Hampton Roads Ozone Advance Action Plan

Annual Report
04-28-2017

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
EGU	electrical generating unit
EPA	United States Environmental Protection Agency
EV	electric vehicles
FRM	federal reference method
HRTPO	Hampton Roads Transportation Planning Organization
MATS	Mercury and Air Toxics Rule
$\mu g/m^3$	micrograms per cubic meter
MW	megawatts
NAAQS	National Ambient Air Quality Standard
NO_X	nitrogen oxides
$PM_{2.5}$	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

Hampton Roads Ozone and $PM_{2.5}$ Air Quality – April 2017 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 particular area. 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 Hampton Roads area and the Commonwealth of Virginia developed the Hampton Roads 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 Hampton Roads 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 emission reductions achieved from the many federal, state, and local air pollution control programs and voluntary efforts being implemented as well as favorable summertime meteorology.

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 was near or above normal levels. Table 1 summarizes Virginia's ozone season temperature and precipitation data for the period 2009 through 2016.

Table 1: Virginia Ozone Season Meteorology Data, 2009-2016

	Virginia Maximum Daily Average Temperature (°F) (May through September)			Virginia Precipitation (inches) (May through September)		
Year	**Average Maximum Temperature**	**Normal**	**Departure from Normal (20th Century)**	**Total Precipitation (inches)**	**Normal**	**Departure from Normal (20th 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

Figure 1 shows the ozone air quality as measured in the Hampton Roads area. Air quality in this part of the Commonwealth has improved over the last decade, and the 2014-2016 monitoring data show a design value of 64 parts per billion (ppb). 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. EPA published a more stringent ozone NAAQS on October 1, 2015, revising the standard to 70 ppb. Air quality data from the Hampton Roads monitors for 2014 through 2016 also comply with this new standard.

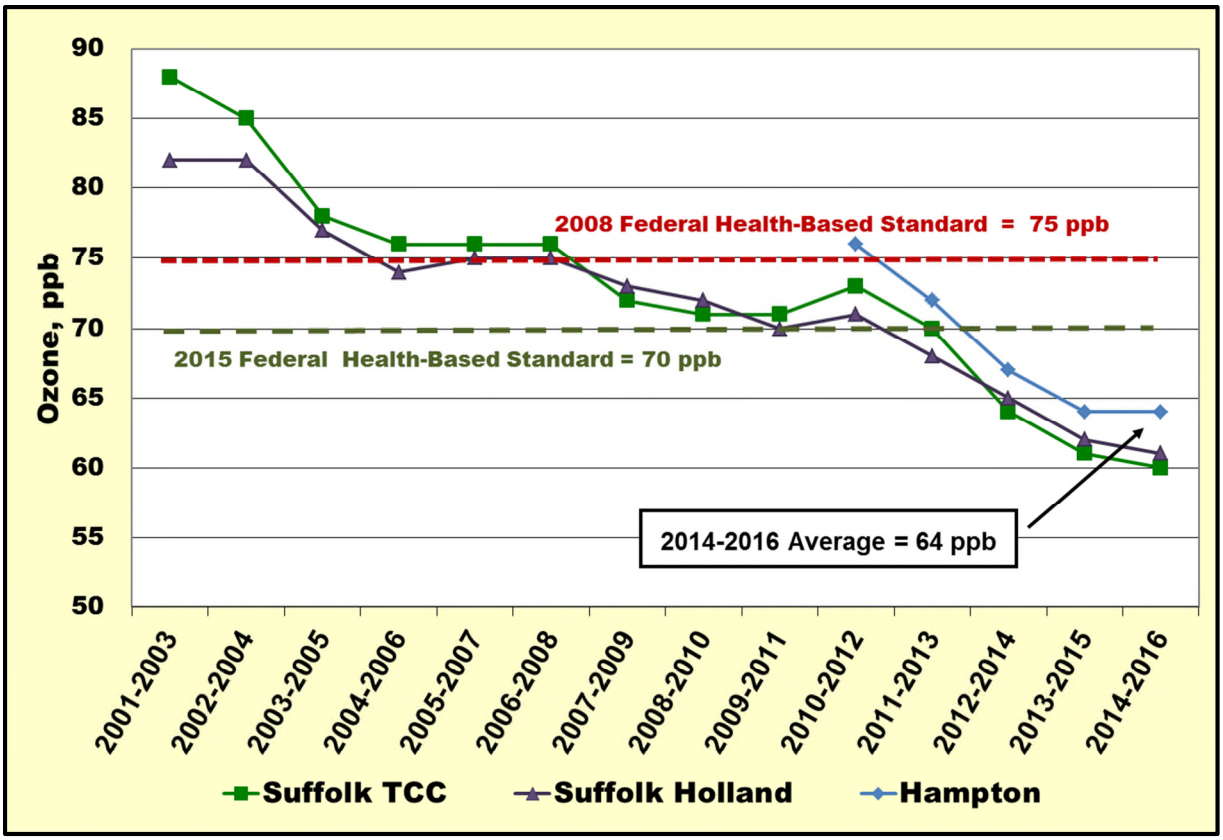

Figure 1: Hampton Roads Ozone Air Quality

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 2014-2016 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 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 2016, Virginia recorded nine exceedance days.

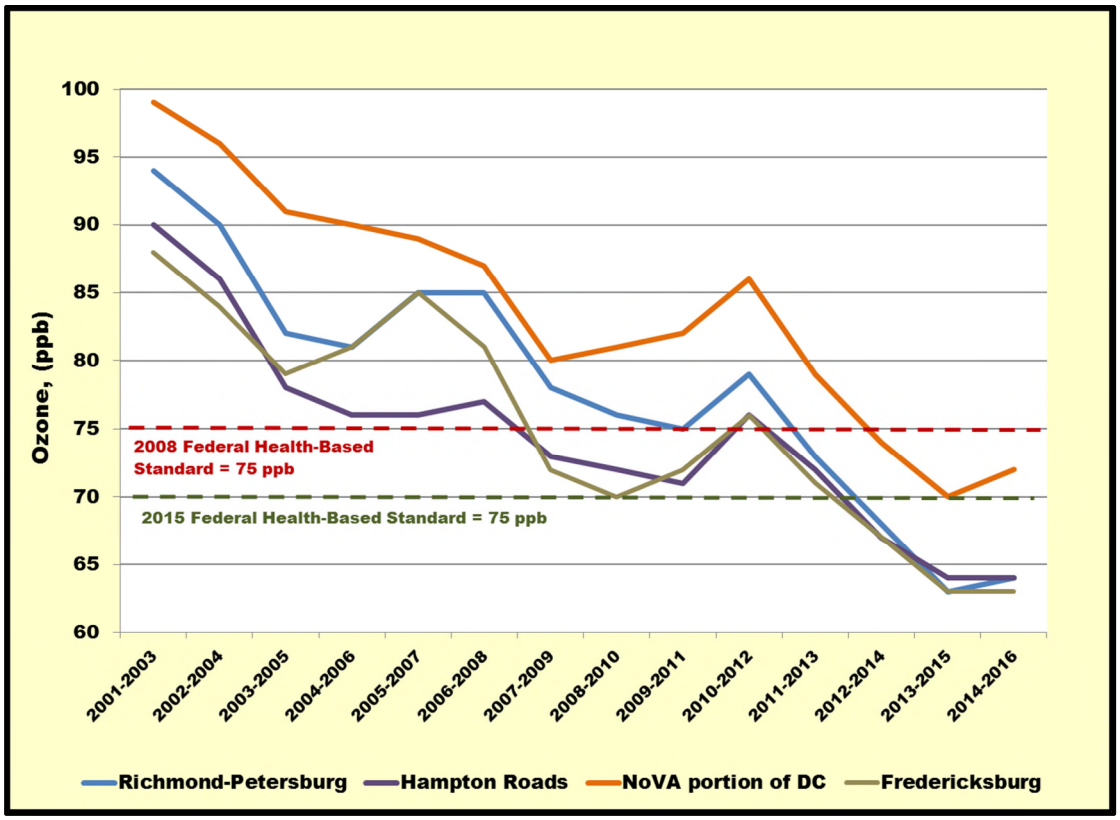

Figure 2: Ozone Three-Year Averages in Virginia

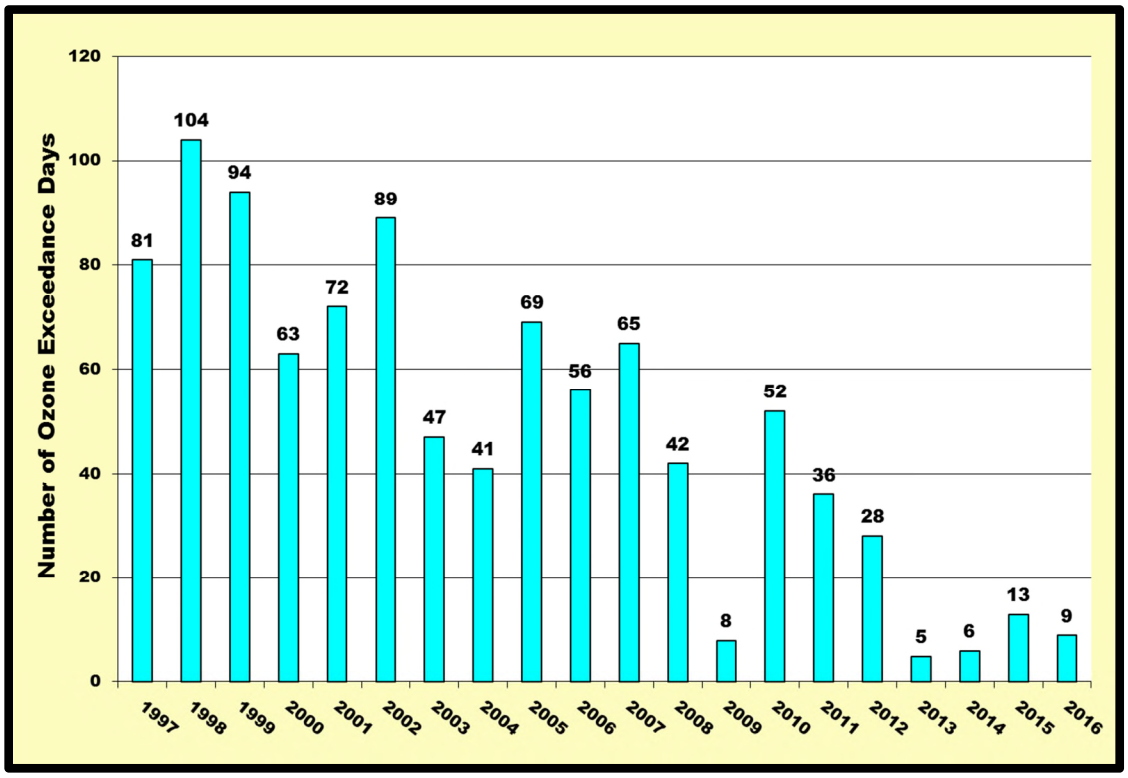

Figure 3: Virginia Ozone Exceedance Day Trends, 2015 Ozone NAAQS

$PM_{2.5}$

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, 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/m^3, established in 2006. The second value is an annual average of 12.0 µg/m^3, 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. 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/m^3 on a 24-hour basis and 12.0 µg/m^3 on an annual basis. This improvement is largely due to SO_2 emission reductions because SO_2 forms sulfates, a component of $PM_{2.5}$, in the atmosphere. Reductions in SO_2 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
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

Data Source: DEQ-Air Quality Monitoring Division

Figures 4 and 5 provide the annual and daily $PM_{2.5}$ monitoring information, respectively, from the $PM_{2.5}$ monitors located in the Hampton Roads area. These figures highlight the remarkable improvement in $PM_{2.5}$ air quality.

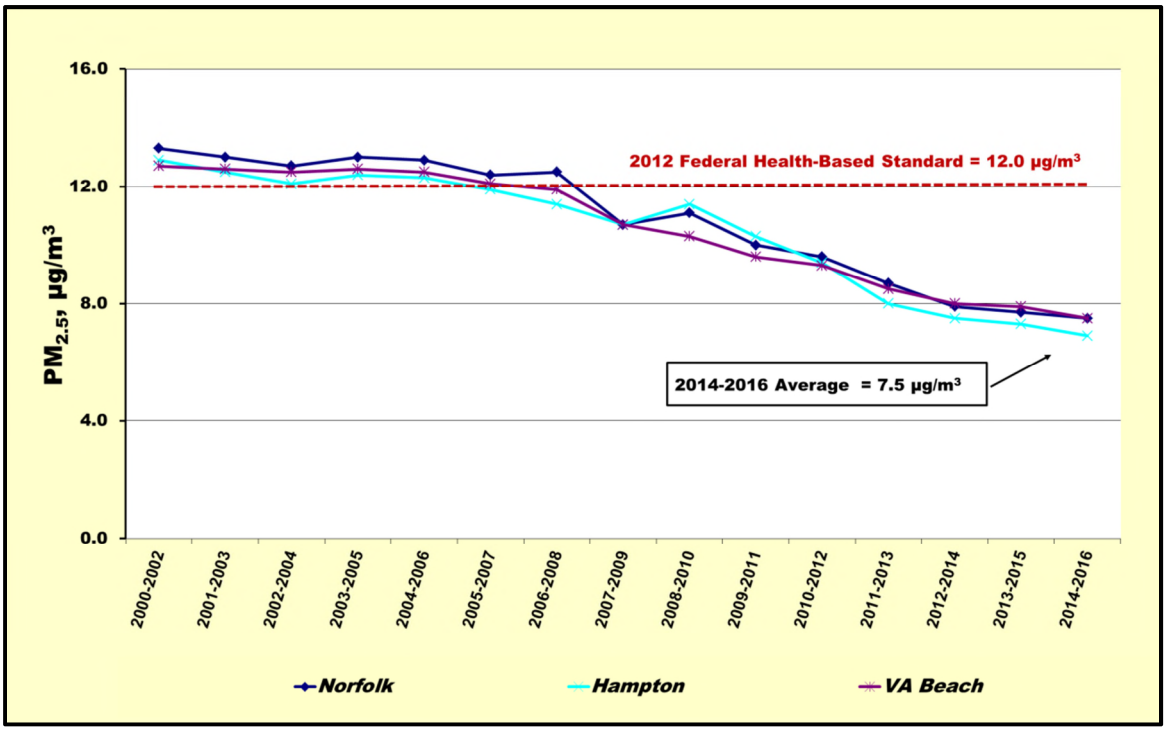

Figure 4: Hampton Roads Annual $PM_{2.5}$ Air Quality Data

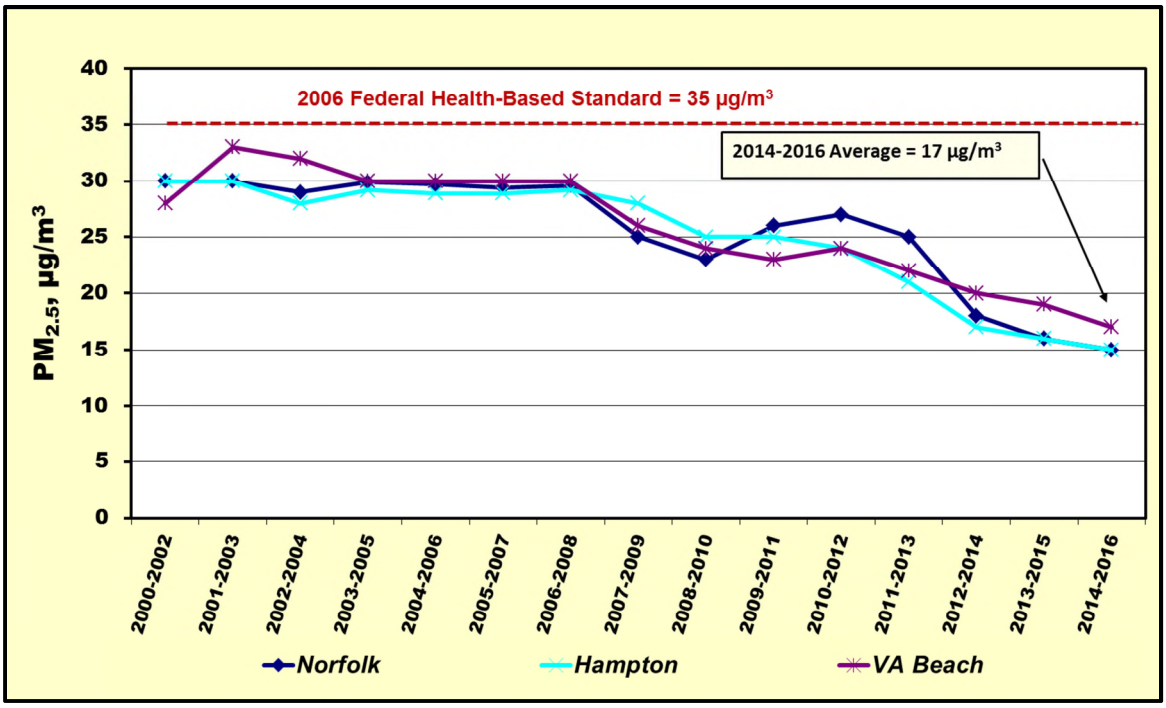

Figure 5: Hampton Roads Daily $PM_{2.5}$ Air Quality Data

Figure 6 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. The reductions seen in the sulfate and organic carbon portions of the speciation data are directly attributable to reductions in SO_2 and VOC emissions.

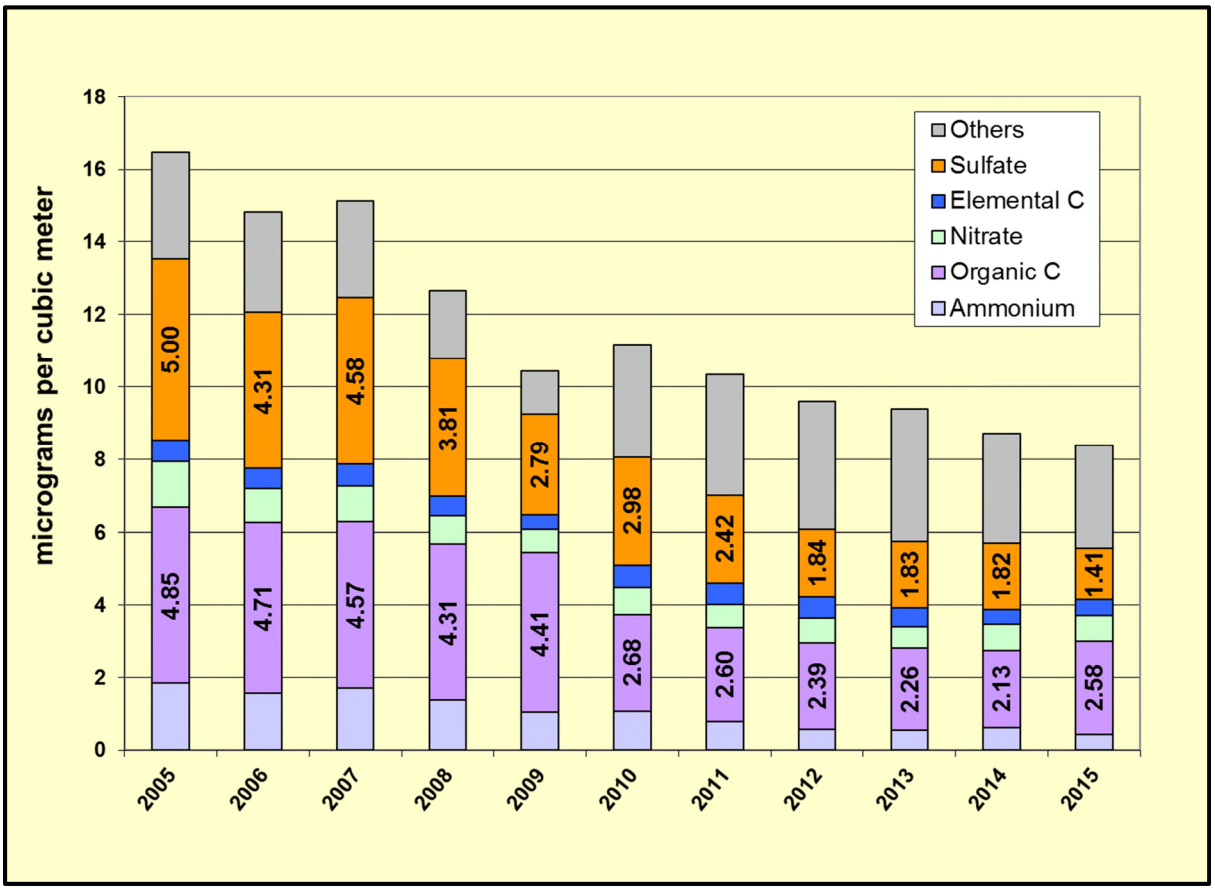

Figure 6: Henrico Speciation Data

Emission Reduction Programs

For the upcoming 2017 ozone season, DEQ expects that additional upwind NO_X reductions will continue to benefit air quality. AdvanSix (Honeywell-Hopewell), located in Hopewell, Virginia, completed work on two new selective catalytic reduction (SCR) control devices and began operating them on November 21, 2016. These two new SCR make a total of six SCR that have been installed in the last five years. Annual NO_X emissions in Figure 7 from this facility show the reductions associated with the use of these control devices. NO_X emissions in 2016 and 2017 will reflect the additional controls and continue this downward trend.

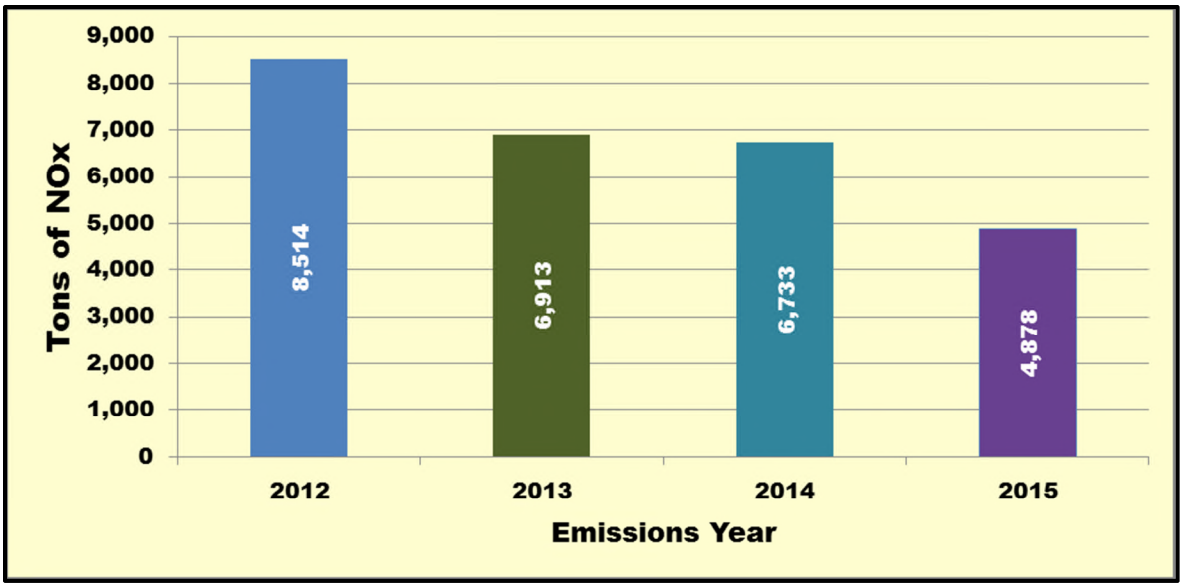

Figure 7: AdvanSix Annual NOX Emissions, 2012-2015

To promote renewable energy resources, Virginia enacted the 2009 Small Renewable Energy Projects legislation, which directed DEQ to develop permit-by-rules for various small renewable energy projects. These projects include solar-powered and wind-powered electrical generation facilities up to capacities of 100 megawatts (MW). The permit-by-rule for wind energy projects became effective December 2010, and the permit-by-rule for solar energy projects became effective July 2012. DEQ has issued permits for 319.8 MW of renewable power and has received Notice of Intent information for projects totaling more than an additional 1,000 MW of renewable power. Figure 8 provides the locations of these facilities.

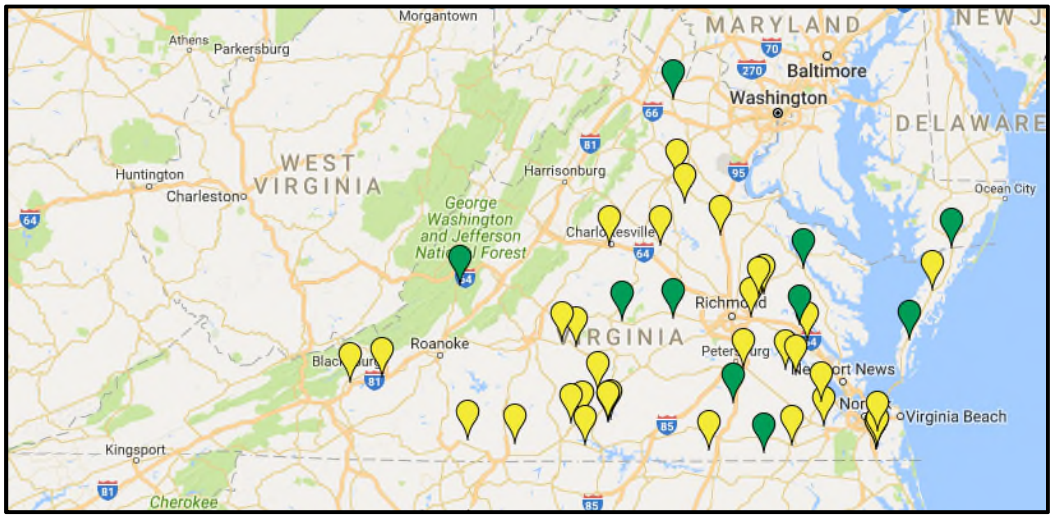

Figure 8: Proposed and Permitted Solar and Wind Energy

In this figure, green markers denote facilities that have received permits, while the yellow markers denote facilities that are in the permitting process. Eight of these facilities, with a total rated capacity of approximately 225 MW, are expected to locate in the Hampton Roads Ozone Advance area. As these facilities complete construction and come on line, this additional electrical generating capacity will reduce electrical generating unit (EGU) emissions within the Hampton Roads area and upwind of this area.

Another important program taking effect in 2017 is the Cross State Air Pollution Rule (CSAPR) Update, published October 26, 2016 (8 FR 74504). This rule will reduce NO_X ozone season allocations beginning in the 2017 to further encourage summertime NO_X reductions from the EGU sector.

The following tables provide updates on the programs described in the Hampton Roads Ozone Advance Action Plan. Table 3 provides information on programs that are on-going as well as on programs that are currently in development or began after the area's leaders finalized the Hampton Roads Ozone Advance Action Plan. Table 4 provides information on programs that have been completed.

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

Table 3: Emission Reduction Programs-In Development or On-going

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Virginia Port Authority					
GO Program	VPA	On-going	Vehicles retrofitted or repowered	Voluntary	• Program is on-going • Replaced 30 trucks in FY16 • Replaced or retrofitted 410 trucks since inception. • http://www.portofvirginia.com/fy16-sustainability-report/clean-sea-land-and-air.php
Terminal Operations	VPA	On-going	Program Report	Voluntary	• Program is on-going.
Metropolitan Planning Organizations					
I-64 Express/Inter-Terminal Barge Service	VPA, RAMPO, HRTPO	On-going	TEUs transported annually	Voluntary	• In 2016, moved more than 16,000 containers moved by barge service • Barge service running 3 trips/week • See Port of VA – RRTPO CMAQ 2-2-17 Update v2.pptx • http://www.portofvirginia.com/fy16-sustainability-report/clean-sea-land-and-air.php
TRAFFIX	TRAFFIX	On-going	VMT avoided annually Trips avoided annually	Voluntary	• FY 2015 Traffix Annual Report.pdf.
The Tide	HRTPO	On-going	Program Report	Voluntary	• Program is on-going. • http://www.gohrt.com/services/the-tide/
DMME-Division of Energy					
VEMP	DMME	On-going	SF of public buildings retrofitted? Private capital deployed? Energy savings?	Voluntary	• Total value of contracts through FY 2014 is $685 million. Cumulative estimated CO_2 emission reductions through calendar year 2014 are 271,732 tons.

Table 3: Emission Reduction Programs-In Development or On-going

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Energize Virginia	DMME	2011-2016	Funds awarded? Programs to be implemented?	Voluntary	• 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.
Dominion Virginia Power					
Yorktown Power Station	Dominion	2017-2018	Units retired?	MATS	• Dominion will retire two coal-fired units at the Yorktown Power Station contingent upon the completion of a transmission upgrade project.
Energy Conservation Programs	Dominion	On-going	Program on-going	Voluntary	• Company currently offers several energy conservation programs to its residential and non-residential utility customers in Virginia and continues to evaluate opportunities to redesign current, and develop new, demand-side management initiatives. https://www.dom.com/dominion-virginia-power/customer-service/energy-conservation/ec-programs.jsp
Utility-Scale Solar	Dominion	On-going	Program on-going	Voluntary	• In February 2015, Dominion announced plans to develop multiple utility-scale solar projects totaling 400 megawatts of electricity. All projects will be built in Virginia with involvement of Virginia-based companies and are expected to be operational by 2020. http://dom.mediaroom.com/2015-02-05-Dominion-Virginia-Power-Planning-Major-Expansion-of-Large-Scale-Solar-in-Virginia and https://www.dom.com/about-us/making-energy/renewables/solar/virginia-and-north-carolina-solar-projects. • 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.

Table 3: Emission Reduction Programs-In Development or On-going

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Utility-Scale Solar, Continued	Dominion	On-going	Program on-going	Voluntary	• 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 Virginia Power, the University of Virginia and its Darden School of Business announced an innovative 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. Construction is slated to start in late 2017, with commercial operations occurring by the end of 2018, pending regulatory approval. • In August 2016, Dominion Virginia Power, 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. On March 27, 2017, the SCC issued its approval for the Company to construct and operate the facility, which is expected to become operational in late 2017. http://dom.mediaroom.com/2016-08-02-Dominion-Virginia-Power-to-Build-Solar-Facility-at-Naval-Air-Station-Oceana • Dominion is partnering with the Commonwealth of Virginia and Microsoft for a 20 MW solar facility in Fauquier County, VA. The facility, which received approval from the SCC in February 2017, is expected to become 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. • 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 in five Virginia counties, expected to be operational in late 2017. https://www.dom.com/news/news-releases/137197.

Table 3: Emission Reduction Programs-In Development or On-going

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Solar Partnership Program	Dominion	2013-2018	Program on-going	Voluntary	• The Company received approval in November 2012 for this multi-year pilot program designed to expand Dominion's understanding of community-based solar energy 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 nine facilities for a total of 5.2 MW operational under this program in partnership with Canon in Gloucester, VA; ODU in Norfolk, VA; VUU in Richmond, VA; Capital One in Chester, VA; Prologis in Sterling, VA; Randolph-Macon University in Ashland, VA; Western Branch High School in Chesapeake, VA; and UVA in Charlottesville, VA. An additional 1.5 MW facility is under development at Merck in Elkton, VA. • These combined facilities represent a total of approximately 7 MW of solar generating capacity. • https://www.dom.com/large-business/renewable-energy-programs/solar-partnership-program
Solar Purchase Program	Dominion	2013-2018	Program on-going	Voluntary	• The 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 Feb 2017, 139 customers are participating for a total of approximately 1.7 MW installed.
Net Metering	Dominion	On-going	Offered by Statute	Offered by Statute	• This program is offered by statute in both VA and NC. The Company has customers participating in both states. • As of Feb. 2017 participation in Dominion's service territories in VA and NC totaled 2,220 customers and approximately 18 MW, with the vast majority of participation in Dominion's VA service area.

Table 3: Emission Reduction Programs-In Development or On-going

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Renewable Energy Pilot Program	Dominion participating in program	On-going	SCC established program guidelines in November 2013	Established by Statute in 2013	• 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). • Eight facilities totaling approximately 1.2 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	• 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 will become 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.
Alternative Vehicles and Fuels Program	Dominion	On-going	% of fleet powered by alternative fuels?	Voluntary	• Vehicles powered by alternative fuels now make up about 33% of the Company's on-road fleet of about 6,000 cars and trucks. https://www.dom.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.
Virginia Department of Environmental Quality – Ozone Forecasting					
Ozone Forecasting	DEQ	On-going	Program funded?	Voluntary	• Program continues to be funded and operating.

Table 3: Emission Reduction Programs-In Development or On-going

Control Program	Stakeholders	Time Frame	Milestones	Program Type	Feedback & Comments
Virginia Clean Cities					
Virginia Get Ready	VCC	On-going	Statewide network of chargers	Voluntary	• VA registrations of electric vehicles increased from 2,347 in 2015 to 4,208 in 2016. VA public charging stations increased in number from 358 in 2015 to 458 in 2016. • http://www.virginiaev.org/ • See va_electric+hybrid_vehicles_and_stations_2008-2016.xlsx • See VCCC-Alt-Fuels-Report-Q4-2016.pdf
Other Programs not included in the Hampton Roads Ozone Advance Action Plan					
Virginia Offshore Wind Technology Advance-ment Project	Dominion	2017-2018	n/a	Voluntary	• Dominion is involved in the Virginia Offshore Wind Technology Advancement Project (VOWTAP), a research and development project supporting offshore wind generation, which will consist of two offshore wind turbines with a combined capacity of approximately 12 MW. • https://www.dom.com/about-us/making-energy/renewables/wind/virginia-offshore-wind-technology-advancement-project • On September 4, 2013, Dominion bid $1.6 million to win the lease for 112,800 acres off the Virginia coast to develop an off-shore wind farm capable of generating up to 2,000 MW of electricity. https://www.dom.com/about-us/making-energy/renewables/wind/virginia-commercial-offshore-leased-wea
Regional Reductions					
Honeywell SCR Installation	DEQ	12/2012 through 06/2019		Permitting; Consent Agreement	• Two SCR began operating December 2012. • Two SCR began operating October of 2014. • Two SCR began operating November of 2016.

Table 4: Emission Reduction Programs-Completed

Control Program	Stakeholders	Time Frame	Program Type	Feedback & Comments
Virginia Port Authority				
Hybrid Shuttle Carrier Demonstration Project	VPA	2014-2016	Permit	• Facility deployed three hybrid shuttle carriers. • http://www.joc.com/port-news/us-ports/port-virginia/virginia-port-deploys-hybrid-shuttle-carriers_20150825.html • See Port of Virginia – 2015 Sustainability Report.pdf • http://www.portofvirginia.com/stewardship/sustainability/fast-facts/
Ocean-going Vessel Hybridization & Fuel Switching Project	HRTPO, VPA	On-going	Voluntary	• Two commercial container vessels entering the Port of Virginia hybridized with either FlexGen Energy Management System or to use alternative fuels. • 50-100 containerships incentivized to use ultra-low sulfur marine diesel fuel (0.1%) while at berth.
Maersk Low Sulfur Fuel	VPA	2012-2015	Voluntary	• Program complete.
Dominion Virginia Power				
Generating unit retrofits and fuel switches	Dominion	2012-2016	Permit	• Permits received for Hopewell, Altavista, and Southampton fuel switch from coal to biomass. Units are burning biomass and no longer burn coal.
			MATS; 2010 SO_2 NAAQS	• Chesapeake Energy Center retired all coal-fired units in December 2014.
Virginia Clean Cities				
Propane Autogas Program	VCC	2009-2013	Voluntary	• Program concluded in 2013. • Converted 117 vehicles to autogas in VA. • Alternative fuel vehicles estimated to reduce NO_X emissions 273 tons annually in VA.

Table 4: Emission Reduction Programs-Completed

Control Program	Stakeholders	Time Frame	Program Type	Feedback & Comments
Huntington Ingalls				
Boiler updates	Huntington Ingalls	2015	Permit	• Replaced residual oil-fired boilers with natural gas, low-emitting boilers. • Converted residual oil-fired, barge-mounted boilers to ultra-low sulfur distillate oil.
Regional Reductions				
Invista Powerhouse Project	DEQ	2013-2014	Permit	• Coal fired boilers retired 2014..
Celco Powerhouse Project	DEQ	2015	Permit	• Coal fired boilers retired September 2015.
Philip Morris – Park 500	DEQ	2014-2015	Permit	• Facility has converted coal-fired boilers to multi-fueled units and is now burning cleaner fuels.
New generating units, generating unit retrofits, generating unit fuel switches, generating unit retirements	Dominion	2013	Permit/MATS/SO_2 NAAQS	• Bremo Bluff ceased burning coal in fall of 2013. Facility is now burning solely natural gas.
		2008-2012	Consent Agreement/MATS	• Dominion installation of SO_2 scrubbers has been completed for all coal units at the Chesterfield Power Station near Richmond, VA.
		2014	Permit	• 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 and equipped with state of the art controls. https://www.dom.com/residential/dominion-virginia-power/news/customer-newsletters/feb15-meeting-steeper-power-peaks
		2016	Permit	• 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 and equipped with state of the art controls. https://www.dom.com/about-us/making-energy/coal-oil-and-gas/brunswick-county-power-station