

WHAT WE CAN DO TO IMPROVE AIR QUALITY IN METROPOLITAN WASHINGTON

A menu of options to help achieve the goal of no unhealthy air quality days

Introduction

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 submit a state implementation plan (SIP) and implement any emission reduction programs to achieve the standard. However, the region is required to achieve the above standard within three years from getting designated. For the above reasons, the Metropolitan Washington Air Quality Committee (MWAQC), at its September 2017 meeting, resolved 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.

Following is a list of ongoing and new local and state programs that will support additional near-term NO_x emission reductions (2018 – 2020) in metropolitan Washington. These measures are expected to provide significant NO_x emission reduction in the Washington region leading to further improvement in ozone levels and reduction in the exceedance days for the 2015 ozone standard (70 ppb). These measures are listed by type (voluntary, regulatory, advocacy). Where available, cost and emission benefit for each measure has also been provided. Emission benefit is defined as small (<1 ton per day [tpd]), medium (1-5 tpd), and large (> 5tpd). Most actions can be implemented by state or local governments; some would be implemented by others (ex. DC Water, MWAA) where indicated. This is not an exhaustive list of actions being taken on by COG state and local government members;

however, it does call attention to major trends making an impact as well as new and innovative initiatives.

TABLE OF CONTENTS

Introduction	0
SUMMARY TABLE	3
VOLUNTARY MEASURES - NON-POINT SOURCES	6
Community Distributed Renewable Energy Production	6
Community Solar	6
Public Sector Solar Installations	6
Solar Coops	6
Electricity Grid-Based Green Power and Storage	7
Battery Storage incentives	7
Demand Response Programs	7
Green Power Purchasing Programs	8
Renewable Portfolio Standards (RPS)	8
Land Use, Buildings, and Site Planning	9
Building-level Energy Efficiency and Renewable Energy Programs for Existing Development	9
District Energy Systems and Microgrids	10
Green Building Programs for new development	10
Green Infrastructure and Heat Island Mitigation	11
Sustainable Development Planning	12
VOLUNTARY MEASURES – ON-ROAD SOURCE	13
Clean Fleets	13
Purchase of Compressed Natural Gas (CNG) transit buses:	13
Purchase of electric transit buses	13
Purchase of CNG refuse truck	14
Purchase of electric refuse truck	14
Diesel and Heavy-duty Vehicle Measures	14
Diesel inspection and maintenance (I/M) programs	14
Effective Implementation of on-road heavy-duty vehicle long-duration idling reduction	14
Freight and Supply Chain Fuel Management Programs: EPA Smartway Partnership	14
Idling Reduction Rebate	15
On-Road Alternative Fuels Retrofits and Repowers: Class 6 and above truck	15
Supporting the Ramp-Up of Alternative Fuel Vehicles (AFVs) and Infrastructure Throughout Metropolitan Washington	15
Travel Efficiency Measures	16
VOLUNTARY MEASURES – NON-ROAD SOURCE	16
Non-Road Alternative Fuels, Retrofits and Rebuilds	16
Nonroad diesel engine retrofit & rebuilds	16
Switcher Engine Replacement	17
Airport Ground Support Equipment (GSE) Alternative Fuels (Liquid Propane Gas [LPG]/CNG)	17
Airport GSE Alternative Fuel (Electric)	17

Non-road Anti-Idling	17
Reduce locomotive idling	17
Idling restrictions for lawn & garden equipment	17
Effective implementation of Idle reduction initiative	17
Nonroad Diesel Equipment Anti-Idling	18
STATE REGULATORY MEASURES	18
Electric Generating Units (EGU) – Point Source	18
2015 O ₃ National Ambient Air Quality Standard (NAAQS) Reasonably Available Control Technology (RACT) Adoption	18
Performance Standards for High Electricity Demand Days (HEDD) Simple Cycle Turbines	18
Non-Electric Generating Units (EGU) – Point Source: 2015 O₃ NAAQS RACT Adoption	18
Waste Incineration Facility NO _x Control:	18
OTC Natural Gas Ultra Low NO _x Burners	19
Non-Road Source: OTC aftermarket catalyst rule	19
ADVOCACY MEASURES	19
CAFE Phase 2 (Light-Duty Vehicle GHG Standards for MY 2022-2025)	19
Clean Power Plan Implementation	19
Tougher Aircraft Engine Standards	19
Tougher Locomotive Engine Standards	20
Tougher Marine Engine Standards	20
United States’ Participation in the Paris Agreement	20
INNOVATIVE AND EMERGING MEASURES	20
Commercial Property Assessed Clean Energy (PACE) Financing	20
Green Banks	20
Potential for Enacting Local Clean Air Rules	21
Procurement or Preferred Treatment Measures	21














WWCD DRAFT SUMMARY TABLE

Measures (below)	Maximum Potential NOx Benefits	Maximum implementer costs (*if available, cost per NOx ton)	Cost-Offsetting Factors	DRAFT Priority Rating
Rating system legend -->	Full circle = large (>=5 tons per day [tpd]); Half circle = medium (between 1 to 5 tpd); Quarter circle = small (< 1 tpd)	Quarter circle = Low (\$0 to 99K); Half circle = Moderate (100K to 499K); Full circle = High (500K) plus. * Orange fill = Cost per ton: Quarter circle = Low (< \$25K/ton); Half circle = Moderate (\$25-99K/ton); Full circle = High (\$100K/ton and up)	Potential Cost savings; Federal tax credits; Cost-recovering mechanism available = Recoverable; High upfront investment but long-term cost savings = Long-term savings; Broad societal benefits in addition to AQ = Societal	Based on NOx benefits, cost, feasibility and scalability. ● High priority ● Medium priority ● Low priority
Voluntary Measures - Non-Point Sources				
Community Distributed Renewable Energy Production				
Community Solar	●	●	Federal tax credits; Long-term savings	●
Public Sector Solar Installations	●	●	Societal	●
Solar Coops	●	●	Federal tax credits; Long-term savings	●
Electricity Grid-Based Green Power and Storage				
Battery Storage Incentives	●	●		●
Demand Response Programs	●	●	Cost savings	●
Green Power Purchasing Programs	●	●	Cost savings	●
Renewable Portfolio Standards (RPS)	●	●		●
Land Use, Buildings and Site Planning				
Building-Level Energy Efficiency and Renewable Energy Programs for Existing Development	●	●	Federal tax credits; Long-term savings	●
District Energy Systems and Microgrids	●	●	Long-term savings	●
Green Building Programs for New Development	●	●	Recoverable	●
Green Infrastructure and Heat Island Mitigation	●	●	Societal	●
Sustainable Development Planning	●	●	Societal	●
Voluntary Measures – On-Road Source				
Clean Fleets				
Purchase of Compressed Natural Gas (CNG) transit buses	●	●	Federal tax credits; Long-term savings	●
Purchase of electric transit buses	●	●	Federal tax credits; Long-term savings	●
Purchase of CNG refuse truck	●	●	Federal tax credits; Long-term savings	●
Purchase of electric refuse truck	●	●	Federal tax credits; Long-term savings	●
Diesel and Heavy-Duty Vehicle Measures				
Diesel inspection and maintenance (I/M) programs	●	●	Recoverable	●
Effective Implementation of on-road heavy-duty vehicle long-duration idling reduction	●	●		●
Idling Reduction Rebate	●	●	Cost savings	●

WWCD DRAFT SUMMARY TABLE

Measures (below)	Maximum Potential NOx Benefits	Maximum implementer costs (*if available, cost per NOx ton)	Cost-Offsetting Factors	DRAFT Priority Rating
Rating system legend -->	Full circle = large (>=5 tons per day [tpd]); Half circle = medium (between 1 to 5 tpd); Quarter circle = small (< 1 tpd)	Quarter circle = Low (\$0 to 99K); Half circle = Moderate (100K to 499K); Full circle = High (500K) plus. * Orange fill = Cost per ton: Quarter circle = Low (< \$25K/ton); Half circle = Moderate (\$25-99K/ton); Full circle = High (\$100K/ton and up)	Potential Cost savings; Federal tax credits; Cost-recovering mechanism available=Recoverable; High upfront investment but long-term cost savings =Long-term savings; Broad societal benefits in addition to AQ = Societal	Based on feasibility, NOx benefits, cost, cobenefits, feasibility and scalability. 1=High priority, 3=Low priority
On-Road Alternative Fuels Retrofits and Repowers: Class 6 and above truck			Long-term savings	
Freight and Supply Chain Fuel Management Programs: EPA Smartway Partnership				
Supporting the Ramp-Up of Alternative Fuel Vehicles (AFVs) and Infrastructure Throughout Metropolitan Washington	Not Quantified		Federal tax credits; Long-term savings	
Travel Efficiency Measures			Recoverable	
Voluntary Measures – Non-Road Source				
Non-Road Alternative Fuels, Retrofits and Rebuilds				
Nonroad diesel engine retrofit & rebuilds			Long-term savings	
Switcher Engine Replacement			Long-term savings	
Airport Ground Support Equipment (GSE) Alternative Fuels (Liquid Propane Gas [LPG]/CNG)			Cost savings	
Airport GSE Alternative Fuel (Electric)			Cost savings	
Non-road Anti-Idling				
Reduce locomotive idling		Not Quantified		
Idling restrictions for lawn & garden equipment			Cost savings	
Effective implementation of Idle reduction initiative				
Nonroad Diesel Equipment Anti-Idling				
State Regulatory Measures				
Electric Generating Units (EGU) – Point Source				
2015 O3 National Ambient Air Quality Standard (NAAQS) Reasonably Available Control Technology (RACT) Adoption				
Performance Standards for HEDD Simple Cycle Turbines				
Non-Electric Generating Units (EGU) – Point Source, 2015 O3 NAAQS RACT Adoption				
Waste incineration facility NOx control				
OTC natural gas ultra low NOx burners				
Non-Road Source: OTC aftermarket catalyst rule				
Advocacy Measures				
CAFE Phase 2 (Light-Duty Vehicle Greenhouse Gas Standards for model year 2022-2025)			Societal	

WWCD DRAFT SUMMARY TABLE

Measures (below)	Maximum Potential NOx Benefits	Maximum implementer costs (*if available, cost per NOx ton)	Cost-Offsetting Factors	DRAFT Priority Rating
Rating system legend -->	Full circle =large (>=5 tons per day [tpd]); Half circle= medium (between 1 to 5 tpd); Quarter circle =small (< 1 tpd)	Quarter circle= Low (\$0 to 99K); Half circle = Moderate (100K to 499K); Full circle = High (500K) plus. * Orange fill = Cost per ton: Quarter circle = Low (< \$25K/ton); Half circle = Moderate (\$25-99K/ton); Full circle = High (\$100K/ton and	Potential Cost savings; Federal tax credits; Cost-recovering mechanism available=Recoverable; High upfront investment but long-term cost savings =Long-term savings; Broad societal benefits in addition to AQ = Societal	Based on feasibility, NOx benefits, cost, cobenefits, feasibility and scalability. 1=High priority; 3=Low priority
Clean Power Plan Implementation			Societal	
Tougher Aircraft Engine Standards			Long-term savings	
Tougher Locomotive Engine Standards			Long-term savings	
Tougher Marine Engine Standards			Long-term savings	
United States Participation in the Paris Agreement	Not Quantified		Societal	
Innovative and Emerging Measures				
Commercial PACE Financing	Not Quantified	High	Recoverable	
Green Banks	Not Quantified	High	Recoverable	
Potential for Enacting Local Clean Air Rules	Not Quantified	Not Quantified		
Procurement or Preferred Treatment Measures	Not Quantified	Not Quantified		

VOLUNTARY MEASURES - NON-POINT SOURCES

Community Distributed Renewable Energy Production

COMMUNITY SOLAR

Community solar is local solar installations supported by multiple subscribers that receive credits on their utility bill. It provides access to solar to residents and businesses that may otherwise lack access to solar. (Source: [Solar Energy Industry Association](#))

Emissions Benefit: Depending on the extent of adoption of this program, the benefits could vary between small to medium.

Costs: Medium upfront; savings over time

- District of Columbia
 - The City's largest community solar project was recently completed. Benefits are provided to low-income households and is supported by the City's Solar for All Program. (Source: [DC Curbed](#))
- Maryland Public Service Commission
 - Pilot community solar program regulations have been adopted. The program emphasizes providing benefits to LMI customers. It supports the state in meeting Renewable Portfolio Standards with private investments. The 3-year pilot is being implemented by BGE, Potomac Edison, and Pepco. (Source: [Maryland PSC](#))
- Dominion Virginia Power
 - In 2018, Dominion release a request for proposal (RFP) for new solar generation for its Community Solar Pilot Program. (Source: [Dominion Energy](#))

PUBLIC SECTOR SOLAR INSTALLATIONS

Local governments are installing renewable energy systems on local government property.

Emission benefit: Small

Costs: Medium upfront; savings over time

- Bowie
 - In 2017, the City signed a deal with Tesla to develop 2 solar arrays that would supply 60% of the City's energy demand. One is now complete, the other is underway (Source: BEEAC September 2017 and February 2018 Meeting Summaries)
- Montgomery County
 - In 2014, the County awarded SolarCity a contract to install 5 MW of solar PV systems across 14 sites, 12 of which have now been completed and one more currently underway. Other local governments in Maryland are riding this contract for their own solar installation. (Source: [MWCOG White House Climate Action Champion Case Study](#), [Montgomery County DGS](#))
- Prince George's County
 - County law requires clean energy technology is incorporated into new construction and major renovations of County facilities. (Source: [Prince George's County](#))

SOLAR COOPS

Solar coops are a group of people that act together to install solar energy on their home or business at a discount. Local governments and non-profits help coordinate solar coops in their communities.

(Source: [GreenBiz](#))

Emission benefit: Small

Cost: Medium upfront; savings over time

- Solar United Neighbors (SUN)
 - Getting its start in Washington DC, SUN has operated solar coops in partnership with local governments in DC, MD, VA and beyond. Coops that are currently open are in DC and Arlington and Montgomery Counties. Past coops have been held in Frederick and Prince George's Counties. (Source: [Solar United Neighbors](#))
- Solarize NOVA
 - Established in 2014, Solarize NOVA continues to offer campaigns in Alexandria, Fairfax City and County, Falls Church, Manassas Park, and Prince William County. Thus far, 196 solar systems have been installed with a total capacity of 1.5 MW and the 2018 program is currently open. (Source: [Solarize NOVA](#))

Electricity Grid–Based Green Power and Storage

BATTERY STORAGE INCENTIVES

While energy can be produced in short periods of time, demand fluctuates. Energy storage technology balances energy supply and demand. ([US DOE](#))

Emissions Benefit: Depending on the extent of adoption of this program, the benefits could vary between small to large.

Cost: Depends on levels of incentives

- Montgomery County
 - In 2018, the County is launching a battery storage coop and is also leveraging the state tax incentives to provide additional benefit. (Source: BEEAC Feb 2018 Meeting Summary)
- Maryland
 - In 2017, Maryland launched the Energy Storage Tax Credit Program. Up to \$750,000 in tax credits may be awarded per project. Residential and commercial properties are eligible. (Source: [Maryland Energy Administration](#))

DEMAND RESPONSE PROGRAMS

Demand Response Programs help shave peak energy demand. Consumers are incentivized to reduce or shift energy use during peak demand. ([US DOE](#))

Emission benefit: Small-Medium

Cost: 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); (Source: OTC Model Rules, 2016)

The units are difficult to locate and quantify which in turn makes rulemaking difficult.

- District of Columbia and Maryland
 - Under review
- Virginia
 - General permits are available for a few generators

- **Locals: Distributed generator emission controls?**

GREEN POWER PURCHASING PROGRAMS

Local governments can purchase renewable energy, such as solar and wind, via a range of supply options and products. (Source: [US EPA](#))

Emission benefit: Depends on amount of purchase and location

Cost: Varies depending on source, amount, and location from low to high or cost saving

- District of Columbia
 - In 2015, DC DGS entered into a 20-year wind power purchase agreement with a wind farm in PA that adds more than 46 megawatts of capacity to the regional electricity grid. (Source: [C40](#))
- Montgomery County
 - Montgomery County Clean Energy Buyers Group coordinates a cooperative procurement of green power for government agencies in the county with a target of 100% by 2016. (Source: [US DOE](#)).
- EPA Green Power Program
 - EPA Green Power Partners (GPP) must meet a minimum percentage of their facility(ies) electricity use with green power (minimums depend on ranges of consumption). There are currently more than 125 EPA Green Power Partners (GPP) in metropolitan Washington, including 14 local governments. (Source: [EPA GPP Rankings](#))
 - EPA Green Power Communities (GPC) must meet minimum green power requirements as a percent of overall community consumption. There are currently 7 EPA GPC currently in metropolitan Washington including Washington DC, Falls Church, VA and in Maryland - College Park, Rockville, Hyattsville, Edmonston, and Brookeville. (Source: [EPA GPC Rankings](#))
 - The District and Montgomery County Clean Energy Buyers Group are currently ranked 3rd and 4th in EPA GPP's top local government partner rankings. (Source: [EPA GPP Top 30 Local Government Rankings](#))
 - Data on location of green power source (local, regional, national) is not available.

RENEWABLE PORTFOLIO STANDARDS (RPS)

States set renewable portfolio standards to increase production of renewable energy in the state. (Source: [NREL](#))

Emission benefit: Large

Cost: Low for government; some costs to utilities may be passed on to consumers

- District of Columbia
 - Mandatory RPS of 50% by 2032. (Source: [DSIRE](#))
- Maryland
 - Mandatory RPS standards of 25% by 2020. (Source: [DSIRE](#))
- Virginia
 - Virginia's RPS is voluntary with a goal of renewables accounting for 15% of base year (2007) sales by 2025. (Source: [DSIRE](#))

Land Use, Buildings, and Site Planning

BUILDING-LEVEL ENERGY EFFICIENCY AND RENEWABLE ENERGY PROGRAMS FOR EXISTING DEVELOPMENT

State and local programs can support implementation of energy efficiency and renewable energy actions. Local governments are supporting energy efficiency and renewable energy adoption in their communities. Many programs help make housing more affordable through reduced energy bills for low income households. Additionally, energy benchmarking regulations/ordinances require larger buildings in the community to track and disclosure energy use. Building performance can be compared to similar buildings and drive energy efficiency upgrades. (Source: [DOEE](#))

Emission benefit: Varies depending on level of adoption

Cost: Varies

- Fairfax County
 - In 2018, the County is offering a tax credit for solar (residential and commercial). (Source: [WTOP](#))
- Frederick County
 - The County's Green Homes Challenge guides, rewards and recognizes residents for saving energy and using renewable energy. As of 2018, more than 2000 participants have taken actions that have resulted in more than 10 million kWhs of electricity reduced. (Source: [Green Homes Challenge](#))
- Prince George's County
 - The County Municipal Collaboration has a concerted effort to create LMI sustainable communities. The collaboration has served more than 500 homes with weatherization and energy efficiency upgrades resulting in reducing energy by more than 200,000 kWh annually. (Source: Collaboration's application to the 2016 Climate and Energy Leadership Awards)
 - Transformation Neighborhood Initiative newly includes a Clean Energy Grant Program to offset costs of energy and water efficiency measures and solar in neighborhoods facing economic challenges. (Source: [Prince George's County](#))
 - Multifamily building owners are now eligible for a new Energy Star Certification and Green Leasing Grant Program to support efficiency retrofits and to engage landlords and tenants in energy efficient practices. (Source: [Prince George's County](#))
- District of Columbia
 - In late 2017, DC's Solar for All Program awarded >12.6 million in grants to support low income solar installations for more than 4,000 District households. (Source: [DOEE](#))
 - Launched in 2011, DC Sustainable Energy Utility delivers financial incentives and technical assistance to residents and businesses for energy efficiency upgrades. DCSEU achieved annual reductions of more than 2 million therms and more than 90,000 MWh from its 2017 initiatives. Also, in FY 2017, DCSEU installed more than 2,200 kW of solar capacity. (Source: [DOEE](#), [DCSEU](#))
 - In 2015, DC energy benchmarking disclosure became fully phased in with more than 1,500 building tracking and disclosing energy consumption. (Source: [DOEE](#))
- Montgomery County
 - In 2018, the County disclosed the results of the private sector's energy benchmarking data for the first time. Energy benchmarking and disclosure is required for buildings more than 50,000 sq. ft. Rockville has opted into the

requirements and Gaithersburg may follow. (Source: [Montgomery County Department of Environmental Protection](#), BEEAC February 2018 Meeting Summary)

- Maryland
 - EmPower Maryland Low-Income Energy Efficiency Program offers no-cost repairs and upgrades to reduce energy use in income qualified households. (Source: [Maryland Dept of Housing and Community Development](#))
 - Clean Energy Communities Low-to-Moderate Income Grant Program supports energy efficiency projects for LMI households, neighborhoods, and communities. (Source: [Maryland Energy Administration](#))
 - Commercial Clean Energy Grant Program provides incentives for solar PV, solar water heating, geothermal, and wind. (Source: [Maryland Energy Administration](#))
 - As part of the EmPOWER Maryland legislation, energy utilities offer programs to save home or business energy, including lighting and appliance rebates, home energy assessments, rebates for energy improvements like insulation, air sealing and lighting, and energy efficiency services for industrial facilities. (Source: [Maryland Energy Administration](#), [Maryland Public Service Commission](#))
 - The Smart Energy Communities provides support to local governments that adopt policies and commit to long-term sustained energy savings and renewable energy development and provides funding to support implementation of projects to achieve energy goals. (Source: [Maryland Energy Administration](#))
- Virginia
 - VirginiaSAVES Green Community Program provides subsidized financing for energy efficiency, renewable energy, and alternative fuel loans in the form of Qualified Energy Conservation Bonds (QECBs) to local government, non-profit organizations, businesses, and industry for projects with a 10 year or less payback period. (Source: [Virginia Department of Environmental Quality](#))
 - Weatherization Assistance Program provides funds to install measures that reduce residential heating and cooling costs for low-income families. The program covers repairs and improvements to home heating and cooling systems including insulation and air sealing. (Source: [Virginia Department of Housing and Community Development](#))

DISTRICT ENERGY SYSTEMS AND MICROGRIDS

District energy systems are a network of pipes that deliver hot water, steam or chilled to multiple buildings to efficiently and resiliently heat and cool buildings. DE systems can use a wide variety of energy sources and may incorporate a microgrid. Microgrids are small-scale electricity distribution systems that link and coordinate multiple distributed energy resources and can operate off the grid. (Source: [MWCOCG](#))

Emission benefit: Small

Cost: High upfront investment; long term savings

- Montgomery County
 - Microgrids are currently under development at the County's Public Safety Headquarters and County Correctional Facility. (Source: [Montgomery County Department of General Services](#))

GREEN BUILDING PROGRAMS FOR NEW DEVELOPMENT

Building codes, policies and incentives are some of the tools local governments employ to support green buildings. Locals can require or incentivize the private sector to obtain LEED certification, Energy Star certification, Net Zero Energy, and Living Buildings.

Emissions benefits: Medium

Cost: Varies

- Arlington County
 - Green Building Incentive Program includes density bonuses. (Source: [Arlington County](#))
 - Discovery Elementary School is the first net zero energy school in Virginia. (Source: [NREL](#))
- District of Columbia
 - The Energy Conservation Code, Green Construction Code and Green Building Act support energy efficient construction in the District. (Source: [DCRA](#))
 - Sustainable DC sets a goal for all new construction to be net zero energy by 2032. (Source: [Sustainable DC](#))
- Fairfax County
 - Green Building Policy calls for new county buildings and renovations to meet minimum green standards. More than 30 buildings have been certified by LEED or Green Globes. (Source: [Fairfax County](#))
- Prince George's County
 - The County's Economic Development Authority is investing in net zero energy affordable housing. (Source: COG 2015 Regional Climate and Energy Progress Report)
 - Alice Ferguson Foundation is working toward meeting net zero and Living Building Challenge Standards for its entire campus. The rigorous, holistic standards, in part, call for meeting net-positive energy and water standards. The first building on campus has been certified and was a learning and collaborative experience with AFF, developers, county staff, and the community. (Source: COG 2015 Climate and Energy Progress Report)

GREEN INFRASTRUCTURE AND HEAT ISLAND MITIGATION

Heat islands are developed areas that are hotter than less developed nearby areas and can lead to increased energy use, air pollution, health impacts, etc. Vegetation such as green roofs, natural landscapes and trees directly absorb ozone and NO_x pollution and reduce building energy demand and vehicle emissions through shading and cooling in built areas. Forests near urban areas absorb ozone pollution. (Source: [US EPA](#))

Note: A recent National Academies study showed that cool roofs and cool pavements can increase ozone slightly due to UV reflectance, and recommended the development of UV standards to reduce this penalty (Source: [National Academies](#))

Emission benefit: Small to medium

A Sacramento study found that if the city planted 1 million new trees, ozone would be reduced by 1.5 tpd and Nox by .24 tpd. The calculation includes avoided emissions from shaded cars and buildings as well as absorption (Source: [National Forest Service](#)).

Cost: Varies; in some cases costs may borne by ratepayers or developers

- District of Columbia and DC Water
 - In 2017, the District Department of Energy and Environment (DOEE) released an updated guidebook on the Green Area Ratio zoning regulation, a landscape and site design standard to reduce stormwater runoff and heat island and improve air quality. (Source: [DOEE](#))
 - As of 2017, DC's SmartRoof Program has deployed 9 megawatts of solar, installed 400,000 square feet (sq. ft) of vegetative roofs, and constructed 2.2 million sq. ft of cool roofs. (Source: DC DGS application to COG Climate and Energy Leadership Awards, 2017)
 - In 2016, the District adopted Climate Ready DC, a plan that calls for expanding urban heat island programs and incentives in the short-term (Source: [DOEE](#)).
 - In 2016, the DC Water Long Term Control Plan modification to include green infrastructure on 133 impervious acres was approved. The first project is scheduled to be complete in late 2018. (Source: [DC Water](#))
 - In 2014, the District of Columbia adopted the International Green Construction Code and Building Energy Code. Implementation of heat island mitigation strategies are required in buildings over 10,000 square feet. (Source: [Georgetown Climate Center](#))
 - DC's RiverSmart Program offers incentives and grants for green infrastructure installations in the community, such as incentives for green roofs, tree plantings, and reducing impervious surfaces, etc. (Source: [DOEE](#))
- Prince George's County
 - Tree Planting and Survivability Program targets shading homes and streets to tackle urban heat islands. More than 10,000 trees have been planted in the last 3 fiscal years. (Source: County's application to COG Climate and Energy Leadership Awards, 2017)
 - The county's Complete and Green Streets Policy requires incorporation of environmental site design in County financed and approved road, sidewalk, trail and transit related projects. (Source: [County presentation to COG](#))
- Arlington County
 - Arlington County continues to implement green street projects with a total of 9 projects completed. (Source: [Arlington County](#))
- Montgomery County
 - The county's Tree Canopy Law requires land developers to plant shade trees to offset trees removed during development or pay a fee-in-lieu which is used to fund tree planting in other locations. The law has resulted in the planting of over 1,200 shade trees from 2014 through March 1, 2017 (Source: [Montgomery County](#))
- Maryland
 - During the first fifteen years of implementation of Maryland's Forest Conservation Act, while 71,885 acres were cleared for development, 120,638 acres of forest were retained, and 21,461 acres were planted with new forest – more than twice as many acres were planted or protected as were cleared. (Source: [Maryland](#))

SUSTAINABLE DEVELOPMENT PLANNING

Plans, policies, and incentives are some of the tools local governments employ to support sustainable development. Sustainable site design, neighborhood planning comprehensive plans that encourage regionally efficient development patterns reduce energy demand and transportation

emissions while conserving land. Small area plans such as ecodistricts provide for meeting future energy needs sustainably.

Potential emission benefit: Small to large depending on level of implementation.

Cost: Varies; Planning is part of regular business; sustainable development may incur high upfront costs but save money to owners and taxpayers over time

- Alexandria
 - The Eisenhower West Small Area Plan evaluates the energy infrastructure needs and potential for distributed clean energy to meet needs of future development in the community. (Source: [Alexandria](#))
- District of Columbia
 - The DC Comprehensive Plan emphasizes resilient communities (Source: [Plan DC](#))
- Fairfax County
 - Increased building heights incentive in the Annandale Community Business Center Plan is an example of sustainable development plans in the county. (Source: [Fairfax County](#))
- Montgomery County
 - The Bethesda Downtown Plan has a foundation of sustainability and environmental innovation. The high-performance area incentivizes energy efficient buildings. (Source: [Montgomery Planning](#))
- Prince George's County
 - Prince George's County Comprehensive Plan

VOLUNTARY MEASURES -- ON-ROAD SOURCE

Clean Fleets

Replacement of any types of public fleet vehicles with cleaner technology has a positive impact on reducing emissions. For example, Montgomery County uses CNG dump trucks and pick-up trucks, and has purchased sixteen Chevy Bolt EVs and installed idling reduction software on 25 vehicles (Source: [Montgomery County](#)). This section focuses on quantifying the benefits of purchasing electric buses and trucks to add to the existing fleet or replacement of older diesel buses (useful life = 12 years) or older diesel refuse trucks (useful life = 6 years) at the end of their useful lives. Regardless, proper maintenance is important to maximizing current fleet efficiency.

PURCHASE OF COMPRESSED NATURAL GAS (CNG) TRANSIT BUSES:

Emission benefit: Medium; Maximum emission benefit = 95.2% (Table A); total emission from transit buses in Washington region = 3.3 tpd (Dusan Vuksan, TPB Staff email dated March 13, 2018)

Additional cost = \$130,435/ton if replacing an end-of-life diesel transit bus with a new CNG transit bus (Table A)

PURCHASE OF ELECTRIC TRANSIT BUSES

Emission benefit: Medium; Direct emission benefit = 100% (Table A); total emission from transit buses in Washington region = 3.3 tpd (Dusan Vuksan, TPB Staff email dated March 13, 2018)
Additional cost = \$1,021,740/ton if replacing an end-of-life diesel transit bus with a new electric transit bus (Table A)

- District of Columbia
 - In 2018, 14 electric buses will be rolled out on all six DC Circular routes, making it the largest electric bus fleet on the East Coast. (Source: [DC Circular](#))
- Frederick County
 - Frederick Transit bus fleet currently includes 5 electric buses and two hybrid buses and is looking to purchase another 3-4 electric buses in the next 3 years. (Source: [Frederick News Post](#))
- Montgomery County
 - Four electric buses and charging stations are being purchased for the County's public transit system, Ride On. (Source: [Bethesda Magazine](#))

PURCHASE OF CNG REFUSE TRUCK

Emission benefit: Small; Direct emission benefit = 96.5% (Table A)
Additional cost = \$191,490/ton if replacing an end-of-life diesel refuse truck with a new CNG refuse truck (Table A)

PURCHASE OF ELECTRIC REFUSE TRUCK

Emission benefit: Small; Direct emission benefit = 100% (Table A)
Additional cost = \$510,638/ton if replacing an end-of-life diesel refuse truck with a new electric refuse truck (Table A)

Diesel and Heavy-duty Vehicle Measures

DIESEL INSPECTION AND MAINTENANCE (I/M) PROGRAMS

Emission benefit: Medium

Cost: Varies

- District of Columbia
 - May evaluate in future
- Maryland
 - Has diesel opacity test
- Virginia
 - Tests Light-Duty diesel vehicles

EFFECTIVE IMPLEMENTATION OF ON-ROAD HEAVY-DUTY VEHICLE LONG-DURATION IDLING REDUCTION

Emission benefit: Small (10% - 33% control)

Cost: 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 (Source: EPA Menu of Controls)

- District of Columbia, Maryland, Virginia
 - Ongoing idle reduction rules in place, need more enhanced enforcement.

FREIGHT AND SUPPLY CHAIN FUEL MANAGEMENT PROGRAMS: EPA SMARTWAY PARTNERSHIP

State and local governments can join as a SmartWay affiliate or support private sector participation in this program that uses market-based incentives and technology solutions to address long-term trends, changes and challenges in the freight transportation sector. Smartway promotes supply chain analysis, information sharing and benchmarking.

Emission benefit: 550,000 tons between 2004-2016 nationally; There are currently 3,700 partners & affiliates.

Cost: low

- District of Columbia & Maryland
 - DOEE an MDE are affiliates.

(Source: <https://www.epa.gov/smartway>)

IDLING REDUCTION REBATE

Emission benefit: Small (2.5-5.5 tpy/0.007-0.015 tpd)

Cost: \$3,800-1,727/ton

- District of Columbia
 - 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
- Maryland
 - Considering restart of the MD Idle Reduction Technology Grant Program, which supported installation and use of idle reduction technologies

(Source: Table 3, Draft DOEE Spending Plan for Volkswagen Settlement Funds)

ON-ROAD ALTERNATIVE FUELS RETROFITS AND REPOWERS: CLASS 6 AND ABOVE TRUCK

Emission benefit: Small-Medium

Cost: \$4,284-\$12,157/ton (Source: EPA Menu of Controls)

- Virginia
 - Ongoing VPO GO & Alternative Fuels Fleet Vehicle Incentive programs.

Supporting the Ramp-Up of Alternative Fuel Vehicles (AFVs) and Infrastructure Throughout Metropolitan Washington

State and local programs help support alternative fuel vehicle adoption through infrastructure planning and implementation and vehicle purchase incentives. State, regional and local governments can help work with Electrify America programs to steer the additional opportunities created by the Volkswagen Settlement.

Emission benefits: Not quantified.

Cost: Varies.

- Maryland
 - Alternative Fuel Vehicle and fueling infrastructure programs available. Maryland has Freedom Fleet Voucher & Alternative Fuel Infrastructure Programs

- Effective 2017 – 2020, the EV Tax Credit provide a one-time tax credit up to \$3,000 for purchasing a qualified EV. (Source: [Maryland Department of Transportation](#))
- Effective 2017 – 2020, the EV Supply Equipment Rebate Program 2.0 provides funding assistance for installing qualified EV charging stations. (Source: [Maryland Energy Administration](#))
- Launched in FY18, the Parking Lot Solar PV Canopy and EV Charger Grant Program offers grants of up to \$400/kW of installed solar PV capacity with a cap of \$200,000 per project. (Source: [Maryland Energy Administration](#))
- Initiatives via Electrify America funding
- Virginia
 - Alternative Fuel Vehicle and fueling infrastructure programs available.
 - Initiatives via Electrify America funding

Travel Efficiency Measures

These measures include smart growth, 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. This measure may include expanding transit service, or projects such as the I66 congestion reduction effort.

Emission benefit: 2017 on-road NO_x emission (2016 CLRP) = 86.2 tpd, With 2%-5% control benefit = 1.7 tpd to 4.3 tpd

Cost: Depends

- District of Columbia, Maryland, Virginia
 - Each participate in these programs, can be expanded further
- On behalf of its members, COG coordinates the annual Bike to Work Day and Car Free Day in metropolitan Washington. Most if not all local government members help in planning, promoting, and coordinating community events. (Source: [Bike to Work Metro DC](#), [Car Free Metro DC](#))
- COG coordinates the Commuter Connections program – a network of transportation organizations, coordinated by, that provides commuter information, facilitates ridesharing and helps employers establish commuter benefit programs in metropolitan Washington (Source: Commuter Connections)

VOLUNTARY MEASURES – NON-ROAD SOURCE

Non-Road Alternative Fuels, Retrofits and Rebuilds

NONROAD DIESEL ENGINE RETROFIT & REBUILDS

Emission benefit: Large (0-37% control) Up to 18 tpd

Cost: \$4,500/ton for most, \$3,245-\$5,164/ton for some construction equipment

This analysis requires a lot of work for confirmation. NR-MOVES model would need all diesel equipment. There are 1000s of pieces of equipment and is not doable.

Source: EPA Menu of Controls

SWITCHER ENGINE REPLACEMENT

Emission benefit: Small (12.9 tpy/0.035 tpd) per engine

Cost: \$104, 284/ton

Source: Draft DOEE Spending Plan for Volkswagen Settlement Funds

- District of Columbia
 - Proposed (Draft DC VW Funding Plan)
- Maryland
 - Ongoing programs for locomotives

AIRPORT GROUND SUPPORT EQUIPMENT (GSE) ALTERNATIVE FUELS (LIQUID PROPANE GAS [LPG]/CNG)

Emission benefit: Small

Cost: Gas: \$0 (savings), Diesel: \$1,110-\$3,325/ton VOC/CO/NO_x combined

Source: EPA Menu of Controls

- Metropolitan Washington Airports Authority can implement this.

AIRPORT GSE ALTERNATIVE FUEL (ELECTRIC)

Emission benefit: Small

Cost: \$6,500-\$18,000/ton

Source: EPA Menu of Controls

- Metropolitan Washington Airports Authority can implement this.

Non-road Anti-Idling

REDUCE LOCOMOTIVE IDLING

Emission benefit: Small

Note: There may be a jurisdictional authority issue here. APUs, shore power, and automatic shut-offs available to stop idling.

IDLING RESTRICTIONS FOR LAWN & GARDEN EQUIPMENT

Emission benefit: Small-Medium

Cost: None

EFFECTIVE IMPLEMENTATION OF IDLE REDUCTION INITIATIVE

Emission benefit: Small (~1 tpd)

Cost: Low

- District of Columbia, Maryland, Virginia
 - Nonroad idling rule in place in all three jurisdictions
- Maryland

- Considering enhanced enforcement with MDOT & State Police

NONROAD DIESEL EQUIPMENT ANTI-IDLING

Emission benefit: Large - \$194,831 ton/year (534 tpd) in OTR (2009 estimate)

Source: Table 3-15, OTC Model Rules, August 2016

- District of Columbia
 - Adopted
- Maryland
 - Adopted, Discussion of enhanced enforcement with MDOT & MD State Police currently underway

STATE REGULATORY MEASURES

Electric Generating Units (EGU) – Point Source

2015 O₃ NATIONAL AMBIENT AIR QUALITY STANDARD (NAAQS) REASONABLY AVAILABLE CONTROL TECHNOLOGY (RACT) ADOPTION

Emission benefit: Large (typically this measure provided large benefits in the past, but states need to analyze this to determine actual expected benefits)

Cost: Variable depending on fuel and control technology used

- Maryland

Emission benefit: Negligible additional reduction expected

- Virginia
 - Possum Point (Gas boilers Units 3&4 potential candidates, Oil fired Unit 5 currently undergoing RACT)

PERFORMANCE STANDARDS FOR HIGH ELECTRICITY DEMAND DAYS (HEDD) SIMPLE CYCLE TURBINES

Emission benefit: Small

Cost: Water injection - \$4,400/ton, Turbine retrofit - \$1,100-\$9,000/ton (OTC Model Rules, August 2016)

- Virginia: Possum Point (6 small units, <2 tpy)

Non-Electric Generating Units (EGU) – Point Source: 2015 O₃ NAAQS RACT Adoption

Emission benefit: Small-Medium (States need to analyze this to determine actual expected benefits)

Cost: Varies depending on control technology used

WASTE INCINERATION FACILITY NO_x CONTROL:

Emission benefit: Small

- Maryland

- Negligible additional reduction expected from Montgomery county RRC facility
- Virginia
 - Covanta emissions from Alexandria/Arlington and Fairfax (4.63 tpd)* to be reduced due to the expected employment of the LN technology as part of RACT. Actual reduction estimate to be available after RACT publication. * 2008 O₃ MP EI (NEGU emissions)

OTC NATURAL GAS ULTRA LOW NO_x BURNERS

New Natural Gas-Fired Boilers, Steam Generators, Process Heaters, and Water Heaters; 75,000 BTUs/hr to 5,000,000 BTUs/hr

Emission benefit: Small

Cost: Units (75,000 Btu/hr to 2.0 million Btu/hr) - \$1,108-5,385/ton

Units (2.0 million Btu/hr to 5.0 million Btu/hr) - \$12,000-\$23,000/ton

(Source: OTC Model Rules, August 2016)

Non-Road Source: OTC aftermarket catalyst rule

States can adopt the Ozone Transport Commission's (OTC) Model Rule **prohibiting the sale of refurbished catalytic converters that do not meet air quality standards.**

Emission benefit: Small-Medium (20-28 tpd in OTR)

Cost: \$4,000-7,000/ton

- District of Columbia
 - May evaluate in future
- Maryland
 - Under development

(Source: [OTC Model Rules](#), August 2016)

ADVOCACY MEASURES

MWAQC, locals and states can advocate for federal actions that reduce NO_x emissions such as strengthening federal standards, implementing current rules on time, etc. MWAQC has previously advocated for designation under the 2015 Ozone Standard and keeping the original attainment deadlines, and implementation of the Clean Power Plan and greenhouse gas emissions standards for light-duty vehicles.

Cost: Low

CAFE Phase 2 (Light-Duty Vehicle GHG Standards for MY 2022-2025)

Emission benefit: Small

Clean Power Plan Implementation

Emission benefit: Large

Tougher Aircraft Engine Standards

Emission benefit: Large

Tougher Locomotive Engine Standards

Emission benefit: Medium

Tougher Marine Engine Standards

Emission benefit: Small

United States' Participation in the Paris Agreement

Emission benefit: Not quantified

INNOVATIVE AND EMERGING MEASURES

Commercial Property Assessed Clean Energy (PACE) Financing

Local government commercial PACE programs finance upfront costs of energy efficiency and renewable energy projects at multi-family, commercial, and industrial properties in the community and are repaid via property tax bills. ([US DOE](#))

Emissions benefits: not quantified

Cost: administrative costs; may be recoverable

- Arlington County
 - In 2018, Arlington County launched its commercial PACE Program (Source: [Mid-Atlantic PACE Alliance](#), [Arlington PACE](#))
- Mid-Atlantic PACE Alliance
 - In 2017, Mid-Atlantic PACE Alliance was launched. It's a collaboration of stakeholders in DC, MD, and VA to accelerate implementation of PACE projects. The District of Columbia and the Counties of Arlington, Charles, Frederick and Montgomery have PACE programs. (Source: [Mid-Atlantic PACE Alliance](#))
- Montgomery County
 - In 2017, the County's first PACE project was completed. A total of 11 projects were underway in 2017. (Source: [MyGreenMontgomery](#), BEEAC October 2017 Meeting Summary)
- District of Columbia
 - In 2015, the District of Columbia launched DCPACE, a program offering 100% financing for energy and water projects. Thus far, 16 projects have been financed across the District and include apartments, churches, schools, retail, non-profits small businesses, etc. Total value financed is \$34 million. (Sources: [DCPACE](#), [DOEE](#))

Green Banks

Green banks are institutions formed to finance clean energy projects using limited public funds to incentivize greater private investment. (Source: [Coalition for Green Capital](#))

Emissions benefits: not quantified

Cost: administrative costs; may be recoverable

- District of Columbia
 - In 2017, DC announced plans to establish a Green Bank, the first city in the US to work towards establishing its own green bank. (Source: [DOEE](#))
- Montgomery County
 - In 2018, the County launched its first loan product via the County Green Bank. Montgomery County is the first county in the country to establish a green bank. (Source: [BizJournal](#), [MC Green Bank](#))

Potential for Enacting Local Clean Air Rules

Federal Clean Air Act does not prevent states or local governments from adopting and enforcing air pollution laws that are stricter than federal laws and regulations. However, the “right” that the Clean Air Act speaks of is not a right unless the state gives their local governments that right. In case of a conflict between the federal and the state law, the federal law must be applied.

- Maryland – Has Savings clause to allow locals to set emission standards or ambient air quality standards not less stringent than the ones set by the state.
- Virginia – Has preempting local air laws. Locals need to seek approval from the VA Air Pollution Control Board before adopting any pollution control rule.
- District – Possible to enact stricter local air pollution laws without needing state approval because of a lack of state/local distinction.

Procurement or Preferred Treatment Measures

- Portland, Oregon is working with businesses to encourage and support sustainable consumption and minimizing the intensity of their supply chains. The City’s Climate Action Plan calls for the development of a sustainable consumption strategy for local government activities. (Source: [City of Portland Oregon and Multnomah County Climate Action Plan 2017 Progress Report](#))
- In Montgomery County, as of 2012, CNG trucks must be used for recycling, trash, and yard trim pickups by Montgomery County collection contractors. The County has 2015 collection trucks using CNG instead of diesel. (Source: COG 2012 Climate and Energy Progress Report)
- Some cities give alternative energy vehicles preferred treatment, such as moving to the front of the taxi stand or preferred parking spots. These types of measures can encourage AFV adoption.

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 NO _x Emissions (total tons emitted per year)	% Reduction Compared to Diesel Refuse Truck/Diesel Transit Bus	Reduction in Direct NO _x 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 bus = $0.027 - 0 = 0.027$ 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 bus = $0.027 - 0.0013 = 0.0257$ 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			