WHAT WE CAN DO TO IMPROVE AIR QUALITY IN THE WASHINGTON REGION - DRAFT

A menu of options to help achieve no unhealthy air days in the Washington region

May 2018

WHAT WE CAN DO TO IMPROVE AIR QUALITY IN THE WASHINGTON REGION
Compiled for the Metropolitan Washington Air Quality Committee

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BACKGROUND

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 causes a number of health problems, especially for sensitive populations such as children, elderly people, and people with respiratory problems.

The Washington region was designated as a marginal nonattainment area for the 2015 ozone National Ambient Air Quality Standard. The region must attain the 2015 standard (70 ppb) in 2021, within three years of designation.

MWAQC Chair Hans Riemer and members of the Air and Climate Public Advisory Committee (ACPAC) discussed the value 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 (unhealthy for sensitive group or worse) across the Washington region. MWAQC asked ACPAC to develop a scope of work for an analysis to identify the suite of local and regional measures, or "What We Can Do", that could achieve the above goal.

ACPAC considered the cost and value of qualitative and quantitative assessments for planning new or expanding measures to reduce ozone levels in the region. ACPAC, recognizing the level of effort and resources required for a quantitative modeling-based assessment, recommended completing a qualitative assessment approach for reducing ozone precursor NOx (nitrogen oxides) emissions[1].

A number of regional reports and studies have identified air quality measures that could be put in place to achieve emissions reductions and further improve 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.

This report documents local and state programs that would result in additional NOx emission reductions in the Washington region, leading to further improvement in ozone levels and reduction in unhealthy air days. These measures are listed by type (voluntary, regulatory, advocacy, innovative). Where available, cost and emission benefit (for NOx) for each measure are provided.

This report focuses on those measures which could be implemented by local or state governments. It also identifies some which could be implemented by others (ex. DC Water, MWAA).

The summary table shows the relative level of costs, benefits, cost offsetting factors, and priority rankings of the measures discussed in detail in the document. The cost and priority rankings are displayed in the table as high, medium, and low (low cost has the highest ranking) and NOx emission benefits are displayed as large, medium, and small. Ranges of large to small costs and high to low benefits are shown in the footnote. Priority rankings are based on the NOx emission benefits, cost, scalability, and political feasibility of different measures.

[1] The metropolitan Washington region is considered NOx limited rather than VOC limited for ozone formation.

METHODOLOGY

Methodologies used to evaluate costs and benefits for individual measures are described in detail in the respective sections of the document. These measures were evaluated for their potential to provide NOx emission benefits for the next three years. However, many of these measures once adopted will keep providing benefits in the future as well.

The assessment of cost and benefit of each measure uses best available information. However, there are limited data regarding quantified cost and emission reductions for many of the measures. Additional analysis would be needed to assess the cost and emission reductions for implementation of these measures by individual jurisdictions.

FINDINGS

COG air quality staff assessed the NOx benefits of implementing the high priority measures and medium priority measures using available data. Estimates show that the if those measures are implemented region-wide within the next three years, the region could come close to achieving the goal of no unhealthy air days and achieve the 2015 ozone standard.

COG air quality staff estimates that if the region implemented all of the high priority measures, regional NOx emissions would be reduced by at least 30 tons per day (tpd). These measures include:

- Expanding green electricity generation and storage through battery incentives, green power purchasing programs, and expanded renewable portfolio standards;
- Enhanced land use and building efficiency practices through energy efficiency and renewable energy programs, green infrastructure and urban heat island mitigation, sustainable development planning;
- Repowering on-road, class 6 and above truck engines and non-road diesel equipment; and
- Non-road diesel equipment anti-idling.

Implementation of measures by US EPA could lead to 35 tpd or more of NOx reduction in our region. These measures include:

- Retaining post 2022 Phase 2 light duty vehicle CAFE standards;
- Implementing emission reductions as provided for under the Clean Power Plan; and
- Adopting more stringent aircraft engine, locomotive, and marine engine emission standards.

According to a Virginia Department of Environmental Quality ozone modeling study (Ozone Sensitivity Modeling Analysis to Evaluate Application of NOx RACT to Possum Point Power Station (PPPS) Unit 5), a reduction of 2.57 tpd of NOx can reduce the ozone level from 0.3 to 0.6 ppb.

Based on this estimate, a reduction of 30 tpd of NOx can lead to 4 ppb to 7 ppb reduction in ozone levels. The current design value for ozone is 72 ppb and a reduction of 4 ppb can reduce it to 68 ppb, below the current NAAQS (70 ppb).

There were twelve ozone exceedance days on an average from 2013 to 2017 in the Washington region. A reduction of 4 ppb to 7 ppb in ozone levels would have resulted in a reduction of three (25%) to six (50%) exceedance days per year.

The implementation of medium level priority measures can lead to at least 13 tpd of additional NOx reduction, which could reduce ozone levels to a total of 5 ppb to 10 ppb. This would have resulted in a reduction of seven (58%) to eleven (92%) of the ozone exceedance days.

The implementation of low level priority measures could further lower or eliminate the number of exceedance days.

Implementation of high and medium level priority measures could reduce the number of ozone exceedance days significantly. However, these measures would have to be implemented regionwide to get these projected benefits. Additional study would be needed to determine the feasibility of implementing these measures at the state and local level.

EPA's implementation of additional federal measures could lead to further reduction in exceedance days, particularly as these measures would typically be implemented across, and beyond, this region.

SUMMARY TABLE

Measures	Maximum Potential NOx Benefits[2] (***=High)	Maximum Implementer Costs[3] (***=Low)	Potential Cost-Offsetting Factors[4]	DRAFT Priority Rating[5] (***=High)
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**	***

[2] *** Large (>=5 tons per day [tpd]); ** Medium (between 1 to 5 tpd); * Small (< 1 tpd)

[3] *** Low (less than $100K or up to $25K/ton; ** Moderate ($100K to 499K or $25K to $99K/ton); * High ($500K or $100K/ton and up)

[4] Cost savings; Federal tax credits; Recoverable; High upfront investment but long-term cost savings =Long-term savings; Broad societal benefits besides AQ = Societal

[5] Based on feasibility, NOx benefits, cost, and scalability. *** High priority; * Medium priority, * Low priority

Measures	Maximum Potential NOx Benefits	Maximum Implementer Costs	Potential Cost-Offsetting Factors	DRAFT Priority Rating
Voluntary Measures – On-Road Sources				
Clean Fleets				
Purchase of Compressed Natural Gas (CNG) transit buses	**	*	**Long-term savings**	*
Purchase of Electric Transit Buses	**	*	**Long-term savings**	**
Purchase of Electric School Buses	*	*	**Recoverable; Societal**	**
Purchase of CNG Refuse Truck	*	*	**Long-term savings**	*
Purchase of Electric Refuse Truck	*	*	**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**	**
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 Sources				
Non-Road Alternative Fuels, Retrofits and Rebuilds				
Nonroad Diesel Engine Retrofit & Rebuilds	***	***	**Long-term savings**	***
Switcher Engine Replacement	*	*	**Long-term savings**	*

Measures	Maximum Potential NOx Benefits	Maximum Implementer Costs	Potential Cost-Offsetting Factors	DRAFT Priority Rating
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				
Retainment of CAFE Phase 2 (Light-Duty Vehicle Greenhouse Gas Standards for model year 2022-2025)	*	***	**Societal**	***
Retainment of Clean Power Plan	***	***	**Societal**	***
Adoption of More Stringent Aircraft Engine Standards	***	***	**Long-term savings**	***
Adoption of More Stringent Locomotive Engine Standards	**	***	**Long-term savings**	***
Adoption of More Stringent Marine Engine Standards	*	***	**Long-term savings**	***
Innovative and Emerging Measures				
Commercial PACE Financing	**Not Quantified**	**High**	**Recoverable**	-

Measures	Maximum Potential NOx Benefits	Maximum Implementer Costs	Potential Cost-Offsetting Factors	DRAFT Priority Rating
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)

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

Cost: 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

Cost: 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)
Emission 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)
- 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, August 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

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 the Washington region, 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 the Washington region 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; costs/benefits to utilities are often 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: MWCOG)

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.

Emission benefit: 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 than 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 NOx 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.

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 SOURCES

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 the replacement of old diesel buses (useful life = 12 years) or old diesel refuse trucks (useful life = 6 years) at the end of their useful lives. Actual emission benefits from the replacement for these vehicles will vary depending on the specifics of the projects to be implemented by individual jurisdictions. Grants are available from different sources to purchase alternatively fueled buses, which can reduce the replacement cost significantly.

PURCHASE OF COMPRESSED NATURAL GAS (CNG) TRANSIT BUSES:

Emission benefit: Medium
Total diesel transit buses in Washington region = 6,111*
Assuming these buses are spread over 12 years (useful life of transit bus), there are roughly 500 buses at the end of their useful live4s in the fleet. Therefore, over three years, approximately 1500 buses will need to be replaced. Taking a conservative estimate, total benefit resulting from the replacement of 1000 buses using either CNG or electric buses will be 1 ton per day (See Table 1).
* (Source: Dusan Vuksan, TPB Staff memo- email dated March 8, 2018)
Cost: Additional $60,000,000 if replacing end-of-life diesel transit buses with a new CNG transit buses (Table 1). However, this cost does not include savings from lower fuel and maintenance cost, which could reduce the additional cost substantially.

PURCHASE OF ELECTRIC TRANSIT BUSES

Emission benefit: Medium
See discussion on the emission benefit above in the CNG transit bus section.
Cost: Additional $470,000,000 if replacing end-of-life diesel transit buses with new electric transit buses (Table 1). This does not include the cost of charging infrastructure. Though this upfront cost seems very high, savings from fuel and maintenance cost could reduce the additional cost substantially. In addition, the purchase of electric buses equipped with a new technology called Vehicle-to-Grid (V2G) can also further lower the cost over the life time of the bus.

- 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)

Table 1: Comparison of Emission Benefits & Costs – 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 Emission Reduction from Replacement of 1 End-of-Life Diesel Bus with New CNG/Electric Bus (tpy/tpd)	NOx Emission Reduction from Replacement of 1000 End-of-Life Buses Over 3 Years (tpd)	Additional Cost for Replacement
New Diesel Transit Bus	$300,000	-		
New CNG Transit Bus	$360,000	0.46/0.001 (Assumed same as new electric transit bus)	1000 * 0.001 = 1.0 tpd	($360,000 - $300,000) * 1,000 = $60,000,000
New Electric Transit Bus	$770,000	0.46/0.001	1000 * 0.001 = 1.0 tpd	($770,000 - $300,000) * 1000 = $470,000,000

PURCHASE OF ELECTRIC SCHOOL BUSES

Emission benefit: Low
Total diesel school buses in Washington region = 4,704*
Total NOx emission from diesel school buses in Washington region = 0.5-1.0 tpd**
Assuming these buses are spread over 14 years (useful life of school bus), there are roughly 300 buses at the end of their useful lives in the fleet. Therefore, over three years, approximately 900

buses will need to be replaced. Taking a conservative estimate, total benefit resulting from the replacement of 900 buses using either CNG or electric buses will be 0.009 ton per day (See Table 2).
* (Source: Dusan Vuksan, TPB Staff memo- email dated March 8, 2018)
** (Source: Dusan Vuksan, TPB Staff email dated March 17, 2018)
Cost: Additional $10,800,000 if replacing end-of-life diesel school buses with new electric school buses (Table 2). Though this upfront cost seems high, savings from fuel and maintenance cost could reduce the additional cost substantially. In addition, the purchase of electric buses equipped with a new technology called Vehicle-to-Grid (V2G) can also significantly lower the cost over the life time of the bus. According to a study undertaken by the University of Delaware[6], choosing a V2G equipped school bus such as, a eTrans bus rather than a diesel bus would save approximately $230,000 per bus (although this does not account for different seating capacities) over the fourteen year lifespan of each bus. This could also enhance school children's health.

- Virginia
    - Fairfax county plans to switch to electric buses (Link to Plan)

Table 2: Comparison of Emission Benefits & Costs – School Bus Replacements

Vehicle Type	Vehicle Purchase Cost	Direct NO_x Emission Reduction from Replacement of 1 End-of-Life School Bus with New Electric Bus (tpd)	NOx Emission Reduction from Replacement of 900 End-of-Life Buses Over 3 Years (tpd)	Additional Cost for Replacement
New Diesel School Bus	$110,000	-		
New Electric Refuse Truck	$230,000	Emission from 1 bus = total emission in the region/total number of buses = 0.50/4,704 = 0.00001 Emission benefit = 0.00001 - 0.0 = 0.00001	900 * 0.00001 = 0.009 tpd	($230,000 - $110,000) * 900 = $10,800,000

PURCHASE OF CNG REFUSE TRUCK

Emission benefit: Small
Cost: Additional $18,000,000 if replacing end-of-life diesel refuse trucks with new CNG refuse trucks (Table 3). However, this cost does not include savings from lower fuel and maintenance cost, which could reduce the additional cost substantially.

PURCHASE OF ELECTRIC REFUSE TRUCK

Emission benefit: Small
Cost: Additional $48,000,000 if replacing end-of-life diesel refuse trucks with new electric refuse trucks (Table 3). This does not include the cost of charging infrastructure, savings from fuel and maintenance cost, which could overall reduce the additional cost substantially.

[6] A cost benefit analysis of a V2G-capable electric school bus compared to a traditional diesel school bus; Noel, L. & McCormack R. 2014, Applied Energy, 126: 246-265.

Table 3: Comparison of Emission Benefits & Costs - Refuse Truck Replacements
(Based on Info- provided in DOEE's Draft Spending Plan for Volkswagen Settlement Funds)

Vehicle Type	Vehicle Purchase Cost	Direct NO_x Emission Reduction from Replacement of 1 End-of-Life Diesel Truck with New CNG/Electric Truck (tpy/tpd)	NOx Emission Reduction from Replacement of 200 End-of-Life Trucks Over 3 Years (tpd)	Additional Cost for Replacement
New Diesel Refuse Truck	$210,000	-		
New CNG Refuse Truck	$300,000	0.47/0.001	200 * 0.001 = 0.2 tpd	($300,000 - $210,000) * 200 = $18,000,000
New Electric Refuse Truck	$450,000	0.47/0.001	200 * 0.001 = 0.2 tpd	($450,000 - $210,000) * 200 = $48,000,000

Diesel and Heavy-duty Vehicle Measures

On-road mobile sources such as, cars, buses, and trucks are the largest contributors of NOx emission in the Washington region. Among these sources, diesel fueled and heavy-duty motor vehicles contribute significantly to NOx emissions. Measures such as diesel vehicle inspection and maintenance programs, effective implementation of the heavy-duty vehicle anti-idling rules, participation in EPA's Smartway Partnership, idling reduction rebate, and alternative-fueled heavy-duty vehicle retrofits and repowers can provide valuable NOx reduction.

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)

- Maryland
    - The Port of Baltimore dray truck replacement program available for eligible trucks. (Source: Port of Baltimore Dray Truck Replacement Program)
      The Washington region does not have a port but does have local truck fleets that could be considered for a similar program.
- Virginia
    - Ongoing VPO GO & Alternative Fuels Fleet Vehicle Incentive programs.

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

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 benefit: 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 various strategies related to the enhancing system operations, reduced speeding on freeways, travel demand management, transit enhancements, and transit incentives.

- The enhancing system operations strategies include improving the operational performance of freeways and arterial/collectors
- Reduce speeding on freeways
- The travel demand management strategies include reduce vehicle travel by shifting motorists to higher-occupancy modes (carpools, vanpools), public transit, walking, and bicycling, telecommuting, reducing the availability of free parking in activity centers by imposing parking impact fees and parking caps and create parking pricing for on- and off-street parking, related strategies to encourage park-and-ride usage, incentives to encourage carpooling and ridesharing, non-motorized modes of commuting, and telecommuting through the use of programs that establish: a) telecommuting opportunities; b) carpool incentive programs; c) vanpool incentive programs, and; d) employer outreach. Finally, the measures include ordinances that require employers to offer parking cash out and transit benefits.
- The travel enhancement strategies include increasing the share of transit trips through increased or improved services such as, increased circulator buses, enhanced commuter bus services, real-time bus schedule information, transit signal priority improvements, bus rapid transit, streetcar, or light rail improvements, expanded metro rail/commuter rail, bus stop improvements, schedule coordination between transit agencies, permitting buses on

highway shoulders, transit access improvements, establishing dedicated transit lanes, and bus infrastructure commitments.
- The transit incentive strategies include incentivizing transit use through lower fares, such as, reduced price monthly transit passes, free bus-rail transfers, and free off-peak bus service.

Emission benefit: Medium (at least 1.61 tpd, total for 2020 from all five strategies)
(Source: Multi-Sector Approach to Reducing Greenhouse Gas Emissions in the Metropolitan Washington Region, Final Technical Report, January 31, 2016, MWCOG)
Cost: Varies (Refer to MSWG report above)

- 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 the Washington region. 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 the Washington region (Source: Commuter Connections)

VOLUNTARY MEASURES -- NON-ROAD SOURCES

Non-Road Alternative Fuels, Retrofits and Rebuilds

Emission control standards for nonroad engines have lagged behind standards for other mobile sources such as passenger cars. Because of this, these engines contribute significantly to the overall mobile source pollutant emissions inventory. Over the last ten years, EPA has introduced a series of highway and nonroad gasoline and diesel fuel quality and emission standards that when fully implemented will reduce emissions from newer engines. Emissions from existing engines, however, will continue to emit high levels of pollution for many years. To address this issue, states and local governments can switch to alternatively fueled engines and replace, rebuild, or repower old engines.

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/NOx 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

States and local governments can introduce measures such as, anti-idling rules and implement them effectively to avoid unnecessary emissions.

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.
Cost: None

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)
Evaluation of emission benefit in the Washington region is difficult owing to the
(Source: Table 3-15, OTC Model Rules, August 2016)
Cost: None

- 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

Electric generating units such as, power plants are major sources of NOx emission in the Washington region. Adoption of the Reasonably Available Control Technology (RACT) as part of the 2015 ozone NAAQS will help bring down emission from these power plants.

2015 O_3 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 boiler Unit 3 and Unit 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
(Source: OTC Model Rules, August 2016)
Virginia: Possum Point (6 small units, <2 tpy)

Non-Electric Generating Units (Non-EGU) – Point Source

Non-electric generating units such as, large industrial units, waste incineration facilities, etc. are also important sources of NOx emission in the Washington region. Adoption of the Reasonably Available Control Technology (RACT) as part of the 2015 ozone NAAQS will help bring down emission from these power plants. The use of natural gas based ultra-low NOx burners suggested by the Ozone Transport Commission (OTC) can provide important NOx emission benefit.

2015 O_3 NATIONAL AMBIENT AIR QUALITY STANDARD (NAAQS) REASONABLY AVAILABLE CONTROL TECHNOLOGY (RACT) ADOPTION

Emission benefit: Medium (Expected, States need to analyze this to determine actual benefits)
Cost: Varies depending on control technology used

WASTE INCINERATION FACILITY NOX CONTROL

Emission benefit: Medium
Cost: None

- Maryland

    - Negligible additional reduction expected from Montgomery county RRC facility
- Virginia
    - Covanta emissions (4.63 tpd)* from Alexandria/Arlington and Fairfax to be reduced due to the expected employment of the LN technology as part of RACT. Medium emission benefit expected; actual reduction estimate to be available after RACT publication.
      * (Source: 2008 Ozone NAAQS Maintenance Plan Non-EGU Emissions Inventory)

OTC NATURAL 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
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)

On-Road Sources

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 preserve already planned NOx emission reduction by retaining existing federal standards or further reduce NOx emission by strengthening federal standards. MWAQC has previously advocated for retaining the Clean Power Plan and greenhouse gas emissions standards for light-duty vehicles for model years 2022 through 2025.
Emission benefit: Varies
Cost: None

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

Emission benefit: Small

Retainment of Clean Power Plan

Emission benefit: Large

Adoption of More Stringent Aircraft Engine Standards

Emission benefit: Large

Adoption of More Stringent Locomotive Engine Standards

Emission benefit: Medium

Adoption of More Stringent Marine Engine Standards

Emission benefit: Small

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)
Emission benefit: not quantified
Cost: Varies

- 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)
Emission benefit: not quantified
Cost: Varies

- 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.
Emission benefit: not quantified
Cost: administrative costs; may be recoverable

- 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

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.

- 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)