program is implemented by the EPA under the *Final Emissions Standards for Locomotives* (EPA420-F-97-048) published in December 1997.

Projected Reductions

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2008 NOx Reductions	0.26	1.02	1.26	2.54
2009 NOx Reductions	0.27	1.09	1.37	2.73

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2008 VOC Reductions	0.01	0.02	0.02	0.05
2009 VOC Reductions	0.01	0.03	0.02	0.06

Note: NOx and VOC values are generated using the Area Source spreasheet but are presented in the overall nonroad sector totals.

Emission Benefit Calculations

Emission benefits are based on EPA guidance on emission factors for locomotives. In 2008, the reductions are 10.3% for VOC and 30.7% for NOx. In 2009, the reductions are 13.5% for VOC and 32.35% for NOx.

References

Regulatory Update, EPA's Nonroad Engine Emissions Control Programs, EPA, Air and Radiation, EPA420-F-99-001, January 1999.

Final Emissions Standards for Locomotives, EPA420-F-97-048, December 1997.

Emission Factors for Locomotives, EPA420-F-97-051, December 1997, Table 9.

6.4 ON-ROAD MEASURES

The following onroad emission reduction measures that are discussed in this section are calculated using the MOBILE6 emission factor model:

- Controls on Refueling Emissions and Reformulated Gasoline for On-road Applications, 6.4.1
- Enhanced I/M, 6.4.2
- Federal Tier 1 Vehicle Standards, 6.4.3
- National Low Emission Vehicle Standards, 6.4.4
- Federal Tier 2 Vehicle Standards, 6.4.5
- Heavy Duty Diesel Engine Rule, 6.4.6

Projected Reductions and Emission Benefit Calculations

Past SIP documents for the Washington region have presented the emission reductions from each of the above measures individually, and then summed the reductions to create a controlled on road inventory for each milestone year. MOBILE5b, the mobile emissions model used in previous SIPs, was designed to calculate the benefits of each of the above control measures individually. In the update to MOBILE6, changes were made to the model, creating synergistic effects between the six mobile control measures listed above. These effects do not lend themselves to isolating credit from one control program, and make it very difficult to calculate incremental benefits from implementation of individual control measures. As a result, this and future SIP revisions will not enumerate the benefits of individual mobile control measures, with the exception of the transportation control measures (TCMs) and vehicle technology, fuel, and maintenance-based measures, which are quantified outside of the MOBILE6 model. The table below summarizes the combined benefits from the above control measures by jurisdiction. See Appendix E for documentation of the MOBILE 6 modeling process.

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2008 VOC Reductions	0.52	2.70	2.97	6.19
2009 VOC Reductions	0.64	3.33	3.21	7.18

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total**
2008 NOx Reductions	2.11	14.66	12.90	29.67
2009 NOx Reductions	2.73	18.80	16.09	37.62

6.4.1 Phase II Volatility Controls of Refueling Emissions and Reformulated Gasoline Use in On-road Vehicles (federal regulation)

This measure takes credit for lower refueling emissions resulting from the effects of federally mandated reductions in gasoline volatility, as required under 42 U.S.C. §§7545 (h) and (k). The measure affects emissions from all gasoline vehicles. In 2005, the measure requires the use of federal reformulated gasoline in the Washington nonattainment area. This is accomplished through an opt-in to the federal program, which subsequently became mandatory as a result of designation as severe ozone nonattainment.

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

Source Type Affected

All gasoline-powered vehicles (non-road source benefits are documented under Section 6.4.2) are affected by this measure. Vehicle refueling emissions at service stations are also reduced.

Control Strategy

Federal reformulated gasoline has been sold in the Washington, DC-MD-VA ozone nonattainment area since January 1, 1995. The volatility reductions under §7545 (h) became effective in summer 1992. Further volatility reductions required under §7545 (k) are associated with the reformulated gasoline that began selling in the Washington nonattainment area on January 1, 1995.

Implementation

The volatility controls of refueling emissions program was implemented by the EPA under 42 U.S.C. §§7545 (h) and (k). Implementation of the RFG program occurs through a state "opt-in" process. The governors of Maryland and Virginia and the mayor of the District of Columbia have "opted in" for, and EPA has approved, delivery of reformulated gasoline in their respective portions of the Washington, DC-MD-VA ozone nonattainment area. Under Phase I of the RFG program, all gasoline sold in the nonattainment area on or after January 1, 1995, must be reformulated gasoline. Phase II of the RFG program became effective after January 1, 2000. The program became mandatory for the Washington region one year after designation as Severe nonattainment, which occurred on March 23, 2004.

References

1990 Clean Air Act Amendments, 42 U.S.C. §§7545 (h) and (k).

U.S. Environmental Protection Agency, Office of Mobile Sources, *User's Guide to MOBILE6.0*, Chapter 2, January 2002.

6.4.2 Enhanced Vehicle Emissions Inspection and Maintenance (Enhanced I/M) (federal regulation)

This measure involves requiring a regional vehicle emissions inspection and maintenance (I/M) program with requirements stricter than "basic" programs, as required under 42 U.S.C. § 7511a(c)(3) and 7521. Before 1994, "basic" automobile emissions testing checked only tailpipe emissions while idling and sometimes at 2,500 rpm. The new procedures include a dynamometer (treadmill) test checks the car's emissions under driving conditions. In addition, evaporative emissions and the on-board diagnostic computer are checked.

Source Type Affected

This measure affects light-duty gasoline vehicles and light-duty gasoline trucks.

Control Strategy

Maryland, the District of Columbia, and Virginia committed to EPA Performance Standard Enhanced I/M programs in the 15% VOC Emissions Reduction Plan. Each affected vehicle in the region is given a high-tech emissions test every two years. In Maryland and the District of Columbia, emissions tests are performed at test-only stations. Virginia tests vehicles in stations that may also perform repairs.

Implementation

District of Columbia - Department of Public Works, Dept. of Consumer and Regulatory Affairs
Maryland - Motor Vehicles Administration
Virginia - Department of Environmental Quality

Appendix E contains detailed information regarding implementation of I/M programs in the District, Maryland, and Virginia.

References

U.S. Environmental Protection Agency, "Inspection/ Maintenance Program Requirements," Final Rule, 57 *Federal Register* 52950 (November 5, 1992).

U.S. Environmental Protection Agency, "I/M Costs, Benefits, and Impacts Analysis," Draft, February 1992.

6.4.3 Federal "Tier I" New Vehicle Emission and New Federal Evaporative Emissions Standards (federal regulation)

Under 42 U.S.C. §7521, EPA issued a new and cleaner set of federal motor vehicle emission standards (Tier I standards), which were phased in beginning with model year 1994.

The benefits of this program are reflected in the baseline inventory.

Source Type Affected

These federally implemented programs affected light-duty vehicles and trucks.

Control Strategy

The Federal Motor Vehicle Control Program requires more stringent exhaust emission standards as well as a uniform level of evaporative emission controls, demonstrated through the new federal evaporative test procedures. Under 42 U.S.C. §7521(g), all post-1995 model year cars must achieve the Tier I (or Phase I) exhaust standards, which are as follows. Emissions are in grams per mile, and are related to durability timeframes of 5 yrs/50,000 miles and 10 yrs/100,000 miles.

Vehicle Type	*5 yrs/50,000 mi*			*10 yrs/100,000 mi*		
	VOCs	CO	NOx	VOCs	CO	NOx
Light-duty vehicles; light-duty trucks (loaded weight 3,750 lbs)	0.25	3.4	0.4*	0.31	4.2	0.6*
Light-duty trucks (loaded weight of 3,751 to 5,750 lbs)	0.32	4.4	0.7**	0.40	5.5	0.97

*For diesel-fueled light-duty vehicles and for LDTs at 3,750 lbs, before model year 2004, the applicable NOx standards shall be 1.0 at 5 yrs/50,000 mi and 1.25 at 10 yrs/100,000.
**This NOx standard does not apply to diesel-fueled trucks of 3,751 to 5,750 lbs.

Implementation
This program is implemented by the EPA under 42 U.S.C. §7521.

References

U.S. Environmental Protection Agency, Office of Mobile Sources, *User's Guide to MOBILE5*, Chapter 2, March 1993.

6.4.4 National Low Emission Vehicle Program (federal regulation)

Under the National Low-Emission Vehicle (LEV) program, auto manufacturers have agreed to comply with tailpipe standards that are more stringent than EPA can mandate prior to model year (MY) 2004. Once manufacturers committed to the program, the standards became enforceable in the same manner that other federal motor vehicle emissions control requirements are enforceable. The program went into effect throughout the Ozone Transport Region (OTR), including Maryland, Virginia, and the District of Columbia, in model year 1999 and was in place nationwide in model year 2001.

The benefits of this program are reflected in the baseline inventory. No additional reductions are calculated.

Source Type Affected

These federally implemented programs affect light-duty vehicles and trucks.

Control Strategy

The National Low Emission Vehicle Program requires more stringent exhaust emission standards than the Federal Motor Vehicle Control Program Tier I (or Phase I) exhaust standards.

Implementation

This program is implemented by the EPA, under 40 CFR Part 86 Subpart R. Nine states within the OTR, including the MWAQC states, have opted-in to the program as have all the auto manufacturers. EPA found the program to be in effect on March 2, 1998.

References

U.S. Environmental Protection Agency, Office of Mobile Sources, *User's Guide to MOBILE5*, Chapter 2, March 1993.

6.4.5 Tier 2 Motor Vehicle Emission Regulations (federal regulation)

The U.S. EPA promulgated a rule on February 10, 2000 requiring more stringent tailpipe emissions standards for all passenger vehicles, including sport utility vehicles (SUVs), minivans, vans and pick-up trucks. These regulations also require lower levels of sulfur in gasoline, which will ensure the effectiveness of low emission-control technologies in vehicles and reduce harmful air pollution.

Source Type Affected

These federally implemented programs affect light-duty vehicles and trucks.

Control Strategy

The new tailpipe and sulfur standards require passenger vehicles to be 77 to 95 percent cleaner than those built before the rule was promulgated and will reduce the sulfur content of gasoline by up to 90 percent. The new tailpipe standards are set at an average standard of 0.07 grams per mile for NOx for all classes of passenger vehicles beginning in 2004. This includes all light-duty trucks, as well as the largest SUVs. Vehicles weighing less than 6000 pounds will be phased-in to this standard between 2004 and 2007.

Beginning in 2004, the refiners and importers of gasoline have the flexibility to manufacture gasoline with a range of sulfur levels as long as all of their production is capped at 300 parts per million (ppm) and their annual corporate average sulfur levels are 120 ppm. In 2005, the refinery average was set at 30 ppm, with a corporate average of 90 ppm and a cap of 300 ppm. Finally, in 2006, refiners met a 30 ppm average sulfur level with a maximum cap of 80 ppm.

As newer, cleaner cars enter the national fleet, the new tailpipe standards will significantly reduce emissions of nitrogen oxides from vehicles by about 74 percent by 2030.

Implementation

EPA implements this program under 40 CFR Parts 80, 85, and 86.

References

U.S. Environmental Protection Agency, "Control of Air Pollution from New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements," Final Rule, 65 *Federal Register 6697,* February 10, 2000.

6.4.6 Heavy-Duty Diesel Engine Rule (federal regulation)

Under the Heavy-Duty Diesel Engine Rule, truck manufacturers must comply with more stringent tailpipe standards by 2004 and 2007. The standards are enforceable in the same manner that other federal motor vehicle emissions control requirements are enforceable.

Source Type Affected

These federally implemented programs affect heavy-duty diesel engines used in trucks.

Control Strategy

The Heavy-Duty Diesel Engine Rule requires more stringent exhaust emission standards.

Implementation

This program is implemented by the EPA, under 40 CFR Parts 9 and 86 Control of Emissions of Air Pollution From Highway Heavy-Duty Engines; Final Rule.

References

U.S. Environmental Protection Agency, Office of Mobile Sources, *User's Guide to MOBILE5*, Chapter 2, March 1993.

40 CFR Parts 9 and 86 Control of Emissions of Air Pollution from Highway Heavy-Duty Engines; Final Rule (62 FR 54694), October 21, 1997.

6.4.7 Transportation Control Measures (TCMs) and Vehicle Technology, Fuel, and Maintenance-based Measures (state and local program)

Section 108(f) of the Clean Air Act Amendments provides examples of Transportation Control Measures (TCMs) that can be implemented to reduce emissions from mobile sources. Most TCMs are designed to reduce vehicle miles traveled or vehicle trips or improve the flow of traffic.

In conjunction with state departments of transportation and local transit authorities, state air agencies have identified a number of projects designed to reduce vehicle travel and mitigate traffic congestion in the Metropolitan Washington nonattainment area. These measures include purchase of alternative-fueled vehicles, improvements to bicycle and pedestrian facilities, and improvements to transit services and access to transit facilities. All responsible agencies have committed to implementing these projects by January 1, 2005.

Additional information on TCMs is contained in Appendix F.

Source Type Affected
Transportation-related activities in the Metropolitan Washington nonattainment area

Implementation
District of Columbia – Department of Transportation
Maryland - Department of Transportation
Virginia - Department of Transportation
Washington Metropolitan Area Transit Authority
Northern Virginia Local Governments

Projected Reductions

Transportation Control Measures:

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total***
2008 VOC Reductions				
2009 VOC Reductions				

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total***
2008 NOx Reductions				
2009 NOx Reductions				

Vehicle Technology, Maintenance, or Fuel-Based Measures:

	VOC Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total***
2008 VOC Reductions				
2009 VOC Reductions				

	NOx Emission Reductions (tons per day)			
	District of Columbia	**Maryland**	**Virginia**	**Total***
2008 NOx Reductions				
2009 NOx Reductions				

Note: Emission reduction estimates were supplied by the District of Columbia Department of Transportation, the Maryland Department of Transportation, the Virginia Department of Transportation. See Appendix F for details.

6.5 Voluntary Bundle

In September 2004, EPA issued its policy on "Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP)."[2] This policy establishes criteria for EPA to approve credit under a SIP for emission reductions from voluntary and emerging measures. This policy permits states to develop and implement innovative programs that partner with local jurisdictions, businesses and private citizens to implement emission-reducing behaviors at the local level.

In August 2005, EPA issued a second guidance document to facilitate innovative control measures. This document was entitled "Guidance on Incorporating Bundled Measures in a State Implementation Plan."[3] The guidance supports the development of innovative measures by describing how States can develop individual voluntary and emerging measures and "bundle" them into a single SIP submission. The emissions reductions for each measure in the bundle are quantified but it is the performance of the entire bundle (the sum of the emission reductions from all the measures in the bundle) that is measured by EPA for SIP compliance purposes. The bundled measures policy takes into account the fact that some measures may perform less effectively than projected by allowing the State to average these measures with others that perform better than expected. Implementing agencies must implement the voluntary control measure, and states must monitor the measure for effectiveness and report the findings to EPA. If the estimated reductions are not achieved, states commit to take corrective action by either making changes to the existing program or developing a more effective control measure.

The SIP for the one-hour ozone standard included a bundle of voluntary measures, and all of the measures approved by EPA as part of the voluntary bundle for the one-hour standard are included in SIP for the eight-hour ozone standard. Some of these measures have been completed, and other commitments have been expanded. In addition, some commitments remain unchanged, and other new programs have been proposed.

One of the programs included in the SIP voluntary bundle for the one-hour ozone standard (Low-VOC Consumer Products in Virginia) has been adopted as a mandatory measure and therefore, it is no longer included as part of the voluntary bundle. With the exception of this measure, the voluntary bundle includes the total of emissions reductions associated with both the "on-the-books" voluntary measures as well as the expanded and new commitments proposed herein. All of the voluntary measures have been implemented after the 2002 SIP base year.

The bundled measures will reduce emissions daily through the ozone season in May through September. The measures will be implemented by county, city and state agencies in consultation with the District of Columbia, the State of Maryland or the Commonwealth of Virginia.

Some of the programs identified in the voluntary measures package for Rate of Progress will be fully implemented by May 1, 2008 – the beginning of the 2008 ozone season – even though most reductions will occur by January 2008, the date on which the region will achieve rate of

[2] See http://www.epa.gov/cleanenergy/stateandlocal/guidance.htm
[3] Ibid.

progress. Full implementation of all other measures will begin in 2009.

This voluntary measures package may be expanded in future SIPs as additional voluntary measures are developed and implemented. Many state agencies and local governments are currently developing programs that could, in the future, qualify as voluntary measures.

This section contains descriptions of the voluntary measures that are included in this SIP submission. A detailed estimate of the benefits resulting from each measure is contained in Appendix H. The information below summarizes the emission reductions for the entire voluntary bundle. Individual measures contained in the bundle are described on succeeding pages.

Source Type Affected

This bundle affects, on a voluntary basis, some owners, operators, purchasers or users of the following types of emissions-related items/equipment in the Metropolitan Washington area: commercial power generation, motor vehicles, school and transit buses, portable fuel containers, municipal buildings, urban forest trees, locomotives, solvents, and paints.

Implementation

Arlington County, Virginia
Calvert County, Maryland
City of Alexandria, Virginia
City of Falls Church, Virginia
City of Greenbelt, Maryland
Fairfax City, Virginia
Fairfax County, Virginia
Loudoun County, Virginia
Maryland Department of Transportation
Maryland National Capital Parks and Planning Commission
Montgomery County, Maryland
Prince George's County, Maryland
Prince William County, Virginia
Virginia Department of Environmental Quality
Washington Surburban Sanitary Commission, Maryland

Monitoring and Enforcement

The District of Columbia, the State of Maryland, and the Commonwealth of Virginia commit to monitoring, evaluation and reporting of the emissions effects of the programs comprising this voluntary measure. All governments and agencies that have committed to implementing voluntary measures have been informed of the monitoring and evaluation requirement and have agreed to provide monitoring information to the state air agencies.

The District of Columbia, Maryland, and Virginia will re-evaluate the emission benefits from this voluntary measures package through a "true-up" analysis to be conducted at least every three calendar years. As agreed in the one-hour ozone SIP, the first true-up is scheduled for March 2007. The next true-up will be completed by June 2010, three years from the submittal of this SIP revision. Should the re-evaluation program determine that the programs listed in this section have not delivered the estimated reductions, the states commit to remedy the resulting deficiency within one year if rulemaking is not required, or within two years if rulemaking is required. If the June 2010 true-up shows emissions benefits lower than expected, the states will remedy the deficiency by June 2011 if the remedy does not require rulemaking, or by June 2012 if rulemaking is required.

Projected Reductions

The District of Columbia, the State of Maryland, and the Commonwealth of Virginia have used available methods to create their best estimate of the emission benefits creased from the bundle of voluntary measures. These estimates have been agreed upon by the implementing agencies and are conservative in nature. The summary of the estimates and the methodology follows below. More detailed information about the methodologies is provided in Appendix H.

Table 6-8 Summary of Emission Reductions for Voluntary Bundle

	VOC Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 VOC Reductions	-	-	-	0.17
2009 VOC Reductions	-	-	-	0.17

	NOx Emission Reductions (tons per day)			
	District of Columbia	Maryland	Virginia	Total
2008 NOx Reductions	-	-	-	0.2
2009 NOx Reductions	-	-	-	0.2

Point Source Strategies

Renewable Energy and Energy Efficiency

The following Energy Efficiency and Renewable Energy Measures are included as innovative voluntary control measures in the SIP.

- Renewable Energy Programs
  - Regional Wind Power Purchase Program
  - Clean Energy Rewards Program
  - DC Renewable Portfolio Standard
- Energy Efficiency Programs
  - LED Traffic Signal Retrofit Program
  - Building Energy Efficiency Programs
- Green Building Programs

Emission Reduction Calculations and Projected Reductions

In recent years, substantial progress has been made in the development of methodologies to quantify emission reduction benefits from energy efficiency and renewable energy (EERE) measures. Several methods have been used to calculate the benefits resulting from the displacement of fossil fuel generation in the dispatch order. The methodology outlined below was developed by Resource Systems Group, Inc. (RSG) in cooperation with Environmental Resources Trust (ERT).

The State of Maryland relied on an initial version of the RSG/ERT methodology in its regional wind purchase submission as part of the bundle of voluntary measures submitted to EPA in its one-hour ozone SIP. This SIP control measure was subsequently cited with approval by the EPA in its August 2004 "Guidance on State Implementation Plan (SIP) Credits for Emission Reductions from Electric-sector Energy Efficiency and Renewable Energy Measures."[4] EPA also approved the wind purchase as the first-ever renewable energy measure to receive NOx emissions reduction credit in a State Implementation Plan.[5]

An updated version of the RSG methodology has been subsequently used in three separate projects to estimate the displacement of emissions at fossil fuel fired power plants resulting from EERE measures in New Jersey, Connecticut, and Virginia. Most of this work has been supported by the U.S. Department of Energy.[6] The New Jersey work was conducted in

[4] See http://www.epa.gov/cleanenergy/stateandlocal/guidance.htm

[5] 70 Fed. Reg. 24988 (May 12, 2005).

[6] U.S Department of Energy, *Final Report on the Clean Energy/Air Quality Integration Initiative for the Mid-Atlantic Region*, August 2006. See http://www.eere.energy.gov/wip/clean_energy_initiative.html; Resource Systems Group, *Estimation of Avoided Emission Rates for Nitrogen Oxide Resulting from Renewable Electric Power Generation in the New England, New York and PJM Interconnection Power Market Areas, 2006*, Prepared under grant funding from the U.S. Department of Energy and under subcontract to Environmental Resources Trust and Connecticut Smart Power; Resource Systems Group, *Avoided Emissions at Three Proposed Wind Power Projects in Virginia*, 2006, Prepared under grant funding from the U.S. DOE's Clean Energy/Air Quality Integration Initiative.

cooperation with the U.S. Environmental Protection Agency and the National Renewable Energy Laboratory.

Each state plans to include provisions in their NOx Ozone Season emissions trading program that will set aside a portion of the state's total NOx allowance budget to support renewable energy and energy efficiency projects. Each state will assure that NOx allowances are retired in an amount commensurate with the size of the six EERE measures cited below to ensure surplus emission reductions.

The SIP measures will be structured to take into account the differences in the NOx emissions trading regulations of Maryland, the District of Columbia, and Virginia. Maryland's NOx SIP Call regulations authorize the allocation of NOx allowances to support EERE projects and purchases but the NOx SIP Call regulations for the District of Columbia and Virginia do not provide such authority. Thus, emission reductions from EERE projects will not be claimed for Virginia government entities in 2007 and 2008.

However, in 2009, NOx emissions trading for electric generating units in all three states will be governed by the Clean Air Interstate Rule (CAIR), and all three states plan to include provisions in their CAIR setting aside a portion of allowances to support EERE projects and purchases. The Virginia regulation is expected to be adopted in December 2006, and Maryland and District of Columbia plan to adopt their regulations by the end of April 2007. As a result, surplus emission reductions from all three jurisdictions can be claimed for 2009.

Table 6-9. Summary of Benefits EERE Programs

Measure	Daily kWh Generation /Savings	NOx Emission Reduction (tpd)
Renewable Energy Programs		
Regional Wind Power Purchase Program	142,501,601	0.10
Clean Energy Rewards Program	up to 31,900,000	-
Renewable Portfolio Standard	22,500,000	0.03
Energy Efficiency Programs		
LED Traffic Signal Retrofit Program	[pending]	-
Building Energy Efficiency Programs	~15,000,000	~0.01
Green Building Programs	-	-
TOTAL	165,000,000	0.13

Note: Total does not include the Clean Energy Rewards or the Building Energy Efficiency Programs.

Regional Wind Power Purchase Program

Under this measure, local and State government entities in the nonattainment area have committed to purchase a specific number of kilowatt-hours (kWh) of power per ozone season day from wind turbines. The government agencies will purchase the wind energy directly from an electricity supplier or purchase renewable energy certificates (RECs)[7] that assure that such

[7] Renewable energy certificates represent the unique and exclusive proof that 1 Megawatt-hour of energy was generated from a renewable energy source and placed on the electric grid.

wind energy is placed on the electric grid. This zero-emission wind power will displace emissions from fossil fuel-fired power plants that would normally supply power to the Metropolitan Washington region. The air agencies in Maryland, the District of Columbia, and Virginia will retire NOx allowances in an amount commensurate with the amount of emissions displaced.

Source Type Affected

The measure affects certain local and State government entities within the Metropolitan Washington nonattainment area. The region is implementing this measure to reduce electric power generation from coal, oil, and/or gas-fired sources, thereby reducing NOx emissions from these sources.

Control Strategy

This measure is envisioned as a region-wide measure encompassing wind power purchases by state and local government entities within the Metropolitan Washington nonattainment area.

This program was initiated on a pilot basis in the one-hour ozone SIP and is being expanded here. To meet the existing commitments from the one-hour ozone SIP, local governments signed long-term commitments with wind power suppliers to assure that a fixed quantity of wind energy would be placed on the electric grid in upwind States. These purchases have displaced fossil fuel generated power, thus reducing the NOx emitted from those plants.

Implementation

Arlington County, Virginia
Fairfax County, Virginia
Prince William County, Virginia
Montgomery County, Maryland
Members of the Montgomery County buying group (see list below)
Prince George's County
Washington Suburban Sanitary Commission (WSSC)
District of Columbia

In Fiscal Year (FY) 2005 to 2006, a buying group led by Montgomery County, Maryland purchased 40,845,139 kWh of wind energy RECs per fiscal year. Montgomery County executed a contract amendment on September 18, 2006 to purchase additional kWhs of clean, renewable energy in compliance with SIP requirements (RECs for energy generated at the Mountaineer Wind Energy Center in West Virginia) for FY07 and FY08, June 2006-July 2008. The total County Government purchase of wind power RECs equals 17,175,666 kWh, or 10% of the County Government's annual electricity consumption. Many other members of the buying group opted to increase their wind energy purchase to 10% as well, for a total of 51,809,091 kWh purchased by the group in FY07, and 46,765,420 kWh in FY08. Credit for 28,000,000 kWH was taken in the one-hour ozone SIP, so the kWHs available for credit in the 8-hour SIP amount to

23,809,091 kWhs in FY07 and 18,765,420 kWhs in FY08. The purchase will cover the period 2007 and 2008. The fiscal year runs from July to June.

The following other counties, cities, and state agencies will participate in the Montgomery County buying group:

Montgomery County Public Schools (MCPS)
Montgomery County Government
Maryland National Capital Park and Planning Commissions (M-NCPPC)
Montgomery College
Housing Opportunities Commission (HOC)
City of Rockville
Gaithersburg
Takoma Park
College Park
Rockville Housing Enterprise
Town of Kensington
Chevy Chase Village
Somerset
Glenn Echo
Chevy Chase Sect. 5
Town of Laytonsville

The Virginia Energy Purchasing Governmental Authority (VEPGA) is issuing an RFP in 2007 to select a supplier of wind energy or wind energy RECs in the amount of at least 8.14 MWh/year. The RFP will cover the period 2007-2009. The following other counties, cities, and state agencies will participate in this buying group: Fairfax County, Arlington County, and Prince William County.

The District of Columbia plans to purchase 16,500 kwh/year from wind energy or wind energy RECs. There is the possibility that this purchase can be used by utilities to meet RPS requirements so is not analyzed further here.

All three RFPs will include:

- A requirement that the wind energy purchase be made from wind facilities in the PJM Interconnection grid upwind of the Washington Metropolitan area. Based on ozone transport data contained in the preamble to the EPA's CAIR, purchases from wind plants in Maryland, Virginia, Pennsylvania, West Virginia, or Ohio will qualify for purchase under the RFPs.
- A reporting requirement indicating actual amount of wind energy in kWh purchased during the ozone season and per year.

Monitoring and Enforcement

Each State will provide evidence that it has assured the retirement of the designated amount of

NOx allowances from future use under its renewable energy set-aside. In addition, all jurisdictions and agencies participating in the regional wind power purchase program have committed to maintain copies of signed contracts and energy bills to verify the amount of wind energy purchased. They also will purchase wind energy from a certified supplier who can provide independent certification that the wind energy purchased is placed on the electric grid. This evidence will help to validate the emission reduction credit included in the SIP.

Projected Reductions

Beyond the existing commitments in the one-hour ozone SIP, this program is expected to purchase 142,501,601 kWh of power annually, reducing 0.1 tpd NOx during the ozone season. Further information on the projected reductions is included in Appendix H.

Table 6-10. Summary of Benefits of Regional Wind Power Purchase

Wind Power Purchases	Generation kWh/year	Ozone Season NOx Reduction (tpd)
Montgomery County, MD	57,000,000	
Prince George's County, MD	7,611,601	
WSSC	70,000,000	
Arlington County, VA	1,340,000	
Fairfax County, VA	5,800,000	
Prince William County, VA	750,000	
Total	142,501,601	0.10

The emission factors used for this analysis are discussed in Appendix H.

Clean Energy Rewards Program

Under this measure, Montgomery County Government will provide rewards (incentives) to residents, small businesses, and community organizations purchasing clean energy products certified by the Department of Environmental Protection (DEP). The authority for this program is granted in the Montgomery County Code Section 18A-11, as amended, and Executive Regulation No. 2-06AM. Based on the program's funding of $361,000 for FY 2007, Montgomery County has estimated that its Clean Energy Rewards Program will provide incentives for 31,900 MWh of clean energy.

Source Type Affected

The measure affects Montgomery County residents, small businesses, congregations, and non-profits, and is supported by Montgomery County Government, within the Metropolitan Washington nonattainment area. Montgomery County is implementing this measure to reduce consumers' consumption of electric power generated from coal, oil, and/or gas fired sources, thereby reducing NOx emissions from these sources.

Control Strategy

Clean Energy Rewards is a unique program developed by Montgomery County to encourage consumers to switch to clean energy. Consumers must purchase at least 50% of their annual energy consumption from a clean energy product certified by the Department of Environmental Protection (DEP) to be eligible for rewards.

Under the program, eligible clean energy products must be generated within the PJM Regional Transmission Organization (RTO) from solar, wind, and/or Tier 1 biomass as defined by the Maryland Code, Public Utility Company Article, 7-703 (Maryland's RPS). However, current products for FY 2007 are limited to energy generated from wind and solar sources, and Montgomery County believes that the majority of certified clean energy products will be wind-based in 2007.

Participating suppliers must provide documentation to DEP's Director verifying that all products marketed through Clean Energy Rewards meet the program's criteria. [Montgomery County needs to define Tier 1 biomass. If, as suspected Tier 1 biomass includes generation from landfill gas or other similar sources, then Montgomery County should estimate the percentage of Tier 1 biomass versus wind and solar generation expected to be purchased under its Rewards Program. Because of the difficulty of estimating net NOx emission reductions, only purchases from solar or wind should count.] These steps ensure the clean energy is generated within the PJM region and is not used to meet the requirements of the Maryland Renewable Energy Portfolio Standard or is otherwise double counted.

Implementation

Montgomery County Government. The Department of Environmental Protection solicited support from several energy suppliers and REC marketers for this program. Potential suppliers are required to submit product information labels or other generation data about each product to be marketed through the program, and sign a Memorandum of Understanding with the County agreeing to deliver the rewards to consumers either as a credit on their bill, or as a product discount. Montgomery County residents will receive 1 cent/kWh up to 20,000 kWh per year. Non-residential end-users (small business, congregations, and non-profits) will receive 1.5 cents/kWh up to 100,000 kWh per year. The Clean Energy Rewards certified energy suppliers, for the remainder of fiscal year 2007, are Pepco Energy Services and Washington Gas Energy Service; and the two renewable energy certificate (REC) marketers are Clean Currents and WindCurrent. Additional suppliers and REC marketers may enroll for fiscal year 2008.

DEP is the main marketing arm of the Clean Energy Rewards Program. However, program suppliers also are encouraged to market the product and the program to Montgomery County consumers with DEP guidance to insure consistency. DEP has developed a web site and educational materials to inform consumers about the program and the benefits of clean energy. The County is running an advertising campaign in Montgomery County Metro stations and in the *Montgomery County Extra* section of *The Washington Post*; and is meeting with and promoting the program through community organizations and other Montgomery County support structures. DEP anticipates that these marketing measures will reach thousands of Montgomery County electric consumers.

Consumers can sign-up for clean energy products through DEP's web site starting November 15, 2006, and will begin receiving the products and accruing rewards starting January 1, 2007.

Monitoring and Enforcement

DEP is requiring suppliers to submit reports identifying the consumers participating in the Clean Energy Rewards Program, the amount of eligible clean energy consumed through the program by resource type [Important for the SIP for the County to require information on purchases by resource type], and additional product verification data. Customer lists and energy consumption will be submitted to DEP on a quarterly basis. This information will be used to determine the funds to reimburse energy suppliers for rewards paid.

By March of 2008 and each following year, DEP will receive reports from energy suppliers verifying the energy reserved for the program and the generation sources. Participating suppliers must provide documentation to DEP's Director verifying that all products marketed through Clean Energy Rewards meet the program's criteria. Additionally, suppliers are required to reserve electricity in an account under the PJM Generation Attribute Tracking System (GATS) using the identifier "(ENV)" and designate it as "Montgomery County Clean Energy Rewards." Once electricity is reserved in this account, it cannot be used to meet RPS requirements or otherwise sold. These steps ensure that the clean energy is generated within the regional airshed and is not used to meet the RPS requirements or is otherwise double counted. The details of these submissions will allow Montgomery County to verify the amount of zero-emission NOx

clean energy generated within Maryland and adjacent states on an annual basis.

Since this is a new program, it is impossible to estimate with certainty the exact volume of clean energy that will be purchased by Montgomery County consumers. However, given the funding appropriated, the County Council's support, and the Clean Energy Products Certified in FY2007 this program is likely to be well subscribed. Moreover, under the EERE set-aside in the Maryland NOx emission trading regulations, in the future NOx allowances also will be retired commensurate with the amount of avoided emissions.

Renewable Portfolio Standards

This measure will focus on NOx emission reductions resulting from the displacement of power generation from coal, oil, and/or gas-fired sources by zero-emission renewable energy sources. The District of Columbia Department of the Environment will retire NOx allowances in an amount commensurate with the amount of emissions displaced.

Source Type Affected

The measure affects the District of Columbia within the Metropolitan Washington nonattainment area. According to the DC Renewable Energy Portfolio Standard (RPS) Act of 2004, a major purpose of the Act is to "ensure that the benefits of electricity from renewable energy sources, including long-term reduced emissions…accrue to the public at large."

Control Strategy

Under the DC RPS Act, retail electricity suppliers are required to meet their regulatory requirements by supplying renewable energy that is located: (A) in the PJM Interconnection region or in a state that is adjacent to the PJM Interconnection region; or (B) outside the area described in (A) but in a control area that is adjacent to the PJM Interconnection region, if the electricity is delivered into the PJM Interconnection region.

The increased supply of renewable energy will displace fossil fuel generated power in the PJM Interconnection area, thus reducing the NOx emitted from these upwind plants.

The District of Columbia plans to include provisions in its NOx Ozone Season Trading Program under the Clean Air Interstate Rule setting aside a portion of the District's total NOx allowance budget to support renewable energy and energy efficiency projects. The District will assure that NOx allowances will be retired in an amount commensurate with the NOx emissions reduced as a result of the tier one zero-emission renewable energy purchases. This retirement of allowances will ensure that surplus emission reductions will be provided. Since the CAIR program for electric generating units is not effective until 2009, credit for NOx emission reductions will not be claimed until 2009.

Implementation

District of Columbia. Under the DC RPS Act, retail electricity suppliers serving customers in the District of Columbia are required to provide 2.5% of their supply from tier one renewable energy sources in 2009, including 0.019% from solar energy. This renewable energy percentage increases each year to a level of 11% in 2022 and later. Tier 1 renewable sources are defined to include: (1) zero-emission renewable energy sources, including solar energy, wind energy, geothermal energy, and ocean energy; and (2) low-emission renewable energy, including qualifying biomass, qualified methane from anaerobic decomposition, and fuel cells.

Monitoring and Enforcement

The District of Columbia will provide evidence that it has assured the retirement of the designated amount of NOx allowances from future use under its renewable energy set-aside. In addition, the District of Columbia Department of the Environment has committed to obtain information from the DC Public Service Commission confirming that electricity suppliers have made purchases of renewable energy consistent with the commitments incorporated in this control measure.

Calculation of Emission Reduction Benefits

The calculation of NOx emission reductions for 2009 involves the following steps:

(1) Estimate total retail sales of electricity in DC for the summer ozone season in 2009;
(2) Estimate the amount of Megawatt-hours supplied from zero-emission Tier 1 renewable resources in the summer ozone season for 2009 (based on the requirements of the DC RPS Act and estimates by the DC Department of the Environment);
(3) Calculate avoided NOx emissions in lbs/MWh during the summer ozone season based on an estimate of actual avoided NOx emissions and the calculation of NOx allowances retired; and
(4) Calculate avoided NOx emissions in tons/day during the summer ozone season.

Tier 1 renewable purchases must be 2.5% of the total electricity consumption. The total annual consumption of electricity in the District of Columbia is 12,354,981.11 MWh. Wind energy represents an estimated 6.56% of the Tier 1 requirement. Solar energy must provide 0.019% of total electricity consumption. Electricity generated from landfill gas is not considered in the analysis. The emissions calculator was used to estimate the avoided NOx emissions.

Table 6-11 Projected Annual Generation and Avoided Emissions from the DC RPS Tier 1 Sources

DC RPS Tier 1 Category	MWh Annual Generation	NOx Emissions Avoided (tpd)
Wind	20,262	0.025
Solar PV	2,347	0.007

Green Building Programs
Under this program, local governments in the non-attainment area have committed to reducing energy demand associated with operation of existing and new buildings by implementing Green Building Programs. Depending on the energy efficiency and renewable energy components of these programs, they will decrease demand for electricity and displace power generation from coal, oil, and/or gas-fired sources that would normally supply power to the Metropolitan Washington region, thereby reducing NOx emissions from those sources.

Source Type Affected
The measure affects state and local governments within the Metropolitan Washington nonattainment area.

Control Strategy
This measure is envisioned as a region-wide measure encompassing green building programs by state and local governments within the Metropolitan Washington nonattainment area. These programs are in the early stages of development and affect several local jurisdictions in the nonattainment area. Local governments have begun to implement a variety of Green Building Programs that may reduce demand for electricity. The reduction in energy demand will displace fossil fuel generated power, thus reducing the NOx emitted from those plants.

Green Building Programs can include a number of initiatives such as certification under the Leadership in Environmental and Energy Design (LEED) Program, labeling under the ENERGY STAR program, Green Globes rating, and green building codes. In order to provide air quality benefits, any program must include as a key component a requirement that retrofitted or new buildings achieve a reduction in energy demand compared to an established baseline.

Each state in the nonattainment area plans to include provisions in its NOx Ozone Season emissions trading regulations that set aside a percentage of the state's total NOx allowance budget to support energy efficiency and renewable energy (EERE) projects. If energy efficiency from Green Buildings Programs were quantified with sufficient certainty to obtain set-aside allowances, then the state could assure that NOx allowances from those set-asides will be retired in an amount commensurate with the size of the actual emission reductions.

The SIP measure will be structured to take into account the differences in the NOx emissions trading regulations of Maryland, the District of Columbia, and Virginia. Maryland's NOx SIP Call regulations currently authorize the allocation of NOx allowances to support EERE projects but the NOx SIP Call regulations for the District of Columbia and Virginia do not provide such authority. Thus, emission reductions from Green Building Programs could be claimed only for Maryland government entities in 2007 and 2008.

However, in 2009, NOx emissions trading for electric generating units in all three jurisdictions will be governed by the Clean Air Interstate Rule (CAIR), and all three jurisdictions plan to include provisions in their CAIR setting aside a portion of total allowances to support EERE projects. The Virginia regulation is expected to be adopted in December 2006, and Maryland and the District of Columbia plan to adopt their regulations by the end of April 2007. The relevant jurisdictions plan to obtain NOx allowance allocation under their new regulations and to

retire such allowances. As a result, surplus emission reductions from all three jurisdictions can be claimed for 2009.

Implementation

As local governments are developing their Green Building Programs, careful consideration must be given to specific EERE requirements if they wish to quantify the effects that these programs may have on electric load and associated power plant emissions. This section identifies the current status of Green Building Programs listed for the SIP, examines what uses or adaptations of major green building rating systems could be made to quantify emissions effects in a SIP context, and summarizes major green buildings efforts to date within the nonattainment area.

Current Status of Green Building Programs for the SIP

The following table lists the initial survey responses for Green Building programs in the nonattainment area that the jurisdictions indicated they would like to include as voluntary measures, for SIP purposes. None of the jurisdictions intend to quantify the listed Green Buildings program elements for 2009 emission reductions for the 8-hour Ozone SIP.

Table 6-12. Summary of Voluntary Measures Initial Survey Responses Regarding Green Building Programs (2002-2009, Washington, DC-MD-VA Ozone Nonattainment Area)

Jurisdiction	Program Element
Fairfax County	LEED goal for recreation center
Arlington County	LEED scorecard for projects; developer incentives
Montgomery County	Possible Green Building ordinance
District of Columbia	Planning for LEED requirements for all govt buildings
City of Alexandria	LEED silver goal for all govt buildings
City of Alexandria	Require plan for voluntary LEED for private sector
City of Greenbelt	LEED silver for public works building

Additional green building activities of the local governments in the nonattainment area are further described in the section below on "Green Building Activities in the Nonattainment Area."

For these green building programs to produce quantifiable electric load and emission reduction results, more specific program requirements will be necessary. Green building program rating systems are a good framework for discussing how these specific program requirements could be designed.

Green Building Program Rating Systems

Popular green building program rating systems are LEED certification, Energy Star Building label, and Green Globes.

LEED. LEED® is a nationally accepted benchmark for the design, construction, and operation of high performance green buildings established by the U.S. Green Building Council (USGBC). LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings,

energy efficiency, materials selection, and indoor environmental quality. Specific LEED programs include:

- New Commercial Construction and Major Renovation projects (known as LEED-NC and is the most widely applied)
- Existing Building Operations and Maintenance (known as LEED-EB)
- Commercial Interiors projects
- Core and Shell Development projects
- Homes (pilot program)
- Neighborhood Development (pre-pilot program)
- Guidelines for Multiple and On-Campus Building Projects; Schools; Retail for New Construction and Commercial Interiors; Healthcare; and Laboratories.

To earn LEED certification, a building project must meet certain prerequisites and performance benchmarks or "credits" within each category. Projects are awarded Certified, Silver, Gold, or Platinum certification depending on the number of credits they achieve.

As the documentation required for LEED certification is substantial, it is common for organizations to require “LEED-equivalent” building performance levels to avoid the administrative cost of certification. However, without the certification documentation, performance can be difficult to verify.

LEED-NC has 14 out of a total of 69 credits that impact building energy and corresponding power generation emissions. Several buildings have successfully certified for LEED Silver without earning any of those building energy credits. Therefore, it is important to design MWCOG Green Buildings programs to require a reduction in energy consumption in addition to the LEED certification level.

Also, LEED-NC energy performance is based on the simulated design of the building, which once constructed and occupied may or may not operationally achieve the certified energy performance levels as predicted. The building design simulation is typically conducted on an hourly calculation basis, and these calculation models and results could be used to derive ozone season energy savings. The intention of the USGBC is that building projects certified under the LEED-NC rating system subsequently re-certify under LEED-EB with actual building energy performance data.

Energy Star. ENERGY STAR ® Label for Buildings is provided by the U. S. Environmental Protection Agency (EPA) to benchmark the energy performance of commercial buildings. A building with performance scored among the nation's top 25 percent – equal to an energy performance score of 75 or greater on a 1 to 100 scale – and that maintains a healthy and productive indoor environment can qualify as an ENERGY STAR building. The score accounts for the most significant drivers of energy intensity such as weather (based on location information) and building characteristics (such as size). Currently there are twelve eligible building space types. The score is based on annual energy intensity, normalized in units of kBtu/ft2-yr, and 12-months of operation with energy utility bills are required. The Statement of Energy Performance automatically includes a calculation of power generation CO_2 emissions (as

determined by the EPA) based on the annual site energy use in that location.

The LEED-EB rating system awards energy performance credits based on the Energy Star rating score.

As achieving the Energy Star building label may require improvements to the building to reduce annual energy usage (and increase the score), the corresponding power generation emission reductions could be quantified and counted. The Energy Star rating tool already automatically calculates annual CO_2 emissions reductions corresponding to the energy consumption reduction. However, more detailed information would have to be recorded to account for the seasonal, daily or hourly emission reductions occurring during the nonattainment period.

Green Globes. Another green building rating program has been developed by the Green Building Initiative™ and is known as The Green Globes™ environmental assessment and rating system. Green Globes is questionnaire-driven for new building construction projects. At each stage of the design process, users go through a sequence of questions that provide guidance for integrating important elements of sustainability. The construction documents questionnaire is the basis for the rating and seven areas are addressed: Project Management – Policies and Practices; Site; Energy; Water; Resources, Building Materials and Solid Waste; Emissions and Effluents; and Indoor Environment. The building energy points are awarded based on the Energy Star rating score as determined by the Target Finder tool. The emissions points address fossil-fuel heating equipment and operation. Once an assessment is verified by a third party, building properties achieving a score of 35% or more receive a Green Globes rating (one to four globes) based on the percentage of total points (up to 1000) achieved.

Green Building Activities in the Nonattainment Area

This section identifies green buildings activities in the jurisdictions, LEED-certified buildings in the nonattainment area, and discusses Federal green buildings.

Jurisdiction Activities. Many of the jurisdictions are undertaking green buildings activities. These have not necessarily been identified for inclusion in the SIP at this time. NREL compiled this information from the Internet and personal communications.

Metropolitan Washington Council of Governments (COG). In June 2006, COG Board Chair Jay Fisette announced a goal of promoting Green Building policies and practices in the Washington region. This effort supports the COG Board's focus on growth and development, and provides environmental and energy friendly methods for supporting sustainable development in the region, consistent with COG's Strategic Energy Plan. On September 29th, COG's "Regional Leadership Conference on Green Building" was held with over 300 attendees from the public and private sectors. The conference focused on a review of local and national Green Building best management practices, policies, regulations and legislation. In addition, several COG members have adopted or will soon adopt legislation encouraging or requiring Green Building practices for government and/or private sector construction. The COG Board adopted resolution R55-06 at the November 8, 2006 COG Board Meeting, which supports the development of regional Green Building policies and best practice guidelines, establishes a special ad hoc elected official advisory committee, and adopts the existing Intergovernmental Green Building Group (IGBG) as a COG technical committee.

The 2006 Regional Energy Strategic Plan - "Powered by Energy Efficiency – Fueled by Energy Conservation," outlines an energy vision and mission for the National Capital Region and expands existing regional energy and environmental goals. The Energy Strategic Plan also identifies potential initiatives to address the region's diversity of energy sources, help manage energy demand, mitigate the effects of energy disruption and enhance overall environmental quality. Development of the Plan was identified by the COG Board of Directors as a 2006 priority. In addition, the Plan is consistent with and complements the proposed Green Building Program. The Plan was submitted to member governments in June 2006 for a 90-day comment period. The COG Board approved the revised version of the Energy Strategic Plan by adopting resolution R56-06 at the COG Board Meeting on November 8, 2006.

Washington, D.C. The DC Council enacted green building legislation applicable to private development. The legislation, which is expected to be approved by the U.S. Congress, would make Washington the first major city to require private developers to adhere to the standards of the USGBC. Even before the legislation, the district was already on track to open the nation's first LEED-certified stadium.

The bill, passed December 5, 2006, would require all commercial development of 50,000 square feet or more to meet the building council's standards starting in 2012. The requirement applies to both new construction and significant renovations of old buildings.

All city-owned commercial projects funded in 2008 or later would have to attain certification, and district-funded housing projects would be required to follow similar environmental

standards. The bill also orders the mayor to adopt separate standards for schools, which the USGBC is now developing.

Montgomery County. On November 28, 2006, the Montgomery County Council unanimously enacted "Green Building" requirements for future public and private construction in Montgomery County, the strongest "Green Building" requirements in the region.

The legislation requires that County-built or funded non-residential buildings achieve a LEED Silver rating and requires private non-residential or multi-family residential buildings to achieve a LEED Certified rating.

Buildings covered by the law include any newly constructed or extensively modified non-residential or multi-family residential building with at least 10,000 square feet of gross floor area. The law would take effect for private buildings one year after the County implementing regulations are finalized, but not later than September 1, 2008. Many of the details on the rating system (LEED NC, EB) and what is equivalent will be left to executive regulation which is expected by to be developed by July of 2007.

As written the bill does not have a defined mandatory energy-efficiency component beyond the prerequisites of the LEED rating system, and the Montgomery County energy code IECC 2003 (IECC 2006 is expected to be adopted in the spring of 2007) which is more aggressive than most of the neighboring jurisdictions.

Arlington County. Arlington County's green building program is a leading municipal program in the region and has been developed in the context of the County's commitment to smart growth and community sustainability. County policy encourages all large commercial and multi-family residential projects to incorporate LEED components of 25 or more credits on a voluntary basis. Arlington's Green Building Incentive Program allows developers to apply for bonus density in exchange for official LEED certification. Projects may apply for a bonus density of 0.15 to 0.35 additional floor-to-area ratio (FAR). Developers who choose to participate in the density bonus and commit to LEED certification post a bond that is released when the building is certified. Site plan projects that do not receive official LEED certification from the USGBC are asked to contribute $0.03 per square foot to the County's Green Building Fund. This money is used to fund green building education and workshops.

A few buildings have gone through the County's green building incentive program, including the new Navy League building, the National Rural Electric Cooperative Association building, and a private multifamily building currently under construction. Examples of the County's own green buildings include Langston Brown School and the Walter Reed Community Center.

Fairfax County. Fairfax County is expanding activities in support of environmentally sustainable development, which include incorporating more sustainable building practices. The County has focused its green building efforts in two areas: the greening of public buildings, and policy for private development. Of 20 municipal buildings recently built in the County, 18 have LEED elements, with many moving toward certification. The County is in the process of reviewing the Comprehensive Plan, its key guidance document, and is developing broad language supporting

green building.

City of Alexandria. The City of Alexandria initiated a green building policy four years ago and adopted a LEED standard for all public buildings in 2003-4. Project staff review the LEED checklist to see what they can do within their existing budgets, and then make the decision whether to fully certify. They currently target a 3.5 percent premium for projects in order to meet the LEED silver standard. One percent is reserved for green construction costs. Alexandria also passed legislation in July 2006 to allow a design-build process for projects. Green building will be integrated into that process.

LEED Certified and Registered Buildings. At least 46 building projects of the nonattainment area jurisdictions are registered for LEED, and one LEED certified building is currently listed on the USGBC website:

> Langston-Brown High School Continuation & Community Center
> LEED® Project # 0172
> LEED Version 2 Certification Level: SILVER
> September 3, 2003
> Arlington Public Schools, Arlington County
> Arlington, VA
> http://www.usgbc.org/ShowFile.aspx?DocumentID=425
> This project was awarded 1 credit for 15% reduction in the energy cost budget.

Energy Star Buildings Label. There are over 300 Energy Star labeled buildings in Maryland, Virginia and Washington, D.C., but none are owned by the MWCOG government organizations. Many of the jurisdictions are signed-up as Energy Star Partners committed to improving their energy efficiency. These local government partners currently include:

Alexandria Public Schools
Arlington County
Commonwealth of Virginia
Fairfax County Government
Fairfax County Public Schools (Special Recognition in 2004)
Loudon County Public Schools
Prince William County
City of Washington, DC (and DC Energy Office)
Washington DC Public Schools
Charles County Public Schools
City of Takoma Park
Montgomery County

Federal Green Buildings. Legislation and federal mandates provide an example of setting guidelines for sustainable buildings generally and energy efficiency specifically. The Energy Policy Act of 2005 and Executive Order 13423 of January 2007 require all new federal buildings to achieve a 30% improvement in energy cost to ASHRAE Standard 90.1-2004. This ASHRAE Standard is the same baseline applied in LEED-NC version 2.2. The Executive Order also

requires federal agencies to follow the guidelines of the Memorandum of Understanding for Federal Leadership in High Performance and Sustainable Buildings. Federal agencies are also required to meet progressive energy use intensity reduction targets for their entire building stock. Climate change as driven by emissions motivates these targets, but the goals are stated in terms of energy consumption reduction. There are a number federal buildings located in the MWCOG region with case study information available.

Monitoring and Enforcement

All jurisdictions and agencies reporting emissions reductions from green buildings programs must commit to maintain records of the projects undertaken to verify the reduction in electricity demand.

The factors that must be recorded include the baseline and proposed design or operationally achieved annual energy usage values by fuel type. The corresponding energy savings values have to be further tracked on an hourly or seasonal basis to correspond to the nonattainment period.

Projected Reductions and Emissions Benefit Calculations

Annual electricity consumption reductions can be calculated from reporting the LEED Energy Performance, On-Site Renewable Energy, and Green Power certified credits and the baseline and proposed/achieved building energy usage numbers by fuel type. LEED certification energy performance values are reported on an annual cost basis, although an hourly simulation program is usually utilized for building energy modeling. With additional guidance, seasonal or daily numbers could be available from the process.

Alternatively, a "summer season allocation" methodology could be applied.[8] Note that for new construction projects, energy and emissions reductions are achieved compared to a theoretical baseline, so additional analysis may be required based on the baseline growth assumed for SIP planning purposes.

Co-benefits of Green Building programs include reduction in energy demand and associated emissions from building heating appliance fuels; reducing the heat island effect (with vegetative shading and high-albedo materials); reduction in VOCs associated with built environment treatments (adhesives and sealants, paints and coatings, carpet, and composite wood); and reduction in transportation emissions (by encouraging the use of mass transit and alternative fuel vehicles).

[8] Jacobson, D; P. O'Connor; C. High; J. Brown. "Final Report on the Clean Energy/ Air Quality Integration Initiative Project of the U.S. Department of Energy's Mid-Atlantic Regional." DOE/GO-102006-2354. August 2006.

LED Traffic Signal Retrofit Program

Under this program, state and local governments in the nonattainment area have committed to replace existing traffic signals with more energy efficient Light Emitting Diode (LED) technology. This will decrease demand for electricity and subsequent power generation from coal, oil, and/or gas-fired sources that would normally supply power to the Metropolitan Washington region, thereby reducing NOx emissions from those sources.

Source Type Affected

The measure affects state and local governments within the Metropolitan Washington nonattainment area.

Control Strategy

This measure is envisioned as a region-wide measure encompassing LED traffic signal retrofits by state and local governments within the Metropolitan Washington nonattainment area. This program is in the early stages of development, and commitments received at this point affect several state and local jurisdictions in the nonattainment area. Transportation agencies have begun to retrofit existing traffic signals to LED technology to reduce the demand for electricity. The reduction in energy demand will displace fossil fuel generated power, thus reducing the NOx emitted from those plants.

Each state in the nonattainment area are including a provision in their regulatory program that sets aside a portion of the state's total NOx allowance budget for clean air projects. The state will retire NOx set-aside allowances in an amount commensurate with the size of the energy demand reduction to ensure reductions of ozone season emissions allowed under the state regulatory program.

Implementation

Maryland Department of Transportation (MDOT)
Virginia Department of Transportation (VDOT)
District Department of Transportation (DDOT)
Montgomery County, Maryland
[details from state input pending.]

Monitoring and Enforcement

All jurisdictions and agencies participating in the LED Traffic Signal Retrofit program have committed to maintain records of the traffic signals being replaced and energy bills to verify the reduction in energy demand.

Projected Reductions and Emissions Benefit Calculations
[pending] .

Building Energy Efficiency Programs

Energy Efficiency Programs
Under this program, the local governments in the nonattainment area have undertaken measures to improve the energy performance of government facilities. This section describes the estimation of the electricity reductions (measured in kilowatt-hours, kWh) achieved by those measures. An overview is given here, and the details of each local governments' program are given in Annex I.

Source Type Affected
These programs improve the energy efficiency of buildings and building equipment owned and operated by the local governments in the Metropolitan Washington area.

Control Strategy
This measure is envisioned as a region-wide measure encompassing energy performance contracts and other structured energy savings programs by state and local governments within the Metropolitan Washington nonattainment area. This program is at varying stages of development, and commitments received involve several local jurisdictions in the non-attainment area. Local governments have signed contracts with energy service companies (ESCOs) to retrofit existing facilities to reduce the demand for electricity and have undertaken other energy efficiency measures in their facilities. The reduction in electricity demand will displace fossil fuel generated power, thus reducing the NOx emitted from those plants.

Each state in the nonattainment area plans to include provisions in its NOx Ozone Season emissions trading regulations that set aside a percentage of the state's total NOx allowance budget to support energy efficiency and renewable energy (EERE) projects. If energy efficiency from Green Buildings Programs were quantified with sufficient certainty to obtain set-aside allowances, then the state could assure that NOx allowances from those set-asides will be retired in an amount commensurate with the size of the actual emission reductions.

The SIP measure will be structured to take into account the differences in the NOx emissions trading regulations of Maryland, the District of Columbia, and Virginia. Maryland's NOx SIP Call regulations currently authorize the allocation of NOx allowances to support EERE projects but the NOx SIP Call regulations for the District of Columbia and Virginia do not provide such authority. Thus, emission reductions from building energy efficiency retrofits will be claimed only for Maryland government entities in 2007 and 2008.

However, in 2009, NOx emissions trading for electric generating units in all three jurisdictions will be governed by the Clean Air Interstate Rule (CAIR), and all three jurisdictions plan to include provisions in their CAIR setting aside a portion of total allowances to support EERE projects. The Virginia regulation is expected to be adopted in December 2006, and Maryland and the District of Columbia plan to adopt their regulations by the end of April 2007. The relevant jurisdictions plan to obtain NOx allowance allocation under their new regulations and to retire such allowances. As a result, surplus emission reductions from all three jurisdictions can be claimed for 2009.

Implementation

Arlington County, Virginia. The Arlington County government has instituted a variety of measures since 2002 to improve energy efficiency of operations. In addition, Arlington has allocated funds for additional efficiency investments that will increase the energy savings between now and 2010.

Fairfax County, Virginia. Fairfax County government has implemented several large energy efficiency projects in 2005 and 2006. These projects involve variable speed drives, lighting and heating, ventilation and air conditioning (HVAC) upgrades, and other efficiency investments.

Montgomery County, Maryland. Montgomery County departments undertake their own energy efficiency investments, as detailed in each of their Resource Conservation Plans. (See http://www.montgomerycountymd.gov/content/dep/Energy/2007rcp.pdf). These investments cover a wide range of measures during the period 2003 to 2008.

Monitoring and Enforcement

All jurisdictions and agencies reporting emission reductions from energy efficiency programs have committed to maintain copies of signed energy service performance contracts and energy bills and other documentation to verify the reduction in electricity demand.[9]

If the jurisdictions adopt the methodology outlined in Annex II for future energy efficiency programs, they would document code requirements for energy efficiency for use as the baseline. The jurisdictions also would maintain additional documentation to verify energy reduction.

Projected Reductions and Emissions Benefit Calculations

The estimates below were developed in collaboration with local jurisdictions. These estimates quantify the reductions in energy consumption resulting from the energy service performance contracts and other efficiency measures undertaken by each jurisdiction. The methods used to develop these estimates, if provided by the jurisdiction, are described in Annex I, which also explains how electricity savings are divided into three categories.

[9] Currently, not enough is known about the methods used to develop kWh reduction estimates to be able to define the documentation necessary to establish their validity.

Table 6-13. Projected Annual Reductions from Energy Efficiency Programs

Annual kWh Reductions by Year and Type of Measure, MWH			
Arlington County			
Year	A/C	Lighting	Other
2008	27	775	312
2009	31	820	607
Fairfax County			
Year	A/C	Lighting	Other
2008	-	98	4,232
2009	-	84	3,597
Montgomery County			
Year	A/C	Lighting	Other
2008	4,855	13,788	8,367
2009	4,127	11,720	7,112

Use of these Estimates in Emissions Benefits Calculations

The reductions in electricity consumption are used to estimate associated emission reductions. Each of the three categories of efficiency measures has an associated displaced emissions factor derived from the expected time pattern of its electricity reductions.[10] The emissions impact of each category of measure is simply the product of the kWh savings and the associated displaced emissions factor.

[10] Forthcoming, after the methods described in: High, C.J; K.M. Hathaway. "Avoided Air Emissions from Energy Efficiency and Renewable Electric Power Generation in the PJM Interconnection Power Market Area." Resource Systems Group, Inc. White River Junction, VT. December 10, 2006 Draft Report.

Mobile Source Strategies

The following mobile source strategies are included in the voluntary bundle:

- Remote Sensing Program

There were two programs included in the 1-hour ozone SIP which are now being withdrawn, and as such, will not be included in the 8-hour ozone SIP voluntary bundle: diesel retrofit and alternative fuel vehicle/low-emission vehicle purchase program.

- **Diesel Retrofit Program.** Under this program, local governments and transit agencies identify high-emitting, high-mileage diesel vehicles, such as older school buses and transit buses for retrofit. These vehicles are retrofitted using any of a variety of technologies certified under EPA's Voluntary Diesel Retrofit Program. Commonly considered technologies include oxidation catalysts and particulate filters.

- **Alternative Fuel Vehicle/Low-emission Vehicle Purchase Program.** Under this program, local governments and transit agencies purchase low-emission vehicles instead of conventional gasoline powered vehicles.

Local governments committed to these two initiatives in the 1-hour ozone SIP voluntary bundle, and no emission reduction credits were applied. Annual reporting for the evaluation report indicates that these commitments were met. Local governments are now reserving any emission reduction credits that these programs may generate for potential future use in meeting transportation conformity. As such, they are no longer included in the local voluntary bundle in the 8-hour ozone SIP. The 8-hour ozone SIP demonstrates RFP and attainment without modeling of any reductions from these measures, therefore removal of these commitments from the voluntary bundle does not interfere with air quality planning requirements.

Remote Sensing Device Program

The Commonwealth of Virginia has implemented a remote sensing program throughout the Northern Virginia portion of the Washington nonattainment area. This program reduces the number of high-emitting vehicles in the Virginia portion of the Washington region by requiring vehicles identified as high emitting to undergo out-of-cycle testing.

Source Type Affected

The measure affects Virginia motorists driving through the Virginia portion of the Washington nonattainment area.

Control Strategy

Under this measure, cars emitting in excess of the state emission limit are identified via a remote sensing program as they drive throughout the region. Owners of high-emitting vehicles are mailed a notice requiring out-of-cycle testing and repair for the vehicle's emission system. High-emitting Virginia vehicles not registered within the I/M program area but driving through the Washington region on a regular basis are also be required to repair their emissions control systems. This will reduce the number of high-emitting vehicles in the Washington nonattainment area.

Implementation

Virginia – Department of Environmental Quality

Monitoring and Enforcement

VDEQ has developed a rule that will backstop this program and provide clear penalties for noncompliance. Penalties are based on the level of the emissions exceedences and vary from $450 to $225, adjusted from the base year of 1990 by the consumer price index. See 9 VAC 5-91-750. The entire rule may be found at http://www.deq.virginia.gov/air/pdf/airregs/C091.pdf.

Projected Reductions and Emission Benefit Calculations

Because of the uncertainty surrounding the amount of creditable reductions available from this program and also due to the problematic nature of relating mobile source concentrations to emission rates, Virginia is claiming zero credit from this measure.

Auxiliary Power Units on Locomotives

Diesel locomotives produce large quantities of NOx and particulate matter. Because it is time consuming to start up and shut down locomotives engines, many locomotive operators leave engines running when the locomotives are not in use. This is especially true of locomotives used in switchyards, which must operate frequently at irregular intervals. As a result, operators often tolerate idling so as to have the switcher ready when needed. This program encourages commuter, freight and commercial passenger railroads to install electric-powered APUs on locomotives operating in the Washington nonattainment area. An APU offers a low emission alternative to constantly idling the locomotive engine.

Source Type Affected

Locomotives operating within the Metropolitan Washington nonattainment area.

Control Strategy

This measure is envisioned as a region-wide measure encouraging a variety of locomotive owners and operators within the Metropolitan Washington nonattainment area to purchase install auxiliary power units to reduce locomotive idling.

This program was included in the one-hour ozone SIP and is not being expanded at this time. Only one commitment has been received. Virginia Railway Express (VRE), a local commuter railroad, has committed to install 13 auxiliary power units (APUs) on locomotives operating within the Metropolitan Washington region. These APUs are used when locomotives would normally idle in the rail yards, reducing fuel usage and locomotive emissions.

There are no new commitments beyond those made in the one-hour ozone SIP.

Implementation

Virginia Railway Express

VRE has completed their APU installation program. VRE has already completed installation of these units, and the units are functioning properly. VRE has budgeted funds for the electricity charges and for routine maintenance on the units.

Monitoring and Enforcement

VRE has committed to maintain copies of signed contracts and invoices to verify the number and type of APUs purchased. VRE has also pledged to track the average hours the APUs are operated. These records will be provided to the appropriate state air agency on an annual basis and will be used to provide documentation for the region's periodic evaluation report.

Projected Reductions

VRE is operating 13 APUs at a projected reduction of 0.1 tpd NOx per year.

Emissions Benefits Calculations

Emission benefits are calculated as follows:

$$\frac{\#\text{ of units} \times \frac{hours}{week}\text{ idling avoided} \times \frac{gal}{hour}\text{ avoided fuel consumption} \times \frac{lb}{gal}\text{ emissions avoided}}{2000\frac{lb}{ton} \times 7\frac{days}{week}} = \text{tpd avoided}$$

VOC Reduction Strategies

The following programs are included in the voluntary bundle to reduce emissions of VOCs in the region:

- Low-VOC Paints Program
- Gasoline Container Replacement Program
- Solvent Parts Washer Replacement Program

Low-VOC Paints Program

Interior and exterior paint is applied to a variety of surfaces, including buildings and roads. Though the Architectural and Industrial Maintenance Coatings rule, requires a lower VOC content for many paints, many manufacturers sell no-VOC paint, or paint with VOC content much lower than the AIM rule standard. Use of no- or very low-VOC paint further reduces VOC emissions in the Washington nonattainment area.

Source Type Affected

The measure affects state and local governments and their contractors involved in some interior and exterior painting and traffic marking activities.

Control Strategy

This measure is envisioned as a region-wide measure encouraging use of very low or zero-VOC paint by public citizens, private industry and state and local governments within the Metropolitan Washington nonattainment area.

This program was included in the one-hour ozone SIP and is being expanded here. State agencies and local governments have committed to using paint and traffic marking materials with very low or zero VOC content. The lower-VOC paint is to be purchased and applied daily throughout the ozone season, and often year-round. It is hoped that continuing outreach efforts will expand this program to include participation from additional government entities and the private sector.

Implementation

Arlington County, Virginia
Calvert County, Maryland
City of Alexandria, Virginia
City of Greenbelt, Maryland
Fairfax County, Virginia
Maryland Department of Transportation
Maryland National Capital Parks and Planning Commission (M-NCPPC), Prince George's County
Prince George's County, Maryland

All participating jurisdictions plan to purchase and use paints with VOC content below the allowable levels under the existing regulatory programs for architectural, industrial, and maintenance coatings. See Appendix H for more details.

Monitoring and Enforcement

All jurisdictions and agencies participating in the low-VOC paint program have committed to maintain records of the number of gallons of paint used and the paint's VOC content. VOC content will be determined either by using the VOC level certification found on the paint can label or through laboratory testing, at the discretion of the participant. These records will be provided to the appropriate state air agency on an annual basis and will be used to provide documentation for the region's periodic evaluation reports.

Projected Reductions

Including the commitments made in the one-hour ozone SIP, this measure affects 566 gallons of paint per day and is anticipated to reduce 0.17 tpd VOC. Further information on commitments and projected reductions is included in Appendix H.

Emissions Benefits Calculations

Benefits from this program are calculated by determining emissions reduced over and above those required by the OTC AIM rule (Measure 6.4.12). They are calculated as follows:

$$\text{VOC Reduced (tpd)} = \frac{\frac{gallons}{day} \times 3.7854 \frac{liters}{gallon}}{453.39 \frac{g}{lb} \times 2000 \frac{lb}{ton}} * \left(\frac{g}{liter} \text{cap under AIM rule} - \frac{g}{liter} \text{cap in commitments} \right)$$

Solvent Parts Washer Replacement Program

Under this program, local governments voluntarily replace solvent-based parts cleaners with zero-emitting technology. This program reduces VOC emissions in the Washington nonattainment area.

Source Type Affected

The measure affects local governments within the Metropolitan Washington nonattainment area.

Control Strategy

This measure is envisioned as a region-wide measure encouraging replacement of solvent-based parts cleaners with zero-emitting technology private industry and state and local governments within the Metropolitan Washington nonattainment area.

This program is in the early stages of development, and commitments received at this point affects only one local jurisdiction in the nonattainment area. Montgomery County has begun to replace county-owned solvent-based parts cleaners with zero-emitting technology. The program eliminates VOC emissions from those units.

Implementation

Montgomery County, Maryland

Montgomery County has a program to replace solvent-based parts washers with microbial/aqueous washers at county-owned vehicle service facilities. The county is also developing a strategy to offer rebates to private automotive shops to purchase microbial/aqueous parts washers. Montgomery County is also working to implement an Environmental Partners Program. The program will certify local auto repair shops as "Environmental Partners" by performing environmental compliance inspections, helping the business achieve compliance and encouraging the use of "green" alternatives such as aqueous/microbial parts washers. The county hopes to expand the program to involve other business sectors such as dry cleaners.

Monitoring and Enforcement

All jurisdictions and agencies participating in the Solvent Parts Washer Replacement program have committed to maintain records of the number of units replaced, the annual quantity of solvent use that was displaced, and the VOC content of the displaced solvent. These records will be provided to the appropriate state air agency on an annual basis and will be used to provide documentation for the region's periodic evaluation reports.

Projected Reductions and Emissions Benefit Calculations

VOC emission reductions can vary based on the amount of solvent previously used by the facility before the switch to a solvent free system. Based on preliminary estimates provided by staff, replacing a typical unit may reduce VOC emissions by 0.1 to 2 tons/year/unit. Maryland is claiming zero SIP credit for this measure.

Gas Can Replacement Program

Portable gas cans are a significant source of daily VOC emissions. Emissions from gas cans occur from evaporation and due to spillage for overfilling of power equipment fuel tanks. In transporting and storing cans, emissions are also released through secondary vent holes and permeation. By using newer gas cans with features such as shut off valves, harmful gasoline fumes can be reduced by 75%.

Source Type Affected

Owners of portable fuel containers, except containers with a capacity of less than or equal to one quart, rapid refueling devices with capacities greater than or equal to four gallons, safety cans and portable marine fuel tanks operating with outboard motors, and products resulting in cumulative VOC emissions below those of a representative container or spout.

Control Strategy

This program was adopted as part of the voluntary bundle developed for the one-hour ozone SIP. Commitments included local jurisdictions, state agencies, and their contractors operating in the nonattainment area. Jurisdictions pledged to collect functional cans that were not already scheduled for replacement, and replace those in-use, functional cans with redesigned cans meeting the new Portable Fuel Containers standard. Old cans were destroyed in accordance with requirements for disposal of hazardous waste.

There are no new commitments beyond those made in the one-hour ozone SIP.

Implementation

Arlington County, Virginia
Fairfax County, Virginia
City of Fairfax, Virginia
Maryland National Capital Parks & Planning Commission, Prince George's County
Montgomery County, Maryland
Prince George's County, Maryland
Prince William County, Maryland

Monitoring and Enforcement

All jurisdictions and agencies participating in the fuel container replacement program committed to maintain records of the number of fuel containers replaced and the method of disposal. These records are provided to the appropriate state air agency on an annual basis and are used to provide documentation for the region's program evaluation report.

Projected Reductions

This program was expected to replace 1,478 gas cans, resulting in a benefit of 0.01 tpd VOC.

Emissions Benefits Calculations

Calculation of emission benefits was based on estimates prepared by EH Pechan for use by the Ozone Transport Commission (Reference 2). In the report, Pechan estimates that 2.28 million gas cans are sold annually in the OTC Region. Table IV-6 in the Pechan document shows that for the 2.5 year period from January 1, 2003 through July 1, 2005, emissions in the OTC region will be reduced by 48 tpd VOC. Over this time period, the expected benefit in the Metropolitan Washington region would be 4.3 tpd, assuming a January 1, 2003 implementation date. The estimated annual benefit from the measure in the Washington region is 4.3/48=8.96% of the total benefit.

Assuming that emission reductions are linearly related to gas can turnover, the Washington region accounts for 8.96% of the 2.28 million cans sold in the region per year, or 204,000 cans. Annual regional reductions from the measure are estimated at 1.88 tpd. Therefore, replacement of one can will, on average, deliver a benefit of 1.88/204,000 = 0.00000922 tpd VOC.

Urban Heat Island Mitigation/Tree Planting/Canopy Conservation and Management

Strategic tree planting and tree canopy conservation and management are innovative voluntary measures that will achieve area-wide improvement of the tree canopy, providing air quality benefits including reductions in ground-level ozone in the Washington DC Metro nonattainment area. Air quality benefits associated with trees and their shade result from lowering summertime air temperatures and from actual pollutant absorption and contact removal from the trees themselves.

One of the most dramatic improvements achievable from area-wide comprehensive tree canopy conservation and planting is reducing the negative effects of urban heat islands (the rise in temperatures due to an increased number of buildings and impermeable surface areas retaining heat). Strategic placement of trees around homes, buildings, streets, and parking lots, increases shade and evapotranspiration, thereby lowering summertime air temperatures and surface temperatures of asphalt, concrete, and other impervious areas. Lowering air summertime temperatures helps reduce ground-level ozone in several ways:

- slow the temperature-dependent reaction that forms ground-level ozone;
- reduce evaporative emissions, primarily VOCs (precursors to ground-level ozone) from sources such as vehicles; and
- reduce the amount of electricity generated for cooling, thereby reducing air pollutant emissions including ground-level ozone precursors, from power plants.

In addition, through up-take and contact removal, trees remove ground-level ozone, nitrogen oxides, sulfur oxides, and other ozone precursors from the air. Other air quality benefits from trees include removal of carbon monoxide and fine particulate matter less than 10 microns. Carbon dioxide is removed and stored by trees, dust is intercepted, and oxygen is released.

Source Type Affected

The measure affects state and local governments within the Washington DC Metro nonattainment area.

Control Strategy

To achieve reductions in ground-level ozone, government agencies, volunteer organizations, and private landowners must make long-term commitments to conserving existing canopy and planting significant numbers of trees in strategic locations. Under this measure, local governments in the metropolitan nonattainment area will commit to:

1. Measure Existing Resources and Track Changes – Initiate and/or enhance efforts to measure, track, and enhance existing urban tree canopy and canopy expansion efforts.

2. Programs to Enhance and Increase Benefits from Trees – Implement urban forestry programs to enhance canopy coverage to reduce summertime air and surface temperatures. Programs include planting trees in strategic locations to cool targeted

surfaces and provisions for long-term maintenance. Priority planting sites include locations where buildings, streets, driveways, and parking lots will be shaded by the new plantings.

3. Public Outreach – The region commits to undertake a public outreach program designed to promote tree and canopy conservation and planting. Local governments, counties, states, and COG will work with volunteer tree planting organizations, school children, property owners, and stakeholder groups of businesses to support tree conservation and planting, conduct educational outreach regarding the benefits of trees and canopy, species selection, tree planting and establishment, and long-term tree maintenance. Efforts will be made to document all conservation and planting efforts including voluntary programs.

4. Regional Canopy Management Plan – Local governments will work to develop a long range plan to enhance tree conservation and planting, and to establish goals for increasing tree canopy coverage between 2010 and 2030 that could lead to lower levels of ground-level ozone pollution. Issues to address include coordination of efforts, tracking progress in centralized databases, continuation and increases of resources from state and federal sources, involvement of private landowners and businesses, and periodic evaluations and reports.
5. Species Selection – During photosynthesis, trees release secondary metabolic products. Some of these include biogenic volatile organic compounds (VOCs), precursors to the formation of ozone. In most instances, the improvements in air quality gained from trees outweigh the concerns over additional biogenic VOC emissions. Additionally, large trees are considerably more beneficial for air quality than small trees. Therefore, when planting trees, species should be selected for large-size and long-term survival based on specific site conditions and adjusted, when possible, for low-VOC emitters.
6. Monitoring Programs – Monitor these activities and report periodically.

Current Programs

Many programs that support, encourage, or require the tree and forest conservation and planting exist within the local jurisdictions, counties, and states in the Washington DC Metro nonattainment area. Special attention will be paid coordinating these programs to enhance tree protection, canopy conservation and expansion to enhance regional air quality.

Implementation

Fairfax County tree canopy requirement for new development.
Fairfax County parking lot canopy ordinance.
Fairfax County government land planting program.
Fairfax County countywide nonprofit tree planting program.
Arlington County Urban Forest Master Plan.
Arlington County plant 1,280 trees annually.
Arlington County Chesapeake Bay Preservation Ordinance/Landscape Conservation Plan.

City of Alexandria Urban Forestry Plan under development.
City of Alexandria 12,000 square feet of vegetative roof installed on city buildings.
City of Alexandria Reflective roofs standard for government buildings.
City of Greenbelt Tree planting program. Shade tree improvement initiative.
Montgomery County street tree planting program. 1,200 trees per year.
Montgomery County "Shade to Save" pilot program.
Montgomery County is developing a residential tree planting program.
Montgomery County is developing urban tree legislation.
Montgomery County Stream Restoration Projects plant native trees and shrubs to enhance and establish forests near stream project sites.
Montgomery County Rainscapes Program.
Montgomery County Forest Conservation Law
Amendments to the Forest Conservation Law to adjust for changes in development patterns are being developed.
Montgomery County Forest Banking Program
Montgomery County Legacy Open Space program
Montgomery County Rural Legacy Program
Montgomery County Development Rights Program
MNCPPC Montgomery County Parks Department actively maintains and plants shade trees in developed areas of parks.
MNCPPC Montgomery County Parks Department establishes forested areas on open land within the park system.
Calvert County Reflective roof systems on 6 county buildings.

Monitoring and Enforcement

The state and local governments will maintain records of program activity and public outreach campaigns designed to promote tree and canopy conservation and planting or enhancement. The jurisdictions will also provide evidence of educational outreach efforts regarding documenting and reporting voluntary planting and maintenance programs. Results of all initiatives will be quantified and reported consistent with other SIP requirements to the public and EPA.

Projected Reductions and Emissions Benefits Calculations

This program is expected to lead to reductions in ground-level ozone throughout the Washington DC Metro nonattainment area. Methods to quantify benefits from trees and tree canopy are evolving. Several methods have been used to calculate benefits resulting from canopy expansion. Currently, the Air Pollution Removal Calculator developed by the United States Forest Service will be used to estimate pollution removal and value for urban trees based on basic user inputs. This program draws on data collected and analyzed for various cites in the region by the USFS for the Urban Forest Effects (UFORE) model.

Maryland, Virginia, and the District of Columbia are claiming zero credit for this measure.

References

US EPA. 2007. Heat Island Effect: Vegetation & Air Quality. Most recent update Jan 16, 2007. http://epa.gov/heatisland/strategies/level3_vegairquality.html. Trees and Our Air, January 1999, Galveston-Houston Association for Smog Prevention.