
**AIR QUALITY AND AIR POLLUTION
CONTROL POLICIES OF THE
COMMONWEALTH OF VIRGINIA**

*A Report to the Honorable Ralph S. Northam, Governor
and the General Assembly of Virginia*

Virginia Department of Environmental Quality

October 2018

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Commonly Used Abbreviations

AQM	Office of Air Quality Monitoring	ORVR	On Board Refueling Vapor Recovery
CAA	Clean Air Act		
CMS	Compliance Monitoring Strategy	OTR	Ozone Transport Region
CO	Carbon monoxide	Pb	Lead
CSAPR	Cross State Air Pollution Rule	PCE	Partial Compliance Evaluation
CTG	Control Technique Guideline	PM _{2.5}	Particulate matter not more than 2.5 angstroms in diameter
DEQ	Virginia Department of Environmental Quality	ppb	Parts per billion
ECHO	Enforcement and Compliance History Online	ppm	Parts per million
EPA	Environmental Protection Agency	PSD	Prevention of Significant Deterioration
FCE	Full Compliance Evaluation	RACT	Reasonably Available Control Technology
GVWR	Gross Vehicle Weight Rating	RBIS	Risk Based Inspection System
HAP	Hazardous Air Pollutant	SAPCB	State Air Pollution Control Board
I/M	Motor Vehicle Inspection and Maintenance Program	SBA	Small Business Assistance
MACT	Maximum Achievable Control Technology	SIP	State Implementation Plan
MATS	Mercury and Air Toxics Standard	SO ₂	Sulfur dioxide
µg/m ³	Micrograms per cubic meter	SOP	State Operating Permit
MSOS	Mobile Source Operations Section	tpy	Tons per year
NAAQS	National Ambient Air Quality Standard	VDH	Virginia Department of Health
NO ₂	Nitrogen dioxide	VOC	Volatile Organic Compounds
NO _x	Nitrogen oxides	VPM	Virginia Productivity Measurements
NSR	New Source Review		
ORE	On-Road Emissions Program		

1. Executive Summary

This report was prepared by the Virginia Department of Environmental Quality (DEQ) on behalf of the State Air Pollution Control Board (SAPCB) for the Governor and General Assembly pursuant to § 10.1-1307 H of the Code of Virginia. This report details the status of Virginia's air quality, provides an overview of the air division programs, and briefly summarizes federal and state air quality programs.

1.1. Air Quality in the Commonwealth

Air quality in Virginia continues to improve. Ambient concentrations of fine particulate matter (PM_{2.5}), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and carbon monoxide (CO) in Virginia met United States Environmental Protection Agency (EPA) National Ambient Air Quality Standards (NAAQS) in 2017. All areas except Northern Virginia met federal standards for ozone. All areas except Buchanan County, Alleghany County, Botetourt County, Giles County and the City of Covington met the federal standards for sulfur dioxides (SO₂). EPA finalized the 2015 ozone NAAQS on October 26, 2015 (80 FR 65292) and set this new standard at 0.070 parts per million (ppm). On June 4, 2018 (83 FR 25838), EPA designated all areas of the Commonwealth except nine jurisdictions in Northern Virginia as attaining this standard. On June 22, 2010 (75 FR 35520), EPA finalized a new primary NAAQS for SO₂. This regulation significantly strengthened the short-term requirements by lowering the standard to 75 ppb on a one-hour basis. On January 9, 2018 (83 FR 1098), EPA designated all jurisdictions in Virginia as attaining this standard with the exception of Buchanan County, Alleghany County, Botetourt County, Giles County and the City of Covington. Buchanan County was designated unclassifiable. Alleghany County, Botetourt County, Giles County and the City of Covington will be designated by December 31, 2020.

1.2. Air Quality Policies in the Commonwealth

The Cross State Air Pollution Rule (CSAPR) update became effective in Virginia in 2017. This rule addresses interstate transport requirements for the 2008 ozone NAAQS. Issues impacting Virginia in the near future include new Regional Haze analyses, implementation of 2008 ozone NAAQS control technology requirements, and changes to monitoring network requirements.

1.3. Summary of Annual Air Division Activities

Monitoring Locations:	38	On Site Inspections:	764
Monitoring Instruments:	114	Enforcement Actions:	226
Minor Source Permits Issued:	148	Vehicles Inspected:	818,815¹
PSD Permits Issued:	2	Vehicles Failed:	20,690
General Permits Issued:	77	Inspection Station Overt Audits:	464
State Operating Permits Issued:	4	Inspection Station Covert Audits:	149
Federal Operating Permits Issued:	3	Consent Orders Issued:	37
Compliance Evaluations (all):	4331	Civil Charges Collected:	\$871,360

¹Total includes tests performed at emissions inspection stations and on-road emissions tests.

2. Status of Air Quality in the Commonwealth of Virginia

DEQ monitors a variety of different pollutants in the ambient atmosphere. A portion of Virginia's monitoring network measures concentrations of the criteria pollutants: ozone, PM_{2.5}, PM₁₀, NO₂, SO₂, Lead (Pb), and CO. Criteria pollutants are harmful to public health and the environment, and EPA has set NAAQS for these pollutants to protect public health and welfare. The two criteria pollutants that have historically presented challenges in Virginia are ozone and PM_{2.5}. Air quality for both pollutants is improving.

PM_{2.5} air quality is now in the healthy range across Virginia and has been for the past several years. In 2017, air quality met federal ozone standards across the Commonwealth with the exception of Northern Virginia.

2.1. Criteria Pollutant Overview

Ozone (O₃) is not generally emitted directly into the atmosphere. Rather, a photochemical reaction between volatile organic compounds (VOC) and oxides of nitrogen (NO_x) creates this pollutant when these precursors combine in the presence of sunlight. Ozone, the primary component of smog, is a lung irritant and interferes with the ability of plants to process food and ward off diseases.

EPA defines **PM_{2.5}** as any airborne particle of solid or liquid matter that is less than or equal to 2.5 micrometers in diameter. PM_{2.5} is not a single pollutant. Rather, the nomenclature describes a category of compounds that have diameters less than 2.5 micrometers, approximately 1/30th the width of a human hair. The main adverse health impacts of PM_{2.5} are on the respiratory system and the cardiovascular system.

PM₁₀ is particulate matter comprised of solid particles or liquid droplets with an aerodynamic diameter of less than or equal to 10 micrometers, and is sometimes referred to as "coarse particles." PM₁₀ particles are larger than PM_{2.5} but are still in a size range that can pose health problems because they can be inhaled and retained in the human respiratory system, causing breathing difficulties, and eye, nose, and throat irritation. In addition to the health effects of PM₁₀, these particles can impair visibility, can contribute to climate change, and result in "acidic dry deposition."

Nitrogen dioxide (NO₂) is a gaseous air pollutant that forms when fossil fuels such as coal, oil, gasoline, or diesel burn at high temperatures. NO₂ contributes to the formation of particle pollution by converting in the atmosphere to nitrate aerosols, a component of PM_{2.5}. This gas is also a building block of ozone.

Sulfur dioxide (SO₂) is one of a group of highly reactive compounds known as "oxides of sulfur." The largest source of SO₂ emissions is fossil fuel combustion at power plants and at other types of industrial facilities. Smaller sources of SO₂ emissions include industrial processes such as extracting metal from ore and the combustion of sulfur-laden fuels by locomotives, large ships, and non-road equipment. Emissions of SO₂ also contribute to the formation of particle pollution by converting in the atmosphere to sulfate aerosols, a major component of PM_{2.5}.

Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. In the past, emissions from cars and trucks using leaded gasoline were the primary sources of lead in the atmosphere. Efforts by EPA to remove lead from motor vehicle gasoline resulted in dramatic reductions

of lead in the ambient air from 1980 to 1999. Now the major sources of lead in the air are ore processing, metals processing, ammunitions manufacturing, and piston-engine aircraft operating on leaded aviation gasoline.

Carbon monoxide (CO) is a colorless, odorless gas emitted from combustion processes. Particularly in urban areas, the majority of CO emissions to ambient air originate from mobile sources. CO can cause harmful health effects by reducing oxygen delivery to the body's organs.

2.2. Monitoring Network

DEQ's Office of Air Quality Monitoring (AQM) maintains an extensive air quality monitoring network throughout the Commonwealth. Approximately 114 instruments at 38 sites monitored ambient air quality across Virginia during 2017 - 2018. Three SO₂ sites have been added to the Virginia air monitoring network that is maintained by independent companies. Two federal ozone monitors have been added to the DEQ network as well.

Figure 2.1 shows the various ozone monitoring sites in Virginia. All monitoring sites meet EPA's siting criteria (40 CFR Part 58, Appendices D and E), and all sites conform to EPA guidance documents and generally accepted air quality monitoring practices. AQM quality assures all data gathered from the Virginia air quality monitoring network in accordance with federal requirements (40 CFR Part 58, Appendix A). The data are published annually in the *Virginia Ambient Air Monitoring Data Report* and are available from the DEQ website at <http://www.deq.virginia.gov/Programs/Air/AirMonitoring/Publications.aspx>.

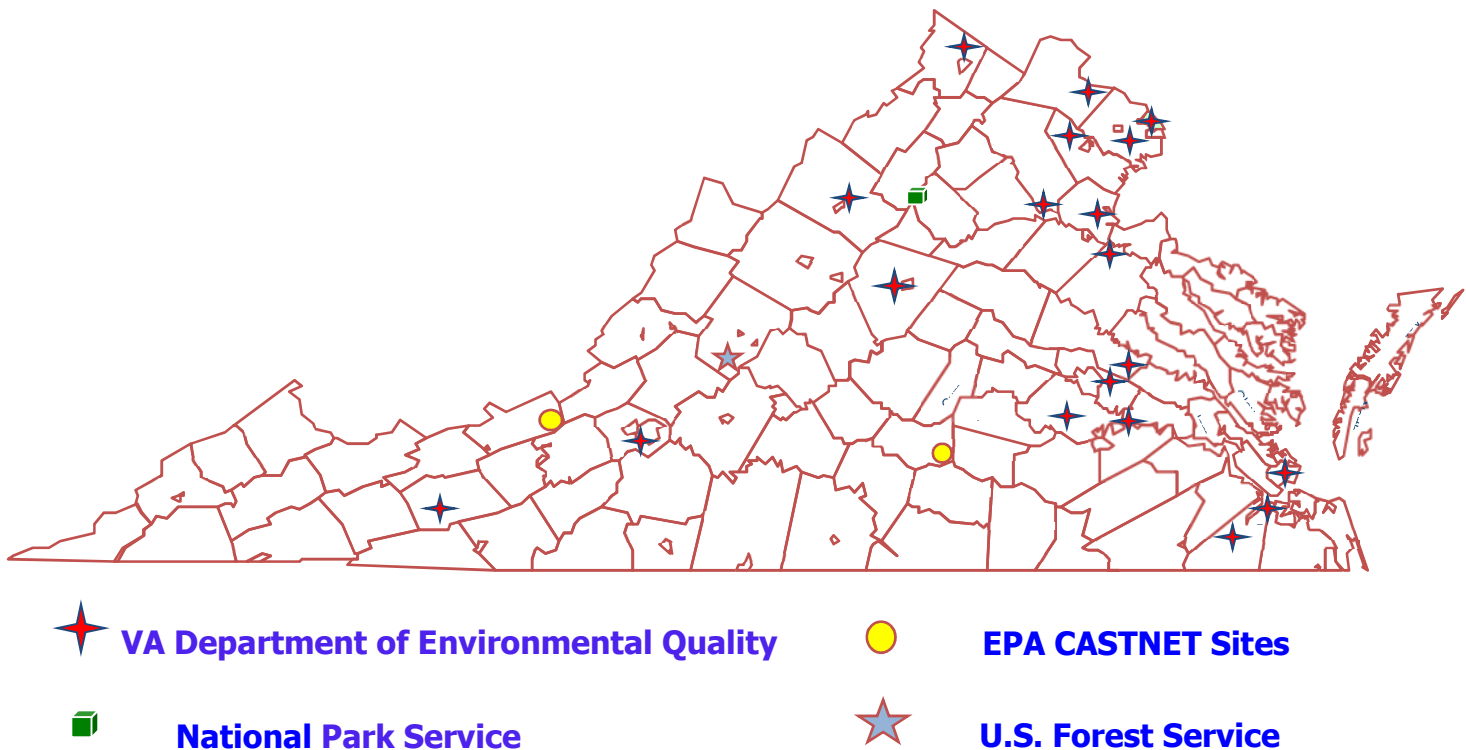


Figure 2-1: Virginia Ozone Monitoring Network

2.2.1. Community Air Monitoring Study (Suffolk)

Pursuant to House Bill 1625 (2011), DEQ is conducting an air monitoring study at two large fumigation facilities located in Suffolk to provide data to the Virginia Department of Health for its assessment of health impacts. DEQ formed a stakeholder group to help communicate the results of the study to the public. DEQ designed the study in cooperation with the Department of Health, and the Department of Agriculture and Consumer Services is assisting with the stakeholder process. The sampling was put on hold due to the relocation of both fumigation facilities. Both facilities were relocated and have resumed operations. Monitoring of the new facilities began in the spring of 2018.

2.2.2. Near-Road Monitoring for NO₂

In February 2010, EPA promulgated a new NO₂ NAAQS, setting the standard at 100 parts per billion (ppb). This standard included a new requirement for the installation and operation of monitoring stations in close proximity to heavily traveled roadways. According to federal mandates, DEQ must install three such monitoring stations. DEQ has installed two of the three monitoring stations. The Richmond station at Bryan Park is adjacent to the I-95 and I-64 interchange and has been running since October 2013. The northern Virginia site, which is located in Springfield on Backlick Road, began sampling in April 2016. The data from these sites are available on DEQ's webpage. DEQ expects to install a similar station that will be located along I-64 in Hampton near the interchange in Newport News.

2.3. Data Trends for Criteria Pollutants

Trends for all criteria pollutants across Virginia show significant improvements over the past decade. These improvements are the result of emission reductions associated with a variety of implemented control programs. Emissions from nearby states also have decreased, so that less pollution is transported into the Commonwealth from upwind areas.

Figure 2-2 provides the three-year average ozone design value concentrations for monitors in the Hampton Roads, Richmond-Petersburg, Fredericksburg, Roanoke, and Northern Virginia areas. All areas except Northern Virginia demonstrate compliance with the 2008 ozone NAAQS of 0.075 ppm (75 ppb) as well as the 2015 ozone NAAQS of 0.070 ppm (70 ppb).

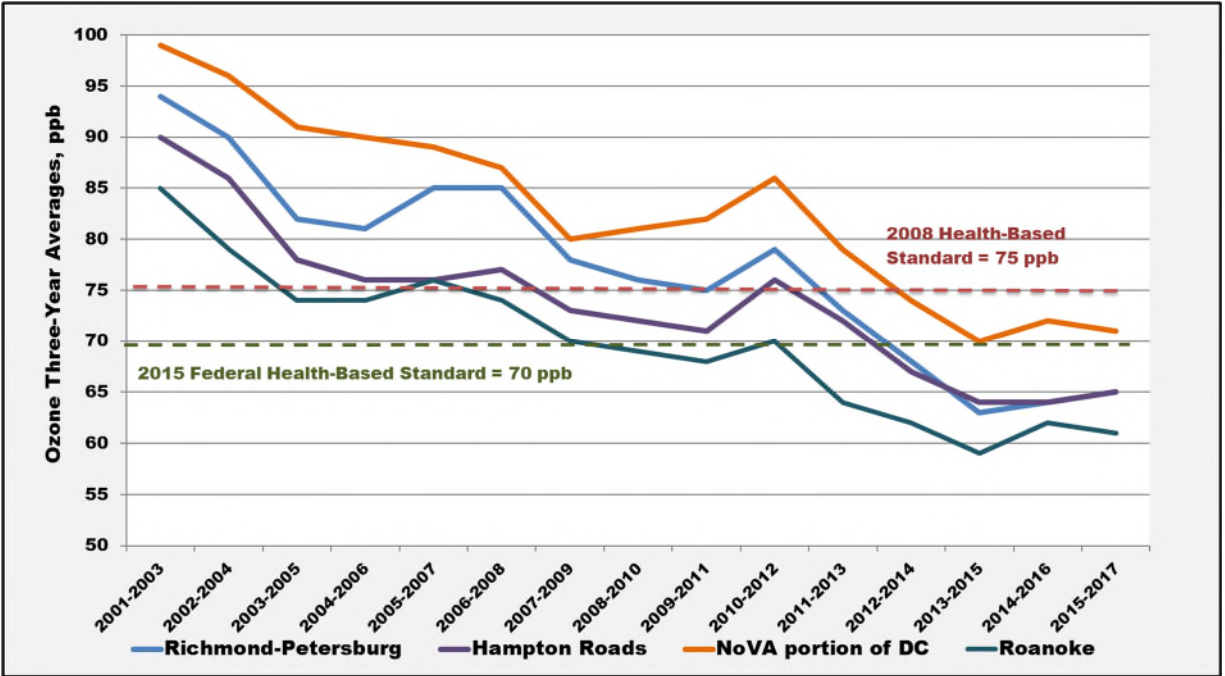


Figure 2-2: Ozone Concentrations

Figure 2-3 provides the PM_{2.5} daily design value concentrations for Hampton Roads, Richmond-Petersburg, and Northern Virginia. Figure 2-4 provides the annual average PM_{2.5} design value concentrations for these three areas. Concentrations of PM_{2.5} follow these trends across the Commonwealth and comply with the 2006 PM_{2.5} daily NAAQS of 35 µg/m³ and the 2012 PM_{2.5} annual NAAQS of 12.0 µg/m³.

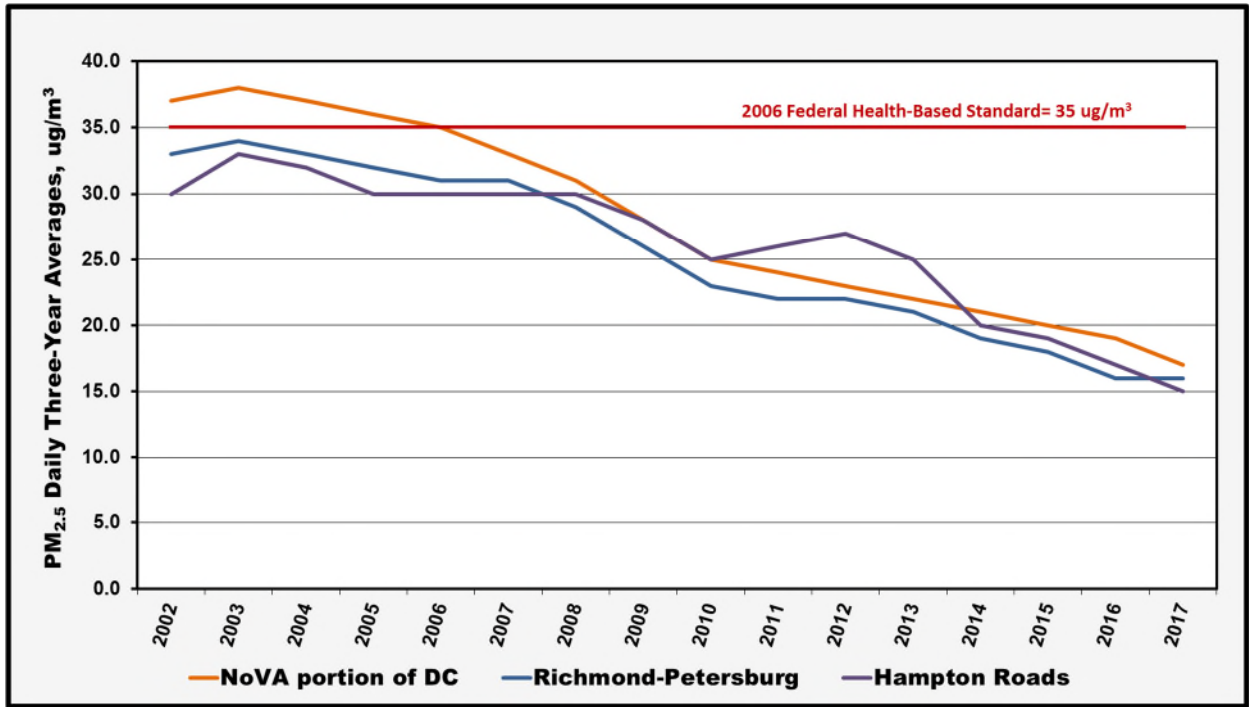


Figure 2-3: Daily PM_{2.5} Averages

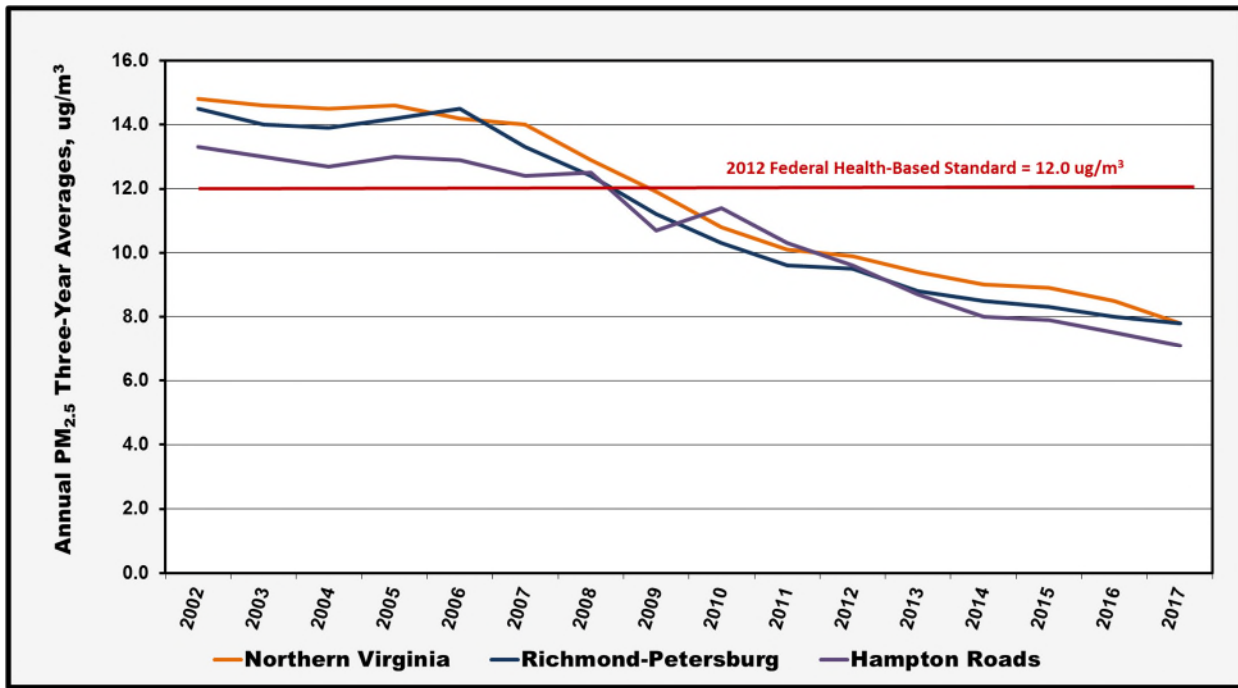


Figure 2-4: Annual PM_{2.5} Averages

Figure 2-5 provides NO₂ measurements and compares this data to the 2010 NO₂ NAAQS of 100 ppb. Likewise, Figure 2-6 provides SO₂ measurements and compares this data to the 2010 SO₂ NAAQS of 75 ppb, and Figure 2-7 provides CO measurements for comparison against the 1971 CO NAAQS of 9 ppm. All monitors demonstrate compliance with the federal NAAQS for these pollutants. The downward trends shown in these figures should continue into the future due to forthcoming emission reductions associated with implemented and new control programs.

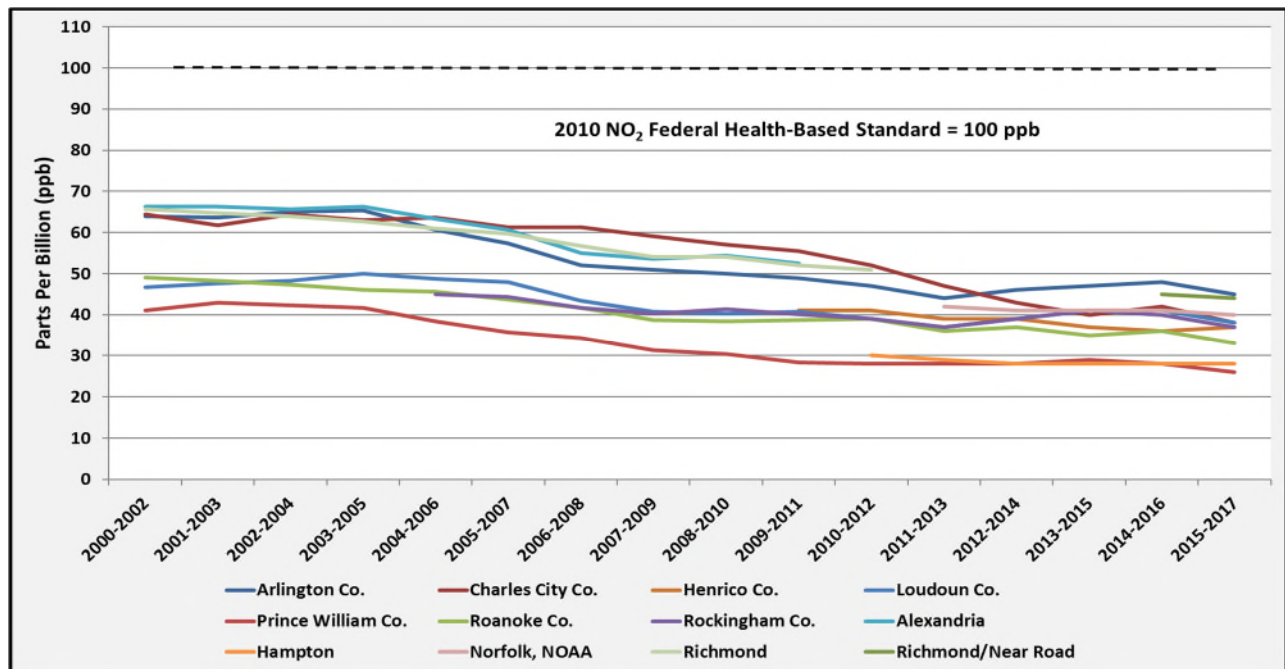


Figure 2-5: Virginia NO₂ Measurements

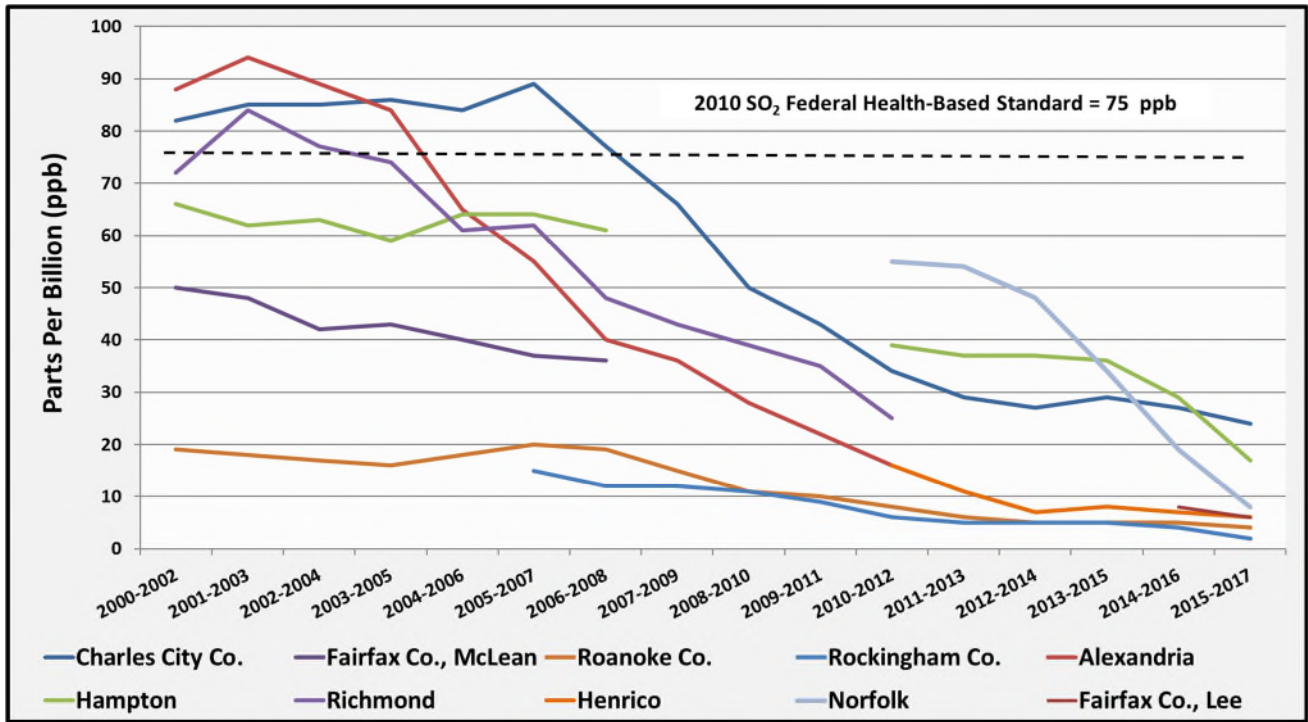


Figure 2-6: Virginia SO₂ Measurements

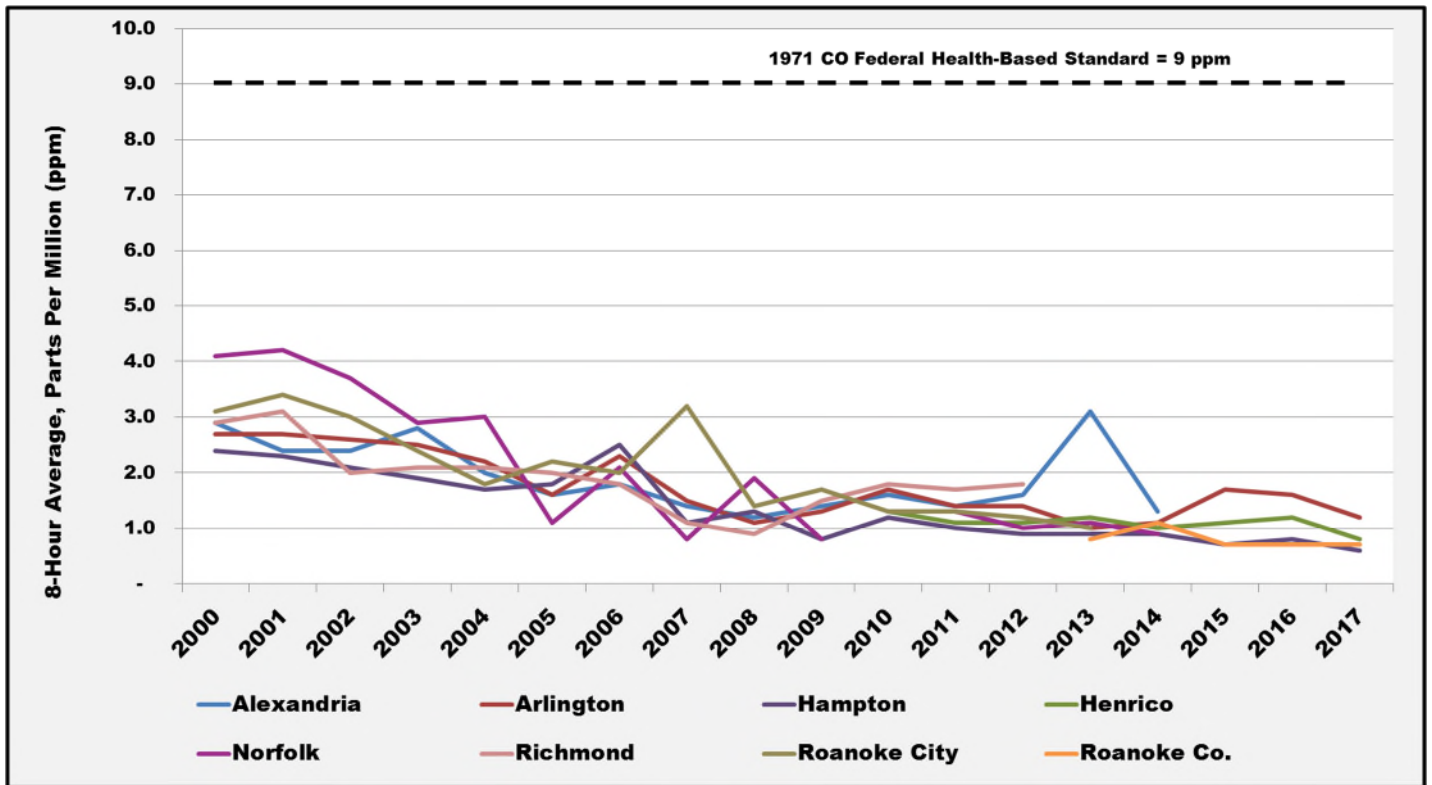


Figure 2-7: Virginia CO Measurements

3. Air Pollution Control Overview

This overview describes planning, permitting, compliance, enforcement, and other initiatives. Each section provides information on significant current policy issues related to each category.

3.1. Air Quality Planning and Regulatory Initiatives

Air quality planning strategies focus on meeting all federal requirements associated with current NAAQS. DEQ also expends resources on improving the Virginia portion of EPA's emissions inventory and modeling platforms and analyzing potential effects of proposed rules and federal guidance documents.

3.1.1. CO NAAQS

On August 31, 2011 (76 FR 54294), EPA issued a decision to retain the existing primary CO NAAQS, which were originally promulgated in 1971. The existing primary standards are 9 ppm measured over an eight-hour period and 35 ppm measured over a one-hour period. EPA revised the CO monitoring network requirements to include near-road CO monitoring sites in large urban areas. All jurisdictions within the Commonwealth are attaining these standards and are designated either attainment areas or attainment/maintenance areas for the 1971 CO NAAQS.

3.1.2. 2006 PM_{2.5} NAAQS

On October 17, 2006 (71 FR 61144), EPA promulgated a revised PM_{2.5} NAAQS. The 2006 standard revised the daily PM_{2.5} standard from 65 µg/m³ to 35 µg/m³ and retained the PM_{2.5} annual standard of 15.0 µg/m³. On November 13, 2009 (74 FR 58688), EPA published the final designations for the 2006 daily PM_{2.5} standard, and all areas of the Commonwealth were designated as attainment or unclassifiable.

3.1.3. 2008 Ozone NAAQS

On March 27, 2008 (73 FR 16436), EPA revised both the primary and the secondary NAAQS for ozone to 0.075 ppm. EPA published the final area designations and classifications for this standard on May 21, 2012 (77 FR 30088). EPA designated all areas of the Commonwealth, with the exception of northern Virginia, as attaining this standard. EPA designated northern Virginia as nonattainment, with a classification of marginal. Due to improvements in air quality, DEQ is working with the other states included in the Metropolitan Washington D.C. nonattainment area (the District of Columbia and Maryland) to develop and submit a redesignation request for this standard.

On March 6, 2015 (80 FR 12264), EPA issued the implementation rule for this standard. The implementation rule requires that states implement Reasonably Available Control Technology (RACT) in support of this standard for all major stationary sources within the Ozone Transport Region (OTR). The OTR includes ten jurisdictions within Virginia, and according to this rule, all major stationary sources of VOC or NO_x must implement RACT by January 1, 2017. DEQ is working with EPA and regulated facilities to determine and implement source specific RACT requirements.

3.1.4. 2008 Lead NAAQS

On November 12, 2008 (73 FR 66964), EPA strengthened the NAAQS for lead (Pb), revising the level of the health-based standard to 0.15 µg/m³. On November 22, 2011 (76 FR 72097), EPA published the

final Pb designations for the 2008 NAAQS and designated the entire Commonwealth as attainment/unclassifiable since monitoring data showed compliance with the new standard.

3.1.5. 2010 NO₂ NAAQS

On February 9, 2010 (75 FR 6474), EPA revised the primary NO₂ NAAQS and set the standard at 100 ppb over a one-hour average. On February 17, 2012 (77 FR 9532), EPA classified all areas of the Commonwealth as attainment/unclassifiable for this standard. EPA may update these classifications once sufficient near-road NO₂ data are available.

3.1.6. 2010 SO₂ NAAQS

On June 22, 2010 (75 FR 35520), EPA finalized a new primary NAAQS for SO₂. This regulation significantly strengthened the short-term requirements by lowering the standard to 75 ppb on a one-hour basis. On January 9, 2018 (83 FR 1098), EPA designated all jurisdictions in Virginia as attaining this standard with the exception of Buchanan County Alleghany County, Botetourt County, Giles County and the City of Covington. Buchanan County was designated unclassifiable. Alleghany County, Botetourt County, Giles County and the City of Covington will be designated by December 31, 2020. EPA based these attainment designations on modeling outputs and data from the current SO₂ monitoring network.

EPA will publish additional designations by December 31, 2020, based on new information from expanded SO₂ monitoring networks. DEQ will continue to work with regulated facilities and EPA to meet all requirements in this regulation in a timely manner.

3.1.7. 2012 PM_{2.5} NAAQS

On January 15, 2013 (78 FR 3086), EPA published a rule strengthening the NAAQS for PM_{2.5}. This rule left the daily value initially published in 2006 unchanged at 35 µg/m³ but reduced the annual threshold from 15 µg/m³ to 12 µg/m³. On January 15, 2015 (80 FR 2206), EPA designated all of Virginia unclassifiable/attainment for this standard.

3.1.8. 2015 Ozone NAAQS

On October 26, 2015 (80 FR 65292), EPA revised the NAAQS for ozone. This revision lowered the standard from 0.075 ppm to 0.070 ppm. On June 4, 2018 (83 FR 25838), EPA designated all areas of the Commonwealth except nine jurisdictions in Northern Virginia as attaining this standard. The nine jurisdictions in Northern Virginia designated as nonattainment with a classification of marginal are the Counties of Arlington, Fairfax, Loudoun, and Prince William and the Cities of Alexandria, Fairfax, Falls Church, Manassas, and Manassas Park. The classification of marginal is the least stringent classification, indicating that EPA expects this area to comply with the standard by August 3, 2021, due to reductions in emissions from federal control measures.

3.1.9. Regional Haze

Section 169 A of the Clean Air Act (CAA) mandates the protection of visibility in national parks, forests, and wilderness areas, referred to as Class I federal areas. The absorption and scattering of light by fine particles cause visibility impairment (haze) in these areas. Sources and activities that emit fine particles and their precursors, such as NO_x, SO₂, VOC, and ammonia, contribute to this problem. In

1999, EPA finalized the Regional Haze Rule, which requires that state, tribal, and federal agencies work together to improve visibility in 156 national parks and wilderness areas.

DEQ developed a state implementation plan (SIP) to address visibility impairment in the Commonwealth's two Class I areas, the Shenandoah National Park and the James River Face Wilderness Area, as well as a progress report showing visibility improvements achieved and expected future improvements in both areas. This progress in visibility improvement is mainly due to the reduced emissions of SO₂ and sulfates from fuel combustion sources. In concert with other southeastern states, DEQ has begun working on the next Regional Haze SIP submittal, which will be due to EPA in 2021.

3.2. Air Permitting Activities

DEQ issues two basic types of air permits: construction permits and operating permits. Construction permits, termed New Source Review (NSR) permits, apply to new facilities as well as existing facilities that undergo an expansion or modification. Operating permits apply to sources that are already in operation.

DEQ has three construction permit programs for criteria pollutants, as described below:

The Prevention of Significant Deterioration (PSD) major new source review program applies to major sources that are located in an area that is in attainment with the National Ambient Air Quality Standards (NAAQS). Sources must apply Best Available Control Technology (BACT) as well as undergo a thorough air quality analysis demonstration (i.e., air modeling) to assure the new facility or major modification to an existing facility will not cause or contribute to a violation of the NAAQS or have an adverse impact on any Class I area. DEQ issued two PSD permits in fiscal year 2018.

The second program is the nonattainment major NSR program, which applies to major sources located in an area designated as nonattainment for one or more NAAQS. A facility in a nonattainment area must apply the Lowest Achievable Emission Rate (LAER), which is often more rigorous than BACT, and must obtain offsets for the pollutant for which the area is not in attainment. DEQ did not issue any nonattainment NSR permits in fiscal year 2018.

The third program is the minor NSR program. This program applies to new sources or existing sources that are undergoing a modification and are below major source emissions thresholds. During the 2018 fiscal year, DEQ issued 148 minor NSR permits. Additionally, the minor NSR program is used to issue state major source permits, which apply to those sources that have emissions greater than 100 tpy of a criteria pollutant but do not fit the criteria to be classified as PSD or nonattainment major NSR. DEQ issued two state major permits in fiscal year 2018. Virginia also has general permits (i.e., permits by regulation) for non-metallic mineral processors and distributed generation. If a facility meets the necessary requirements, the facility may use the general permit process instead of the normal minor NSR permitting process. DEQ issued 77 general permits during fiscal year 2018.

DEQ issues two types of operating permits: state operating permits (SOPs) and federal operating permits that include federal operating (Title V) permits, as described below:

SOPs are used primarily to cap a source's emissions to keep it below major source emissions thresholds and therefore exempt from a major source permitting program. Facilities often use SOPs to place

federally and state enforceable limits on hazardous air pollutants (HAPs) to remain exempt from the federal HAP program. The federal HAP program generally requires the implementation of maximum achievable control technology (MACT) standards. A source may request SOPs at any time, and DEQ may issue SOPs as necessary (due to a modeled or actual exceedance of a NAAQS or to meet a CAA requirement). DEQ issued four SOPs during fiscal year 2018. The Title V permit program applies to sources that meet the criteria for being “major” under Title V of the CAA. The purpose of a Title V permit is to compile all requirements from a source’s multiple air permits and applicable regulations into one permit document. A newly constructed source that is large enough to qualify as a Title V source must apply for a Title V permit within one year of starting operation. Title V permits must be renewed every five years. Acid Rain permits also are considered federal operating permits. DEQ must issue these permits to sources that are subject to the federal Acid Rain program (CAA Title IV). DEQ issued three federal operating permits and 26 operating permit renewals during fiscal year 2018.

DEQ provides citizens an extensive website on air permitting issues, including active permit application listings and issued operating permits available for review, at <http://www.deq.virginia.gov/Programs/Air/PermittingCompliance/Permitting.aspx>.

3.3. Air Compliance Activities

DEQ’s air compliance program identifies and addresses potential violations of applicable regulations and laws to ensure compliance by facilities operating within the Commonwealth. The focus of the air compliance program is to return facilities to compliance expeditiously, supporting DEQ’s mission to protect the environment and human health. To do so, air compliance personnel perform partial compliance evaluations (PCEs) and full compliance evaluations (FCEs). These actions include onsite inspections, test observations, and comprehensive evaluations of the facility records and equipment associated with pollutant emissions, including examination of documents detailing throughputs, emissions, testing, and reporting.

DEQ’s air compliance program operates in accordance with EPA’s 2016 Clean Air Act Stationary Source Compliance Monitoring Strategy (CMS). This strategy primarily identifies the largest potential emitters of air pollution for an FCE at a minimum recommended frequency of once every two years. Depending on available resources, DEQ’s air compliance program also identifies smaller potential emitters under its Risk-Based Inspection Strategy (RBIS). This strategy allows flexibility during inspection planning. Regional offices may identify facilities for an FCE based on the likelihood of noncompliance or in response to sector initiatives.

Virginia has nearly 3,806 registered air facilities, excluding gasoline service stations in the Richmond area and Northern Virginia. For the 2017 Federal Fiscal Year (October 1, 2016 through September 30, 2017), the air compliance program conducted 4,331 compliance evaluations, including 764 on-site inspections and 103 stack test observations. As a result, the air compliance program issued 226 formal and informal enforcement actions. DEQ reports compliance and enforcement activities related to Virginia’s regulated facilities to EPA on a weekly basis. This information is publicly available on EPA’s Environmental Compliance and History Online (ECHO) website: <https://echo.epa.gov/>.

3.4. Air Enforcement Activities

The goal of enforcement is to take appropriate actions to address violations of environmental laws and return facilities to compliance with Virginia’s statutory and regulatory requirements. The mechanism

used by DEQ to achieve compliance is proportional to the violation, responsive to the facility's compliance history, and protective of human health and the environment. In addition, an appropriate enforcement action, which may include a civil charge and recovery of economic benefit, sends a message of deterrence to the regulated community. In federal fiscal year 2017, DEQ issued 37 consent orders that resulted in the collection of \$871,360 in civil charges.

3.5. Small Business Assistance

DEQ provides various forms of compliance assistance to potentially thousands of small businesses throughout the Commonwealth. DEQ provides these services at no cost to facilities in order to inform, educate, and assist small businesses in complying with environmental regulations. More generally, the Small Business Assistance (SBA) program conducts personal and web-based outreach to small businesses, providing access to various resources including regulatory updates, fact sheets, checklists, brochures, enforcement case assistance, and financial resources. DEQ maintains the SBA website at <http://deq.state.va.us/Programs/Air/SmallBusinessAssistance.aspx>.

3.6. Motor Vehicle Inspection and Maintenance Program

Virginia's vehicle inspection and maintenance (I/M) program improves air quality by identifying high-emitting vehicles in need of repair operating in the Commonwealth's nonattainment area, and requiring them to be fixed as a prerequisite to vehicle registration. The CAA mandates I/M for several areas across the country, including the Northern Virginia area, based upon criteria such as air quality classification, population, and geographic location.

DEQ's decentralized I/M program includes over 500 permitted emissions inspection stations and about 300 certified repair facilities, providing a convenient option to have emissions inspections and repairs performed at the same location. These stations and facilities use the latest accepted technology to determine which vehicles emit excessive pollutants. Gasoline-powered vehicles up to 10,000 pounds gross vehicle weight rating (GVWR) and newer than 25 model years and diesel-powered vehicles up to 8,500 pounds GVWR and 1997 model year and newer registered in the I/M area are required to pass an emissions test or receive a waiver every two years in order to obtain vehicle registration. In calendar year 2017, inspection stations performed 731,352 initial emissions inspections and over 20,000 retests, prompting 20,690 vehicles to receive repairs. DEQ maintains an extensive I/M program website at <http://www.deq.virginia.gov/Programs/AirCheckVirginia.aspx>.

3.6.1. Mobile Source Operations Section

The Mobile Source Operations Section (MSOS) of DEQ's Northern Regional Office monitors the performance of the various emissions inspection stations, certified emissions repair facilities, over 400 certified emissions repair technicians and over 1,500 licensed emissions inspectors within the I/M program. In calendar year 2017, MSOS personnel conducted 464 overt and 149 covert performance audits of 464 emission inspection stations.

3.6.2. On-Road Emissions Monitoring Program

Virginia's On-Road Emissions (ORE) program is designed to use on-road, remote sensing devices to identify both high-emitting and very clean vehicles. Owners of high-emitting vehicles receive a Notice of Violation and are prompted to receive a confirmation test and necessary repairs. Low-income owners may be eligible for repair assistance. Owners of exceptionally clean vehicles receive a "clean screen"

notice, which may be redeemed in lieu of submitting for a traditional test at an emissions inspection station. In addition to the 731,352 tests performed at stations in 2017, there were 87,463 clean screens issued. Additionally, DEQ administers a “liquid leaker” advisory program, which uses the remote sensing devices to identify vehicles with very high evaporative emissions, separate from tailpipe exhaust emissions, notifies vehicle owners of the potential leak and recommends that they have their vehicle examined and repaired if necessary.

4. Emission Estimates and Control Programs

Figure 4-1 provides Virginia emissions data from EPA’s National Emissions Inventory (<https://www.epa.gov/air-emissions-inventories>) for 2008, 2011, and 2014 as well as estimates of projected emissions for 2018. As shown in Figure 4-1, anthropogenic emissions of NO_x, VOC, and SO₂ in Virginia have decreased significantly between 2008 and 2014. Projected emissions for 2018 continue these downward trends. Between 2008 and 2018, NO_x emissions are projected to drop 42%, VOC emissions are projected to drop 25%, and SO₂ emissions are projected to drop 80%. These emission estimates reflect forecasted growth in vehicle miles traveled, population, and industry through 2018. The reductions shown are the result of control programs implemented at the federal and state level as well as changing economic factors.

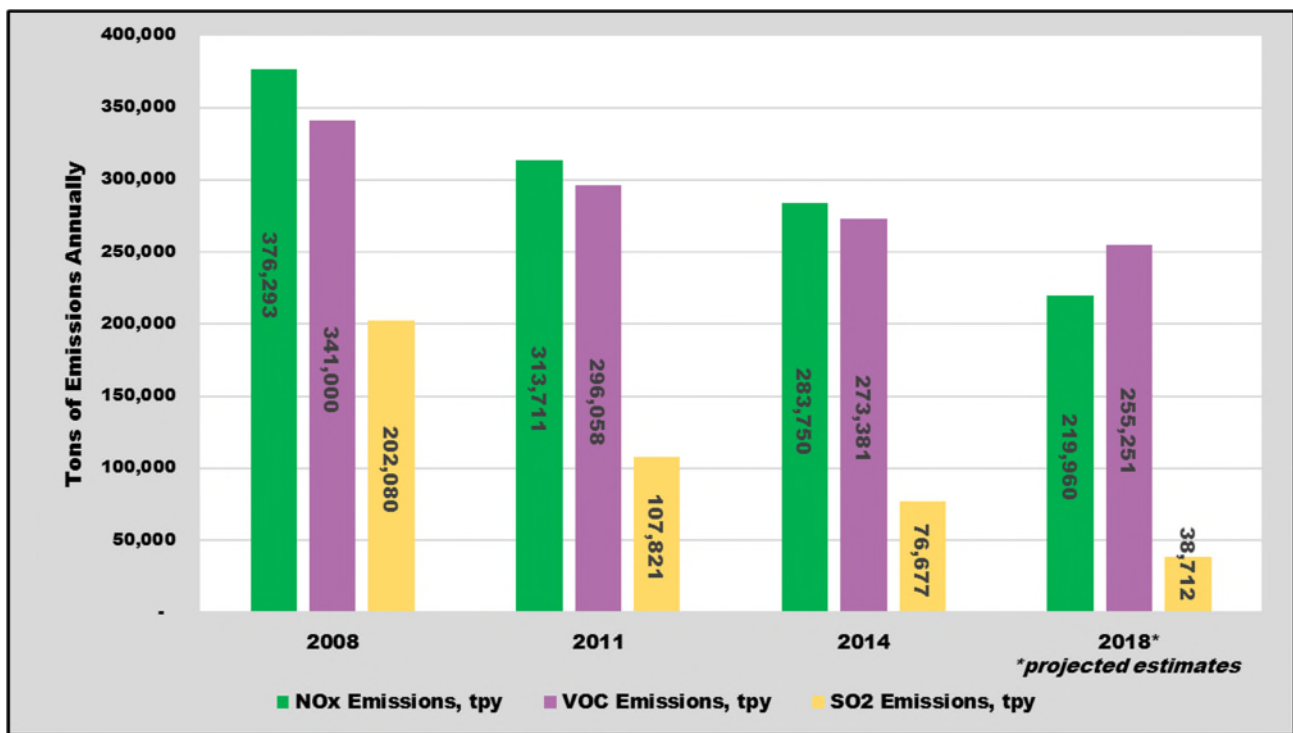


Figure 4-1: Anthropogenic Emission Estimates for Virginia: 2008, 2011, 2014, and 2018

4.1. Emissions from Electrical Generation

Figure 4-2 provides the annual emissions of SO₂ and NO_x from Acid Rain Program electrical generating units located in Virginia. These units are the largest fossil fuel-fired equipment in the Commonwealth. Emission reductions from this source sector are attributable to a number of factors, including control programs such as the federal Mercury and Air Toxics Rule; retirement of older, high-emitting units; and

the construction and operation of new, very low-emitting units. Between 2002 and 2017, Virginia emissions and emission rates decreased in this source sector even though fuel usage rates, depicted by the yellow line in Figure 4-2, have increased in recent years.

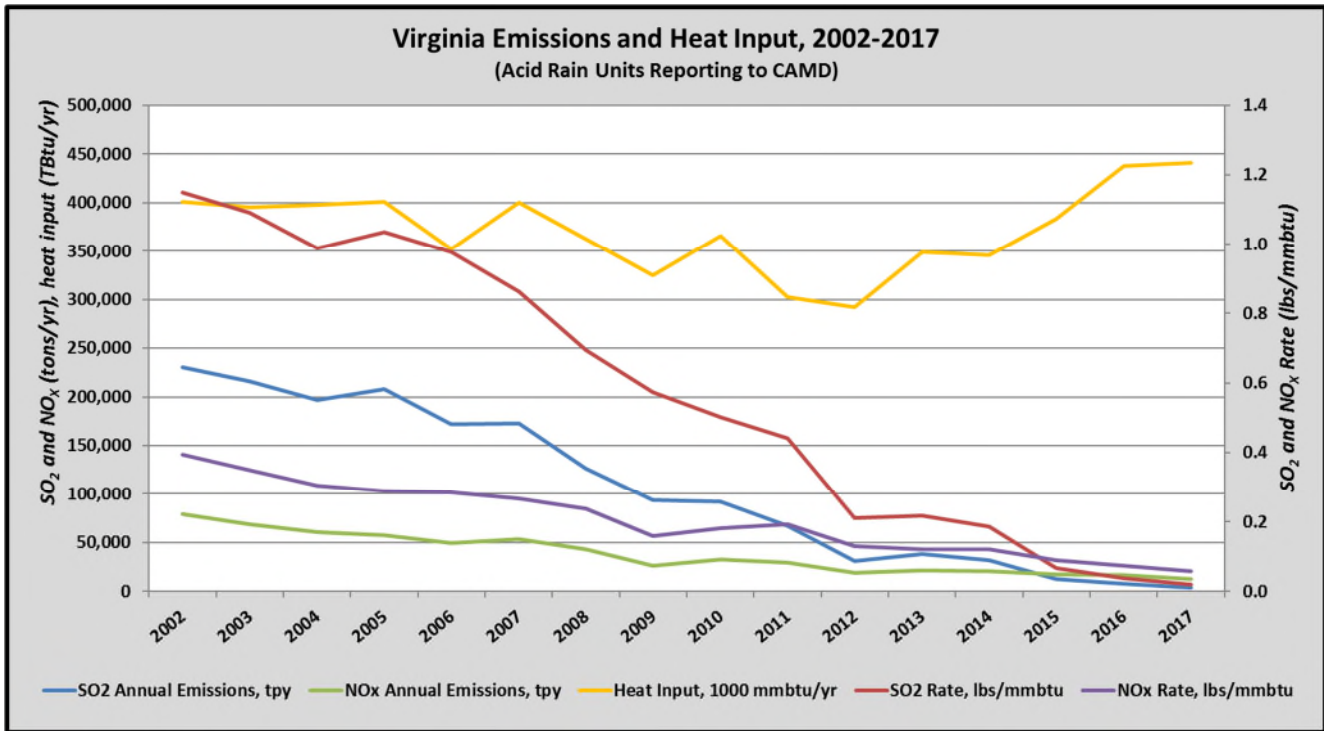


Figure 4-2: Virginia Acid Rain Unit Emissions

4.1.1. Mercury and Air Toxics Standard

On February 16, 2012 (77 FR 9304), EPA promulgated the National Emission Standards for Hazardous Air Pollutants from Coal- and Oil-Fired Electric Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units. This rule is often referred to as the Mercury and Air Toxics Standard (MATS). The standard applies to 13 electrical generating facilities in Virginia. Sources had until April 16, 2015, to comply with the rule unless granted a one-year extension for control installation or an additional extension for reliability reasons.

On June 16, 2017, the Department of Energy issued an emergency order to continue operating Units 1 and 2 at the Yorktown Power Station as needed and as determined by PJM to address reliability needs. The Department of Energy published this order online at <https://energy.gov/nepa/downloads/cx-016614-categorical-exclusion-determination>. EPA provides more information on this rule at <http://www.epa.gov/mats/>. Virginia implements the MATS rule via state regulations that adopt the federal standards by reference.

4.1.2. Interstate Transport

The CAA requires each upwind state to ensure that it does not interfere with either the attainment of a NAAQS or continued compliance with a NAAQS at any downwind monitor. This section of the CAA, § 110(a)(2)(D)(i)(I), is called the "Good Neighbor" provision. EPA has implemented a number of rules

enforcing the Good Neighbor provision for a variety of NAAQS, including the NO_x Budget Trading Program (1990 ozone NAAQS), CSAPR (1997 ozone NAAQS, 1997 PM_{2.5} NAAQS, and 2006 PM_{2.5} NAAQS), and the CSAPR update (2008 ozone NAAQS). Each of these rules sets emissions budgets for the electrical generation sector. EPA issued the CSAPR update addressing the 2008 ozone NAAQS on September 7, 2016. This rule took effect in 2017 and reduced summertime NO_x emissions in the 22 affected states, Virginia included. EPA provides more information on this process at <https://www.epa.gov/airmarkets/final-cross-state-air-pollution-rule-update>.

4.2. On Road Mobile Source Programs

In EPA's 2011 National Emissions Inventory (Version 2), NO_x emissions from the on road mobile source sector accounted for 46% of Virginia's entire anthropogenic NO_x inventory. In EPA's 2014 National Emissions Inventory, NO_x emissions from the mobile source sector accounted for 47% of Virginia's entire anthropogenic NO_x emissions. NO_x is the predominant cause of ozone in this part of the United States and contributes to nitrogen deposition in the Chesapeake Bay.

On April 28, 2014 (79 FR 23414), EPA finalized a new rule that lowers emissions standards from on-road engines beginning with model year 2017 vehicles. This rule, known as the Tier 3 standards, also reduced the amount of sulfur in gasoline beginning in 2017. Reducing the sulfur content of gasoline allowed manufacturers to equip vehicles with better controls so that new vehicles meet lower engine standards. The cleaner fuel also reduced emissions from existing vehicles because the catalytic converters on existing vehicles operate more efficiently. EPA provides more information on this rule at <http://www.epa.gov/otaq/tier3.htm>.

4.3. Reformulated Gasoline

Reformulated gasoline (RFG) is gasoline blended to burn more cleanly than conventional gasoline. Using this fuel reduces emissions of VOC, CO, and NO_x as well as some toxic pollutants like benzene. The CAA under § 211(k)(10)(D) mandated the use of RFG in certain large, metropolitan areas, including ten jurisdictions in Northern Virginia area. Based on air quality, other Virginia areas opted into this program to garner reductions necessary to reduce ozone concentrations. Such areas in Virginia include seven jurisdictions in the Richmond-Petersburg area and eleven jurisdictions in the Hampton Roads area. Based on 2016 Virginia Department of Motor Vehicle data, these jurisdictions house 58% of all registered vehicles in Virginia. Based on Virginia Department of Transportation data, these jurisdictions account for 52% of all vehicle miles traveled in Virginia.

EPA estimates that RFG reduces mobile source emissions of VOC by 27% and of NO_x by 7% as compared to emissions from conventional gasoline. Emission reductions occur for on-road use, such as in passenger vehicles and gasoline-powered trucks, and in other types of engines, such as lawn equipment, watercraft, and gasoline-powered generators. EPA also estimates that RFG emits 22% less toxic air pollutants than conventional gasoline. EPA provides more information on this program at <https://www.epa.gov/gasoline-standards/reformulated-gasoline>.

4.4. Non-Road Mobile Control Programs

Non-road mobile equipment includes off-road mobile sources that use gasoline, diesel, and other fuels. Source types include construction equipment, lawn and garden equipment, aircraft ground support equipment, locomotives, and commercial marine vessels. In 2011, these source sectors accounted for

22% of the anthropogenic NO_x emissions in Virginia, according to EPA's 2011 National Emissions Inventory (Version 2). In 2014, these source sectors accounted for 19% of the anthropogenic NO_x emissions in Virginia, according to EPA's 2014 National Emissions Inventory.

Federal regulations control emissions of various pollutants from all these categories. Most of these regulations have phase-in periods, where standards are more stringent for equipment manufactured in later years. These federal standards result in a 60% to 90% reduction in air pollutants. Air pollution benefits are related to the purchase of new equipment, and the benefits to air quality continue until the entire fleet of a type of equipment has been replaced.

4.4.1. Engine Controls

EPA promulgated a series of control programs in 40 CFR Part 89, Part 90, Part 91, Part 92, and Part 94. These regulations phased in emission limitations in compression ignition engines, spark-ignition nonroad engines, marine engines, and locomotive engines through 2012. Environmental benefits continue into the future as consumers replace older engines with newer engines that have improved fuel economy and that have more stringent emissions standards. These regulations also required the use of cleaner fuels. EPA has extensive information available on these programs at this website:

<http://www.epa.gov/nonroad/>.

4.4.2. Emission Control Area Designation and Commercial Marine Vessels

On April 4, 2014, new standards for ocean-going vessels became effective and applied to ships constructed after 2015. These requirements also mandate the use of significantly cleaner fuels by all large ocean-going vessels when operated near the coast lines. The cleaner fuels lower SO₂ emission rates as well as emissions of other criteria pollutants since the engines operate more efficiently on the cleaner fuel. Additional information on this program is available on EPA's website at:

<https://www.epa.gov/otaq/oceanvessels.htm>.