

“What Can We Do” Project

Over the last 25 years, the Washington region has made substantial progress in improving the air we breathe. Still, the region experienced eight code orange (unhealthy for sensitive group) air days in 2017. Poor air quality on code orange days cause a number of health problems, especially for sensitive populations such as, children, elderly people, and people with respiratory problems. The Washington region is expected to be designated as a marginal nonattainment area for the 2015 ozone standard, which would not require it to implement any emission reduction programs to achieve the standard. For the above reasons, the Metropolitan Washington Air Quality Committee (MWAQC), at its September 2017 meeting, resolved to:

1. Commit to meeting the 2015 ozone National Ambient Air Quality Standards (NAAQS) in a timely manner and not delay reaching attainment even if EPA delays the official process; and
2. Support implementation of region wide and local actions to address the current and the future ozone NAAQS and to better protect public health and welfare; and
3. Is committed to achieving reductions in air pollutant emissions through a broad range of cost-effective control measures across multiple sectors.

There are a number of regional reports and studies available to state and local governments, which identified various air quality measures to achieve emissions reduction to further improve the air quality. However, these reports do not prioritize, rank, or quantify the emission reductions or costs of the most promising measures based on the latest available literature. This project aims to address that gap.

At a discussion in mid-2017, the MWAQC Chair and members of the Air and Climate Public Advisory Committee (ACPAC) raised the prospect of conducting an analysis showing what actions could be put in place to reduce air pollution to a level that would result in no unhealthy air days across metropolitan Washington. Following up on this interest, MWAQC asked ACPAC to develop a Scope of Work for an analysis to identify the suite of local and regional measures, aka What We Can Do, that could achieve a ‘no unhealthy air days’ goal. ACPAC discussed the options of both qualitative and quantitative assessments for planning new or expanding existing measures to reduce ozone levels in the region. After some research and discussion, ACPAC members, recognizing the level of effort and resources required for a quantitative modeling based assessment, recommended focusing on a qualitative assessment approach for reducing NO_x emission, which is the most important drive for ozone production in the region.

The following tables provide a list of various NO_x emission control measures. The measures are listed by type (voluntary and regulatory) as well as by implementation agency (local, state, and Metropolitan Washington Airport Authority).

Potential NOx Emission Control Measures – “What Can We Do” Analysis

Voluntary Measures

Voluntary Measures	NOx Reduction (tpd)	Cost	Implementing Agency & Suggestions for Implementation of Measures	
Non-Point Source			Local	State
District Energy Systems and Microgrids	Small		Can encourage high efficiency district energy and microgrid systems in public and commercial facilities. 25% of COG jurisdictions to undertake this by 2020. ⁸ Potential for rest of the jurisdictions to adopt	
Urban Heat Island Mitigation	Small		Can incentivize or encourage cool/green roofs, cool pavements, urban tree cover. 100% of COG jurisdictions to establish or expand this by 2020. ⁸	
High Performance Building	Small		Arlington – Model program for commercial bldg. energy performance. Can adopt more rigorous energy codes, voluntary programs to improve bldg. efficiency and on-site RE generation, Refer to page 10 ⁸	DC – New construction to be net zero energy use by 2032.
Green Power purchasing	Depends on amount of purchase	Varies depending on source and amount	Montgomery – 100% RE electric by 2016, 75% of COG jurisdictions to achieve or	DC- 100% RE electricity

			maintain EPA green power partnership for government operations. Other jurisdictions – Potential candidates	
Energy Efficiency & Renewable Energy programs	Small-Medium		Install renewable energy systems on local government property and provide or promote incentives for building-level renewable technologies or energy storage systems, provide public education and outreach on renewable technologies, support cost-effective renewable energy incentives and financing mechanisms for distribution generation at utility, state, and national levels, continue to support strong state-level renewable portfolio standards and encourage Renewable Energy Credit (REC) markets. Refer to page 13 for additional potential actions ⁸	Exists
Demand Response/Distributed Generator emissions controls	Small-Medium (43 tons per hour in OTR) ³	Varies depending on power (Cost to retrofit a diesel generator with SCR technology = \$39,700-\$79,700/ton for 1-2 MW, \$145,000-\$165,00/ton for 1750 kW-2500 kW) ³		DC & MD – Under review VA – General permits available for a few generators * Difficult to locate and quantify and therefore develop rules
Ultra-low sulfur fuel oil (Home and water heating fuel oil)	Small			DC - Proposed MD – Under consideration, check status from both VA – None

On-Road Source				
EPA Smartway Partnership	550,000 tons between 2004-2016 nationally		Can join as SmartWay affiliate (currently 3,700 partners & affiliates)	DC – DOEE is an affiliate MD – MDE is an affiliate VA – Potential to join as an affiliate
On-road fleet retrofits and repowers (Class 6 and above truck)	Small-Medium	\$4,284-\$12,157/ton ¹	Incentives can be provided to those companies agreeing to retrofit their vehicle engines or repower them	DC & MD – Check for any ongoing program VA – Ongoing VPO GO & Alternative Fuels Fleet Vehicle Incentive programs
Purchase of CNG transit buses	Medium Total emission from transit buses in Washington region = 3.3 tpd ⁷ Maximum emission benefit = 95.2% (Table A) of 3.3 (assuming transit bus fleet is 100% diesel operated) = 3.1 tpd	\$130,435/ton if replacing a diesel transit bus (Table A)	Diesel transit bus fleet can be replaced with those powered with CNG	DC – Proposed ² MD & VA – AFV and fueling infra- programs available
Purchase of electric transit buses	Medium Total emission from transit buses in Washington region = 3.3 tpd ⁷ Maximum emission benefit = 100% (Table A) of 3.3 (assuming transit bus truck fleet is 100% diesel operated) = 3.3 tpd	\$1,021,740/ton if replacing a diesel transit bus (Table A)	Fairfax and Montgomery county awarded grants to purchase electric buses, Other jurisdictions – can purchase these buses	DC – Proposed ² MD & VA – AFV and fueling infra- programs available
Purchase of CNG refuse trucks	Small Total emission from refuse trucks in Washington region = 1 tpd ⁷ Maximum emission benefit = 96.5% (Table A) of 1 tpd (assuming refuse truck fleet is 100% diesel operated) = 0.96 tpd	\$191,490/ton if replacing a diesel refuse truck (Table A)	Diesel refuse truck fleet can be replaced with those powered with CNG	DC – Proposed ² MD & VA – AFV and fueling infra- programs available

Purchase of electric refuse trucks	Small Total emission from refuse trucks in Washington region = 1 tpd ⁷ Maximum emission benefit = 100% (Table A) of 1 tpd (assuming refuse truck fleet is 100% diesel operated) = 1 tpd	\$510,638/ton if replacing a diesel refuse truck (Table A)	Diesel refuse truck fleet can be replaced with those powered with battery	DC – Proposed ² MD & VA – AFV and fueling infra- programs available
Bicycle & Pedestrian programs	Small	Variable	50% of COG jurisdictions to undertake this by 2020. ⁸ Potential for rest of the jurisdictions to adopt	
Effective Implementation of on-road heavy-duty vehicle long-duration idling reduction	Small (10-33% control) ¹	Class 8: from a cost of \$46,506 to savings of \$16,001/ton Class 6&7: from a cost of \$68,323 to savings of \$15,501/ton ¹	Local enforcement can be undertaken, idling reduction signs can be posted	Ongoing idle reduction rules in place, need more enhanced enforcement
Idling reduction rebate	Small (2.5-5.5 tpy/0.007-0.015 tpd) (Table 3) ²	\$3,800-1,727/ton (Table 3) ²		DC – Proposed rebates to public and private fleet owners to retrofit older diesel shuttle buses, transit buses, and Class 5-8 medium and heavy-duty trucks with idling reduction technologies MD – Check VA - None
CAL LEV	Small	None		MD – Exists Need to implement in DC and VA since Tier 3 benefits are similar?

Travel Efficiency Measures (Smart growth/transit, commuter strategies, system operations (e.g., eco-driving, ramp metering), pricing (e.g., parking taxes, congestion pricing, intercity tolls), speed limit restrictions, and multimodal freight strategies	Medium 2017 on-road NOx emission (2016 CLRP) = 86.2 tpd 2%-5% control ¹ Emission benefit = 1.7 tpd-4.3 tpd		More Smart growth, transit service enhancements and fare reduction, road pricing, speed limit restrictions, commuter strategies, parking fee increase can be undertaken	DC, MD, VA – Participate in these programs, can be expanded
Diesel I/M programs	Medium			DC – Under consideration MD – Diesel opacity test VA – Tests LD diesel vehicles
OTC aftermarket catalyst initiative	Small-Medium (20-28 tpd in OTR) ³	\$4,000-7,000/ton ³		DC – Under consideration, check status MD – In dev, check status VA – None
Nonroad Source				
Nonroad Diesel Engine Retrofit & Rebuilds	Large (0-37% control) ¹ Up to 18 tpd	\$4,500/ton for most, \$3,245-\$5,164/ton for some construction equipment ¹	Need info- on any ongoing/planned programs	Need info- on any ongoing/planned programs
Idling Restrictions for Lawn & Garden Equipment	Small-Medium	None	Need info- on any ongoing/planned programs	
Effective implementation of Idle reduction initiative	Small (~1 tpd)		Opportunity for enhanced enforcement	Nonroad idling rule in place in all three jurisdictions MD – Considering enhanced enforcement with MDOT & State Police
Aircraft GSE Alternative Fuels (LPG/CNG)	Small	Gas: \$0 (savings) Diesel: \$1,110-\$3,325/ton	MWAA	

		VOC/CO/NOx combined ¹		
Aircraft GSE Alternative Fuel (Electric)	Small	\$6,500-\$18,000/ton ¹	MWAA	
Nonroad Diesel Equipment Anti-Idling	Large - \$194,831 ton/year (534 tpd) in OTR (2009 estimate) (Table 3-15) ³	None		DC – Exists MD – Exists, Discussion of enhanced enforcement with MDOT & MD State Police currently underway VA – None
Switcher Engine Replacement	Small (12.9 tpy/0.035 tpd) per engine ²	\$104, 284/ton ² \$6,500-\$18,000/ton for Diesel-electric hybrid ¹		DC – Proposed (Draft DC VW Funding Plan) VA – Ongoing programs for locomotives MD – Potential
Reduce locomotive idling	Small			There may be a jurisdictional issue here. APUs, shore power, and automatic shut-offs available to stop idling
Boat engine replacement	Small			DC – Ongoing program (check with DOEE for details) VA - None

Regulatory Measures

Regulatory Measures	NOx Reduction (tpd)	Cost	Implementing Agency (State)
Electric Generating Units (EGU) – Point Source			
2015 O3 NAAQS RACT Adoption	Large (typically this measure provided large benefits in the past, but states need to analyze this to determine actual expected benefits)	Variable depending on fuel and control technology used	MD – Awaiting info- VA – Possum Point (Gas boilers Units 3&4 potential candidates, Oil fired Unit 5 currently undergoing RACT)
Performance Standards for HEDD Simple Cycle Turbines	Small	Water injection - \$4,400/ton Turbine retrofit - \$1,100-\$9,000/ton ³	MD – Awaiting info- VA – Possum Point (6 small units, <2 tpy)
Non-Electric Generating Units (Non-EGU) – Point Source			
2015 O3 NAAQS RACT Adoption	Small-Medium (States need to analyze this to determine actual expected benefits)	Varies depending on control technology used	Check status with states
<i>Examples of Technologies/Costs</i>			
Waste Incineration Facility NOx Control	Medium VA – Covanta emissions from Alexandria/Arlington and Fairfax = 4.63 tpd. These two facilities can provide medium level reductions once LN technology is employed as RACT. Actual reduction estimate to be available after RACT publication.	VA – \$5,000-\$7,000/ton (Using LN technology)	VA - Covanta emissions from Alexandria/Arlington and Fairfax to be reduced due to the expected employment of the LN technology

	<p>MD-Mont County Res. Rec. facility = 1.31 tpd, not much reduction expected as LN tech already employed.</p> <p>* Facility emissions data from 2008 O3 MP EI (NEGU emissions)</p>		
<p>OTC Nat Gas Ultra Low NOx Burners - New Natural Gas-Fired Boilers, Steam Generators, Process Heaters, and Water Heaters; 75,000 BTUs/hr to 5,000,000 BTUs/hr</p>	<p>Small³</p>	<p>Units (75,000 Btu/hr to 2.0 million Btu/hr) - \$1,108-5,385/ton³</p> <p>Units (2.0 million Btu/hr to 5.0 million Btu/hr) - \$12,000-\$23,000/ton³</p>	<p>DC & MD - Under consideration, check status VA – None</p>

Advocacy Measures

Tougher Aircraft Engine Standards	Large	Varies depending on technology	Advocacy to EPA for rule implementation
Tougher Locomotive Engine Standards	Medium	Varies depending on technology	Advocacy to EPA for rule implementation
Tougher Marine Diesel Engine Standards	Small	Varies depending on technology	Advocacy to EPA for rule implementation
CAFE Phase 2 (LDV GHG Standards for MY 2022-2025)	Small	None	Advocacy to EPA for retaining the current standards

Emission Reduction Potential: Large: >5 tpd, Medium: 1-5 tpd, Small: <1 tpd

¹ EPA Menu of Controls

² Draft DOEE Spending Plan for Volkswagen Settlement Funds

³ OTC Model Rules, August 2016

⁴ <http://www.mwcog.org/uploads/committee-documents/ZV1aVl1Y20131209141112.pdf>

⁵ Status of Adoption of OTC Model Rules (2009-2014)

⁶ TPB Staff Email/Memo- Dated March 8, 2018

⁷ TPB Staff (Dusan Vuksan) Email Dated March 13, 2018

⁸ Regional Climate and Energy Action Plan (2017)

Table A: Comparison of Emission Benefits & Costs - Refuse Truck and Transit Bus Replacements

(Based on Info- provided in DOEE's Draft Spending Plan for Volkswagen Settlement Funds)

Vehicle Type	Vehicle Purchase Cost	Direct NOx Emissions (total tons emitted per year)	% Reduction Compared to Diesel Refuse Truck/Diesel Transit Bus	Reduction in Direct NOx Emissions (total tons reduced per year/day)	Additional Cost to Replace a Diesel Truck (per ton)
Electric Refuse Truck	\$450,000	0	Total reduction per truck = $0.029 - 0 = 0.029$ tpd % Reduction = $(0.029 * 100) / 0.029 = 100\%$	0.47 tpy/ 0.001 tpd	$\$450,000 - \$210,000 / 0.47 = \$510,638$
CNG Refuse Truck	\$300,000	0.001	Total reduction per truck = $0.029 - 0.001 = 0.028$ tpd % Reduction = $(0.028 * 100) / 0.029 = 96.5\%$	0.47 tpy/ 0.001 tpd	$\$300,000 - \$210,000 / 0.47 = \$191,490$
New Diesel Refuse Truck	\$210,000	0.029	-		
Electric Transit Bus	\$770,000	0	Total reduction per truck = $0.027 - 0 = 0.027$ tpd % Reduction = $(0.027 * 100) / 0.027 = 100\%$	0.46 tpy/ 0.001 tpd	$\$770,000 - \$300,000 / 0.46 = \$1,021,740$
CNG Transit Bus	\$360,000	0.0013	Total reduction per truck = $0.027 - 0.0013 = 0.0257$ tpd % Reduction = $(0.0257 * 100) / 0.027 = 95.2\%$	0.46 tpy/ 0.001 tpd (Assumed same as CNG Transit Bus)	$\$360,000 - \$300,000 / 0.46 = \$130,435$
New Diesel Transit Bus	\$300,000	0.027			