

Fredericksburg Ozone Advance Action Plan

Annual Report
04-30-2018



Abbreviations

CMAQ	Congestion, Mitigation, and Air Quality
CPCN	certificate of public convenience and necessity
CSAPR	Cross State Air Pollution Rule
DMME	Virginia Department of Mines, Minerals, and Energy
EPA	United States Environmental Protection Agency
EV	electric vehicles
FAMPO	Fredericksburg Area Metropolitan Planning Organization
FRM	Federal reference method
LEED	Leadership in Energy and Environmental Design
MATS	Mercury and Air Toxics Rule
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
MW	megawatts
NAAQS	National Ambient Air Quality Standard
NO_x	nitrogen oxides
ORE	On Road Emissions Program
$\text{PM}_{2.5}$	fine particulate matter less than 2.5 micrometers in diameter
ppb	parts per billion
RAMPO	Richmond Area Metropolitan Planning Organization
SCC	State Corporation Commission
SCR	selective catalytic reduction
SF	square foot
SO_2	sulfur dioxide
VCC	Virginia Clean Cities, Inc.
DEQ	Virginia Department of Environmental Quality
VEMP	Virginia Energy Management Program
VOC	volatile organic compounds
VPA	Virginia Port Authority

Fredericksburg Ozone and PM_{2.5} Air Quality – April 2018 Update

The Ozone Advance program is a collaborative effort between federal, state, and local governments as well as area stakeholders to develop an Action Plan for a region. Action Plans encourage programs and practices that facilitate emission reductions of ozone and fine particulate (PM_{2.5}) precursors so that citizens may continue to benefit from healthy air quality. These Action Plans help to ensure that covered areas remain compliant with federal National Ambient Air Quality Standards (NAAQS) and provide a roadmap for progress toward compliance with future NAAQS updates, such as the 2015 ozone NAAQS published on October 26, 2015 (80 FR 65292). The U.S. Environmental Protection Agency (EPA) provided programmatic guidance concerning the Ozone Advance program in April 2012. After reviewing air quality data and considering the information in the guidance document, leaders in the Fredericksburg area and the Commonwealth of Virginia developed the Fredericksburg Ozone Advance Action Plan to promote continued good air quality.

The Action Plan, which EPA received in April 2013, provided information on the air quality in the Fredericksburg area and across Virginia. The plan is available on the Virginia Department of Environmental Quality (DEQ) website at <http://www.deq.virginia.gov/Programs/Air/AirQualityPlans/OzoneandPM25RegionalPlanningActivities.aspx>. This document updates the air quality information in the Action Plan and shows that air quality improvements are continuing. The improvements are the result of the emission reductions achieved from the many federal, state, and local air pollution control programs and voluntary efforts being implemented as well as the favorable meteorology during the summers of 2013, 2014, and 2015.

Ozone

Photochemical reactions between volatile organic compounds (VOC) and nitrogen oxides (NO_x) create ozone when they mix in the presence of sunlight. Ozone is the primary component of smog and a lung irritant. Populations that are especially susceptible to impacts from this pollutant include elderly people, children, and those with lung ailments such as asthma and emphysema. Ozone also interferes with plants' abilities to process food and ward off diseases.

Emission reductions of NO_x, the primary precursor to ozone in the Commonwealth, have been significant in recent years and should continue into the future, as detailed in the Action Plan. For example, emissions from on-road vehicles will continue to decrease due to the new Tier 3 Motor Vehicle Emission and Fuel Standards that EPA

finalized on April 28, 2014 (79 FR 23414). The Tier 3 program sets new, cleaner standards that start with model year 2017 vehicles.

Meteorology also plays a key role in ozone formation. The meteorology in 2009, 2013, 2014, and 2015 was not conducive to ozone formation due in part to greater than normal precipitation. In addition, below-normal ozone season maximum daily temperatures in 2009, 2013, and 2014 contributed to lower ozone values. The meteorology during the summers of 2010, 2011, 2012, and 2016 was more conducive to ozone formation. The 2010 ozone season in Virginia was the warmest on record. The 2011, 2012, and 2016 ozone seasons had higher than average maximum daily temperatures although precipitation in these years was near or above normal levels. Table 1 summarizes Virginia's ozone season temperature and precipitation data for the period 2009 through 2017.

Table 1: Virginia Ozone Season Meteorology Data, 2009-2017

Year	Virginia Maximum Daily Average Temperature (°F) (May through September)			Virginia Precipitation (inches) (May through September)		
	Average Maximum Temperature	Normal	Departure from Normal (20 th Century)	Total Precipitation (inches)	Normal	Departure from Normal (20 th Century)
2009	80.1	81.1	-1.0	23.31	20.23	+3.08
2010	84.9		+3.8	19.52		-0.71
2011	82.5		+1.4	23.74		+3.51
2012	82.4		+1.3	20.50		+0.27
2013	79.8		-1.3	23.96		+3.73
2014	80.7		-0.4	19.32		-0.91
2015	82.2		+1.1	22.27		+2.04
2016	82.2		+1.1	25.37		+5.14
2017	80.9		-0.2	21.67		+1.44

Canadian forest fires may have also affected Virginia's air quality in 2015 and 2016. Data is not currently available for definitive exceptional events analyses regarding these events. However, indirect data such as satellite photography suggest transported pollution from large wildfires in Canada contributed to ozone exceedences and generally elevated levels of ozone, over and above levels that would normally be expected given meteorological conditions on those days.

Figure 1 shows the ozone air quality as measured at the Stafford County monitor. The figure also provides data from the Caroline County monitor, which is located outside of

the Fredericksburg area but is nearby. The preliminary design value for the 2015-2017 time period is 62 parts per billion (ppb) in the Fredericksburg area. Air quality in this part of the Commonwealth has improved over the last decade. The long term improvement depicted in Figure 1 demonstrates that the emission reductions achieved both locally and regionally have improved air quality to the point where ozone air quality complies with and is significantly beneath the 2008 ozone NAAQS of 75 ppb as well as the 2015 ozone NAAQS of 70 ppb.

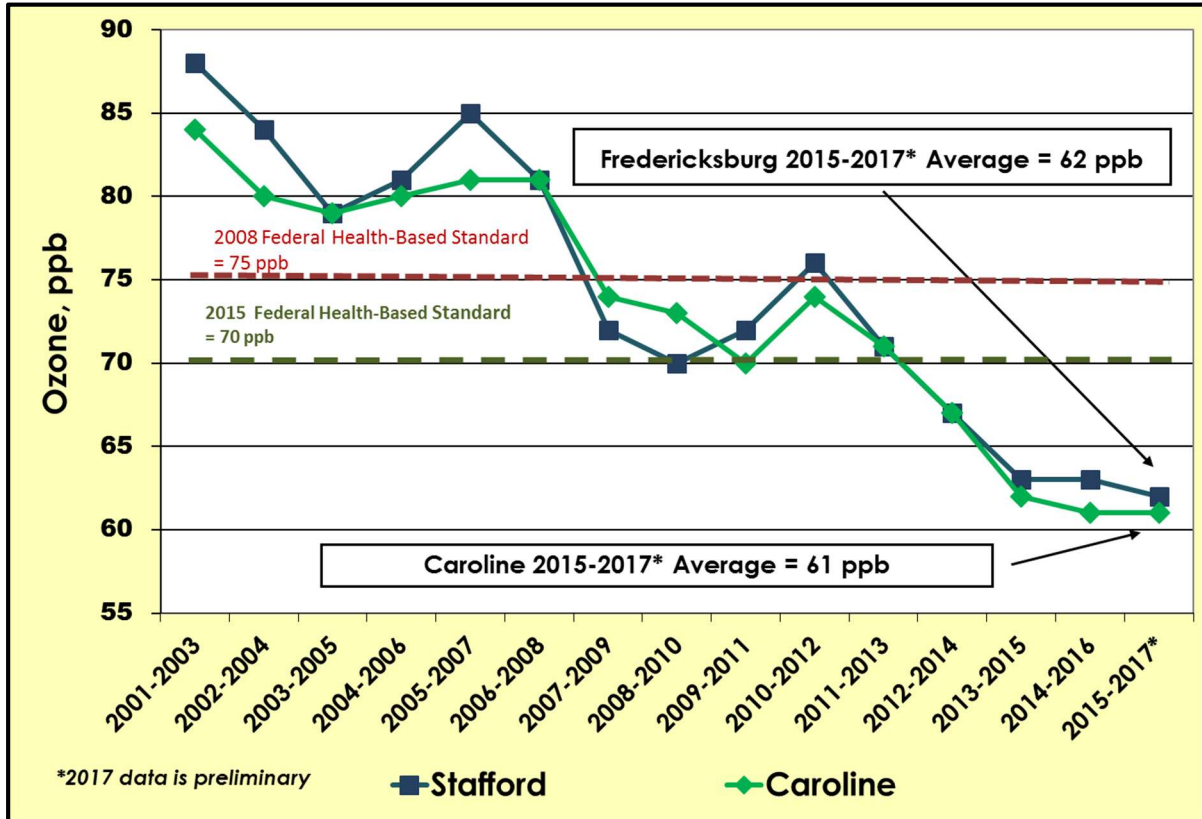


Figure 1: Fredericksburg Ozone Air Quality

Monitoring data across Virginia show similar patterns of air quality improvement. Figure 2 provides this data for various areas of Virginia. All areas of the Commonwealth are benefitting from the ozone precursor emission reductions generated by federal, state, and local control programs, and the Commonwealth has seen tremendous improvements in ozone air quality over the last decade. Based on preliminary 2015-2017 data, air quality in all areas of the Commonwealth complies with the 2008 ozone NAAQS, and air quality in all areas of the Commonwealth except Northern Virginia complies with the 2015 ozone NAAQS.

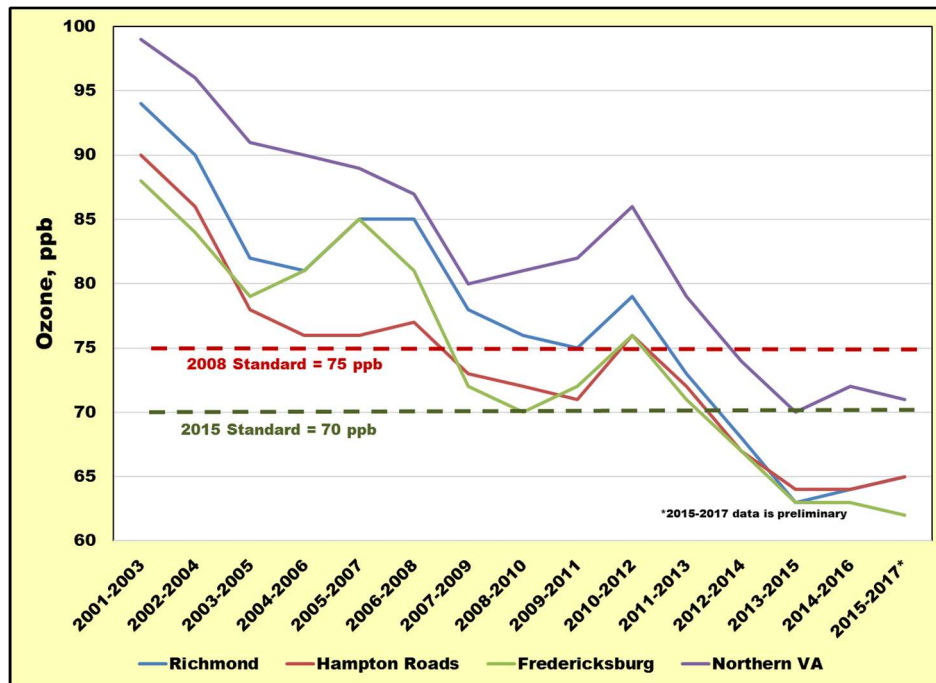


Figure 2: Ozone Three-Year Averages in Virginia

Figure 3 shows the number of ozone air quality exceedance days in Virginia since 1997 based on the 2015 ozone NAAQS. In 1998, Virginia recorded 108 exceedance days statewide. In 2010, the hottest and one of the driest summers on record, this value dropped to 52 exceedance days. In 2017, Virginia recorded four exceedance days.

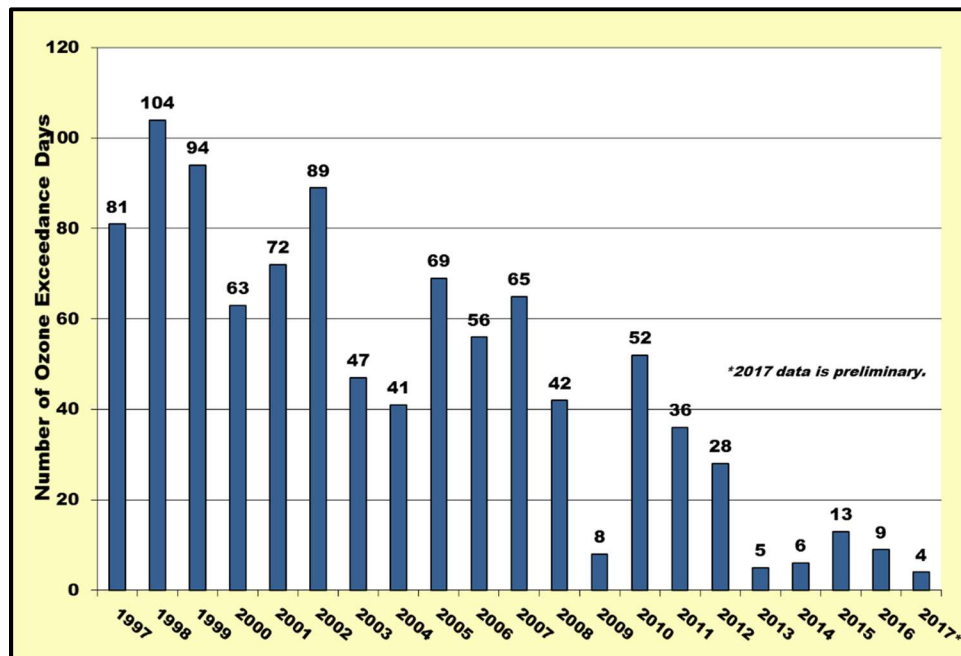


Figure 3: Virginia Ozone Exceedance Day Trends, 2015 Ozone NAAQS

PM_{2.5}

The federal regulations define PM_{2.5} as any airborne particle of solid or liquid matter that is less than or equal to 2.5 micrometers in diameter, which is approximately 1/30th the width of a human hair. Exposure to high levels of PM_{2.5} adversely affects human health, and the main impacts of PM_{2.5} are on the respiratory system and the cardiovascular system. Children, the elderly, and individuals with pre-existing pulmonary or cardiac disease are the most susceptible to PM_{2.5} pollution.

Federal regulations provide two health-based standards for PM_{2.5}. The first value is a daily, or 24-hour, standard of 35 µg/m³, established in 2006. The second value is an annual average of 12.0 µg/m³, established in 2012. All monitors in Virginia comply with these NAAQS. Table 2 provides information from one PM_{2.5} Federal Reference Method (FRM) monitoring site in each area of the Commonwealth. While Fredericksburg does not have a PM_{2.5} FRM monitoring site located within its boundaries, PM_{2.5} air quality within Fredericksburg should reflect similar values due to the regional nature of PM_{2.5} pollution. These data show that PM_{2.5} air quality continues to improve. A significant buffer exists between the monitored values and the health-based standards of 35 µg/m³ on a 24-hour basis and 12.0 µg/m³ on an annual basis. This improvement is largely due to SO₂ emission reductions because SO₂ forms sulfates, a component of PM_{2.5}, in the atmosphere. Reductions in SO₂ and VOC have also helped PM_{2.5} air quality by reducing the organic carbon portion of PM_{2.5}.

Table 2: Virginia Annual and 24-Hour PM_{2.5} Three-Year Averages

3 Year Period	Arlington 51-013-0020		Chesterfield 51-041-0003		Bristol 51-520-0006		Virginia Beach 51-810-0008	
	Annual	24-Hour	Annual	24-Hour	Annual	24-Hour	Annual	24-Hour
2001-2003	14.6 µg/m ³	38 µg/m ³	13.6 µg/m ³	34 µg/m ³	14.3 µg/m ³	33 µg/m ³	12.6 µg/m ³	33 µg/m ³
2002-2004	14.5 µg/m ³	37 µg/m ³	13.4 µg/m ³	33 µg/m ³	13.9 µg/m ³	31 µg/m ³	12.5 µg/m ³	32 µg/m ³
2003-2005	14.6 µg/m ³	36 µg/m ³	13.6 µg/m ³	33 µg/m ³	14.0 µg/m ³	30 µg/m ³	12.6 µg/m ³	30 µg/m ³
2004-2006	14.2 µg/m ³	34 µg/m ³	13.4 µg/m ³	30 µg/m ³	13.9 µg/m ³	31 µg/m ³	12.5 µg/m ³	30 µg/m ³
2005-2007	14.0 µg/m ³	32 µg/m ³	13.3 µg/m ³	31 µg/m ³	13.9 µg/m ³	30 µg/m ³	12.1 µg/m ³	30 µg/m ³
2006-2008	12.9 µg/m ³	30 µg/m ³	12.4 µg/m ³	28 µg/m ³	12.7 µg/m ³	28 µg/m ³	11.9 µg/m ³	30 µg/m ³
2007-2009	11.9 µg/m ³	27 µg/m ³	11.2 µg/m ³	24 µg/m ³	11.2 µg/m ³	25 µg/m ³	10.7 µg/m ³	26 µg/m ³
2008-2010	10.8 µg/m ³	24 µg/m ³	10.3 µg/m ³	21 µg/m ³	10.2 µg/m ³	22 µg/m ³	10.3 µg/m ³	24 µg/m ³
2009-2011	10.1 µg/m ³	22 µg/m ³	9.6 µg/m ³	21 µg/m ³	9.9 µg/m ³	21 µg/m ³	9.6 µg/m ³	23 µg/m ³
2010-2012	9.9 µg/m ³	22 µg/m ³	9.5 µg/m ³	21 µg/m ³	9.8 µg/m ³	20 µg/m ³	9.3 µg/m ³	24 µg/m ³
2011-2013	9.4 µg/m ³	21 µg/m ³	8.7 µg/m ³	21 µg/m ³	9.0 µg/m ³	18 µg/m ³	8.5 µg/m ³	22 µg/m ³
2012-2014	9.0 µg/m ³	21 µg/m ³	8.5 µg/m ³	19 µg/m ³	8.6 µg/m ³	16 µg/m ³	8.0 µg/m ³	20 µg/m ³
2013-2015	8.9 µg/m ³	20 µg/m ³	8.3 µg/m ³	18 µg/m ³	8.2 µg/m ³	15 µg/m ³	7.9 µg/m ³	19 µg/m ³

3 Year Period	Arlington 51-013-0020		Chesterfield 51-041-0003		Bristol 51-520-0006		Virginia Beach 51-810-0008	
	Annual	24-Hour	Annual	24-Hour	Annual	24-Hour	Annual	24-Hour
2014-2016	8.5 µg/m ³	19 µg/m ³	8.0 µg/m ³	16 µg/m ³	8.0 µg/m ³	18 µg/m ³	7.5 µg/m ³	17 µg/m ³
2015-2017*	8.1 µg/m ³	18 µg/m ³	7.8 µg/m ³	16 µg/m ³	7.6 µg/m ³	18 µg/m ³	7.1 µg/m ³	15 µg/m ³

*2017 data is preliminary.

Data Source: DEQ-Air Quality Monitoring Division

Figure 4 shows the improvement in monitored sulfate concentrations over the last several years, as measured by the PM_{2.5} speciation monitor located in Henrico, Virginia. This monitor has the ability to measure the components of PM_{2.5} pollution. The sulfate portion of PM_{2.5} has decreased markedly, as has the organic carbon portion.

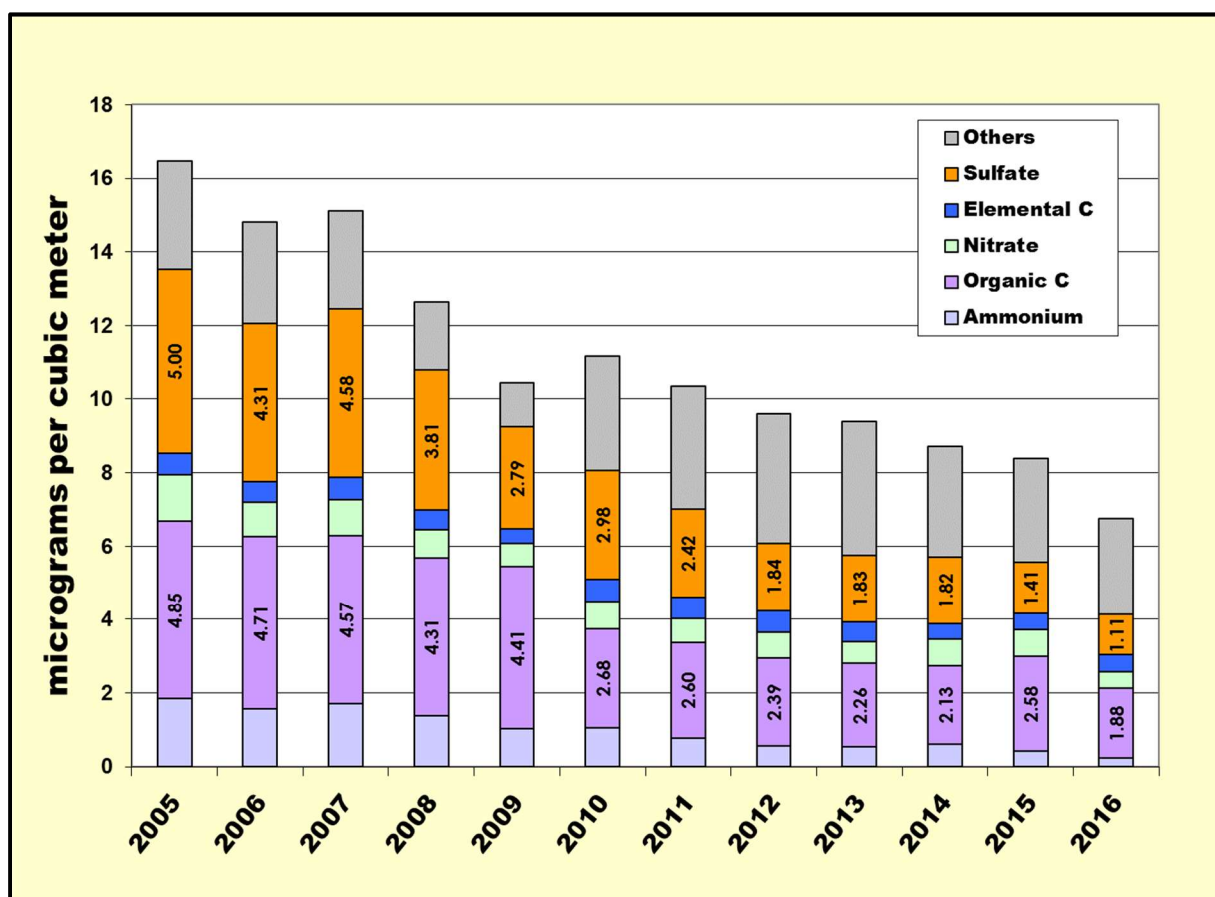


Figure 4: Henrico Speciation Data

Emission Reduction Programs

Emission reduction programs such as those listed in the Ozone Advance Action Plan have reduced NO_x and SO₂ emissions across Virginia. Figure 7 and Figure 8 show NO_x and SO₂ emissions, respectively, from all point sources registered and reporting

emissions to Virginia's Comprehensive Environmental Data System (CEDS). Point sources are generally large emitters of criteria air pollutants such as electrical generating units (EGUs), industrial facilities, commercial and institutional facilities, and waste processing facilities. Responsible officials at these facilities must certify reports to this system as true and complete, and DEQ compliance staff review submittals prior to entry into CEDS. Therefore, the quality of the data is high.

Figure 7 shows that NO_x emissions from point sources across the Commonwealth have decreased by about 50,000 tons from 2006-2007 to 2016. From 2013 to 2016, the time period of the Ozone Advance Action Plans implemented in Virginia, NO_x emissions have decreased by about 10,000 tons. Figure 8 shows that SO₂ emissions from point sources across the Commonwealth have decrease by more than 200,000 from 2006-2007 to 2016. From 2013 to 2016, SO₂ emissions dropped more than 30,000 tons.

A disk containing supporting information, including the various documents referenced in Table 3 and Table 4, is included with this report.

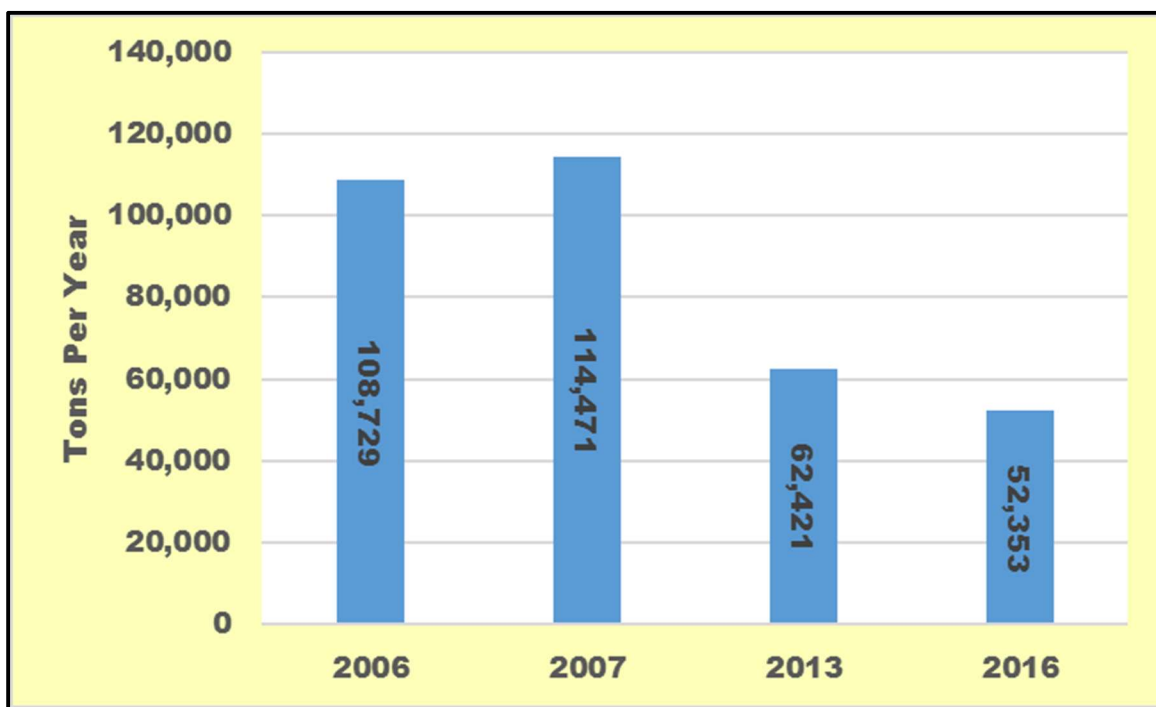


Figure 5: Virginia NO_x Emissions From Point Sources

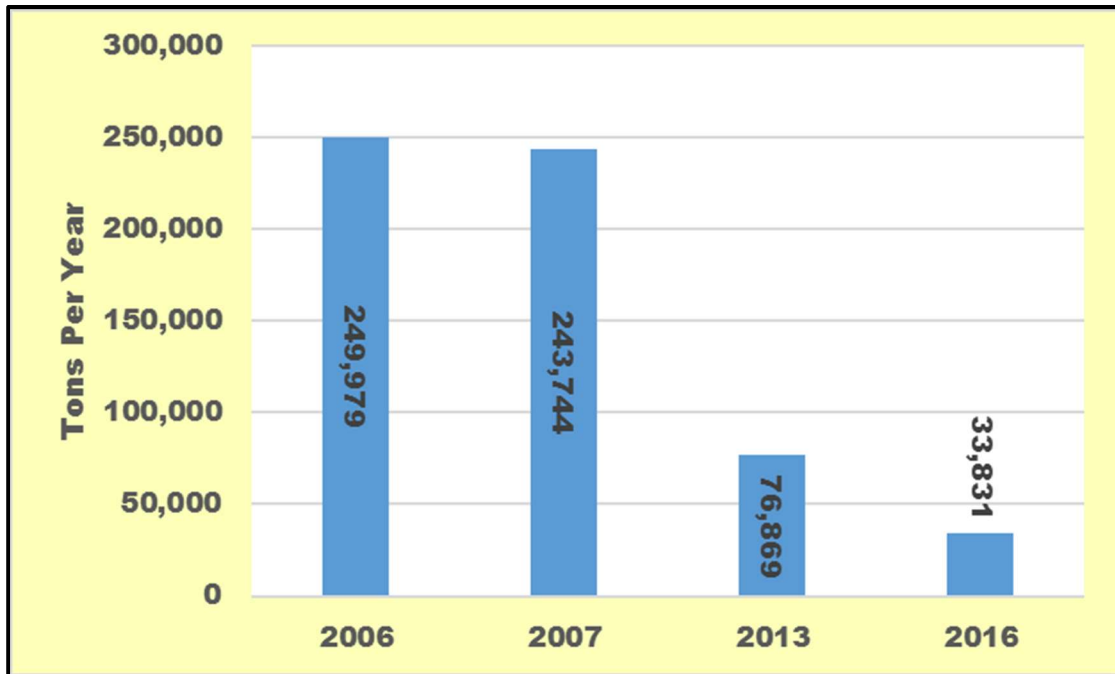


Figure 6: Virginia SO₂ Emissions from Point Sources

Table 3: Emission Reduction Programs - In Development or Ongoing

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Metropolitan Planning Organizations					
CMAQ Projects	FAMPO	2012-2018	Programs initiated?	Voluntary	<ul style="list-style-type: none"> See Resolution-18-25-Allocating-FY19-25-CMAQ-and-RSTP-Funding-attachment.pdf
GWRide Connect	FAMPO GWRideConnect	On-going	VT avoided Vehicle trips avoided Vanpools formed	Voluntary	<ul style="list-style-type: none"> Programs on-going. See Fiscal-Year-2019-Annual-Work-Plan.pdf https://www.gwrideconnect.org/
DMME-Division of Energy					
VEMP	DMME	On-going	SF of public buildings retrofitted? Private capital deployed? Energy savings?	Voluntary	<ul style="list-style-type: none"> Total value of contracts through FY 2014 is \$685 million. Cumulative estimated CO₂ emission reductions through calendar year 2014 are 271,732 tons.
Energize Virginia	DMME	2011-2016	Funds awarded? Programs to be implemented?	Voluntary	<ul style="list-style-type: none"> More than \$10M awarded in 2012. Projects include energy performance contracts, and a solar thermal system. More than \$1.7M has been repaid as of 01/31/2015.
Virginia Clean Cities					
Virginia Get Ready	VCC	On-going	Statewide network of chargers	Voluntary	<ul style="list-style-type: none"> VA registrations of electric vehicles increased from 4,208 in 2016 to 5,518 in 2017. VA public charging stations increased in number from 458 in 2016 to 547 in 2017. http://www.virginiaev.org/ See va_electric+hybrid_vehicles_and_stations_2008-2017.xlsx
Regional Reductions					
Honeywell SCR Installation	DEQ	12/2012 through 06/2019	# of SCR installed? Annual emissions of NO _x ?	Permitting; Consent Agreement	<ul style="list-style-type: none"> Two SCR began operating December 2012. Two SCR began operating October of 2014. Two SCR began operating November 2016. Final two SCR will commence operation on or before 6/30/2019.
Energy Efficiency/ Renewable Energy	A.P. Hill	On-going	LEED certifications Fuel usage	Voluntary	<ul style="list-style-type: none"> See Total MBTU and NO_x track FY17.pdf

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Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Emissions Impact	A.P. Hill	On-going	Annual emissions estimates	Voluntary	<ul style="list-style-type: none"> • See Total MBTU and NO_x track FY17.pdf
Utility-Scale Solar	Dominion	On-going		Voluntary	<ul style="list-style-type: none"> • In February 2015, Dominion announced plans to develop multiple utility-scale solar projects totaling 400 megawatts of electricity by 2020 with the intent to involve Virginia-based companies.. http://dom.mediaroom.com/2015-02-05-Dominion-Virginia-Power-Planning-Major-Expansion-of-Large-Scale-Solar-in-Virginia • In December 2015, Dominion acquired the 20 MW Morgans Corner facility located in Pasquotank County, NC. The output of the facility is under long-term contract with the U.S. Department of the Navy. The facility became operational in mid-December 2015. • On June 2016, Dominion received approval from the Virginia SCC for three separate solar projects located in Powhatan, Louisa, and Isle of Wight counties. These projects began serving customers in December 2016 and collectively total 56 MW of solar capacity. • In December 2016, Dominion Energy, the University of Virginia and its Darden School of Business announced an innovative 17 MW solar power partnership under which the University and Darden will purchase the entire output of electricity produced at a new, 160-acre solar facility (Hollyfield Solar Project) in King William County for the next 25 years. Commercial operations should begin by the end of 2018, pending regulatory approval. • In August 2016, Dominion Energy Virginia, the Department of the Navy, and the Commonwealth of Virginia reached an agreement to construct an 18 MW solar facility at Naval Air Station Oceana in Virginia Beach, Virginia. The project received regulatory approval in March 2017 and became operational in December 2017. http://dom.mediaroom.com/2016-08-02-Dominion-Virginia-Power-to-Build-Solar-Facility-at-Naval-Air-Station-Oceana

Table 3: Emission Reduction Programs - In Development or Ongoing

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Utility-Scale Solar, Continued	Dominion	On-going		Voluntary	<ul style="list-style-type: none"> • Dominion is partnering with the Commonwealth of Virginia and Microsoft on the 20 MW Remington solar facility in Fauquier County, VA. The facility received regulatory approval in February 2017 and became operational in October 2017. • In November 2015, the company announced the acquisition of an 80 MW solar facility in Accomack County, Virginia. The facility began operations in October 2016. Output is being purchased by Amazon Web Services (AWS). • In November 2016, the company announced a major expansion of its solar alliance with Amazon with plans to add 180 MW of solar generating capacity consisting of five projects in five Virginia counties. All five projects achieved commercial operations in December 2017, bringing Dominion Energy's solar alliance with AWS to a total of 260 MW of installed solar generation. https://www.dominionenergy.com/about-us/making-energy/renewables/solar-generation/virginia-solar-projects/solar-alliance • In June 2017, Dominion Energy announced the acquisition of two solar facilities totaling 30 MW. The 10 MW Clarke County Solar Facility in White Post, VA became operational in August 2017, and the 20 MW Cherrydale Solar Facility entered service in November 2017. Power from both projects is being purchased by Old Dominion Electric Cooperative under long-term agreement.
Solar Partnership Program	Dominion	2013-2018	Program on-going	Voluntary	<ul style="list-style-type: none"> • The Company received approval in November 2012 for this multi-year pilot program designed to expand Dominion's understanding of strategic siting of solar distributed generation along the Company's electric distribution system by studying its impact and assessing its benefits while supporting solar energy growth in Virginia. • Dominion has installed solar arrays on rooftops or land owned by large customers. The company currently has 11 facilities for a total of 7.7 MW operational under this program in partnership with Canon in Gloucester, VA; Canon in Newport News, VA; ODU in Norfolk, VA; VUU in Richmond, VA; Capital One in Chester, VA; Philip Morris in Chesterfield, VA; Prologis in Sterling, VA; Randolph-Macon University in Ashland, VA; Western Branch High School in Chesapeake, VA; UVA in Charlottesville, VA; and Merck in Elkton, VA. • https://www.dom.com/large-business/renewable-energy-programs/solar-partnership-program

Table 3: Emission Reduction Programs - In Development or Ongoing

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Solar Purchase Program	Dominion	2013-2018	Program on-going	Voluntary	<ul style="list-style-type: none"> Company received approval in March 2013 for multi-year pilot program designed as an alternative to net metering. The program allows solar customer-generators to sell the output of their on-site solar arrays to the Company for 15 cents/kWh for five years. Program has a 3 MW cap. As of February 2018, 151 customers are participating for a total of approximately 1.8 MW installed.
Net Metering	Dominion	On-going	Offered by Statute	Offered by Statute	<ul style="list-style-type: none"> This program is offered by statute in both VA and NC. The Company has customers participating in both states. As of February 2018 participation in Dominion's service territories in VA and NC totaled 2,849 customers and approximately 24.3 MW, with the vast majority of participation in Dominion's VA service area.
Renewable Energy Pilot Program	Dominion participating in program	On-going	SCC established program guidelines in November 2013	Established by Statute in 2013	<ul style="list-style-type: none"> As of December 1, 2013, qualified customers may participate in the Virginia SCC's Renewable Energy Pilot Program. This pilot program allows qualified customers to enter into a Power Purchase Agreement with a third party renewable energy supplier. The energy supplied must come from a wind or solar generator located on the customer's premise. The program has a 50 MW aggregate cap in Dominion's service territory and a 7 MW aggregate cap for private colleges in APCo's service territory (expanded to APCo by statute in 2017). Eleven facilities totaling approximately 2.1 MW are currently operational under the program. https://www.dom.com/large-business/renewable-energy-programs/renewable-energy-pilot-program https://www.scc.virginia.gov/pur/pilot.aspx
Community Solar	Dominion	Planned	Planned per 2017 legislation	Facilitated by 2017 legislation	<ul style="list-style-type: none"> In 2017, the Virginia General Assembly enacted legislation requiring Virginia electric utilities to conduct community solar pilot programs. The legislation resulted from a constructive stakeholder process including the utilities and solar advocacy groups. The measure was signed by the Governor in March and became law in July 2017. Legislation requires that the amount of generating capacity in the program shall be no less than 10.5 MW and no more than 50 MW with specific but differing caps in Dominion and APCo service territories. On January 19, 2018, Dominion Energy Virginia submitted its Community Solar Pilot Program application to the VA SCC to offer 10 MW of community solar pilot program capacity selected through a competitive RFP process from third-party solar developers

Table 3: Emission Reduction Programs - In Development or Ongoing

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Alternative Vehicles and Fuels Program	Dominion	On-going	% of fleet powered by alternative fuels?	Voluntary	<ul style="list-style-type: none"> Vehicles powered by alternative fuels now make up more than one-third of the Company's on-road fleet of over 6,000 cars and trucks. https://www.dominionenergy.com/community/environment/what-we-are-doing/greening-our-vehicle-fleet-merge The Company has been inducted into the Virginia Green Fleet Hall of Fame and won the Governor's Green Fleet Award. The Company is operating an Electric Vehicle Pricing Plans Pilot Program that provides customers two EV charging rate options to study the impacts of electric vehicle charging on the grid. Over 600 customers are enrolled in the program which runs through November 2018 (https://www.dominionenergy.com/home-and-small-business/ways-to-save/electric-vehicles).
Other Programs not included in the 2013 Fredericksburg Ozone Advance Action Plan					
Green Operators Program at the Port of Richmond	VPA, RAMPO	2013-2015	n/a	Voluntary; funded by CMAQ and by DERA	<ul style="list-style-type: none"> GO program replaced or retrofitted 425 trucks since inception. http://www.portofvirginia.com/fy17-sustainability-report/
Coastal Virginia Offshore Wind (CVOW) Project	Dominion Energy	On-going	n/a	Voluntary	<ul style="list-style-type: none"> Dominion Energy has signed a strategic partnership agreement with Ørsted Energy of Denmark for construction of the Coastal Virginia Offshore Wind (CVOW) Project, formerly the Virginia Offshore Wind Technology Advancement Project. The project will consist of two 6 MW turbines 27 miles off the coast of Virginia in a 2,135-acre site leased by the Virginia Department of Mines, Minerals and Energy. CVOW is expected to be in-service by the end of 2020. The Project will provide operational, weather, and environmental experience that will be critical in unlocking the potential for large-scale offshore wind development in the adjacent 112,800-acre site leased by Dominion Energy from the Bureau of Ocean Energy Management. Full deployment could generate up to 2,000 MW of energy, enough to power half a million homes.

Table 4: Emission Reduction Programs-Completed

Control Program	Stakeholders	Time Frame	Program Type	Feedback & Comments
Virginia Clean Cities				
Propane Autogas Program	VCC	2009-2013	Voluntary	<ul style="list-style-type: none"> Program concluded in 2013. Converted 117 vehicles to autogas in VA. Alternative fuel vehicles estimated to reduce NOx emissions 273 tons annually in VA.
Virginia Department of Environmental Quality				
Expansion of ORE	DEQ	2015	Regulation	<ul style="list-style-type: none"> Program implemented winter 2015.
Regional Reductions				
Invista Powerhouse Project	DEQ	2013-2014	Permit	<ul style="list-style-type: none"> Coal fired boilers shut down in 2014.
Generating unit retrofits, fuel switches, and retirements	Dominion	2014	Permit	<ul style="list-style-type: none"> Bremo Bluff ceased burning coal in fall of 2013. Facility is now burning solely natural gas. Facility is expected to be put into cold storage in 2018.
		2012-2013	Permit	<ul style="list-style-type: none"> Permits received for Hopewell, Altavista, and Southampton fuel switch from coal to biomass. Units burn biomass and no longer burn coal.
		2012	MATS; Consent Agreement	<ul style="list-style-type: none"> Installation of SO₂ scrubbers complete for all coal units at the Chesterfield Power Station near Richmond, VA.
		2014	MATS; 2010 SO ₂ NAAQS	<ul style="list-style-type: none"> Chesapeake Energy Center retired all coal-fired units in December 2014.
		2014	Permit	<ul style="list-style-type: none"> Dominion began commercial operation of the Warren County Power Station in December 2014. This operation is a combined cycle facility rated at about 1,329 MW burning natural gas and equipped with state of the art controls.

Table 4: Emission Reduction Programs-Completed

Control Program	Stakeholders	Time Frame	Program Type	Feedback & Comments
Generating unit retrofits, fuel switches, and retirements (continued)	Dominion	2016	Permit	<ul style="list-style-type: none"> • Dominion began commercial operation of the Brunswick County Power Station April 2016. This operation is a combined cycle facility rated at about 1,300 MW burning natural gas and equipped with state of the art controls
		2018	Voluntary	<ul style="list-style-type: none"> • Dominion Energy plans to place over 1200 MW of generation located in Virginia on cold reserve in 2018 (over 500 MW - 4 units located in the Richmond area). • Facilities are Bellemeade, Bremo Bluff, Chesterfield, Mecklenburg, and Possum Point Power Station. • https://www.platts.com/latest-news/electric-power/houston/dominion-energy-places-nine-regulated-units-into-21096273.
Celco Powerhouse Project	DEQ	Coal units retired?	Permit	<ul style="list-style-type: none"> • All coal fired boilers permanently shut down as of 9/23/2015.
Boiler Fuel Switch	Philip Morris	2014-2015	Permit	<ul style="list-style-type: none"> • Facility has converted coal-fired boilers to multi-fueled units and is now burning natural gas.
Boiler updates	Huntington Ingalls	2015	Permit	<ul style="list-style-type: none"> • Replaced residual oil-fired boilers with natural gas, low-emitting boilers. • Converted residual oil-fired, barge-mounted boilers to ultra-low sulfur distillate oil.
National Parks	VCC, NPS	2014	Voluntary	<ul style="list-style-type: none"> • NPS added 12 prone lawn mowers and 2 electric vehicles to its fleet, along with a public EV charging station and 2 private EV charging stations.