

Gold Book

State and Local Government Initiatives to Clean the Air

Metropolitan Washington, D.C.
Ozone Nonattainment Area

DRAFT FOR REVIEW

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Prepared by

Metropolitan Washington Council of Governments (COG)

For the

Metropolitan Washington Air Quality Committee (MWAQC)

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Table of Contents

<u>Air Quality Improvement Measure</u>	<u>Page</u>	<u>Status</u>
<u>Introduction</u>	5	
<u>Climate, Energy and Sustainability Plans</u>	8	
<u>State Plans</u>	8	Existing
<u>Regional Plans</u>	10	Existing
<u>Local Climate Plans</u>	11	Existing, Expansion
<u>Local Government Air Quality Programs</u>	13	Existing, Expansion
<u>Energy Security & Assurance Plans</u>	15	New
<u>Regional Partnerships</u>	17	
<u>Clean Air Partners Program</u>	17	Existing
<u>Green Cooperative Purchasing</u>	18	Existing, Expansion
<u>Urban Heat Island Mitigation</u>	19	Existing, Expansion
<u>Public-Private Partnerships</u>	23	Existing, Expansion
<u>Green Power and Grid Modernization</u>	26	
<u>Renewable Energy Portfolio Standards</u>	26	Existing, Expansion
<u>Local Government Green Power Purchases</u>	27	Existing, Expansion
<u>Community Renewable Energy Purchasing</u>	29	Existing, Expansion
<u>Maryland Game Changers Program</u>	30	Existing, Expansion
<u>Rooftop Solar Challenge</u>	31	Existing, Expansion
<u>Energy Efficiency</u>	32	
<u>Energy Efficiency Financing</u>	32	Existing, Expansion
<u>Energy Savings Performance Contracting</u>	35	Existing, Expansion
<u>Sustainable Energy Utility</u>	36	Existing, Expansion
<u>High Performance Building Policies</u>	37	Existing, Expansion
<u>Green Leasing</u>	42	Existing, Expansion
<u>Smart Grid and Advanced Metering</u>	43	Existing, Expansion
<u>Transportation Demand Reduction</u>	44	
<u>Transit-Oriented Development</u>	44	Existing, Expansion
<u>Commuter Connections</u>	46	Existing
<u>Telecommute Initiatives</u>	47	Existing, Expansion
<u>Safe Routes to Schools</u>	48	Existing, Expansion
<u>Incident Management and Communication</u>	49	Existing
<u>Transportation Options</u>	50	
<u>Public Transit</u>	50	Existing, Expansion
<u>Commuter Rail</u>	52	Existing, Expansion
<u>Bus Priority Enhancements</u>	53	Existing, Expansion

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

Value-pricing (HOT Lanes)	54	Existing, Expansion
Vehicle Share Programs	55	Existing, Expansion
Bicycle and Pedestrian Programs	56	Existing, Expansion
Vehicle Emission Reduction	58	
Alternative Fuel Vehicles	59	Existing, Expansion
Traffic Signal Optimization	61	Existing
Idling & Emissions Enforcement	62	Existing, Expansion
Voluntary Diesel Retrofit Program	63	Existing
New & Additional Ideas	64	
Microgrids	65	New
Combined Heat & Power	66	New
Waste-to-Energy	67	New
Eco-Driving Programs	68	New
Usage-based Insurance	79	New
Parking Management	70	New
Hoteling	71	New

Introduction

Government agencies in the Washington, DC ozone nonattainment area have a long history of undertaking emission control measures to improve air quality and protect public health. The Clean Air Act requires the US Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (see 40 CFR part 50) for pollutants considered harmful to public health and the environment. The six criteria pollutants regulated by EPA are: particulate matter (PM), ground-level ozone, carbon monoxide, sulfur dioxide (SO₂), nitrogen oxides (NO_x), and lead. All can have harmful effects but PM and ozone are the most prevalent threats. The table below shows the metropolitan Washington region’s air quality designation, classification and attainment of National Ambient Air Quality Standards for ozone and particulate matter over time.

	NAAQS Date	Effective Designation Date/Classification	SIP Status	Attainment Status
1-Hour Ozone Standard (125 ppb)	1979	January 6, 1992/Serious, March 25, 2003/Severe	Submitted 2004	Attained in 2005
8-hour Ozone Standard (84 ppb)	1997	June 15, 2004/Moderate	Submitted 2007	Attained in 2009
PM2.5 Standard (15 ug/m3)	1997	April 5, 2005/not applicable	Submitted 2008	Redesignation Request Submitted in 2013
8-hour Ozone Standard (75 ppb)	2008	July 20, 2012/Marginal	No SIP required	Attainment Deadline of 2015
Anticipated 8-hour Ozone Standard (60-70 ppb)	2014?	Pending	Pending	Anticipated Attainment Deadline of 2020

Air Pollutants

Ozone contributes to reduced visibility (smog or haze), and can cause harmful health effects even at low levels. Ozone exposure can trigger chest pain, coughing, throat irritation, inflame the linings of the lungs and can worsen bronchitis, emphysema, and asthma. Repeated exposure may permanently scar lung tissue. Ground-level ozone is not emitted directly into the air, but created through chemical reactions between nitrogen oxides (NO_x) and volatile organic compounds (VOC). In the metropolitan Washington region, onroad mobile sources are the largest contributor of nitrogen oxides, accounting for approximately 54% of regional emissions in 2011. Other sources of NO_x include power plants, industrial facilities and nonroad mobile sources.

Volatile organic compounds (VOCs) are emitted as gases from a huge variety of materials including paints and lacquers, paint strippers, glues and adhesives, permanent markers, cleaning supplies, pesticides, building materials, and office equipment like copiers and printers. While some VOCs pose serious health threats to indoor air quality, VOCs are primarily regulated because they can contribute to ground-level ozone through reactions with NO_x and carbon monoxide. Mobile sources contributed about half of the region’s VOC emissions in 2011.

Particulate matter (PM) includes “coarse particles” like soot, smoke, dirt and dust, with a diameter between 2.5 and 10 micrometers, and “fine particles,” which have diameters 2.5 micrometers and

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

smaller. PM can cause serious health problems because they can get deep into the lungs and even into the blood stream. Particle pollution exposure is linked to a variety of health problems, including: aggravated asthma, decreased lung function, irregular heartbeat, heart attacks, and even premature death in people with heart or lung disease. Some particulates are emitted directly – primarily from construction sites, unpaved roads, fields, smokestacks or fires – while others form through reactions of sulfur dioxides and nitrogen oxides that are emitted by power plants, industries and vehicles. Mobile sources contributed about a quarter of the region’s fine particle emissions in 2011.

Air Quality Regulation

The Metropolitan Washington Air Quality Committee (MWAQC) is certified by the mayor of the District of Columbia and the governors of Maryland and Virginia to prepare an air quality plan for the DC-MD-VA Metropolitan Statistical Area under Section 174 of the federal Clean Air Act Amendments of 1990. MWAQC coordinates air quality planning activities among the local government members of the Metropolitan Washington Council of Governments (MWCOCG), the Transportation Planning Board (TPB) and external stakeholders to develop and adopt an air quality plan for transmittal to the District of Columbia, Maryland, and Virginia.

Despite progress, the metropolitan Washington region remains in nonattainment of the 2008 NAAQS for 8-hour ozone of 75 ppb. The Clean Air Act requires that the region attain the standard as soon as practicable but no later than December 31, 2015. However, because the region’s designation classification is “marginal,” there is no federal requirement to submit an Attainment Demonstration or a Reasonable Further Progress/Rate of Progress Plan or to establish new lower Motor Vehicle Emission Budgets (MVEBs) as part of any State Implementation Plan (SIP) submittal. If the region does not meet the 2008 standard by the 2015 deadline, the region’s classification will likely be increased to moderate non-attainment and the region will likely be required to adopt additional regulatory programs to achieve and maintain attainment of the NAAQS.

EPA is considering establishing a new more stringent NAAQS for 8-hour ozone in the range of 60-70ppb, with an anticipated attainment deadline of 2020. As part of the agency’s 5-year review process, the EPA’s Clean Air Scientific Advisory Committee (CASAC) recommended a 60-70 ppb standard was necessary to protect public health.¹ If such a standard is passed, stronger measures will be needed to bring regional air pollutant levels in attainment with the new NAAQS.

Federal and State control measures included in past SIP submittals continue to provide air emission reduction and benefits to the region. Some of the most significant control measures include: motor vehicle emission standards, emissions caps or permits for power plants, emission standards for non-road engines, and product formulation requirements for aerosols, adhesives and paints. New control measures currently being developed include: Tier 3 motor vehicle emission standards, measures to reduce emissions being transported into the region from upwind states, and tighter emission standards for non-road engines.

For several decades, local governments in the area have led by adopting strategies and implementing programs to improve air quality. Some of these measures are not easily quantifiable or are not being

¹ [CASAC Review of the EPA’s Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards \(First External Review Draft – August 2012\).](#)

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

credited in the SIP. Additional initiatives continue to be explored and are of significant interest, but have not been fully implemented by state and local governments because of a shortage of time or resources.

The Gold Book is a compendium of these local initiatives. It presents the innovative measures that are now underway and promising measures for the future that could make a difference in our region's air quality. Through the efforts of the participating state and local governments, as outlined in this document, the region has taken many important steps to reduce emissions above and beyond the requirements of federal or state law. The measures contained in this Gold Book are organized into the following categories:

Categories of Measures in the Gold Book

- Climate, Energy, and Sustainability Plans
- Regional Partnerships
- Green Power and Grid Modernization
- Energy Efficiency
- Transportation Demand Reduction
- Transportation Options
- Vehicle Emission Reduction
- New & Additional Ideas

A description of the measure, information on the regional implementation status, opportunities for expansion, and an explanation of air quality benefits are included for each measure in the Gold Book. Many programs are already in place. There are numerous current initiatives that could be expanded, some without significant new investment. Finally, there are promising initiatives that could be implemented in the future, but which may require additional effort, support or investment. The second and third categories include measures that have been discussed at the regional level but not implemented, and those that are already planned but will not take place until after the region's 2015 ozone attainment date.

The Gold Book reflects the progress local governments in the Metropolitan Washington Region are making to improve air quality, and helps local governments identify additional measures they can take. It is intended to be a living document, so feedback, suggestions and additions are welcome. Please direct comments to Isabel Ricker at iricker@mwkog.org.

CLIMATE, ENERGY AND SUSTAINABILITY PLANS

Climate, energy and sustainability plans cover a variety of planning initiatives including greenhouse gas reduction, climate adaptation and resilience, fossil fuel consumption reduction, energy efficiency, renewable energy generation and use, energy security, and more general community livability goals. These plans include a multitude of different measures, strategies and recommendations for achieving climate and sustainability goals, many of which are difficult to quantify but can have very important benefits for both greenhouse gas and air quality goals.

In February 2014, EPA released a new open-access tool called AVERT (Avoided Emissions and Generation Tool), which will enable states, local governments and other stakeholders to estimate hourly emissions benefits of energy efficiency and renewable energy policies and programs. The tool will be very helpful to these entities in developing, tracking progress, and prioritizing measures to include in Climate, Energy and Sustainability plans or in the air quality planning processes. The tool will likely also be critical to calculating benefits of existing programs to comply with new EPA regulations for carbon emissions from existing power plants, which are expected to be proposed in June 2014 and go into effect in 2016.

State Plans

District of Columbia

[The Sustainable DC Plan](#) is the District's first sustainability plan that lays out a path forward to make the District the healthiest, greenest, most livable city in the nation over the next 20 years. A few of the plans goals to achieve by 2032 include minimizing greenhouse gas emissions 50 percent; cut citywide energy use by 50 percent and increase use of renewable energy use by 50 percent; increase use of public transit, biking, and walking to 75 percent of all commuter trips; and achieve ZERO unhealthy air quality days.

Some of the actions identified to help meet those goals include introducing legislation to reduce fossil fuel-based power use; requiring all new buildings to be net-zero or net-positive; expand performance-based parking program; expand car-sharing programs to low-income residents using financial tools; encourage private businesses to offer incentives for employee travel by transit, walking, or biking; encourage and promote telecommuting and alternative work schedules for employees; require District government, and encourage private businesses, to purchase clean fuel, low-emission fleet vehicles; expand electric vehicle charging infrastructure throughout the city; offer incentives to avoid driving and other emission-generating activities on predicted Code Red and Orange air quality days; and track and report mileage data from clean fuel, low-emission, and electric vehicles.

Maryland

In 2007, Governor Martin O'Malley signed Executive Order 01.01.2007.07 establishing the Maryland Commission on Climate Change. Sixteen State agency heads and six members of the General Assembly comprise the Commission. The principal charge of the Commission was to develop a Plan of Action (the [Climate Action Plan](#)) to address the drivers of climate change, to prepare for its likely impacts in Maryland, and to establish goals and timetables for implementation.

In 2009, Maryland Governor O'Malley and the Maryland General Assembly passed the Greenhouse Gas Emissions Reduction Act of 2009 (GGRA). The law requires the State to develop and implement a Plan

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

(the [GGRA Plan](#) or the Plan) to reduce greenhouse gas (GHG) emissions 25 percent from a 2006 baseline by 2020. The top 10 measures to help the state reach the goal are the Regional Greenhouse Gas Initiative (RGGI), EmPOWER Maryland Program, Renewable Portfolio Standards, Maryland Clean Cars Program, CAFÉ standards, public transportation initiatives, zero waste goals, building codes, managing forests to capture carbon, and planting forests in Maryland.

The Regional Greenhouse Gas Initiative (RGGI) is a multi-state emissions cap and trade program with a market-based emissions trading system. The cap and trade program is designed to reduce CO₂, a greenhouse gas, while maintaining electricity affordability and reliability. Maryland's participation in RGGI will reduce CO₂ emissions from the State's electricity generators by roughly 10 percent from current levels by 2019. The program also directly funds energy efficiency and cleaner energy programs that will lower greenhouse gas emissions.

The EmPOWER Maryland Energy Efficiency Act of 2008 sets targets to reduce both per capita energy consumption and per capita peak demand by 15 percent by the end of 2015 (based on a 2007 baseline). To help achieve this goal, Maryland Energy Administration (MEA) encourages residents to adopt the energy saving measures that are most appropriate for their home.

Virginia

The Virginia Governor's Commission on Climate Change released its final report on December 15, 2008, stating that greenhouse gas emissions in the state could increase by 31 percent by 2025 under business as usual. The report presents recommendations to meet the state GHG reduction target of 30 percent below the business-as-usual projection by 2025.

The Virginia General Assembly established state energy policy and directed the Department of Mines, Minerals and Energy to update the [Virginia Energy Plan](#) by July 1, 2010. The plan recommends actions to meet several key goals:

1. Grow both traditional and alternative energy production, jobs and investment.
2. Increase the use of conservation and efficiency.
3. Expand public education about Virginia's energy production and consumption, its effect on our economy, and how Virginians can use energy more efficiently.
4. Maximize the investment in clean energy research and development through the work of the Universities Clean Energy Development and Economic Stimulus Foundation.

Progress Made toward Implementation

The District of Columbia's [2011 Greenhouse Gas Emissions Inventory](#) shows an emissions reduction of 12.5 percent from the 2006 baseline year, even with continued population and employment growth. In addition, emissions associated with District government operations, a subset of the city's total greenhouse-gas emissions, fell by 23 percent between 2006 and 2011.

The status of all Sustainable DC actions can be found in the [2013 Earth Day Baseline Report](#). Maryland's 2011 Greenhouse Gas Emission's Inventory show's a 10.5 percent reduction in net emissions from its 2006 emission inventory. To help reach the EmPOWER Maryland 15 percent by 2015 target the MEA estimates that 64,000 MWh were saved through MEA programs between 2009 and 2010.

These programs reduce emissions of NO_x, SO₂, fine particles and greenhouse gases from fossil-fueled power plants. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Regional Plans

Description

[Region Forward](#) is COG’s vision and mission. It’s a commitment by COG and its member governments, who together seek to create a more accessible, sustainable, prosperous, and livable National Capital Region. *Region Forward* draws its climate and energy related goals from the [2008 National Capital Region Climate Change Report](#). The regional greenhouse gas (GHG) emissions reduction goals include 10 percent below business as usual by 2012, 20 percent below the 2005 levels by 2020, and 80 percent below 2005 levels by 2050.

Regional Implementation

COG’s Climate, Energy and Environment Policy Committee (CEEPC) supports the *Region Forward* vision and mission by providing leadership on climate change, energy, green building, alternative fuels, solid waste and recycling issues and by supporting area governments as they work together to meet *Region Forward* goals. In May 2013, CEEPC adopted the second addition of the [Regional Climate & Energy Action Plan](#), which identifies short-term goals and actions (2013- 2016) to help move the region toward achieving long-term *Region Forward* goals. An Action Plan Resource Guide has been developed to assist local jurisdictions with plan implementation. Progress toward implementation of the action plan is tracked through annual surveys and published in an [Annual Climate and Energy Progress Report](#) (link is to the 2012 Report).

To begin to understand progress made toward the 2012 goal, COG has conducted preliminary analysis of electricity and transportation sectors. Preliminary results show that the region is surpassing reduction goals in the electricity sector, with a 17 percent reduction in CO2 emissions from 2005 to 2012. Combined emissions from natural gas and electricity consumption showed a 16 percent decrease from 2005 levels. According to the most recent regional transportation emissions analysis, emissions from the transportation sector are estimated to be holding steady at 2007 levels. Analysis of other emissions sources, including stationary fuels, is pending.

Opportunities for Expansion

To continue to encourage local action to meet the 2020 GHG reduction goal, CEEPC has announced a “Focus on the Leaders” initiative. The goal is to identify successful models both locally and nationally that can be implemented in our communities. Each CEEPC meeting in 2014 will feature best practices that we can work to advance in the National Capital Region.

In addition, CEEPC has approved the development of a pilot Climate and Energy Leadership Awards Program to recognize environmental achievements of local governments and non-governmental organizations in the region, encourage friendly competition, and provide an opportunity to learn from each other. A key component of the awards program is to share how the leading programs, projects, and policies in the region are transferable to other local communities. The Awards program and the “Focus on the Leaders” initiative have the potential to expand current air quality improvement measures and to bring new ideas to the region.

Local Climate Plans

Regional Implementation

Eleven of the COG member jurisdictions have their own climate, energy or sustainability plans. Each locality is in various stages of development and implementation of their local plans. A summary of local government plans and goals is provided below:

- The [City of Alexandria's Energy and Climate Change Action Plan](#) goals include the following: by 2010, reduce GHG emissions to 2005 levels; by 2020, reduce GHG emissions by 20 percent below 2005 levels and 25 percent of City's energy will be from clean renewable sources; by 2030, all buildings will be carbon neutral; and by 2050, reduce GHG emissions by 80 percent below 2005 levels and 80 percent of the City's energy will be from clean, renewable resources.
- Arlington County's [Community Energy Plan](#) was adopted as a new element of the County's Comprehensive Plan in 2013. Under the County Government goals in this plan, emissions would be reduced 76 percent by 2050 from 2007 levels, with interim goals of 10 percent below 2000 levels by December 2012, 25 percent reduction by 2020, 42 percent reduction by 2030 and 59 percent reduction by 2040. The community-wide target is to reduce greenhouse gas emissions by 70 percent from 2007 to 2050, from 13.4 mt CO₂e per capita per year to 3.0 mt CO₂e per capita per year. Arlington County has evaluated progress towards their greenhouse gas emission reduction goals. Arlington County's [2012 Government Operations Greenhouse Gas Inventory](#) shows that the County has achieved a reduction of 11.7 percent in its emissions, even as its services and facilities increased.
- The City of Bowie is in process of developing a climate action plan where a target reduction goal for city operations is to reduce GHG emissions associated with city government vehicles by 25 percent by 2020 against a 2007 baseline. Target reduction goal community wide is to reduce citywide GHG emissions by 10 percent by 2015 and 20 percent or more by 2020.
- [Fairfax County's plan](#) recommends policy changes and agency actions across government operations to reduce GHG emissions, and is updated annually. The Facilities Management Department (FMD) has set an internal goal of reducing energy use per square foot (kBtu/sf) by one percent per year. Over the last decade, FMD has achieved this goal, avoiding over \$7 million in energy costs in that time.
- [Frederick County Sustainable Action Plan for County Operations](#) has a goal of 25 percent reduction by 2025. It also sets goals in the areas of leading by example, conserving energy and reducing emissions, green building, green purchasing, green infrastructure, recycling and reducing waste, and transportation alternatives that improve air quality. Each goal area identifies guiding principles, an action plan, highlights of current success, and how success will be measured.
- Greenbelt is in the process of developing their climate action plan. In line with State of MD and COG's initiatives, a goal has been established to reduce GHG emissions at City facilities 10 percent below 2005 levels by 2012, 20 percent by 2020 and 80 percent by 2050.
- The [Loudoun County Energy Strategy](#) sets a County goal to reduce greenhouse gasses from 3.85 million metric ton to 3.0 million metric ton by 2040 County-wide. Although by that time the County's population projection increase is 86 percent. The County also has a government operations goal to reduce emissions 15 percent between 2007 and 2012.
- [Montgomery County Climate Protection Plan](#) includes 58 recommendations in the categories of renewable energy; residential building energy efficiency; commercial, multi-family and public building energy efficiency; transportation; forestry and agriculture; land use and planning; and

outreach. Each recommendation contains a summary, detailed background information, and implementation steps. The goal of the plan is to reduce GHG emissions to 80 percent below 2005 levels.

- Prince George’s County has finalized its Climate Action Plan (CAP) and is pending approval from the County Executive's office and County Council after which it will be made public. The County has a [Petroleum Reduction and Renewable Energy Action Plan](#) which calls for the County to: reduce GHG emissions 80 percent below 2008 levels by 2050, to reduce County electricity consumption by 20 percent by 2022, to meet 20 percent of building electricity needs with distributed renewable energy by 2022, to incorporate Green Building principles into all county facilities, and to reduce County fleet petroleum consumption 20 percent by 2018.
- Rockville signed the US Mayors Climate Protection Agreement and is a member of ICLEI. The 2007 [Sustainability Plan](#) contains actions to conserve energy and reduce greenhouse gases.
- Takoma Park’s [Local Action Plan for Reducing Greenhouse Gas Emissions](#) includes the community GHG inventory and describes in detail action measures by sector including municipal, commercial/residential, natural resources, waste, and transportation sectors. The goal of the plan is to reduce CO₂ emissions in Takoma Park to 80 percent of 1990 levels by 2010.

Air Quality Benefits

Climate and Sustainability plans increase public awareness of energy consumption and promote efficient technologies and conservation measures. Reducing energy consumption reduces emissions of conventional pollutants such as NO_x, SO₂ and mercury, as well as greenhouse gases methane and CO₂, by displacing electric generation from coal, oil, and natural gas-fired power plants. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions. Additionally, transportation measures in these sustainability plans reduce emissions of NO_x, ozone and fine particles by encouraging low or no-emissions transportation options, increasing transportation efficiency and reducing travel demand.

Local Government Air Quality Programs

Description

Air Quality Improvement Plans and Action Guides can be an effective tool for local air quality improvement by educating the public of air quality issues and providing concrete steps which residents, employers and local governments can take to reduce air pollution. Such measures may include altering commuting behavior, particularly on bad air quality days, by encouraging teleworking, carpooling, public transit, walking and bicycling. Guides may encourage or require the use of low-polluting materials like low-VOC paint and pesticides, begin a gas cans replacement program, or even provide incentives for electric or alternative fuel vehicles. Other initiatives may focus on reducing or postponing polluting activities, such as vehicle refueling, lawn-mowing, paving and outdoor painting, vehicle idling, and pesticide application on poor air quality days.

Regional Implementation

All COG members participate in the Clean Air Partners Program and encourage residents to participate in Air Quality Action Day and other air quality improvement [measures](#). Some localities in the region also have independent initiatives to encourage measures such as those discussed above.

The Montgomery County Department of Transportation (MCDOT) has an Environmental Sustainability Policy which aims to reduce VOC and NO_x emissions to improve air quality. MCDOT's policies include: reducing congestion, promoting low emission and alternative fueled vehicles, increasing transportation options, expanding and maintaining tree canopy, a waste-to-energy facility, and switching equipment to run on 20 percent soybean oil. In 2008 Prince George's performed an air quality messaging survey to inform development of an Air Quality Strategic Plan. The County also began a program to encourage air quality awareness and stewardship in County operations and among County employees.

The Arlington Initiative to Rethink Energy (AIRE) aims to help residents, businesses and government agencies reduce greenhouse gas and air pollutant emissions. Through the AIRE program, the County has transitioned over half of its vehicle fleet to clean and alternative fuels. Arlington Transportation Partners and BikeArlington also help to improve air quality by encouraging public transit, walking and bicycling.

Opportunities for Expansion

Local governments in the region that do not have air quality improvement policies should consider measures they can take, such as those discussed above and throughout this Gold Book, to reduce VOC and NO_x emissions from public operations.

Localities can also lead or support air quality awareness programs to increase public participation in air quality improvement measures. For example, localities can participate in EPA's [Air Quality Awareness Week \(AQAW\)](#), which encourages residents to take simple actions – like bicycling, walking, using public transit, carpooling, refueling after dark, and using a broom or rake instead of a leaf blower – each day for one week to raise awareness of air quality issues.

Air Quality Benefits

Increasing awareness of air quality pollution and encouraging behavioral changes to improve air quality can have a significant impact on local air quality, particularly on days when air pollution is worst. Energy efficiency and conservation lower electricity demand, reducing emissions of NO_x, SO₂, fine particles and greenhouse gases from fossil-fueled power plants. Reducing emissions from upwind power plants

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Montgomery County's Resource Recovery Facility (RRF) converts waste to electricity, displacing 1,600 barrels of oil or 500 tons of coal for every 1,000 tons of solid waste. Switching to biodiesel reduces particulate matter and carbon monoxide by about 12 percent and reduces NOx emissions about 2 percent. Trees absorb sulfur dioxide, ozone and particulate matter, and because they shade buildings and lower air temperature, trees can reduce electricity consumption needed for cooling. Because NOx emissions are greater at lower speeds associated with idling or congestion, improving traffic flow can have a large benefit for local air quality.

Energy Security & Assurance Plans

Description

In recent years, extreme weather events, like hurricanes Sandy and Irene, the June 2012 derecho and the recent winter ice storms have revealed the vulnerability of the energy system. An aging and patchwork infrastructure makes the metropolitan Washington region's electrical grid susceptible to power outages and poses an additional challenge to ensuring energy quality. Widespread power outages and concerns about the vulnerability of the region's energy system to security breaches and natural hazards led to a regional discussion about energy security and assurance planning.

Local Energy Assurance Plans (EAPs) identify key actions to take during an energy emergency to ensure that critical facilities continue to function. Strategies may include integrated energy planning, energy efficiency, distributed generation, grid modernization, and alternative power systems, including renewable energy. Plans may be based on state EAPs or formulated independently. EAPs can be stand-alone plans, or can be integrated into community energy or emergency management plans.

Regional Implementation

Several COG member jurisdictions are considering developing an EAP or are already implementing energy assurance measures. The City of Bowie has installed generators at key City facilities and provides cooling and warming centers during severe weather events as part of its [Emergency Operations Plan](#). The District Department of the Environment developed an [EAP](#) to assess the types of energy emergencies that could occur in the District, lay out a plan of action and determine who responds in the event of an energy emergency. The Plan also recommends steps the District can take to promote policies and programs that enhance the resiliency of District energy systems and protect critical infrastructure.

Maryland has a grid reliability & resilience initiative, started in 2012 by Governor O'Malley. The [Maryland Task Force on Grid Resiliency report](#) provides an in-depth analysis of the state's electric distribution system, functionality and performance during extreme weather events, and explores numerous options for improving the resilience of the grid including: improved reporting requirements, technological and hardware changes, cost-recovery mechanisms for resilience improvements, and improved communication between Utilities, State Agencies, and Emergency Management Agencies. In May 2013 the Energy Future Coalition released their [proposal for a Maryland Utility 2.0 Pilot Project](#), which will provide a practical demonstration of potential future utility and electric grid practices to address challenges including security and resilience.

The state Public Service Commissions (PSCs) are taking steps to require utilities to improve reliability and address resilience challenges. The Maryland PSC has required that utilities provide reports detailing their preparedness for the derecho and actions taken since the storm to improve service. The Maryland PSC is also evaluating performance-based ratemaking options that would align utility incentives with reliability goals. Pepco and other utilities in the region have modernization efforts under way, particularly implementation of smart meters, which provide real-time energy data to customers and make it easier to track power delivery issues.

Opportunities for Expansion

Given the high level of interest in energy security and reliability issues in the region there are many opportunities for coordination. Collaboration between utilities and governments is crucial to the success of grid reliability efforts. The Department of Defense is making great strides to improve energy reliability

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

and resilience on military installations and has a large interest in these issues in the metropolitan Washington region. Partnerships with hospitals, universities water and sanitation plants, and other critical services can also be expanded to address mutual energy assurance challenges.

COG is working with regional stakeholders to pursue energy assurance planning at the regional level. The project would include a comprehensive vulnerability assessment, identify current energy security policies in the region and make recommendations for strengthening and aligning practices across the region. Such an initiative could also develop energy assurance guidelines and provide resources and technical assistance for local governments.

Air Quality Benefits

In addition to the benefits for security and economic productivity, improving the reliability and resilience of the region's energy system is also beneficial for regional air quality. Many critical infrastructure facilities – including hospitals, airports, water and sanitation plants – in addition to commercial buildings in the region use diesel generators to provide power in the event of an emergency. These generators have significant negative air quality impacts: a diesel generator can release up to 9 tons of NO_x in one event. The Virginia Department of Environmental Quality estimates that distributed generators were responsible for 396.1 tons NO_x emissions in 2007 in northern Virginia alone. Energy Assurance Planning reduces the need for distributed diesel generators by improving reliability and resilience, reducing the frequency and length of blackouts and providing clean, alternative emergency generation sources.

Regional Partnerships

Clean Air Partners Program

Description

In late 1994, the governments of Maryland, Virginia and the District of Columbia provided funds for a regional coordinated clean air public outreach program administered by the Baltimore Metropolitan Council (BMC) and the Metropolitan Washington Council of Governments (COG). The intent was to create a public education program, which would involve citizens and businesses in taking voluntary actions to reduce emissions and improve air quality.

Clean Air Partners (formerly known as Endzone Partners) adopted an employer program as the key element of the public education effort in the summer of 1996. Employer participants agreed to promote voluntary actions among their employees and establish workplace policies to reduce emissions, especially during predicted ozone episodes. Program materials were developed and distributed to employers who joined program. In 2004, the Environmental Protection Agency (EPA) designated both Baltimore and Washington, DC metropolitan regions as nonattainment for fine particles. At that time the Clean Air Partners' Board of Directors expanded the program to include not only unhealthy ozone days but also days where particle pollution reached unhealthy levels.

During Code Orange and Red days, Clean Air Partners is involved in strategic public outreach that concentrates on lowering daily pollution levels. By giving the pollution level a color code (red/ orange/ yellow/ green) and notifying the public and the business world, Clean Air Partners acts to educate the hazards of ground-level ozone and particle pollution and reduce many of the human based activities that create pollution. On unhealthy air days (Code Orange and above), Clean Air Partners distributes AirAlerts to more than 5,000 participants, including citizens, employers, and the local media. Clean Air Partners promotes voluntary actions such as carpooling, fueling after dark, ride-sharing, and trip reductions. Surveys have shown that the system is successful in educating the public and assists in the reduction of human based activities that create ground-level ozone and particle pollution.

Air Quality Benefits

Clean Air Partners programs improve air quality by encouraging behaviors that reduce emissions of NO_x, VOCs, fine particles and other air pollutants. Clean Air Partners has quantified many of the program's benefits through surveys and transit ridership data collection. However, due to changes in funding levels, and the episodic nature of the program, estimated emissions reductions are not calculated. The program provides documented evidence of efforts to improve air quality on the worst days.

Green Cooperative Purchasing

Description

Cooperative purchasing programs bring together a group of individuals, organizations or governments to exercise their collective purchasing power to leverage discounts on bulk purchase of goods or services. Recently, local governments have begun to explore green collective purchasing initiatives to both support emerging clean and green tech industries and to make it more affordable to pursue sustainability initiatives. Green purchasing can apply to anything from LED street lights to alternative fueled vehicles and infrastructure, or compostable food ware to energy efficiency services.

Regional Implementation

COG's Cooperative Purchasing Program began in 1971 with the primary goal of reducing costs through the economies of scale created with large volume purchasing, saving money for jurisdictions and their taxpayers. The region's Chief Purchasing Officers Committee (CPOC) estimates that participants in the Program save in excess of \$2 million annually.

In March 2013, CPOC and the Baltimore Regional Cooperative Purchasing Committee (BRCPC) formed the Mid Atlantic Purchasing Team (MAPT), to leverage increased purchasing power through larger contracting volumes, and to more widely distribute the workload for planning and developing cooperative contracts. MAPT is developing Green contracts database and is available to provide support to local governments pursuing cooperative procurements.

The majority of local governments in the National Capital Region have developed or are developing green fleet policies, and approximately half have alternative fuel infrastructure projects. Through the COG Electric Vehicle Workgroup, interest has been expressed in a cooperative procurement of electric vehicles, electric vehicle infrastructure, and other alternative fuel vehicles and fuels.

Opportunities for Expansion

COG is in the process of surveying local governments, school districts, and water and wastewater entities on green purchasing and alternative fuel vehicles. The information gathered will help identify green contracts that local governments can take advantage of through the COG Rider Clause, assess the feasibility of developing a cooperative purchase for AFVs and infrastructure, and begin to identify other possible green products to cooperatively purchase. Once the survey results are analyzed, COG should coordinate with local governments and other participants in the cooperative procurement program to pursue the purchasing of needs identified in the survey.

Air Quality Benefits

Through collective purchasing local governments are able to invest in cleaner and more efficient materials, equipment and vehicles. Practicing green procurement can reduce emissions of harmful air pollutants.² Collective electric or low-emission vehicle purchasing can reduce NOx and fine particle emissions from cars, trucks, buses, and other mobile sources.³ Other opportunities to improve air quality include cooperative energy efficient or renewable energy technology purchases to reduce emissions from power plants, cool roof or cool pavement procurements, and bulk low-VOC materials purchases.

² http://www.epa.gov/airquality/community/details/i-greenprocure_addl_info.html#activity3

³ http://www.epa.gov/airquality/community/out_transport.html

Urban Heat Island Mitigation

In developed areas, pavement, buildings and rooftops absorb the sun's energy and re-radiate heat, raising ambient air temperatures higher than surrounding natural landscapes. Engines, air conditioners, and other human activities also release more heat in urban areas. This phenomenon, called the urban heat island effect, causes urban summertime air temperatures to be 9 to 16 degrees Fahrenheit warmer than surrounding areas.

Trees and vegetation reduce ground-level ozone concentrations by 1) reducing air temperatures, 2) reducing emissions from energy generation needed for cooling, and 3) directly removing ozone, particulate matter, and NO_x from the air through deposition and absorption. Modeling has clearly shown that trees reduce ozone and can significantly cool urbanized areas with a substantial extent of hard surfaces.

This section covers three options for reducing urban heat island and improving air quality with vegetation and 'cool' technologies: 1) Green roofs, cool roofs and cool pavements, 2) Green Streets policies and 3) tree canopy protection and expansion.

Cool roofs and cool pavements

Description

Cool roofs can be covered by vegetation ('green' roofs) or special coatings (elastomeric acrylic) that reflect the sun's light into the atmosphere and creating less heat. Cool pavements contain special materials or coatings to reflect sunlight or are permeable. Permeable pavements have cooler surfaces due to evaporative cooling.

Regional Implementation

Several jurisdictions have green building codes or green building policies many of which incorporate green roofs. 41 percent of jurisdictions have at least one green roof on government property (CEEPC Annual Survey, 2012). Many green roofs have been installed on residential, commercial, and industrial properties throughout the region. No data is available on the prevalence of cool roofs or cool pavements in the region. No jurisdictions or states have cool roof programs or policies that COG is aware of.



(Above: Green roof in Alexandria, VA)

There are about 75 green roofs in the District of Columbia covering around 350,000 ft². The district is partnering with the Anacostia Watershed Society to offer a [green roof rebate](#) program for residential, commercial, and industrial properties. [The RiverSmart program](#) offers rebates for retrofitting impervious surfaces. DDOT has implemented three [Green Alleys](#), retrofitting the alleys with permeable pavement.

Cool roofs, green roofs, and cool pavements are more economically viable when the roof or pavement is already being replaced. Prince George's County's [Rain Check Rebates program](#) offers rebates for green

roofs, pavement retrofits and urban tree canopy. Montgomery County’s [Rainscapes Rewards program](#) offers rebates for green roofs and permeable pavement.

Opportunities for Expansion

- Expand incentives for green roofs
- Create incentives for cool roofs and cool pavements
- Publicize current rebates, educate public
- Post educational signage in buildings with cool or green roofs or cool pavements
- Resources: [Cool Roofs and Cool Pavements Toolkit](#)

Green Streets Policy

Landscaped features -- such as plants and trees – in the road right-of-way help cool the air through evapotranspiration and shade, and reduce air pollutants through deposition and through their pores⁴.

Regional Implementation

On February 19th, 2014, the Transportation Planning Board (TPB) adopted a Green Streets Policy. The policy states that “TPB supports a transportation system that enhances the region's natural environmental quality and the appearance of its communities, makes alternate travel modes such as walking and bicycling more attractive, and focuses economic development in walkable activity centers.”

All jurisdictions in the COG region have implemented a Green Streets project or incorporated green streets elements in site plans or Master Plans; however only a few have implemented a Green Streets Policy. Maryland requires jurisdictions to use environmental site design in new and reconstructed development of all state and federal projects. Virginia Department of Transportation’s Watershed Implementation Plan includes a provision to encourage LID where appropriate. The District of Columbia has a Green Streets Policy and routinely incorporates trees and environmental site design on city street corridors.

Opportunities for Expansion

- COG jurisdictions and member states can adopt a green streets policy and develop or expand implementation.
- COG plans to conduct surveys of member adoption of Green Streets policies and hold trainings and share resources on Green Streets implementation.

Air Quality Benefits

High temperatures enhance ozone formation and increase VOC evaporative emissions. Cool roofs and cool pavements improve air quality by reducing outdoor temperatures in urban areas and by reducing energy consumption for cooling, thereby reducing emissions from power generation. Green roofs also contribute to improving air quality by directly removing pollutants such as ozone, particulate matter, and NOx from the air through deposition and absorption.

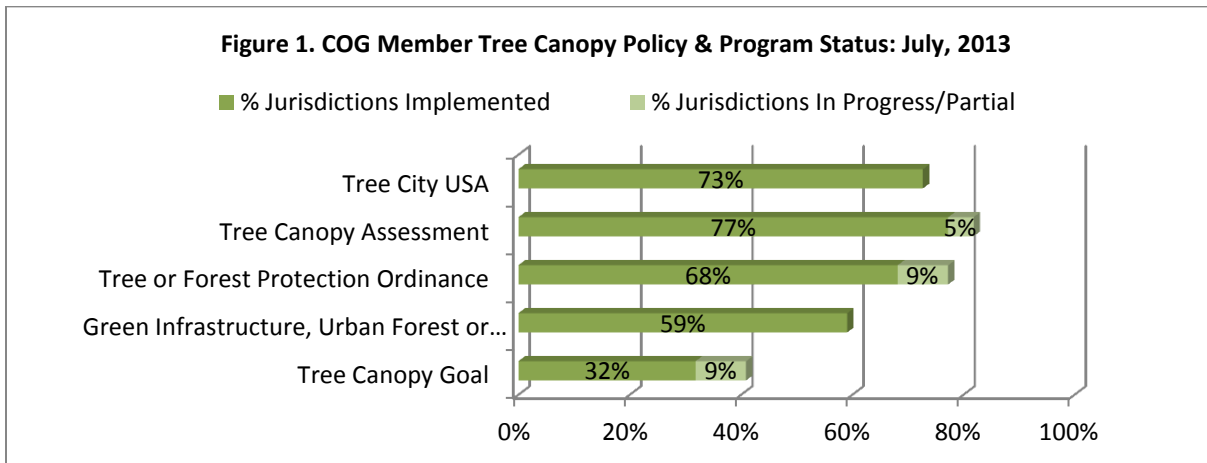
⁴ Some trees produce volatile organic compounds—species selection is important.

Tree Canopy Management

Regional Implementation

COG’s Regional Tree Canopy Workgroup, whose members largely consist of foresters and arborists from local and state governments, has convened over the last two years to share expertise and recommend strategies to maintain and increase the health and extent of tree canopy in the COG region. COG’s 22 jurisdictions have undertaken a variety of measures to protect, enhance and increase tree canopy, summarized in Figure 1.

Figure 1 summarizes jurisdiction actions to measure, manage, and plan for tree canopy through July 2013. Almost two-thirds of jurisdictions have adopted a tree or forest protection ordinance (64 percent) and a large majority of jurisdictions have completed a tree canopy assessment (82 percent). Only a few have established a specific tree canopy percentage goal (23 percent). While only 6 of the 22 jurisdictions implemented a plan to increase tree canopy, 12 jurisdictions have started to develop one.



Sources: CEEPC 2012 Member Survey, COG member jurisdiction websites, [US Forest Service website](#), and/or http://gep.frec.vt.edu/va_utc.html. Tree City USA designees are listed on [ISA website](#).

Most jurisdictions are designated as a ‘Tree City, USA’ (59 percent), a program sponsored by the Arbor Day Foundation in cooperation with the USDA Forest Service and the National Association of State Foresters that sets [criteria](#) at a basic minimum level for tree protection activities.

The District of Columbia’s Urban Forestry Administration, residing in the Department of Transportation, plants an average of 4,500 trees annually. The District requires permits to remove trees within the public right of way, or any tree more than 55” circumference. The RiverSmart Homes program offers incentives to homeowners for planting trees.

In Maryland, tree canopy is bolstered by the state’s recently passed (2013) 40 percent tree canopy goal and the Forest Conservation Act, which promotes the maintenance and protection of forest. Under the law, any person making application for a subdivision, grading permit or sediment control plan on a tract of 40,000 square feet or more must submit a Forest Stand Delineation (FSD) and a Forest Conservation Plan (FCP) (unless meeting criteria for exceptions under the rule). The law also enables the use of forest mitigation banks and other tools to offset the impacts of new development.

Opportunities for Expansion

Additional jurisdictions could:

- achieve Tree City USA status
- establish a forestry and tree planting program
- conduct a detailed tree canopy assessment
- set a tree canopy goal
- develop an urban forest or green space plan
- target tree plantings to mitigate urban heat island effect
- engage property owners in tree stewardship, and
- promulgate tree maintenance and protection ordinances and policies.

The Regional Tree Canopy Workgroup can continue to leverage local resources to promote best practices for tree canopy preservation and expansion.

Air Quality Benefits

Trees and vegetation reduce ground-level ozone concentrations by 1) reducing air temperatures, 2) reducing energy used for cooling and 3) directly removing ozone, particulate matter, and NO_x from the air through deposition and absorption. Modeling has clearly shown that trees reduce ozone and can significantly cool urbanized areas with significant hard surfaces.

Public-Private Partnerships

HIGHER EDUCATION

Description

The Washington DC region has one of the highest concentrations of higher education institutions in the country. Colleges and Universities tend to be high energy users: they are population dense and have large building footprints. In addition to sustainability plans, schools can promote air-quality protection on campus and in their investment decisions. There are a multitude of potential measures that colleges and universities can take to improve air quality on campus in operations, infrastructure, education and behavior of students. School vehicles, such as sports team buses and public safety fleets, can be switched to low or zero-emission vehicles. Schools can implement no-idling rules for vehicles and delivery trucks around campus, educate student drivers in eco-driving practices, and encourage low emission transportation options biking, walking, public transit and carpooling.

Regional Implementation

The Presidents of DC's Colleges and Universities & Mayor Vincent Gray signed the Mayor's College and University Sustainability Pledge (CUSP) at American University in February 2012. The Mayor's CUSP is a voluntary, public affirmation between the District of Columbia's municipal government and the local Higher Education sector, including American University, to signify and support collective work toward a better, healthier, and more environmentally sustainable Washington, DC. Under the CUSP, American University has committed to carrying out three key steps - Phase 1: Sign the Pledge; Phase 2: Develop a Plan; and Phase 3: Implement and Share Progress.

CUSP signatories have staff that serve on a working group that's convened quarterly by the District Department of the Environment and the Consortium of Universities of the Washington, D.C. Metropolitan Area. The working group provides opportunities for ongoing dialogue among signatories and the District government on the development and implementation of sustainability plans and progress toward commitments⁵.

Opportunities for Expansion

On Jan 27th, 2014, COG hosted a meeting of CUSP that went beyond the District and incorporated universities from across the National Capital Region. Participants discussed opportunities for universities in the region to contribute to meeting local and regional sustainability goals. Interest was expressed in idle reduction initiatives and cooperative purchasing. There is potential for the expanded group to continue discussions and potentially air quality-related issues.

Air Quality Benefits

The CUSP program educates local higher education students and institutions about air quality and sustainability issues and engages them in undertaking measures that improve air quality, reduce pollution and potentially foster long-term awareness and behavioral changes.

⁵ <http://www.american.edu/finance/sustainability/CUSP.cfm>

AIRPORTS

Description

The Airports Authority's most ambitious ground transportation project ever is the rail to Dulles project, two-phase construction of the Metrorail's 23-mile extension from West Falls Church to Loudoun County. The Phase I Silver Line extension of the Washington area's Metrorail mass transit system will bring rail service to Reston, VA. Phase 2 will bring Metrorail service to Dulles International and Loudoun County. This effort is one of the largest public works projects in America, and it will provide new convenience for commuters and air passengers.

Reagan airport's popularity is fueled by its proximity to downtown Washington and its convenient access to Metrorail. In fact, Reagan National's Metrorail station has the highest usage of any airport rail stop in the country.

AeroTrain: In 2011, the operation of Dulles International's AeroTrain achieved a 99.54 availability of service and logged more than 2.8 million vehicle miles since inception. The AeroTrain, which serves the majority of the airport's passengers, links the Main Terminal with the A, B and C Gates. In May, the Aero-Train's Main Terminal was named the "Best Airport Rail Terminal" at the 2011 Global Air Awards ceremony.

Building Codes: the MWAA [2008 Building Codes](#) govern airport facilities construction guidelines for the region. There are opportunities for improving the energy efficiency of airport operations through more stringent efficiency standards, or by creating incentives for improved energy performance. Additional benefits could be realized by investing in renewable energy or energy efficiency, such as through power purchase agreements or energy savings performance contracts.

Green Initiatives: The Airports Authority is committed to conserving energy, recycling, using renewable resources, and adopting practices minimizing air and water pollution. The Airports Authority works closely with local jurisdictions to reduce its environmental footprint.

Regional Implementation

In MWAA's 2012 Annual Review reported that construction of Phase 1 of the Metrorail Silver Line is on schedule to be turned over to the Washington Metropolitan Area Transit Authority (WMATA) for final testing in 2013. In April 2013, the Airports Authority announced its intention to award the Phase 2 design/build construction contract to Capital Rail Constructors.

Green Initiatives:

- Certified in the Loudoun County Green Business Challenge.
- Electric vehicle charging stations were added to the Daily Parking garage.
- Several new "clean diesel" airport shuttle buses were placed into service.
- Solar panels installed at the Dulles Toll Road Administration Building.
- Energy audit of major facilities at Reagan National and feasibility assessments of energy-saving lighting systems, co-generation of electric power and the use of alternative fuels for airport vehicles.
- A milestone in airline innovation occurred in 2011 when the first of 75 commercial flights using a biofuel blend, an Alaska Airlines flight from Seattle, landed at Reagan National.
- In 2010, the Airport Authority's recycling program expanded to additional tenants and airlines.

Air Quality Benefits

As large consumers of electricity and fuel, airports have the potential to make significant reductions of both criteria pollutants and greenhouse gas emissions. Airport-rail connections reduce vehicle emissions by encouraging travelers to take transit rather than drive to the airport. Regional airports are also encouraging cleaner vehicles for travelers, shuttle buses, and even in airplanes. Opportunities for additional emissions reductions include transitioning airport maintenance vehicles, shuttles and other fleets to alternative fuels.

Powering airplanes with biofuel could significantly reduce emissions from the air transportation sector. While prices of this fuel blend are still quite high, the practice has proven to be safe and is likely to become more common as the production process and engine technology improves. An even larger impact could be made by reducing airplane idling, which contributes greatly to poor air quality.

Airports have begun to address emissions from electricity consumption by conducting energy audits to improve efficiency and by installing solar panels. There are great opportunities for further emissions reductions in this area, including the adoption of green building practices, expanding energy efficiency measures and purchasing renewable energy.

Energy efficiency and renewable energy purchases offset emissions from conventional electricity production, reducing emissions of NO_x, SO₂, fine particles and greenhouse gases from fossil-fueled power plants. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Green Power and Grid Modernization

Renewable Energy Portfolio Standards

Description

States and localities in the region have adopted Renewable Portfolio Standards (RPS), also called Renewable Energy Standards (RES). These standards require a certain percentage of total electricity to be generated from renewable energy sources such as wind, solar, geothermal, biomass, etc.

Regional Implementation

Maryland and the District of Columbia have enacted legislation to establish a mandatory RPS and both include a “solar carve-out” to ensure that a certain percentage of this renewable energy comes from solar power. Maryland’s RPS requires that all electricity providers in the state provide 20 percent renewable electricity by 2022, including 2 percent from solar power. Washington DC’s RPS requires that all investor-owned utilities and retail suppliers provide 20 percent renewables by 2020, including 2.5 percent from solar by 2023. The Mayor has also set a goal to generate 50 percent the District’s energy supply from renewable energy by 2020. Virginia has a voluntary renewable energy goal, which encourages investor-owned utilities to generate 15 percent of electricity from renewable sources by 2025.

Opportunities for Expansion

The biggest opportunity for expansion of RPS policies in the region is in Virginia, where a mandatory RPS would have positive impacts on job creation and economic growth created by an in-state clean energy industry. Other opportunities include expanding the RPS to all retail providers, as Virginia has many Rural Electric Cooperatives and Municipal Utilities that are not subject to the current voluntary goal. Virginia has the most potential for solar power in the region – according to the National Renewable Energy Laboratory the state’s solar generation capacity is estimated at 1.9 million gigawatt hours per year, about 17 times the state’s annual electricity consumption.

Maryland is currently considering several legislative measures to strengthen the RPS, including bills to increase the RPS to 40 percent by 2025, to include a minimum for hydrokinetic generation and to remove a waste product from paper production that has significant emissions of air pollutants, from the list of qualifying renewable fuels. The DC Council has also considered a bill to remove black liquor from the RPS.

Air Quality Benefits

Renewable Portfolio Standards reduce emissions of conventional pollutants such as NO_x, SO₂, mercury, fine particles and greenhouse gases from fossil-fueled power plants. If the pollutant, such as NO_x, is subject to emissions trading regulations, emissions will decrease over time as allowances are retired and the aggregate emissions cap is lowered. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Local Government Renewable Energy Purchasing

Description

Following the EPA's designation of metropolitan Washington, DC, as a severe ozone non-attainment area, several localities in the region came together to purchase wind energy in order to reduce dangerous ozone transport caused by fossil-fuel power plants in upwind areas. Maryland included the wind energy purchase in the 2004 SIP, the first state submission of wind-energy purchases as a control measure required under the Clean Air Act. Since then, several more local governments in the region have purchased renewably generated energy and are looking into owning renewable energy systems.

The [EPA Green Power Partnership](#) encourages organizations to use clean and renewable energy to reduce air pollution from conventional electricity. EPA resources are available to help participants identify benefits they could achieve by using green power and resources to help with green power purchases, including a [Green Power Locator](#) that lists available green power options by state.

Through this program, local governments can also partner with EPA to become a [Green Power Community](#). Any locality participating in Green Power Partners in which the government, businesses, residents collectively use green power in amounts that meet or exceed EPA's minimum requirements for the population size can qualify to be a Green Power Community.

Regional Implementation

Many businesses and government agencies in the region have become Green Power Partners. There are now approximately 116 Green Power Partners in Washington, DC, 197 in Maryland and 27 in Virginia, including The District of Columbia, Montgomery County, Prince George's County Libraries, the Cities of College Park, Gaithersburg, Greenbelt and Rockville, Arlington County, Arlington Public Schools, the City of Alexandria and the City of Falls Church. When the Gold Book was last updated in 2009 there were only 37 participating entities in the region and only two COG member jurisdictions. The full list is available [here](#).

EPA has recognized Washington, DC as the largest Green Power Community in the country two years in row. Collectively, green power now supplies more than 1 billion kWh per year, over 11 percent of total electricity use in the District.

Local Government Purchases

As part of the Mayor's Sustainable DC Plan, Washington, DC aims to cut electricity consumption in half by 2020 and to generate 50 percent of the District's energy supply from renewable energy by 2020. In early 2013, the Department of General Services signed a one-year contract for 100 percent wind power with Washington Gas. The city is now looking to go farther by purchasing its own wind and solar assets, rather than purchasing Renewable Energy Credits (RECs) for the power it uses.

In Maryland, Montgomery County energy policy was updated in 2003 to require that agencies get at least 5 percent of their energy from renewable sources. In 2005 the Montgomery County Clean Energy Buyers Group entered into a wind power purchase agreement with Washington Gas. The contract has been increased nearly every year since, with the goal of purchasing 20 percent renewable power by 2011. In 2012 the group announced a larger purchase, amounting to 25-30 percent of the collective energy needs. Localities participating in the Montgomery County Clean Energy Buyers Group include Montgomery and Prince George's Counties and the Cities of College Park, Gaithersburg, Rockville, and Takoma Park.

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

Montgomery County's Department of General Services issued a [Request for Energy Proposals \(RFEP\)](#) in January 2014 to identify a solar Power Purchase Agreement (PPA) provider to develop solar systems on 17 County facilities. In 2012, Bowie [solicited proposals](#) to perform a Renewable Energy Feasibility Study and prepare and Implementation Plan. The City plans to complete the study in 2014 and to begin implementing renewable energy technologies in 2015.

In 2011, Prince George's County received a grant from the state to install two solar photovoltaic systems at County facilities in Capital Heights and Landover. In the first year of operation the solar panels produced approximately 527,000 kWh of electricity, enough to power approximately 46 homes. Moreover, these systems offset over 1.3 million pounds of carbon dioxide emissions. Prince George's County recently passed a [law](#) requiring new or renovated public facilities to install 1 kW of renewable energy generation for every 1,000 square feet.

The Washington Suburban Sanitary Commission (WSSC) also recently entered into a PPA agreement for solar projects at two water treatment plants. The solar systems began operation in the fall of 2013 and will generate approximately 6.6 million kWh each year, about 17 percent of the electricity required to operate the two plants, saving ratepayers approximately \$3.5 million over 20 years.

Opportunities for Expansion

Local governments are able to take advantage of lower prices for bulk purchases of renewable energy. Because wind energy prices are now about even with traditional fossil fuel generation, and solar power is quickly becoming cost competitive, local governments can pay less per kWh with a renewable energy contract than they would if purchasing the standard offer service through the utility. The region is already a leader in green power purchasing, but these initiatives can be expanded to other COG member jurisdictions, transit agencies, water utilities and other public entities like the Metropolitan Washington Airports Authority.

Air Quality Benefits

Using clean and renewable energy offsets energy from fossil fuels, reducing emissions of NO_x, SO₂, fine particles and greenhouse gases from conventional power plants. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Community Renewable Energy Purchasing

Description

Area residents are realizing the economic and environmental advantages of collective solar purchases. By sharing expenses, expertise and purchase power, cooperative groups can achieve a significant discount – 20-35 percent – for all participants, and are an effective way to bring more residents into the solar market. This is referred to as cooperative, collective, community or bulk purchasing. The “Solarize” model, which originated in Portland, Oregon, has become a popular program across the country.

Regional Implementation

Collective solar purchasing began in the Washington, DC region in 2006 with the Mount Pleasant Solar Coop. The Mount Pleasant Coop now has over 300 members and has installed solar on over 100 houses. More significantly, the model has spread across the region. DC Solar United Neighborhoods (DC SUN) is an umbrella organization that encompasses 11 solar coops representing six of the Districts eight wards. Similar groups have started in Virginia (VA SUN), Maryland (MD SUN) and West Virginia (WV SUN). The groups are part of the [Community Power Network](#) (CPN), which supports local renewable energy purchasing initiatives nation-wide. CPN helps to connect these various groups and provides resources to help communities interested in starting a collective purchasing project.

In 2013 Frederick, Maryland started a “Solarize Frederick” program with support from EPA’s Climate Showcase Communities Program. The program had over 300 workshop attendees and resulted in 78 solar installations (66 solar PV and 12 solar thermal). Collectively, these systems will produce approximately 685,696 kWh of electricity and reduce CO₂ emissions by 484 metric tons annually. In October 2013, DC passed the [Community Renewable Energy Act](#), which allows DC ratepayers to purchase power from solar facilities not located on their property with virtual net metering. This bill greatly reduces the barriers to solar adoption in the District, and opens the door for those who do not own their homes, have suitable roof space or the necessary financing to install solar on their own.

Opportunities for Expansion

Other localities in the region can adopt “Solarize” or “SUN” programs and work with regional partners to provide collective purchasing opportunities for residents interested in going solar. These programs could also be expanded to include other technologies like wind or storage to maximize energy saving potential. Other jurisdictions in the region could adopt community energy legislation that would allow renters, those with shaded roofs and others to participate in rooftop solar via virtual net metering.

Additional opportunities include community choice aggregation, whereby individual customers within a jurisdiction secure an alternative energy supply contract community-wide. This enables whole communities to move to renewable energy if they so choose. Oak Park, Illinois is experimenting with this idea and the possibility of entering community aggregate energy resource into a demand response program, which would provide revenue for energy improvements and installations.

Air Quality Benefits

Renewable energy purchases offset emissions from conventional electricity production, reducing emissions of NO_x, SO₂, fine particles and greenhouse gases from fossil-fueled power plants. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions. By aggregating community energy needs and purchasing power, the programs described above are able to secure renewable energy at a discounted rate and to greatly increase participation in solar procurement, expanding their impact on air quality.

Maryland Game Changers Program

Description

The Maryland Energy Administration runs a “[Game Changer Grant](#)” program to promote deployment of advanced clean energy technology from private and public laboratories to market applications benefiting Maryland’s citizens. The grants support "game changing," innovative, early-commercialization stage energy generation (electric or thermal energy) technologies in actual installed projects. MEA evaluates the efficacy of each technology through performance data analysis, and the cost/benefit ratio through life cycle analyses. MEA’s goal is to reduce the risks associated with installation of new technologies and to accelerate deployment and market penetration of clean energy technology that will significantly advance the State’s clean energy market.

Regional Implementation

The first round of funding was announced in June 2012 and received over 30 applications. MEA made four grants in early 2013 and an additional five in June 2013. The current projects are:

- TimberRock Energy Solutions, for Solar-Charged Electric Vehicles (EVs) at a General Motors Plant in White Marsh
- Standard Solar, for the State’s First Solar Microgrid at a property owned by Konterra, near Laurel
- Skyline Innovations, for Cost-effective Glazed Polymeric Solar Water Heating Systems
- Land and Cultural Preservation Fund, for Community-scale Wind Project Assessment and Development across the State
- Allied Well Drillers, for Validating Large-Scale Residential Geothermal Heating & Cooling Leasing Opportunity at the Chesapeake Club in North East.
- EnergyWise Partners, for Metering of 70 Commercial Geothermal Heating & Cooling Projects to Validate Leasing Model Across Maryland.
- Alice Ferguson Foundation, for Geothermal Heating & Cooling for the Living Building Challenge at the Potomac Watershed Study Center at Hard Bargain Farm in Accokeek.
- Kentlands Citizens Assembly, for Installation of a Standing Column of Water (SWC) Geothermal Heating & Cooling System at Kentlands Community Center in Gaithersburg.
- Maryland Hawk Corporation and Cambridge Environmental Technologies, for a Greenhouse Installation of a Biomass Boiler/Organic Rankine Cycle Generator CHP System, at the University of Maryland-Eastern Shore Campus

Opportunities for Expansion

The state announced round 2.0 funding in November 2013 requesting applications in additional areas including hybrid solar PV and thermal systems, combined heat and power, district energy, biofuel, biomass, and community solar projects. Counties in Maryland can work with local businesses to develop ideas for projects located in their area. The game changer grant could also be used as a model for programs in Virginia and the District of Columbia.

Air Quality Benefits

Facilitating commercial demonstration projects for promising new technologies and performing a life cycle cost/benefit analysis allows the state to accelerate market deployment and industry growth. These technologies replace or reduce energy from fossil fuels, and thereby reduce emissions of NO_x, SO₂, fine particles and greenhouse gases from fossil-fueled power plants. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Rooftop Solar Challenge

Description

The [Rooftop Solar Challenge](#) is a program funded by the U.S. Department of Energy (DOE) [SunShot Initiative](#). The goal of the SunShot Initiative is to make solar energy cost-competitive with fossil fuels and conventional generation by 2020. The Rooftop Solar Challenge incentivizes 22 across the country to make it easier for Americans to go solar by streamlining permit processes, updating planning and zoning codes, improving standards for connecting solar power to the electric grid, and increasing access to financing. The Rooftop Solar Challenge also enables teams to share best management practices and fosters communication across regions.

Regional Implementation

COG has received Rooftop Solar Challenge grants as part of two teams. COG is one of nine regions across the country participating in the [Solar Ready II](#) project, run by the National Association of Regional Councils (NARC) and the Mid-American Regional Council (MARC). The region is also participating in a national Rooftop Solar Challenge project managed by the solar consultancy Optony. Under this program, COG jurisdictions are participating in the online [Solar Roadmap](#) platform, which connects governments, utilities and consumers with the nation's largest resource library of solar best practices and online tools. There are currently 70 jurisdictions around the country participating in the Roadmap, with a goal of more than 200 by the end of 2014.

Thus far, nine COG member jurisdictions have officially joined the Rooftop Solar Challenge effort: Washington, DC, Arlington and Fairfax Counties in Virginia, and Montgomery and Prince George's Counties, Bowie, Greenbelt, College Park and Bladensburg in Maryland. The kickoff event was held in January of 2014. Over the course of the year, teams will choose which soft costs measures to focus on and how to implement best management practices in each jurisdiction.

Opportunities for Expansion

COG hopes to expand the Rooftop Solar Challenge to include other member jurisdictions in the region that have not yet joined. If the region demonstrates good progress toward creating a healthy solar market there is a possibility of receiving additional funding to continue work in 2015. While the Rooftop Solar Challenge's immediate objective is to streamline processes within jurisdictions, there is a potential to magnify the effectiveness of streamlining by adopting unified processes across jurisdictions and even across states, such as with the same online application processes, permit application checklists, fee structures or even zoning requirements. The national Rooftop Solar Challenge program may expand into more states and localities with each successive round of funding.

Air Quality Benefits

By helping to facilitate solar deployment, the Rooftop Solar Challenge aims to increase the volume of installed solar photovoltaic systems and to get solar installed at a much quicker rate. By lowering demand for fossil fuel-powered electricity this program has the potential to contribute significantly to meeting the region's ozone and PM2.5 goals by reducing emissions of NO_x, SO₂, fine particles and greenhouse gases from fossil-fueled power plants. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Energy Efficiency

Energy efficiency investments and conservation efforts can effectively reduce demand for electricity and associated emissions of conventional pollutants (e.g., ozone precursors) and greenhouse gases (e.g., carbon dioxide) from electric power plants, while saving resources and money. Localities in the Washington region are undertaking many strategies to improve energy efficiency, including developing improved energy efficiency finance tools, creating a Sustainable Energy Utility, improving building codes, benchmarking energy use, requiring higher efficiency standards for public facilities, and incorporating energy efficiency into school facilities and curricula.

Energy Efficiency Financing

Description

Investments in energy conservation and efficiency Energy efficient technologies available today could save homes and businesses 30-50 percent on monthly energy bills, yet only about one-fifth of potential cost-effective energy improvements are made each year. In addition to traditional financing like loans, subsidies, rebates and tax credits, numerous other financing mechanisms exist to help homeowners, businesses and governments make energy efficiency and renewable energy investments. While financing models like Energy Savings Performance Contracts and Energy Services Agreements are fairly well established, there is much opportunity for expanding their use by local governments and public services. Newer tools such as Property Assessed Clean Energy (PACE) financing, On-Bill Financing or Repayment (OBF or OBR), Warehouse for Energy Efficiency Loans (WHEEL) programs, and Green Banks have been successful financing models but have yet to be widely adopted in our region.

Many federal agencies and non-profit organizations have national and state level databases of available financial incentives, including the [Department of Energy](#), the [Small Business Association](#), the [Database of State Incentives for Renewables & Efficiency \(DSIRE\)](#), and the [American Council for and Energy Efficient Economy](#). Regional sources for financing programs are included in COG's [CEEPC Action Plan Resource Guide](#), which is updated annually.

Regional Implementation:

Washington, DC

In the District of Columbia, the DCSEU now administers most energy efficiency incentives and outreach programs. The city offers rebates for residents, businesses and institutions for a range of new energy-efficient equipment, including home heating and cooling systems, lighting, refrigerators and washing machines. DC established a Commercial Pace program following the Council's passage of the [Energy Efficiency Financing Act of 2010](#). The PACE program is applicable to energy efficiency and renewable energy investments or improvements that reduce electricity or gas utility costs. DC also offers a personal property tax exemption for solar energy systems and cogeneration systems. The District also has a Renewable Energy Incentive Program (REIP) which provides rebates to residents, businesses, non-profits and educational institutions for solar PV and solar thermal systems.

Maryland

Maryland's [Be SMART](#) program offers loans for residential, commercial and multi-family property owners for energy efficiency improvements. The Maryland [Small Town Energy Program \(STEP\)](#), funded through the US DOE Better Buildings Program, pairs residents with an Energy Coach who performs a whole-house evaluation, makes recommendations of energy efficiency improvements and helps

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participants find qualified contractors and access rebates. The state enacted legislation in 2009 that authorized counties to establish PACE programs to enable property owners to pay for renewable and energy efficiency investments through a surcharge on their property tax bill. Montgomery County offers residential property tax credits for home energy conservation measures and equipment.

Maryland also offers numerous renewable energy incentives, including rebates for solar PV, solar hot water and geothermal heat pumps for the residential and commercial sectors through the Clean Energy Grant Program. Rebates are available for residential, commercial and community-owned wind energy systems through the [Windswept](#) program.

The state also offers a property tax exemption for solar PV, solar hot water and residential wind energy systems and a personal tax credit of 0.85 cents per kWh produced from geothermal energy, solar energy, hydropower, hydrokinetic, municipal solid waste and biomass resources. Montgomery County offers commercial property tax credits for numerous renewable energy systems and Prince George's County offers residential property tax credits for solar and geothermal systems.

Virginia

Virginia has several energy efficiency and clean energy financial incentive programs, including grant programs for clean energy and solar manufacturing. The state also offers a \$500 per year income tax credit to companies for every green job created with an annual salary over \$50,000. The state allows localities to exempt solar energy equipment from local property taxes. In the COG region, Alexandria Fairfax, Loudoun and Prince William Counties have implemented this exemption.

The Local Energy Assistance Program (LEAP) covers 20 percent of cost up to \$500 for a range of home energy improvements for Northern Virginia and other cities statewide. Virginia residents can also take a personal tax deduction of 20 percent of the sales tax paid for Energy Star appliances. Arlington County's a Green Building Incentive Program grants bonus densities, or additional floor space beyond the amount allowed by the zoning code, to building projects that receive LEED certification.

The [Virginia Resources Authority \(VRA\)](#) was established in 1984 to provide financial assistance to local governments for a variety of projects, including energy and energy conservation projects. Virginia passed legislation in 2009 allowing local governments to establish PACE loan programs for property owners via local ordinance. The state also allows localities to charge reduced property taxes for energy efficient buildings – none of the Northern Virginia jurisdictions have implemented such a program. In 2011, renewable energy was added to the list of eligible projects. The state also has a leasing program that provides financing for energy efficiency projects at a minimum of \$100,000 in facilities operated by state agencies or institutions.

Opportunities for Expansion

The Metropolitan Washington region has one of the highest concentrations of green buildings in the country but the price of making energy efficiency upgrades and clean energy investments is still high. The region has made initial progress allowing commercial PACE financing, but there are a multitude of other financing mechanisms that local and state governments could explore to facilitate clean energy adoption.

Green Banks are state-established banks that use limited public or ratepayer dollars and leverage private funds to provide low-interest and 100 percent up-front loans for clean energy and energy efficiency projects. Connecticut's Clean Energy Finance and Investment Authority (CEFIA) was the first

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

full scale green bank, and has proven to be a viable and effective way to providing clean energy financing at low cost. CEFIA is a quasi-independent entity, but other states have followed the Infrastructure Bank model (such as California Infrastructure and Economic Development Bank) or the State Clean Energy Financing Authority model, where the bank is part of the state government.

The Warehouse for Energy Efficiency Loans (WHEEL) is a new financing structure being developed in Pennsylvania to provide low-cost, large-scale capital to state and local government and utility-sponsored residential energy efficiency loan programs. The WHEEL entity borrows from both private and public sources, but because the public funds take a subordinate position to the private debt, the model attracts investment-grade capital and can offer very low interest rates. The model also allows loans to be securitized, creating a secondary market and generating more capital for borrowers.

While Commercial PACE has been widely adopted, Residential PACE is still in nascent stages due to the Federal Housing Finance Agency (FHFA) recommendation that Fannie Mae and Freddie Mac refrain from purchasing loans on properties with PACE liens due to “safety and soundness concerns.” Some states do allow residential PACE as long as homeowners are aware of the legal issues. In February 2014, several southern California localities began offering residential PACE financing through the [Home Energy Renovation Opportunity \(HERO\)](#) Program. More information is available from [Sullivan Solar Power](#), one of the certified solar contractors under the program.

Clean energy company are exploring other innovative financing methods. Crowd funding, or raising funds through the internet, can allow small companies and startups to raise more capital by pooling small contributions from a large number of investors. Master Limited Partnerships (MLPs) are a special designation that allows corporations to raise money on public exchanges without paying income tax at the corporate level, allowing for a much lower cost of capital. The MLP structure is available to fossil fuel companies but not yet to clean energy companies. There have been [efforts in Congress](#) to expand MLPs to clean energy companies, but as yet these efforts have not been realized.

Air Quality Benefits

Reducing energy consumption through conservation and efficiency measures reduces emissions of conventional pollutants such as NO_x, sulfur dioxides and mercury, as well as greenhouse gases methane and CO₂, by displacing electric generation from coal, oil, and natural gas-fired power plants. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Energy Service Performance Contracting

Description

Energy Savings Performance Contracts (ESPCs) can be used to provide improved energy efficiency and renewable energy improvements to government entities in jurisdictions that have enacted performance contracting authority. Under these contracts, the government entity reaps long-term energy savings without any additional energy costs on a yearly basis. A so-called Energy Service Company (ESCO) provides capital up-front for alternative energy or energy efficiency measures, and receives payment based on the cost-shared energy savings realized over the term of the contract, usually up to 20 years.

Regional Implementation

Virginia and Maryland have authorized shared savings and long-term government contracts to foster performance contracts. Virginia also has a [list of pre-certified contractors](#). The Maryland Board of Public Works has approved 21 ESPC projects which will save the state approximately \$310 million over the life of the contract and reduce greenhouse gas emissions by 130,000 tons annually. In 2013, WMATA entered into a 10-year ESPC with Phillips for LED lighting upgrades in 25 parking garages, which will save energy and provide real time data on energy consumption. WMATA estimates the project will reduce energy usage by 68 percent, or 15 million kWh per year, and reduce greenhouse gas emissions by over 11,000 metric tons annually.

Opportunities for Expansion

Thus far, governments in the region have primarily focused on energy efficiency improvements, but the funding structure can be used in a multitude of project types. Such systems have other benefits as well. Solar photovoltaic systems on schools and government buildings can be designed to provide emergency shelter during natural disasters or other incidents. Integrated storage, microgrids and other resiliency improvements can greatly improve energy security for essential services and critical infrastructure.

Air Quality Benefits

Performance contracting has the potential to save government agencies millions of dollars spent on electricity, and to contribute significantly to meeting the region's ozone and PM2.5 goals by reducing emissions of NO_x, SO₂, fine particles and greenhouse gases from fossil-fueled power plants.

Sustainable Energy Utility

Description

A Sustainable Energy Utility (SEU) is an independent and independently funded entity that provides energy efficiency, conservation and distributed renewable energy services to ratepayers. SEUs act as a single point of contact for area ratepayers for energy efficiency and self-generation, much as conventional utilities are the single point of contact for energy supply. SEU activities include performing energy audits, energy use benchmarking, weatherization and other energy efficiency upgrades, solar installations as well as outreach, education and training. The SEU model is an innovative departure from energy supply utilities as the SEU has a direct interest in helping ratepayers reduce energy consumption and generate their own power.

Delaware established the first SEU in the country in 2006. This program was based on best practices from California, Massachusetts, New Jersey and Vermont. California and Massachusetts are recognized for their utility-run energy efficiency programs and New Jersey for its state-administered programs. Vermont was the first state with a non-profit managed energy efficiency utility, [Efficiency Vermont](#).

Regional Implementation

Washington DC is the first jurisdiction in the Metropolitan Washington region to create a sustainable energy utility. The DC Sustainable Energy Utility (DCSEU) came about through the [Clean and Affordable Energy Act \(CAEA\)](#), passed by the DC Council in 2008. The DCSEU is charged with administering sustainable energy programs in the District to achieve the following:

1. Reduce per-capita energy consumption in the District of Columbia;
2. Increase renewable energy generating capacity in the District of Columbia;
3. Reduce the growth of peak electricity demand in the District of Columbia;
4. Improve the energy efficiency of low-income housing in the District of Columbia;
5. Reduce the growth of the energy demand of the District of Columbia's largest energy users; and
6. Increase the number of green-collar jobs in the District of Columbia

The DC SEU is operated by the Vermont Energy Investment Corporation (VEIC) and eight other local partners under contract to the District Department of the Environment (DDOE). DCSEU is funded by a surcharge on all electric and natural gas utility ratepayers in the District, which flows to the Sustainable Energy Trust Fund (SETF). The DCSEU began operating in March 2011.

Opportunities for Expansion

There is a huge opportunity for expansion across the region if other jurisdictions wish to use the DCSEU model to establish their own sustainable energy utility. The DCSEU is working to expand its work to additional District ratepayers and into other energy-saving activities. The DCSEU does not currently address transportation fuels, but could have a significant impact on air quality and greenhouse gas emissions by expanding services to include transportation demand reduction, low-emission fuels, diesel retrofits, air quality education, etc.

Air Quality Benefits

By helping ratepayers reduce energy consumption, sustainable energy utilities have the potential to contribute significantly to meeting the region's ozone and PM_{2.5} goals by reducing emissions of NO_x, SO₂, fine particles and greenhouse gases from fossil-fueled power plants and potentially NO_x and fine particles from the mobile sector as well.

High Performance Buildings

Description

The Energy Policy Act of 2005 defines a high-performance building as one that integrates and optimizes all major high-performance building attributes, including energy efficiency, durability, life-cycle performance, and occupant productivity.

The metropolitan Washington region has a history for striving for high performance buildings. In December 2007, the COG Intergovernmental Green Building Group (IGBG) issued a report, *Greening the Metropolitan Washington Region's Built Environment*, which explored issues related to building practices and the region's environment, reviews best practices and green building standards, and offered recommendations that local governments and COG could implement to improve the performance of buildings region-wide. The report recommended U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) as the preferred green building rating system for new construction of government and commercial structures, as well as, outlined a series of recommendations for public and private facilities. LEED-Silver was recommended for local government construction and the COG Regional LEED Certified Standard was recommended for private commercial and high-rise residential. The COG Regional LEED certified standard is defined as achieving a LEED Certified rating with at least 4 credits addressing issues of energy and renewables, stormwater management, heat island impacts, and construction waste management.

Regional Implementation

The COG green building report was the first of its efforts to regionalize an approach and set a prevailing green building standard. While the regional goal is 100 percent of jurisdictions adopt a green building policy, 64 percent are currently implementing or in progress of developing a green building policy. Notwithstanding, there has been complimentary actions undertaken on the state and local government level that have continued to elevate the region to national recognition. Most notably DC, Maryland and Virginia were top ranking on the U.S. Green Building Council's top ten list for new LEED certifications in 2012. Virginia was ranked #4 at 170 projects certified in 2012, Maryland ranked # 7 at 127, and the District of Columbia at #8 at 110 projects. Significant projects include the City of Alexandria's Police Headquarters, Community Room, Montgomery College Science Center in Rockville, and the U.S. Mint Building in DC all certified LEED Gold. <http://www.usgbc.org/articles/usgbc-releases-2012-list-top-10-states-leed>

Public and Commercial Buildings

Energy Benchmarking and Disclosure: Energy benchmarking provides a mechanism for measuring how efficiently a building uses energy compared to the same building over time and other similar buildings. In the Washington region, local governments in the region have been leading by example by benchmarking and disclosing energy data of their own buildings, with phased in benchmarking and disclosure policies for the private sector. The 2012 Climate and Energy survey revealed that 95 percent of local jurisdictions are in the process of tracking and/or benchmarking government building energy performance; while 50 percent of jurisdictions require commercial sector energy building benchmarking. Energy benchmarking is a standardized process of measuring building energy efficiency. Benchmarking and disclosure policies can facilitate competition in the market and spur investment in energy efficiency. To that end, benchmarking should be part of a larger framework that includes other measures such as energy audits and commissioning.

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Energy Building Codes: The adoption of model codes presents a significant opportunity to save energy in residential and commercial buildings. Energy codes in the U.S. are adopted at the state and local levels of government. In absence of a national energy code, states and local jurisdictions most often look to the national model, the International Energy Conservation Code (IECC), as the starting point for their own codes. The IECC is updated on a three year cycle, with the most recent being the 2012 IECC. For a current status of energy codes and adoption processes in the region, see Table 1.

TABLE 1: Regional Building Energy Code Status

	DC	MARYLAND	VIRGINIA
Code Adoption Process	Proposals to the DC Conservation Energy Code are initiated by the District of Columbia Building Code Advisory Committee. The DC Council has final approval of all proposed code changes.	The MBPS (Maryland Building Performance Standards) is updated every three years. The State allows each jurisdiction to make local amendments to the code provided the amendments do not weaken the code requirements. MD Department of Housing and Community Development in the process of amending the Energy Code to adopting the International Green Construction Code.	The Board of Housing and Community Development has the authority to adopt changes to the state code, the Unified State Building Code (USBC). Local government building inspections department responsible for enforcement of the USBC.
Code Adoption Cycle	Every 3 years	Every 3 years	12-18 month adoption process after publication of new I-Codes.
RESIDENTIAL BUILDINGS			
Current Code	2009 IECC with Amendments/ASHRAE 90.1-2007	2012 IECC/ASHRAE 90.1-2010	2009 IECC with Amendments
Amendments	Amendments include provisions of the 2009 IECC.		
Effective Date	10/10/08	1/1/12	3/1/11
COMMERCIAL BUILDINGS			
Current Code	2009 IECC/ASHRAE Standard 90.1-2007	2012 IECC/ASHRAE 90.1-2010	2009 IECC
Amendments	Based on 2008 DC Construction Code with several amendments.		References to ASHRAE 90.1-2007
Effective Date	12/26/2009	1/1/2012	1/1/12
Additional Information	ASHRAE 90.1-2007 Mandatory	Meets or exceeds ASHRAE 90.1 or equivalent.	ASHRAE 90.1-2007 Mandatory

	Adoption of the 2012 I-Codes, including a Green Construction Code now under consideration.	<u>Local County Code Amendments:</u> Montgomery Co. – 2012 IECC Frederick County – 2012 IECC City of Frederick – 2012 IECC Gaithersburg – 2009 IECC with amendments Prince Georges – 2006 IECC/IBC/IRC Rockville – 2012 IECC	
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Relevant Legislation: The high performance green building movement in the metropolitan Washington region has accomplished much in a short amount of time; however without effective policies set in place the threshold for increased awareness and on-going improvements to building performance may not have occurred. For a review of key legislation see Table 2.

TABLE 2: Key Regional Legislation

DC	MARYLAND	VIRGINIA
<p><u>Green Building Act (GBA) of 2006</u> Requires LEED Silver performance of all new public projects and progressive requirements for publicly financed and private projects. The GBA includes first green building standard for affordable housing. http://dcclims1.dccouncil.us/images/00001/20061218152322.pdf</p> <p><u>The Clean and Affordable Energy Act of 2008 (CAEA):</u> Requires the energy performance of public and private buildings to be rated using ENERGY STAR and disclosed annually. - Public buildings: benchmarking began in 2010 - Private buildings: April 1, 2013 for buildings 100,000 SF and larger April 1, 2014 for buildings 50,000 to 99,999 SF</p>	<p><u>High Performance Building Act of 2008</u> Requires all new public construction (including schools) and major renovation projects greater achieve either the LEED Silver standard or two Green Globes. http://mlis.state.md.us/2008rs/bills/sb/sb0208t.pdf</p> <p>LOCAL LEVEL ACTION: <u>Montgomery County Bill 2-14: Environmental Sustainability – Buildings-Benchmarking</u> (Proposed legislation) Would require building owners to benchmark energy use of and retro-commission certain building systems to improve their energy efficiency. http://www.montgomerycountymd.gov/COUNCIL/Resources/Files/bill/2014/Packets/20140128_5a.pdf</p> <p><u>Prince George’s County CB-83-2013: Clean Renewable Energy Technology in Public Buildings</u> Requires clean energy systems for new County buildings and major</p>	<p><u>Executive Order 48 of 2007:</u> Requires public facilities over 5,000 square feet should attain LEED Silver or equivalent. http://www.lva.virginia.gov/public/EO/eo48(2007).pdf</p>

http://dcclims1.dccouncil.us/images/00001/20080819161530.pdf	renovations of public buildings	
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High Performance Schools

A growing number of studies show that a high performing green school is one that improves the learning environment of the students while saving energy, resources, and money. Although there isn't a regional goal in place, local school districts have implemented green and high performance building policies that promote the design and construction of schools based on LEED standards, ENERGY STAR standards, or other nationally recognized green building standards. Most current COG survey results showed that 75 percent of local school districts are participating in a green schools program and benchmark their energy performance. It also revealed that school districts recognize the reduced environmental impact resulting from the purchase of locally produced food. Approximately 41 percent indicated they plan to increase local food in school lunches.

Most significantly, Loudoun County Public Schools was named the ENERGY STAR Partner of the Year for 2010, 2011 and 2012. DC has partnered with the US Green Building Council National Capital Regional Chapter on an inaugural program, the DC Green Schools Challenge. The goal of the program is to save money, reduce environmental impacts, and to foster educational and leadership opportunities across DC schools. Participating schools compete to reduce the most energy consumption and group energy efficiency research and design projects. Rewards for winning schools range from t-shirts to a solar energy system. The 3-week competition begins Feb. 10, 2014.

Opportunities for Expansion

While the metropolitan Washington is a proven leader for high performance buildings, there are some other guiding principles that could further the high performance and sustainability goals of local governments if pursued. Those measures are:

- Commissioning: Employ commissioning practices to verify performance of building components and systems to ensure that design requirements are met.
- Measurement and Verification: Install building level electricity meters in new major construction and renovation projects and existing buildings to track and continuously optimize performance; include equivalent meters for natural gas and steam, where natural gas and steam are used.
- Indoor Water Efficiency: Consider use of harvested rainwater, treated wastewater, and air conditioner condensate for nonpotable and potable uses; install water meters to allow for water use management during occupancy.
- Outdoor Water Efficiency: Use harvested rainwater to reduce outdoor potable water consumption and install water meters for locations with significant outdoor water use.
- On-Site Renewable Energy: Meet a percentage of the hot water demand through the installation of solar hot water heaters.

Air Quality Benefits

Much of the impact of buildings is related to energy use. High-performance green buildings use less energy while providing a variety of environmental, economic, human resource benefits, including improved productivity, lower operating costs and reduced environmental footprint. Intangible benefits like improved company branding and goodwill are also a driving demand. Building owners and developers are becoming increasingly aware of the link between environmental issues and health concerns in buildings. The delivery of better performing buildings is not only an economic and environmental necessity but is an ever-increasing expectation by the public. High performing buildings

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

reduce emissions of NO_x, SO₂, fine particles and greenhouse gases from power plants, as well as VOCs emissions from paint and other building materials.

Green Leasing

Description

Green leasing programs establish energy efficiency and conservation standards for leased buildings, usually set by tenants that wish to improve the sustainability of their facilities. Tenant and landlord incentives may not be aligned when it comes to energy efficiency if tenants pay utility bills but do not reap long-term benefits of energy efficiency investments. Green leases work to solve this problem by identifying provisions that can be altered to meet both landlord and tenant sustainability goals.

Retail, industrial and governmental entities are high-value tenants and therefore have more influence in lease negotiations to pursue sustainability goals. The Retail Industry Leaders Association (RILA) and other retail associations are exploring requiring energy efficiency and “green” elements in their lease terms. In cooperation the Institute for Market Transformation (IMT), RIMA released a Retail Green Lease Primer in August 2013 to communicate best practices in green leasing and help further the conversation between retailers and developers.

Regional Implementation

The U.S. General Services Administration (GSA) has several [green leasing policies](#) for federal buildings. The Energy Independence and Security Act of 2007 (EISA) requires that federal agencies only enter into leases for Energy Star certified buildings. The U.S. Department of Energy’s Better Buildings Alliance and IMT have developed a Green Lease Leader program to recognize firms and brokers that are successfully introducing green lease language into new or existing leases. Several local governments in the region require that new construction and major upgrades to public facilities are designed to achieve 75 points on the ENERGY STAR scale, but do not yet incorporate green requirements into leases.

Opportunities for Expansion

Local governments that do not currently have environmental or energy efficiency requirements for leased space can borrow from the Federal and private sector models. Additionally, existing green leasing programs can expand to consider other factors – such as low-VOC materials, sustainable supply chains and availability of non-vehicle transportation options like bike racks, pedestrian corridors and public transit – which would encourage air quality awareness in the real estate sector and increase demand for air-quality-improving measures in the real estate market.

Air Quality Benefits

Green leasing is another way to encourage adoption of energy efficient and high performance building practices. By putting pressure on building owners and property management companies, green leasing policies create a larger market demand for green buildings which owners reflect in subsequent construction projects and developer choices. Green leasing currently encourages building owners and developers to build or acquire energy efficient and high performing buildings, which contributes to meeting the region’s ozone and PM2.5 goals by reducing emissions of NO_x, SO₂, fine particles and greenhouse gases from fossil-fueled power plants.

The same principle could be used to encourage air-quality-improving measures in transportation, land use, supply chains, manufacturing and building use to reduce emissions of NO_x, VOCs, SO₂ and fine particles.

Smart Grid & Advanced Metering

Description

Demand for clean energy, the growth of distributed generation, and new environmental and security concerns are leading utilities and regulators to explore ways to make the grid more efficient, reliable and secure. Smart metering, demand response programs and time-of-use rates can lead to significant efficiency gains simply by increasing customer information and engagement. Grid-level improvements such as voltage optimization and smart switches can greatly improve reliability and security.

Smart or advanced meters are electronic electricity meters that record usage hourly, or more frequently, and send the utility that information for monitoring and billing purposes. This enables the utility to implement time flexible rates, which can incentivize customers to turn off power when demand is high, helping with load shaving. Smart meters also encourage consumer awareness of energy consumption and can therefore lead to improved energy efficient behaviors.

Regional Implementation

Pepco's [Smart Grid project in Washington, DC](#) involves distribution automation, advanced metering, and demand response programs using load control devices and time-based rate programs. When combined with demand response programs, smart meters will help customers reduce electricity usage and peak demand. As part of its smart grid project, Pepco is installing smart meters for all customers in its territory across Maryland and the District of Columbia. The utility has built a separate smart meter website to answer ratepayers' questions about the new devices: takecontroldc.com and takecontrolmaryland.com/pepco. Pepco is doing a similar program in Maryland under the [Maryland Energy Administration's smart grid](#) program.

The Northern Virginia Electric Cooperative (NOVEC) has a smart grid project, called the [Electric Distribution System Automation Program](#), under which the utility is deploying smart meters, a new communications system and other smart grid devices to providing precise monitoring of grid operations and improve system efficiencies. Dominion has begun smart meter installation in the Northern Virginia region and plans to install a total of 200,000 smart meters by the end of 2014. Dominion's smart grid plans also include demonstration projects for energy efficiency, LED street lights and battery storage for renewable energy systems.

Opportunities for Expansion

Harnessing the benefits and efficiencies of clean, distributed energy resources and load management systems can contribute to a resilient and efficient energy system. Monitoring and storage can be used to maximize these benefits and minimize interconnection and variability challenges. Localities and utilities are working to implement these new "smart grid" technologies but many are still at the pilot stage. Additionally, the region has yet to deploy many renewable energy systems to maximize the benefits of smart-grid capabilities.

Air Quality Benefits

Smart grid and advanced metering programs can improve system efficiency for distribution utilities, and can encourage customers to adopt more energy efficient behaviors. By reducing energy consumption system-wide and facilitate deployment of renewable energy, this measure contributes to meeting the region's ozone and PM2.5 standards by reducing power plant emissions of NO_x, SO₂, fine particles and greenhouse gases.

Transportation Demand Reduction

Concentrated Growth / Transit-Oriented Development

Description

Concentrating future residential and commercial development in specific areas of the region that are linked by the regional transit system can lead to significant air quality improvements. Pursuing land-use and transportation policies that support this kind of development will lead to densely developed clusters where residents can live, work, shop, and play, connected along major transit and highway corridors. The most benefits can be realized when transportation and land-use decisions are mutually supportive, enhancing circulation within and connections between densely developed areas. The Urban Land Institute estimates that the five “Ds” of compact development – density, diversity, design, destination and distance to transit – are expected to reduce vehicle miles traveled (VMT) by 12-18 percent.

How it is Being Implemented

Concentrated growth has become a hallmark of regional land-use policy in the metropolitan Washington Region. In 1998, the *TPB Vision* first called for the identification of Regional Activity Centers that would serve as focal points for job and housing development throughout the region, and as nodes for transportation linkages. Support for Activity Centers was reiterated in 2010 when *Region Forward*, a vision for growth through 2050, was adopted and endorsed by each of COG’s Member jurisdictions. More recently, Activity Centers have been highlighted by two new regional plans –*The Regional Transportation Priorities Plan (2014)* and *Place + Opportunity (2014)*—both which reflect an understanding that concentrated development is a concept that will provide benefits for all of the region’s jurisdictions.

Local and regional agencies have begun to implement these ideas on the ground by incentivizing this type of development. Today, the region has many examples of successful Activity Centers, including the NoMa neighborhood in the District of Columbia, Silver Spring in Maryland, and the Rosslyn-Ballston Corridor in Virginia. In order to encourage more concentrated development like this, many local governments have offered incentives, such as increasing the maximum development density allowed under certain zoning categories, utilizing transfer of development rights programs, pursuing street-scape improvement programs, and offering other financial benefits. In addition, The Transportation Planning Board (TPB) awards federal grants to support to local governments in the Metropolitan Washington region as they work to improve transportation/land use coordination through the Transportation Land-Use Connection (TLC) program. Through the program, the TPB provides communities with technical assistance to catalyze or enhance planning efforts.

The region’s commitment to concentrated growth and transit-oriented development is demonstrated in population and employment forecasts as well as local land-use plans. It is forecast that through 2040, 61 percent of new households and 75 percent of new jobs will be located in activity centers. Reviewing local plans for development show that by 2040, 70 percent of Activity Centers will be served by rail transit, 84 percent will be served by the MetroBus Priority Corridor Network (PCN), and a total of 166 Metrorail, light rail, and commuter stations will serve these places.

Opportunities for Expansion

Though we are making progress, there remain many unrealized opportunities to coordinate concentrated development and transportation in more efficient ways, and to improve the jobs and housing balance in the region’s Activity Centers. Many Activity Centers currently lack access to high-

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capacity public transit—Metrorail, bus rapid transit, commuter rail, or light rail. Some Metrorail stations serve areas that are not currently Activity Centers and represent unrealized opportunities to greater efficiency by attracting higher-density development nearby. This is especially true on the eastern side of the region, where many Metro stations are surrounded by undeveloped or underdeveloped land, limiting the number of people who can live or work close to transit and leaving unused capacity in reverse-commute directions on several MetroRail lines.

While concentrated and transit-oriented growth are reducing VMT in the region, there are opportunities to better focus regional investment in geographic areas and on activities that provide greater air quality improvement. For example, the Portland metropolitan region’s [Climate Prosperity Project](#) recommends developing a “regional investment strategy to support green infrastructure, smart growth and sustainable development projects.” The Southeastern Florida [Regional Climate Action Plan](#) prioritizes “transportation investments and service expansions on projects and strategies that will contribute to greenhouse gas emissions reductions and enhance resilience to climate change.”

Similar principles could be incorporated into long term regional planning principles for transportation, land use, housing and economic development in our region. Guidance on air quality, as well as other sustainability issues, could be provided to Activity Centers and other communities in the region to assist them in including these principles into their planning efforts. Initiatives like the [Seattle 2030 District](#), [Boston Innovation District](#), and Kansas City’s [Green Impact Zones](#) are other examples of investment in green, clean and just growth in specific geographic areas that could serve as models for improving air quality in Activity Centers.

Air Quality Benefits

Concentrated, transit oriented development provides air quality benefits by reducing automobile dependency through collocating jobs and housing and offering viable alternatives to automobile travel. By reducing vehicle trips and VMT, concentrated growth helps then region meet our ozone and climate goals by causing fewer NOx and greenhouse gas emissions.

Commuter Connections

Description

Commuter Connections is a regional network of transportation organizations coordinated by the National Capital Region Transportation Planning Board at the Metropolitan Washington Council of Governments to provide employers and commuters in the region with information on commute options. Services provided by Commuter Connections include carpool/vanpool matching, transit information, a regional Guaranteed Ride Home program, bicycle to work information, park-and-ride lot and HOV lane information, telecommute/telework program assistance, commuter information services through the Internet and smart devices, coordination of the region's Bike to Work Day and Car Free Day events, the regional 'Pool Rewards carpool and vanpool incentive, and employer services.

Regional Implementation

The regional SmartBenefits Program is making employer-provided transit subsidies available to increasingly large numbers of workers. The increasing use of WMATA's Smartrip cards is permitting the direct provision of transit and vanpool subsidies at fare card machines, and the expansion of this technology to commuter rail and buses has provided for seamless transfers for transit and vanpool riders. In addition, a new federal bicycle benefit of \$20 per month is also available for employees who bicycle to work. Under this measure, the program has expanded to encompass more participants, reach more employers and commuters, and provide outreach about the benefits available to the public

Opportunities for Expansion

Commuter Connections measures aim to reduce vehicle trips and VMT, which leads to fewer NO_x emissions. The Commuter Connections program and various measures under it receive substantial ongoing funding in the region's Transportation Improvement Program (TIP). The program is providing reductions in emissions which are being reflected in transportation conformity determinations. Expansion of current programs may attract additional participation, although notable increases may be difficult to achieve if the current programs have reached most willing participants, and as automobile technology continues to lead to cleaner emissions.

Air Quality Benefits

By educating employers and employees on available commute options and by fostering car trip coordination, Commuter Connections reduces the number of cars on the road and therefore reduces VMT. Reducing VMT is one of the most effective ways to reduce emissions of NO_x, fine particles and greenhouse gases.

Telecommute Initiatives

Description

Teleworking, also known as telecommuting, allows wage and salary employees to occasionally work at home, at a telework center or an employer's satellite office during an entire work day instead of traveling to their regular work place. Communication is accomplished by phone, e-mail, fax, modem, and teleconferencing.

Regional Implementation

Regionally, more than 450,675,000 workers are going to work simply by picking up the phone or turning on their computers, laptops and/or mobile devices.

Opportunities for Expansion

Employers should become knowledgeable about their jurisdiction's program policy and guidelines or identify the individual who is and refer employees to him/her. They can then identify and list employees who have tasks that can be accomplished while working at home, or at alternative sites. If a jurisdiction has multiple sites, the other locations may serve as alternative work sites. If employees are to telework from home, employers must determine if they have the necessary equipment and set the customary performance objectives and goals.

Employers can have employees keep some work-related items at home or in their vehicle to address business continuity in the event of an emergency. Contact Commuter Connections at www.commuterconnections.org or at 800-745-RIDE with further questions or additional information you may need to either start or expand a telework program.

Air Quality Benefits

Teleworking pays real dividends by reducing traffic congestion and air pollution, increasing the area's economic vitality, and bolstering overall quality of life. For every 10 percent of employees that telework an average of 1.5 days per week, trips will be reduced from 2-3 percent. Reducing vehicle trips and VMT is one of the most effective ways to reduce emissions of NO_x, fine particles and greenhouse gases.

Safe Routes to Schools

Description

Safe Routes to Schools is a popular program in Canada and the U.S. designed to decrease traffic and pollution and increase the health of children and the community. The program promotes walking and biking to school through education and incentives that show how much fun it can be. The program also addresses the safety concerns of parents by encouraging greater enforcement of traffic laws, educating the public, and exploring ways to create safer streets.

Recent studies show that 20-25 percent of morning automobile traffic in some communities is generated from parents driving their children to school. This has caused increased traffic congestion around schools, prompting even more parents to drive their kids.

Regional Implementation

A national program has been developed and makes resources and training available to communities who want to establish a local Safe Routes to School program. Safe Routes to School funds can be used for enforcement and hard improvements as well as education. Eligible activities include hard improvements such as bicycle parking, sidewalks, crosswalks, traffic calming, on and off-road bicycle facilities, etc. on any public road or trail within vicinity of a school. Funds are administered by the State Departments of Transportation, with 100 percent federal share – no local funds required. Each State has a Safe Routes to School Coordinator to administer the program. For more information see www.saferoutesinfo.org.

In the Metropolitan Washington region, many transportation planners, public health advocates and school representatives are working with the Safe Routes to Schools program to implement education and awareness activities to encourage walking and biking to school. Montgomery County established a Safe Routes to School program in 2007 and hosts competitions and games to teach safe biking and walking practices. In Fairfax County, some schools have “bike trains” help teach safe biking practices and help make both parents and students more comfortable biking to school.

Opportunities for Expansion

State and local governments could apply additional resources in their communities to enhance routes to schools, and local governments, schools or school districts that do not yet participate can become involved in the program. Existing programs can be expanded to offer programs for students in kindergarten through 12th grades, and schools can borrow activity ideas from the success of others.

Air Quality Benefits

This program aims to increase opportunity for more people to walk to schools rather than drive. Reducing vehicle trips and VMT is one of the most effective ways to reduce emissions of NO_x, fine particles and greenhouse gases.

Incident Management and Communication

Description

Incidents such as traffic accidents, fires, security breaches and water main breaks can interrupt the usual flow of traffic or make transportation routes unsafe or inaccessible. In situations like these it is crucial to have a coordinate system with established procedures and functioning communication channels.

Regional Implementation

The [Metropolitan Area Transportation Operations Coordination \(MATOC\)](#) Program is a joint program of the TPB, the District of Columbia, Maryland, and Virginia departments of transportation (DDOT, MDOT, and VDOT), and the Washington Metropolitan Area Transit Authority (WMATA). The program's mission is to provide situational awareness of transportation operations in the NCR.

The main goals of the MATOC Program are to improve traveler safety and reduce the delay that results from incidents and emergencies by: (1) providing timely and reliable information to enable individuals to make better travel decisions and (2) by providing a mechanism for better coordination of the transportation management agencies.

MATOC was established in 2008 and began operations in 2009. MATOC is funded by DDOT, MDOT/Maryland State Highway Administration (SHA) and VDOT. MATOC's staff undertakes live coordination operations during its regular hours of Monday through Friday from 4:30 AM to 8:00 PM. On a number of occasions, MATOC has operated on a 24-hour or on-call basis.

Air Quality Benefits

Reducing travel delay reduces fuel consumption and emissions. The MATOC Program estimates the monetized savings for the region resulting from incident coordination for value of time, emissions, and fuel consumption. In FY 2013, MATOC estimates a savings of \$16.88 million, 5 percent of which is savings from emissions and fuel consumption. Because NOx emissions are greater at lower speeds associated with idling or congestion, improving traffic flow can have a large benefit for local air quality.

Transportation Options

Public Transit

Description

Public transit systems are shared-transport services available to the general public. Transport options include subway or underground train lines, buses, trolleys and shuttles. In the United States, public transit systems are usually operated by a municipal transit agency and are subsidized by state and local governments.

Regional Implementation

There are over a dozen public transit systems operating in the metropolitan Washington region. Most Counties have their own system, in addition to state and regional transit authorities. The largest public transit system in the region is the Washington Metropolitan Area Transit Authority (WMATA). WMATA was created in 1967 by an interstate compact between Virginia, Maryland and Washington, DC. WMATA operates 86 metro stations and 106 miles of track, as well as 1,500 buses – providing 1.2 million trips each day. Approximately 45 percent of people working in the central core use WMATA for their commute. The rail system is the second-most traveled in the country and the bus network the sixth-most-traveled.

WMATA's Strategic "[Momentum](#)" Plan emphasizes low energy usage, alternative fuels and sustainable development criteria to be used when making funding decisions for new facilities and vehicles. WMATA has over 500 buses powered by compressed natural gas (CNG), and more than 600 hybrid electric buses in service. These alternative fueled buses have significantly lower emissions of air pollutants and greenhouse gases.

Metro's [Sustainability Agenda](#), released in March 2014, calls for the agency to undertake numerous measures to support regional sustainability, reduce resource consumption, and promote smart growth development. Specific targets include: increasing Metro ridership 25 percent by 2025; reducing energy use per vehicle mile 15 percent by 2025, and cutting greenhouse gas emissions per vehicle mile in half by 2025. These initiatives will yield air quality benefits by reducing NOx and fine particle emissions by displacing vehicle trips, and reducing fossil-fueled power plant emissions of NOx, SO₂, mercury, fine particle and greenhouse gases.

In Northern Virginia, Arlington Transit (ART) provides additional public buses and connects areas further away from the central core to the WMATA network. ART buses all 100 percent CNG. ART ridership is around 6,500 people per day. The Fairfax Connector system provides bus service to Fairfax County residents, connecting to office parks in Reston and Herndon and providing express commuter service from park-and-ride lots to WMATA metro stations. The Connector serves about 38,000 people daily. Loudoun and Prince William Counties have commuter bus service and provide park-and-ride lots, transit information and other resources to help residents reduce automobile dependency.

Montgomery County operates its own RIDE ON bus service, which provides almost 30 million trips per year. The buses are closely integrated with WMATA and Maryland Transit Authority networks, which include the MARC Commuter Rail system and MTA bus service. Prince George's County runs *TheBus* system, which serves many park-and-ride facilities, the MARC train and Central Maryland Regional Transit (CMRT) in addition to WMATA. Frederick County's TransIT service provides local buses and shuttles to MARC train stations and connections to WMATA.

Opportunities for Expansion

In general, opportunities for expansion that would have air quality benefits fall into the following categories: expanding the network extent to provide access for residents farther away from the core; increasing the number of vehicles or increasing vehicle capacity; increasing the frequency of trips; and other measures to encourage ridership.

WMATA's system has been struggling to keep up with the pace of growth in the Metropolitan Washington region, especially as reliance on public transit is rising faster than population. The two new rail lines under construction, the Silver and Purple Lines, would connect the DC core with the outer suburbs of Maryland and Virginia to promote smart growth, economic development and community revitalization, as well as to reduce vehicle trips and congestion across the region. WMATA's [Regional Transit System Plan \(RTSP\)](#) for 2040 proposes two additional Metrorail lines to reduce congestion in the central core by increasing circulation between Northern Virginia and downtown DC, and to increase access to underserved areas like the waterfront, Navy Yard and Union Station.

The [Silver Line](#) will provide rapid transit service to Dulles International Airport and Loudoun County. The line will be 28 miles long and consist of 34 stations, 11 new, making it the largest expansion project since WMATA Metrorail service began in 1976. The first phase of the Silver Line, connecting to Reston, is expected to open in summer 2014. The full line is intended to open in 2018. The [Purple Line](#) is a proposed 16-mile east-west light rail route connecting New Carrollton in Prince George's County to Bethesda in Montgomery County. The Purple Line will include 21 light rail stations and provide direct connections to WMATA's Red, Green, and Orange lines at four stations, as well as connections to all three MARC lines, Amtrak, and local bus routes. The Purple Line is expected to open in 2020.

Arlington's six-year [Transit Development Plan \(TDP\)](#), provides a framework for expansion of the system and better connection to WMATA. The plan was updated in 2012 to reflect recommendations for 2014-2019, including primary transit network improvements to encourage low-vehicle-usage lifestyles and improvements to the quality of service such as connectivity and on-time performance. RIDE ON has 42 CNG buses and plans 15 more.

Transit education and information are crucial to creating a user-friendly system. New developments in this area, particularly real-time arrival information and mobile phone apps have the potential to greatly improve rider experience and increase ridership. When considering transit expansion projects, agencies should encourage alternative fuel and low-emission vehicles and prioritize projects that will contribute to walkable, sustainable communities.

Air Quality Benefits

Public Transit systems reduce the number of people that need to commute and travel by car, and can greatly reduce VMT by providing a fast, convenient alternative transport mode. Reducing VMT is one of the most effective ways to reduce emissions of NOx, fine particles and greenhouse gases. WMATA estimates that Metro avoids 260 tons of VOC emissions, 22 tons of particulate matter emissions and 500,000 tons of CO2 equivalent emissions per year.

Additional air quality benefits can be realized by using CNG, which reduces carbon monoxide emissions by 90 percent and NOx emissions by 60 percent carbon dioxide, a greenhouse gas, is reduced by 30 percent-40 percent. For heavy-duty and medium-duty applications, natural gas engines have demonstrated more than 90 percent reduction of CO and particulate matter and more than 50 percent reduction of NOx relative to commercial diesel engines.

Commuter Rail

Description

Commuter rail offers the option of passenger rail service to suburban residents who regularly commute to and from major metropolitan areas. Train systems in general emit less harmful pollutants and greenhouse gases on a per capita basis than automobiles, so increased use of this mode of transportation can result in air quality benefits. These benefits are even more pronounced when the trains either run on natural gas or electricity.

Regional Implementation

Two separate commuter rail companies serve the metropolitan Washington region – Virginia Railway Express (VRE) in Virginia, and Maryland Area Commuter Rail (MARC) in Maryland. The two systems provide over 50,000 rides per day on over 280 miles of commuter rail track (including lines serving the suburbs of Baltimore). In addition, Amtrak provides regional and intercity service to and from the region that serves as a form of commuter rail with a much further reach.

Opportunities for Expansion

There are plenty of opportunities to increase commuter rail use region-wide and improve efficiency in the current system. Commuter rail companies can increase service offerings by providing extended time tables on workdays and weekends, so that commuters and non-commuters alike can utilize the system we have in place. Existing commuter trains can also be converted to cleaner energy sources, such as natural gas or electricity. Currently only one line on the MARC system uses electric trains.

Infrastructure issues, however, need to be addressed by local governing bodies before service can be expanded. Both commuter rail lines and Amtrak largely rely upon aging infrastructure that is shared with and owned by freight rail lines. Schedules are controlled by the owners of the tracks, which severely limits the frequency and time-tables for commuter rail trains.

The Long Bridge, a 2,500-foot bridge between Virginia and the District of Columbia and the region's only freight and passenger rail crossing over the Potomac River, is a particularly important link in the system. Freight and passenger trains currently share the bridge's two tracks, which are nearing capacity during rush hour times. The bridge's private owner, CSX, maintains the right to give priority to freight traffic over passenger rail, which highly limits the schedule and frequency of passenger trains. In order to fix this major bottleneck and allow for growth in passenger rail frequencies, a major renovation or replacement of the bridge is necessary.

Union Station is another location that is need of major improvement. The central train station located in the heart of the District of Columbia is operating beyond capacity during peak periods, and upgrades will be needed to meet the future transit demands.

Air Quality Benefits:

Trains generally emit fewer harmful pollutants and greenhouse gases per capita than automobiles. Commuter rail offers air quality benefits by reducing vehicle trips, which means fewer NOx, fine particle and greenhouse gas emissions from automobiles.

Bus Priority Enhancements

Description

Bus priority enhancements are measures that can be taken to make bus transit faster, more reliable, and more convenient while utilizing existing transit infrastructure. Instead of implementing new transit services that can be capital intensive, bus priority enhancements create new transit capacity without requiring new operating expenditures. This includes measures such as: signal prioritization, roadway improvements such as bus-only lanes and queue jump lanes, construction of curb extensions and station platforms, implementation of pre-boarding payment systems, and allowing buses to operate on the shoulders of highways in order to bypass traffic.

Regional Implementation

Bus priority enhancements have been implemented throughout the region to improve bus service along key transit routes. Jurisdictions have made roadway improvements that help buses move faster, such as bus-only lanes and queue jump lanes, and there is a lot of interest in doing much more because the benefits of these treatments are significant.

In 2010 the Transportation Planning Board was awarded \$58.8 million in federal TIGER funding to implement bus priority projects in the metropolitan Washington region. The grant funded 16 projects that demonstrate the efficiency benefits of bus priority treatments along major transit corridors in the region. The project will improve the efficiency of the corridors by investing in a bus transit-way, bus-only lanes, queue jump lanes, transit signal priority technology, traffic signal management technology, bulb outs, real-time arrival technology, and other enhancements. Altogether, the bus priority corridor improvements will decrease travel time and improve quality of bus service on approximately 75 bus lines throughout the region.

Opportunities for Expansion

Jurisdictions in the region have the opportunity to provide bus priority enhancements in many more places. One such effort to improve bus service is WMATA's Priority Corridor Network (PCN) plan, which aims to improve bus service, travel times, reliability, capacity, productivity, and system accesses along 24 major transit corridors in Maryland, Virginia, and the District of Columbia. To accomplish this, the PCN encourages roadway improvements, better passenger amenities and information, new buses with lower floors, and new limited stop service.

The benefits of pursuing bus priority enhancements are significant. An analysis of WMATA's PCN found that bus-only lanes and off-board fare collection can each provide time savings of upwards three minutes per mile, and that signal prioritization can save 30 seconds per mile.

Air Quality Benefits

Bus priority enhancements can yield air quality benefits by providing better, more reliable bus service that attracts those who would otherwise use an automobile for mobility. Buses generally emit fewer harmful pollutants and greenhouse gases per capita than automobiles. This can lead to a reduction in NOx, fine particle and greenhouse gas emissions.

Value Pricing / High-Occupancy Toll (HOT) Lanes

Description

High occupancy toll lanes, or HOT lanes, give solo drivers who are willing to pay a toll and those who choose high-occupancy alternatives like carpools and buses the option to bypass congestion and enjoy more reliable travel times. Tolls in the lanes are higher during peak traffic periods and lower at other times of the day in order to maintain free flowing conditions. Tolling major roadway facilities like this is a way to increase the capacity of our existing road system in a way that ensures that the lanes won't simply "fill up again" as more people crowd onto the region's roads. Since HOT lanes are designed to be congestion free at all times, building them also opens the possibility of high-quality express bus transit along these lanes.

Regional Implementation

The Intercounty Connector (ICC) in Maryland and the 495 Express Lanes on the Capital Beltway in Virginia are examples of HOT lanes that are currently under operation, and the Virginia Department of Transportation has begun construction of more Express Lanes on Interstate 95 extending from Stafford County to Arlington County. These highway facilities put a price tag on the use of new road capacity and help to manage congestion and raise revenue to cover construction costs.

The TPB has also endorsed the use of HOT lanes when pursuing roadway expansion projects. The recently approved Regional Transportation Priorities Plan (RTPP) recommends that when jurisdictions in the region are looking to build new lanes or roads that they consider implementing tolling mechanisms such as this. The Plan argues that tolling lanes is the most likely way that we be able to fund needed road improvements throughout the region.

Opportunities for Expansion

Jurisdictions throughout the region have expressed an interest in pursuing tolling mechanisms such as HOT lanes on future road improvement projects, and the TPB has studied the concept extensively. In the 2010 "CLRP Aspirations Scenario," the TPB studied the effects of building a region-wide network of express toll lanes, operating high-quality express bus service along much of that network, and implementing land-use policies to promote denser, transit-oriented development throughout the region. This scenario capitalized on the efficiencies gained by implementing these elements together, and produced significant impacts on daily travel patterns in the region. When analyzed with the regional transportation model, pursuing this scenario led to a reduction in average congestion, and an increase in walk trips, bicycle trips, commute trips made by bus transit, and carpools with three or more people.

The results of the CLRP aspiration scenario suggest that implementing HOT lanes on a region-wide basis could provide many benefits region-wide, especially because a network of these lanes would provide congestion free travel for express buses in addition to automobiles.

Air Quality Benefits

HOT lanes are an effective way of controlling vehicle trips and VMT while also increasing roadway capacity. New lanes decrease congestion and idling, which lead to higher levels of NO_x emissions, and overall vehicle trips are expected to rise more slowly due to the implementation of a toll. HOT lanes also offer the opportunity to implement high-quality express bus service which would give more people a transit option for commuting. These lanes can lead to slower growth in NO_x, fine particle and greenhouse gas emissions.

Vehicle Share Programs

Description

Ridesharing, or two or more persons traveling together in an automobile or van, is an effective way to reduce VMT per capita. Ridesharing services enable commuters to find individuals who share similar commute routes and work hours.

Regional Implementation

Commuter surveys can be used to help determine employees' commute patterns and help to generate a free electronic commuter matchlist of all alternative commute options available in the region through Commuter Connections at www.commuterconnections.org or by calling 800-745-RIDE. The Commuter Connections site can also link people with the closest park-n-ride lot, transit stop, and bicycling and teleworking information once commuters set up a free account and request commuting option solutions. The information is also available via smart devices.

Commuter Connections network members meet with employers to provide free services in designing and implementing an effective on-site ridesharing program, including on-site meetings with employees to further assist with options that may be available to help lessen the daily commute to and from work.

Air Quality Benefits

Ridesharing reduces VMT per capita, reducing fuel costs, wear and tear on roads, traffic congestion, and increasing HOV lane access and driving experience. Ridesharing with a guaranteed ride home component is estimated to reduce vehicle trips 0.5-3 percent. Reducing vehicle trips and VMT is one of the most effective ways to reduce emissions of NO_x, fine particles and greenhouse gases.

Bicycle and Pedestrian Programs

Description

Bicycle and pedestrian programs can cover a variety of initiatives, including enhancing access to transit stations and bus stops, grocery stores, cultural attractions, offices and retail, which encourages people to choose non-motor transport modes for commuting and other trips when possible.

Regional Implementation

The region has made great strides to improve bicycle and pedestrian infrastructure in the last decade. Nearly every jurisdiction in the region has completed a bicycle or pedestrian plan, and most have at least part time bicycle or pedestrian planner. A full list of local plans is available in the [2010 National Capital Region Bicycle and Pedestrian Plan](#). The regional plan was recently updated in January 2014. It includes a total of [409 projects](#), including over 450 miles of bicycle lanes, 630 miles of shared use lanes, 20 intersection improvements and 10 bridge upgrades. By 2040, the plan aims to have over 1400 miles of bicycle routes in the Metropolitan Washington region.

Other initiatives include encouraging more easily accessible bicycle facilities, improving signage on established bicycle routes, encouraging racks and/or lockers for bicycles at workplaces and public transit, permitting bikes on transit at more times of the day, and outfitting buses with bike racks. The [Washington Area Bicyclist Association \(WABA\)](#) provides training, maps, information on commuting and bicyclist rights, as well as other resources for bicyclists in the area. WABA also organizes an annual Bike to Work Day, sponsored by Commuter Connections, which encourages new riders and bike-friendly workplaces.

According to the League of American Bicyclists, the number of people commuting by bike in Washington DC more than doubled between 2000 and 2011, and now almost 3.5 percent of commute trips are made by bike. One of the major bicycling improvements has been the inception and growth of [Capital Bikeshare](#). In 2008, DC became the first city in the country with a bike share program, SmartBike DC. In 2010, DC and Arlington County jointly established Capital Bikeshare, which was joined by Alexandria in 2012 and Montgomery County in 2013. The network now includes over 200 stations and over 1800 bikes. Arlington County developed a [Capital Bikeshare Transit Development Plan](#) to establish a strategic expansion and funding plans for the County's bicycle share system.

Between 1994 and 2008, walk trips grew from 7.7 percent to 8.5 percent as a share of total trips in the region. Transit-oriented development is a hugely important measure for encouraging walking instead of driving. By collocating residential, retail, recreation and office space, localities and real estate developers can help to greatly reduce VMT. To improve existing pedestrian infrastructure, the region is working to improve sidewalks, locate bus stops on sidewalks, provide shelters at bus stops and design crosswalks to enable people to access bus stops on each side of a busy road.

A related initiative, "[Complete streets](#)," aims to design and operate streets to enable safe access for all users, including motorists, pedestrians, bicyclists, and transit users, as well as senior citizens, children, and persons with disabilities. The District of Columbia, Virginia, Arlington, Alexandria, and a number of other jurisdictions have adopted or are moving towards complete streets policies.

Opportunities for Expansion

While the region is experiencing growth in both bicycling and walking as preferred transit modes, there is much opportunity for expansion. 25 percent of automobile trips are 1.5 miles or less, but bicycling still

Metropolitan Washington, D.C. Air Quality Gold Book – Draft

makes up only 0.5 percent of all trips in the region. Local funding targeted towards improved access to bicycle paths, safe bicycle racks, bicycle education, repair shops or Capital Bikeshare may increase participation. The National Capital Region Bicycle and Pedestrian Plan identifies many areas of improvement and prioritizes projects based on the potential benefits the project could have from access to transit, connectivity to the bike network, local support, pedestrian safety and reasonableness of costs.

Air Quality Benefits

Increasing the accessibility and safety of bicycling and walking between residential areas, public transit, retail, offices and cultural destinations helps to encourage people to bike, walk or use public transit instead of driving. Reducing vehicle trips and VMT is one of the most effective ways to reduce emissions of NO_x, fine particles and greenhouse gases.

Vehicle Emission Reduction

Alternative Fuel Vehicles

Description

The transportation sector contributes a third of the metropolitan Washington region’s total greenhouse gas (GHG) emissions. To minimize the impacts of the transportation sector, the 2013-2016 Climate and Energy Action Plan established a goal to increase the use of alternative fuel and high efficiency vehicles, as well as to implement alternative fuel vehicle infrastructure projects.

Regional Implementation

Unlike federal and fuel provider fleets, local government and private fleets are not required under the Energy Policy Act (EPAct) to operate alternative fuel vehicles. However, in the absence of federal requirements, the metropolitan Washington region has embraced the use of clean fuel vehicles. According to a survey data from the Greater Washington Regional Clean Cities Coalition, a nationally recognized program, there currently are over 6,700 AFVs on the road and over 260 alternative fuel stations in the region. Strong leadership by the local governments has been vital to the region’s success. Over 70 percent of jurisdictions indicate implementing a green fleet policy for their government fleet and 50 percent have alternative fuel infrastructure in place. In 2009, Montgomery County Department of General Services, Division of Fleet Management Services, won second place for the 2009 Government Green Fleet Award, a national competition open to all federal, state and local government fleets in North America.

On the state level, major steps, such as laws and incentives, have been taken towards increasing their alternative fuel use, often independent of any outside funding. For a review of federal and state alternative fuel laws and incentives affecting the region, see Table 1. For more information on federal and state alternative fuel laws and incentives, see the US Department of Energy’s Alternative Fuels Data Center.

TABLE 1: FEDERAL AND STATE LAWS AND INCENTIVES

FEDERAL
<p><u>Qualified Plug-In Electric Drive Motor Vehicle Tax Credit</u> A tax credit for new qualified plug-in electric drive motor vehicle for minimum of \$2,500, and the credit up to \$7,500 for vehicles acquired after December 31, 2009.</p>
<p><u>Alternative Fuel Excise Tax Credit</u> A \$0.50 per gallon tax credit available for an alternative fuel sold for use or used as a motor fuel. Expired December 31, 2013 but will remain posted until income tax deadline.</p>
<p><u>Alternative Fuel Infrastructure Tax Credit</u> Eligible for alternative fueling equipment installed between 1/1/06 – 12/31/13 for a tax credit of 30 percent of the cost, not to exceed \$30,000; Tax credit towards multiple states allowed. Expired December 31, 2013 but will remain posted until income tax deadline.</p>
<p><u>Airport Zero Emission Vehicle (ZEV) and Infrastructure Incentives</u> Program provides funding to airports for 50 percent of the eligible cost to acquire ZEVs; vehicles must be used on-road, employed exclusively for airport purposes, and must meet the FAA’s Buy American requirements. Funding for installation or modification of fueling infrastructure is also available.</p>

DC	MARYLAND	VIRGINIA
<p><u>Low Emission Vehicle (LEV) Standards</u> It is expected that EPA’s finalized Tier 3 rule will be referenced in the regulations and implemented through the new vehicle registration program. Tier 3 is harmonized with the California Air Resources Board (CARB) Low Emission Vehicle program (LEVIII)</p>	<p><u>Low Emission Vehicle (LEV) Standards</u> Maryland has adopted the California motor vehicle emission standards California emissions standards and compliance requirements set forth in the California Code of Regulations.</p>	<p><u>State Energy Plan</u> The plan includes policies to promote alternative fuel and efficient vehicle use, encourage efficient driving techniques, and reduce vehicle miles traveled.</p>
<p><u>Alternative Fuel and Fuel-Efficient Vehicle Tax Exemption</u> Qualified AFVs and motor vehicles with an average city fuel economy of at least 40mpg are exempt from the excise tax; Purchasers of the same vehicle are also exempt.</p>	<p><u>Electric Vehicle Supply Equipment (EVSE) Tax Credit</u> MEA offers an income tax credit equal to 20 percent of the cost of qualified EVSE; the credit may not exceed the lesser of \$400 or the state income tax imposed for that tax year.</p>	<p><u>Alternative Fuel and Hybrid Electric Vehicle (HEV) Emissions Testing Exemption</u> Alternative fuel vehicles are exempt from emissions testing. Hybrid electric vehicles with city fuel economy ratings of at least 50mpg are also exempt.</p>
<p><u>Reduced Registration Fee for Fuel-Efficient Vehicles</u> A new motor vehicle with an estimated average city fuel economy of at least 40mpg is eligible for a reduced vehicle registration fee of \$36; Rate applies to the first two years of registration and only the original purchaser.</p>	<p><u>Electric Vehicle Supply Equipment (EVSE) Regulation Exemption</u> Owners and operators of EVSE are not subject to state regulation as electricity suppliers or public service companies.</p>	<p><u>Retail Electric Vehicle Charging Regulations</u> Retail plug-in electric vehicles charging services provided by an individual who is not a public utility, public service corporation, or public service company, is not considered the retail sale of electricity.</p>
<p><u>Alternative Fuel Vehicle Acquisition Requirements</u> Fleets that operate at least 10 vehicles in an ozone nonattainment area must ensure that 70 percent of newly purchased vehicles are clean fuel vehicles.</p>	<p><u>Zero Emission Vehicle (ZEV)⁶ Deployment Program</u> Maryland, California, Connecticut, Massachusetts, New York, Oregon, Rhode Island, and Vermont signed and a memorandum of understanding (MOU) to support the deployment of 3.3 million ZEVs by 2025.</p>	<p><u>Alternative Fuel Program</u> The plan provides for the replacement of state-owned or operated vehicles with vehicles that operate on alternative fuels. The plan also requires development of alternative fuel infrastructure.</p>

Opportunities for Expansion

The state and local government fleets in the region have invested in AFVs and alternative fuel infrastructure to increase the flexibility of use in their fleets. These fleets are employing this strategy to help solve local air-quality issues, develop local economic opportunities, and provide regional leadership. With California’s emission standards and requirements having been traditionally more stringent than EPA’s requirements, has been adopted by DC and Maryland. While this may be

⁶ Zero Emission Vehicles (ZEVs) include plug-in hybrid electric, all electric and hydrogen fuel cell vehicles only.

true, state governments in the region should continue to expand their efforts. It is recommended that DC and Virginia join the ZEV Deployment Program along with Maryland. The ZEV Deployment Program is an eight state agreement signed by the governors of each state. Under the MOU, signatories agreed to support the deployment of 3.3 million ZEVs by 2025 by developing deployment strategies and infrastructure requirements, uniform standards to promote ZEV consumer acceptance, and explore opportunities for coordinated vehicle and fueling station equipment procurement. This will further help reduce air pollution and protect public health in the region.

Cooperative purchasing represents a viable option to obtain benefits in pricing, product quality and contract process efficiencies for member governments. Developing a cooperative purchase agreement for the acquisition of AFVs, alternative fuels and the infrastructure would be an effective tool for COG member jurisdictions. It allows cooperating organizations to aggregate volume and achieves better pricing than they could have on their own. Montgomery County's Division of Fleet Management Services recently developed a solicitation for Electric Vehicle Charging Stations. Through the COG EV Work Group, Montgomery County received interest in joining the solicitation from Prince George's County, Charles County Public Schools, and Anne Arundel County Public Schools.

Additionally, COG member governments should consider using Virginia's Public-Private Education Facilities and Infrastructure Act (PPEA) contracts for natural gas and propane infrastructure where feasible. Through a PPEA, Virginia awarded contracts for natural gas and propane vehicles; including provisions for fueling infrastructure and statewide fuel pricing. For more information, see Virginia's Alternative Fuel Program.

Air Quality Benefits

Alternative fuel and hybrid vehicles have lower tailpipe emissions of air pollutants like carbon monoxide, NO_x, SO_x and fine particles, and provide higher fuel economy than conventional gasoline-powered cars. Switching to these fuels can significantly reduce ozone and improve local air quality.

According to the US Department of Energy Alternative Fuel Vehicle Data center, using natural gas reduces GHG emissions by 6 – 11 percent, using corn-based ethanol instead of gasoline reduces GHG emissions by 19 – 52 percent, and using cellulosic ethanol reduces GHG emissions by up to 86 percent.⁷ Plug-in hybrid and electric vehicles running only on electricity have zero tailpipe emissions of criteria air pollutants, and produce 50 – 65 percent of the GHG emitted by a conventional gasoline-powered vehicle (using our region's average electricity supply mix).

⁷ <http://www.afdc.energy.gov/vehicles/emissions.html>

Traffic Signal Optimization

Description

Poor operating conditions, such as sitting in congestion, driving aggressively, or starting and stopping frequently can have a significant impact on automobile emissions. Because fuel efficiency is sensitive to vehicle speed and emissions are a direct product of fuel combustion, operating speed impacts the volume of emissions. Traffic signal aims to improve the flow of traffic, reduce congestion and reduce the amount of time vehicles are stopped in traffic.

Until recently, optimizing traffic signals has been a challenging and expensive task, relying on inductive loops, cameras or manual counts to monitor traffic. With new technology it is increasingly possible to monitor traffic and update traffic signals in real-time to respond to unexpected conditions. Now, traffic agencies can use satellite imaging to get real-time pictures of a whole route rather than a stationary camera, can track Bluetooth or WiFi devices in passing cars to obtain an accurate picture of travel times along a particular corridor, and can use smart traffic lights that can be remotely updated by the system operator. Intelligent Transportation Systems (ITS) are advanced applications of software and hardware that aim to improve traffic management. ITS is a fairly common concept in Europe but has yet to become widespread in the U.S.

Opportunities for Expansion

Traffic signal optimization is one of the region's Transportation Emissions Reduction Measures (TERMs), which are used to support the region's air quality conformity determination. The TPB provides periodic updates on regional practices related to traffic signal optimization. Between 2009 and 2012, approximately 76 percent of the region's traffic signals were optimized, checked, or adjusted. 47 percent were optimized using computer software, and 22 percent are actively managed using real-time data. While additional benefits may be possible to achieve by expanding the active management program, the region is doing quite well on this measure.

Air Quality Benefits

Signal optimization improves air quality by reducing congestion and idling, which cause higher levels of NOx emissions. Signal optimization has a relatively high emission reduction potential because it affects the entire fleet, including heavy-duty vehicles which are responsible for a growing proportion of NOx and fine particle emissions. It also could reduce emissions region-wide, an advantage over some more localized measures.

Idling and Emissions Enforcement

Description

Inspections and maintenance are key components of reducing vehicle emissions. The EPA has set stringent pollution standards for all new passenger cars and trucks sold in the United States today, but if these vehicles can become high polluters if the engine and emission controls are not functioning properly. The federal government recommends that states require periodic emissions performance checks, and repairs for vehicles that fail emissions tests, to encourage proper vehicle maintenance and discourage tampering with emission control devices.

Emissions of air pollutants are greatest when running a vehicle at low speeds or while idling. EPA estimates that idling truck engines consume over 500 million gallons of diesel fuel and emit 5.5 million tons of carbon dioxide, 100,000 tons of oxides of nitrogen, and 2500 tons of particulate matter into the air each year. Idling uses unnecessary fuel and can cause additional wear or even engine damage, so reducing idling can save drivers money on fuel and maintenance.

Regional Implementation

All jurisdictions are covered by their state's vehicle inspection and maintenance program: in Washington, DC the [Enhanced Emissions Inspection Program \(EEIP\)](#), in [Maryland the Vehicle Emissions Inspection Program \(VEIP\)](#), and [Virginia's Air Check program](#). Virginia also has a Remote Sensing program, which identifies high-emitting vehicles, notifies owners and requires them to perform maintenance to reduce emissions. The program is operated using roadside vehicles equipped with devices to measure tailpipe emissions. Notices of violation are sent to vehicle owners which exceed emission limits.

Most jurisdictions in the region have promulgated rules and ordinances to limit vehicle idling, but these rules are difficult to enforce. State and County Departments of Transportation also play a large role in idling reduction by working to reduce congestion

Opportunities for Expansion

The District of Columbia and Maryland could implement a remote sensing program to support their vehicle inspection and maintenance programs. Localities can also perform education and outreach to make drivers more aware of the benefits of routine maintenance, and the penalties for violation. Targeted outreach to delivery companies, mail carriers and other frequent idlers may be an effective way to reduce idling emissions. Improved idling and maintenance compliance could also be addressed through driver's education and visible public notices.

Air Quality Benefits

Increasing maintenance, inspections and idling enforcement, such as with remote sensing, reduces emissions of mobile sector air pollutants including NO_x and fine particles.

Voluntary Diesel Retrofit Program

Description

Diesel vehicles and locomotives emit significant levels of NO_x and particulate matter. To reduce emissions, diesel engines can be retrofitted with emission control devices or new cleaner burning engines, repowered, rebuilt or upgraded to run on cleaner fuel. Many technologies for reducing emissions exist, including: Diesel Oxidation Catalysts (DOCs), Diesel Particulate Filters (DPF), Closed Crankcase Ventilation (CCV) for reducing particulate matter emissions, and Selective Catalytic Reduction (SCR), Exhaust Gas Recirculation (EGR) and Lean NO_x Catalyst (LNC) for reducing NO_x emissions. EPA maintains a [list of diesel retrofit devices](#) on the Transportation and Air Quality office website. Ultra Low Sulfur Diesel Fuel is a requirement for use of DPFs, and is now widely available across the country.

Regional Implementation

Local and state governments participate in the Mid-Atlantic Diesel Collaborative to establish project priorities in advance of potential new sources of federal funding. The region has made significant progress retrofitting school bus fleets and public transit buses. In 2005 Fairfax County retrofitted 148 transit buses and 1,329 school buses. In 2009, COG partnered with 12 regional fleet operators including Washington Metropolitan Area Transit Authority (WMATA), Washington Area Sewer and Water Authority (DCWASA), Montgomery County, Fairfax County, Prince William County and eight private fleet operators to retrofit 130 transit buses, 64 nonroad diesel construction equipment engines, repower 3 heavy duty dump trucks and replace or upgrade other vehicles including school buses and ambulances.

In 2011, MWCOG received a Diesel Emissions Reduction Act (DERA) grant awarded through EPA's National Clean Diesel Funding Assistance Program to replace the existing diesel engines in two Amtrak switcher locomotives at Union Station in Washington D.C. Working with Amtrak and the Brotherhood of Locomotive Engineers and Trainmen, the project will replace the old engines with two smaller, independently controlled GenSet engines, which cut fuel consumption in half and reduce emissions up to 90 percent, depending on the pollutant. The first repowered switcher, Ella, was unveiled on Earth Day 2014.

Opportunities for Expansion

Public agencies and localities that do not yet have a voluntary diesel retrofit program can join existing regional efforts.

Air Quality Benefits

Diesel retrofits can significantly reduce emissions of NO_x and fine particles, and have been shown to be more cost effective than other congestion and mitigation projects. Diesel retrofits are an attractive air quality improvement measure because results are significant and nearly always immediate, which reduces the need for tracking behavior or other ongoing monitoring activities. In metropolitan areas with high concentrations of heavy-duty vehicles or construction, retrofits can have an even larger impact.

Retrofitting diesel vehicles can reduce in-use emissions of particulate matter by 20-90 percent and NO_x emissions by 25-75 percent depending on the technology used and vehicle specifications. The regional diesel retrofit collaboration retrofitted a total of 789 pieces of heavy duty diesel on-road and off-road equipment to reduce diesel emissions. The emissions reduction from this project is estimated at 572 tons per year of NO_x and 40 tons per year of fine particles.

New & Additional Ideas

The metropolitan Washington region has had great success improving the region’s air quality. However, there is more progress to be made, especially in anticipation of forthcoming higher air quality standards from the EPA. The following section describes several new measures that the region is not yet pursuing or which have great potential for expansion in this region.

New programs are constantly being created and implemented, and there is much this region can learn from local governments and regional councils around the country. Many regional transportation and sustainability plans include air quality improvement measures the metropolitan Washington region has not yet pursued. National leaders in regional-level planning efforts for air quality include:

- Sacramento Area Council of Government (SACOG): [Metropolitan Transportation Plan/Sustainable Communities Strategy](#)
- San Diego Association of Governments (SANDAG): [2050 Regional Transportation Plan](#)
- San Francisco Planning and Urban Renewal Association (SPUR): [Agenda for Change](#) and [Transportation 2035 Plan for the San Francisco Bay Area](#)
- Southern California Association of Governments (SCAG): [2012-2035 Regional Transportation Plan/Sustainable Communities Strategy](#)
- Portland Metropolitan Region: [Climate Prosperity Strategy](#) and [Climate Smart Communities Scenarios Project](#)
- Southeast Florida Regional Climate Change Compact Counties: [Regional Climate Action Plan](#)

Microgrids

Description

Microgrids are small-scale electricity distribution systems that include distributed generation resources linked to one or more users. Microgrids are nearly always connected to the grid but can be switched to operate independently, sometimes called “islanding.” Because of this capability microgrids are another element of grid security and resilience efforts being explored in the region. Microgrids can include any number of different technologies, including solar photovoltaic and thermal systems, geothermal heat pumps and battery storage, to minimize dependence on fuel sources or grid-provided energy.

Regional Implementation

The region is looking into opportunities to use microgrids to ensure energy security for critical infrastructure. Maryland’s Game Changer program awarded one of the first grants to Standard Solar for the state’s first solar microgrid, to be located in Prince George’s County. There are currently no microgrids in DC or COG’s Virginia member jurisdictions. Dominion is partnering with VCU’s Engineering School in Richmond to build a microgrid that will make continuous, real-time energy adjustments to the building, lights and equipment. The project is expected to reduce the building’s energy use by 4 percent, saving \$20,000 annually. The National Renewable Energy Lab is conducting initial studies for a microgrid at the Naval Support Facility in Dahlgren, Virginia.

Opportunities for Expansion

The region is exploring opportunities for microgrids at critical infrastructure, such as water sanitation facilities and pump houses. Howard University has also explored building a microgrid using two natural gas generators to provide at least 50 percent of the school’s electricity needs.

Air Quality Benefits

In addition to the benefits for security and productivity, improving the reliability and resilience of critical infrastructure has benefits for regional air quality. Many essential facilities, including hospitals, airports, water and sanitation plants, in addition to universities and industrial customers in the region use diesel or natural gas generators to provide power in the event of an emergency. These generators have significant negative air quality impacts: a diesel generator can release up to 9 tons of NO_x in one event. The Virginia Department of Environmental Quality estimates that distributed generators were responsible for 396.1 tons NO_x emissions in 2007 in northern Virginia alone.

Microgrids can eliminate the need for generators by providing reliability through grid-independent renewable energy generation and storage. If integrating clean and renewable energy, microgrids can offset electricity from fossil-fueled power plants, reducing emissions of NO_x, SO₂, fine particles and greenhouse gases. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Combined Heat & Power

Description

Combined heat and power (CHP), or cogeneration, is the use of a heat engine or power station to simultaneously generate electricity and useful heat. In independent electricity production, some energy must be discarded as waste heat, usually through a cooling tower. CHP captures some or all of the thermal energy as use for heating, usually close to the plant. The thermal energy can also be used to heat water or other fluid to heat sites at longer distances.

CHP is often used in district energy systems, which provide heating and cooling services in the form of hot water, steam or chilled water from a central plant to multiple buildings in the vicinity. This can be used for space heating, air conditioning, domestic hot water, or industrial heating and cooling processes. District energy systems may also include a microgrid to provide electricity to the end users in the system.

Regional Implementation

There is currently no CHP installed in Washington, DC. The US Department of Energy estimates that installing CHP systems in DC's commercial and industrial sector could generate 1320 - 2410 MW of electricity. Maryland has 14 CHP facilities with a total capacity of 766MW, approximately 6.5 percent of the states total energy market. The University of Maryland has two CHP facilities in College Park, and the FDA White Oak campus in Silver Spring also has a CHP plant and a distrust energy system for distribution. Virginia has 44 CHP facilities, generating 2,147MW, or 11.4 percent of the state's energy market. Fort Belvoir in Alexandria has the only CHP facility in the northern Virginia region.

Opportunities for Expansion

DOE has an aggressive goal to have 20 percent of generation capacity in the country come from CHP by 2030. EPA has a Combined Heat and Power Partnership which seeks to promote the use of CHP to reduce the environmental impacts of electricity generation. The region has a few good models for CHP use already, but there is much potential for new CHP installations. CHP could also help the region realize energy efficiency and emissions reduction goals.

Air Quality Benefits

According to the EPA, CHP systems achieve effective electrical efficiencies of 50-70 percent, while the average US fossil-fueled power plant has efficiencies of around 33 percent. This added efficiency means reduced fossil fuel consumption, reduced greenhouse gas emissions, and reduced NOx and fine particle emissions from power plants for the same amount of useful energy produced. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Waste-to-Energy

Description

Waste-to-energy is an energy recovery process that generates energy in the form of electricity and/or heat from waste. Incineration and direct combustion is the most common form of waste to Energy, but other non-combustion technologies exist, including: gasification, anaerobic digestion, fermentation and thermal depolymerization, which can convert waste to liquid fuels.

Opportunities for Expansion

The region has a few waste-to-energy plants, notably the Covanta Energy Recovery facilities in Fairfax and Montgomery County, but there is opportunity for expansion. Using waste to produce electricity has the advantage of reducing electricity needed to be produced from conventional power plants. However, there are some concerns that by monetizing waste, waste-to-energy projects may create an incentive to produce more waste.

Air Quality Benefits

Generating electricity from waste offsets energy consumption from power plants, reducing emissions of NO_x, SO₂, fine particles and greenhouse gases. While waste combustion does have significant carbon dioxide emissions, the CO₂ emitted has about half the global warming potential than the volume of methane that would have been emitted if the waste were landfilled. Reducing emissions from upwind power plants reduces ozone transfer and can make a significant contribution toward improving local air quality conditions.

Eco-driving Programs

Description

Eco-driving is a driving practice that uses a number of methods to increase fuel efficiency. Public awareness on the impact of driving behavior and vehicle maintenance on fuel efficiency can help to save drivers money at the gas pump, but also to reduce tailpipe emissions.

Opportunities for Expansion

Local governments in the region could undertake public awareness campaigns through their departments of transportation or environment. Eco-driving practices could also be incorporated into driver's education programs. The Commuter Connections program could foreseeably undertake an eco-driving awareness initiative at the regional level.

Air Quality Benefits

Eco driving programs improve air quality by teaching drivers lower-emitting driving behaviors, such as reducing idling and fuel consumption, which reduce emissions of NO_x, fine particles and greenhouse gases. National studies and pilot programs in the U.S. have found that eco-driving practices can improve vehicle fuel efficiency by 10-15 percent. Additionally, this measure has the potential to affect the entire fleet, including heavy-duty vehicles, which makes it more effective for reducing emissions than other more localized or vehicle-specific measures.

Usage-Based Insurance

Description

Usage-based, or pay-as-you-drive (PAYD) insurance, is a type of automobile insurance plan that charges based on your usage. At the simplest, the charge is based on the miles driven, but calculations can also include the type of vehicle used, location, time of day or year and driving behavior. Usage-based plans are offered by several major automobile insurers including Progressive, Allstate and Liberty Mutual.

Opportunities for Expansion

The region has not adopted any usage-based insurance policies. Local governments could participate in consumer awareness to encourage more participants in such programs, could switch all eligible public fleets to usage-based insurance, or could provide incentives for private companies and citizens that switch to usage-based policies.

Air Quality Benefits

Usage-based insurance encourages drivers to drive only when necessary to reduce their insurance premiums, and rewards safe driving, which can ease traffic flow and prevent accidents that cause congestion. Such programs may reduce VMT and therefore reduce emissions of NO_x, fine particles and greenhouse gases. The TPB estimates that PAYD insurance could reduce VMT by 100,414,209 miles and reduce greenhouse gas emissions by 48,979 tons for each 5 percent of the region's eligible drivers that switch to this type of insurance

Parking Management

Description

Most harmful NO_x and particulate matter emissions occur when operating at low speeds, such as while circling the block or neighborhood for a parking space. While free or cheap street parking is popular, it also encourages people to drive, and to occupy spots for long periods of time. Both these factors reduce the number of free spots for those looking to park, increasing the number of people searching for a spot and the amount of time it takes them to park.

Some cities have experimented with alternative parking management strategies that disincentivize long-term street parking, either through increased parking enforcement or by raising parking fees. Philadelphia raised parking meter rates from \$1.50 per hour to \$2 per hour in 2009 and again to \$2.50 per hour in 2011. The change resulted in \$4 million more in city revenues, and encouraged more drivers to choose off-street parking lots. In 2008, San Francisco began a study of traffic and curbside parking in the downtown area in order to address the city's congestion problem. To help drivers reduce circling time, the city aims to create an automatically-updating website and cell phone app showing available parking spots. The system will allow drivers to top up meters remotely using a credit card or a pre-paid parking card, and will enable transportation agencies to adjust meter parking rates and time limits remotely as needed.

Opportunities for Expansion

The region does not yet have any such parking management programs of which we are aware, but it might be a good tool to explore, particularly for congested inner-city areas.

Air Quality Benefits

Studies show that circling for a parking spot is responsible for 30-50 percent of inner-city traffic congestion. A study done by the University of Los Angeles determined that drivers searching for on-street parking in just a 15-block area of Los Angeles burned 47,000 gallons of fuel and traveled four times the distance to the moon. Parking fees can encourage more people to take public transportation, carpool, bike or walk. It also encourages drivers seeking longer-term parking to use off-street lots rather than on-street parking, freeing up more spots for others and reducing the time needed to find a short-term parking space. This reduces NO_x, fine particle and greenhouse gas emissions while helping to ease congestion.

Hoteling

Description

Hoteling is an extension of teleworking programs, whereby employees rotate office space use, similar to how hotel rooms function. “Hot desking,” “free address workstations,” “touchdown workstations,” and “desk sharing” are similar office policies that allow for multiple employees to use the same office space, either on a pre-arranged rotational schedule or by random assignment. When many employees telework, a company may either have many empty offices, or may be able to function with less office space. While this requires employees to use non-dedicated, non-permanent workstations it can contribute both to establishing telework programs and to reducing office energy use.

Opportunities for Expansion

Thus far, no local jurisdictions have hoteling policies that we are aware of, but some local companies and many organizations across the country have begun to use hoteling as a way to reduce both real estate and utility costs for office space, and to further encourage teleworking as a work mode.

Air Quality Benefits

Hoteling reduces vehicle trips and VMT per capita, reducing NO_x, fine particle and greenhouse gas emissions just as telework programs do. In addition to reducing transportation emissions from avoided commutes, hoteling has the added air quality advantage of reducing energy needs for office space, reducing emissions of NO_x, SO₂, mercury, fine particle and greenhouse gases from power plants. Reducing emissions from upwind power plants can reduce ozone transfer to further improve the region’s air quality.

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The Gold Book reflects the progress local governments in the Metropolitan Washington Region are making to improve air quality, and helps local governments identify additional measures they can take. It is intended to be a living document, so feedback, suggestions and additions are welcome. Please direct comments to Isabel Ricker at iricker@mwkog.org.