



Project XL Progress Report

Merck Stonewall Plant



On March 16, 1995, the Clinton Administration announced a portfolio of reinvention initiatives to be implemented by the U.S. Environmental Protection Agency (EPA) as a part of its efforts to achieve greater public health and environmental protection at a more reasonable cost. Through Project XL, which stands for eXcellence and Leadership, EPA enters into specific project agreements with public or private sector sponsors to test regulatory, policy, and procedural alternatives that will produce data and experiences to help the Agency make improvements in the current system of environmental protection. The goal of Project XL is to implement 50 projects that will test ways of producing superior environmental performance with improved economic efficiencies, while increasing public participation through active stakeholder processes. As of October 1999, 15 XL projects are in the implementation phase and 35 XL projects are under development. EPA Project XL Progress Reports provide overviews of the status of XL projects that are implementing Final Project Agreements (FPAs). The progress reports are available on the Internet via EPA's Project XL web site at <http://www.epa.gov/Project XL>. Or, hard copies may be obtained by contacting the Office of Reinvention's Project XL general information number at 202-260-7434. Additional information on Project XL is available on the web site or by contacting the general information number.

Background

Merck & Co., Inc., is a worldwide research-intensive health products company that discovers, develops, manufactures, and markets human and animal health products. Merck's Stonewall Plant near Elkton, Virginia, was established in 1941. The plant employs over 900 people in a range of pharmaceutical manufacturing (batch processing) activities such as fermentation, solvent extraction, organic chemical synthesis, and finishing operations.

The Stonewall Plant is located within a mile and a half of the Shenandoah National Park, a Federal Class I air quality area under the Clean Air Act (CAA). The facility is subject to CAA requirements to comply with the National Ambient Air Quality



Major Milestones

August 24, 1995 Merck XL Proposal Submitted	December 15, 1997 Final Project Agreement Signed	February 10, 1998 PSD Permit Effective	Summer 1999 Installation of the Gas-Fired Boilers Completed	May 2000 Anticipated Completion of Natural Gas Supply to Boilers	August 2005 Anticipated Date of First Stakeholder Review
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Standards (NAAQS). As a result of increased industrial activity in the region, Shenandoah National Park has experienced substantial air quality degradation and related resource impacts over the past several decades. In 1990, the Department of Interior published a public notice describing the negative effects of regional industrial development on Shenandoah's visibility, streams, and vegetation.

In order to reduce negative impacts on the Park and improve economic efficiency, Merck initiated an XL project with the EPA in 1995. The Merck XL project creates a facilitywide emissions cap for criteria air pollutants that will both (1) provide flexibility for the facility to make production changes without obtaining the required prior permitting approval and (2) minimize actual emissions. A new Prevention of Significant Deterioration (PSD) permit, developed through the Merck XL project, provides alternative methods for complying with applicable state implementation plan (SIP) rules, New Source Review (NSR) regulations, and certain Resource Conservation and Recovery Act (RCRA) provisions relating to air emission controls on hazardous waste equipment. The new PSD permit includes a facilitywide cap for total criteria air pollutants and subcaps for sulfur dioxide (SO₂), nitrogen oxide (NO_x), and particulate matter with a diameter of less than 10 microns (PM-10).

Through the Merck XL project, environmental benefits will be gained by the following.

- Capping the facility's total emissions of criteria air pollutants at levels 20% below the baseline levels occurring prior to the XL project; capping SO₂ emissions at levels 25% below baseline levels; capping NO_x emissions at levels 10% below baseline levels (which should reduce ground-level ozone); and capping PM-10 emissions at levels approximately equal to baseline levels.
- Modifying the facility's existing coal-burning power plant to burn natural gas. Replacing coal-fired boilers with natural-gas boilers is expected to result in an upfront reduction of 900 tons per year of total criteria air pollutant emissions, to virtually eliminate lead emissions, and to reduce the combined emissions of the hazardous air pollutants hydrogen chloride and hydrogen fluoride by 65% (47 tons per year). The conversion to natural gas is anticipated to cost Merck approximately \$10 million; the conversion is not required by regulations or as a result of operational problems.
- Choosing to either comply with specific control-technology requirements in future regulations affecting criteria air pollutants, or to reduce the facilitywide cap or subcaps by the amount of reductions that would have been achieved through such compliance.
- Implementing a comprehensive monitoring, record keeping, and reporting program that increases in stringency as actual emissions approach the cap.
- Assessing the air quality impact in Shenandoah National Park if volatile organic compound (VOC) emissions reach specified levels.
- Ensuring compliance with Significant Ambient Air Concentrations (SAAC) regulations of nonhazardous VOC emissions for increases above specified thresholds.

The Experiment

The Merck project tests whether the facility can avoid costly production delays while improving environmental performance through allowing preapproved operational changes under a sitewide cap on the facility's total emissions of criteria air pollutants. The project aims to reduce emission levels for SO₂ and NO_x, thereby protecting visibility and reducing acid deposition in nearby Shenandoah National Park and the neighboring community.

The Flexibility

Merck is working with EPA, the Virginia Department of Environmental Quality (VADEQ), the National Park Service, and the community to achieve superior environmental performance and to operate the Stonewall Plant in a more flexible, cost-effective manner. As an incentive to achieving superior environmental performance, EPA is offering Merck regulatory flexibility in the area of air permitting.

The statutory programs, and the EPA offices administering the programs, that affect the Merck XL project are;

- Clean Air Act (CAA) programs, administered by EPA's Office of Air Quality Planning and Standards;
- Resource Conservation and Recovery Act (RCRA) programs, administered by EPA's Office of Solid Waste; and
- Pollution Prevention Act (PPA) programs, administered by EPA's Office of Prevention, Pesticides, and Toxic Substances.

EPA has delegated to the Commonwealth of Virginia full authority to implement and enforce the new PSD permitting program.

Air Quality Permitting. Pursuant to an agreement between EPA and VADEQ, the latter issued a new, unlimited-duration PSD permit for a facilitywide air emissions cap at the Merck Stonewall Plant. The permit defines compliance with PSD, minor NSR, and other regulatory requirements. A variance issued by VADEQ for the Stonewall Plant allowed VADEQ to issue the flexible PSD permit. Merck will be required to comply with the facilitywide emission caps by, at the latest, 12 months after the facility converts its coal-fired boilers to natural-gas boilers. Until that time, existing air quality permits and regulations, specifically Federal and state PSD and minor NSR permits and regulations, govern facility operations.

The facility's existing air quality permits require that most changes to manufacturing processes be reviewed and approved by VADEQ prior to implementation. The complexity of the regulations requires a considerable effort by the facility and regulators to prepare and review permit applications for many process modifications. Under the Stonewall Plant's new PSD permit, changes or additions to facility operations that result in emission increases would no longer require prior approval under either Federal or state NSR regulations.

Merck's new PSD permit provides the facility with the flexibility to implement a change in operations that could increase emissions, within the constraints of the total criteria pollutant cap and the individual pollutant subcaps for SO₂, NO_x, and PM-10. In addition, the permit affords Merck the option of reducing the facilitywide caps instead of implementing specific control technologies prescribed by future regulations. Merck is also provided flexibility in complying with RCRA air emission requirements that apply to certain existing hazardous waste management units. This operational flexibility is provided in return for the facility demonstrating ongoing superior environmental performance resulting from the permanent, substantial reduction of emissions; the conversion of the power plant to natural gas; the requirements to increase monitoring, record keeping, and reporting as actual emissions approach the caps; and the establishment of five-year periodic stakeholder reviews.

The variance and permit streamline requirements regarding both the content of application for Merck's Title V operating permit and the compliance certification. Merck is required to obtain a Title V permit and will continue to be responsible for adhering to all other applicable state and Federal air regulations. Merck will comply fully with all applicable requirements for the control of hazardous air pollutants (HAPs) under CAA section 112, including;

- maximum achievable control technology (MACT) standards for the pharmaceutical industry under CAA section 112(d);
- risk management plan requirements under CAA section 112(r); and
- future residual risk regulations under CAA section 112(f).

Environmental Performance Reporting. The Merck project provides an innovative three-tiered approach to monitoring, record keeping, and reporting linked to its air quality permit. A site-specific rule and new PSD permit, developed through the Merck project, provide alternative methods for complying with applicable SIP air quality rules, NSR air emission regulations, and certain RCRA provisions relating to air emission controls on hazardous waste equipment. The new PSD permit includes a facilitywide cap for total criteria air pollutants and subcaps for SO₂, NO_x, and PM-10. The requirements for monitoring, record keeping and reporting increase in stringency as the facility's actual total criteria air emissions approach the sitewide emissions cap. Annual reporting is required when facilitywide emissions are less than 75% of the cap. Semiannual reporting is required when facilitywide emissions are between 75% and 90% of the cap. Monthly reporting is required when emissions are equal to or greater than 90% of the total emissions cap. Additionally, monitoring and record-keeping requirements for certain processes may range from daily to annually, depending on the facility's environmental performance relative to the statewide emissions cap. This provides an incentive for Merck to purchase the cleanest available technologies and to maintain low air emission levels.

Promoting Innovation and System Change

Project XL provides EPA opportunities to test and implement approaches that protect the environment and advance collaboration with stakeholders. EPA is continually identifying specific ways in which XL projects are helping to promote innovation and system change. The innovations and system changes emerging from the Merck XL project are described below.

Limited Preapprovals for Air Permits. Certain industries change their product lines frequently. Usually, such changes require a time-consuming preconstruction permit exercise. By focusing on the total emissions of a facility, XL is testing and confirming flexible emission reduction strategies that may be both duplicated at similar facilities across the country and integrated into EPA's existing regulatory regime. Concepts tested by Project XL have already been integrated into the national regulatory system. The recent Pharmaceutical MACT regulations promulgated in September 1998 have incorporated lessons learned from the Merck FPA, allowing the limited preapproval of certain types of production changes without requiring permit revision for each modification. The Agency is formally considering further expanding this use of preapproval and "cap permits."

Tiered Reporting--Building Incentives into Data Collection Requirements. A key innovative feature of Merck's XL project is that the monitoring, record keeping, and reporting requirements for the PSD permit increase in stringency as the site's actual total criteria pollutant emissions come closer to the total emissions cap. Annual reporting is required when facilitywide emissions are less than 75% of the cap. Semiannual reporting is required when facilitywide emissions are between 75% and 90% of the cap. Monthly reporting is required when emissions are equal to or greater than 90% of the total emissions cap. This provides an additional incentive for the facility to minimize its emissions. This project will serve as a test bed for sectorwide collection of higher quality information from regulated industries, and will directly influence the Comprehensive Information Management Plan being developed by EPA's new consolidated Environmental Information Office.

Project Commitment Summary

This table and the environmental performance section that follows summarize progress in meeting commitments described in the FPA for Merck's Stonewall Plant.

Commitment	Status
EPA Commitments	
Issue a site-specific rule to provide an alternative means of compliance with applicable state SIP rules and NSR standards and to address certain provisions of RCRA air standards for air emission controls on hazardous waste equipment.	EPA proposed a site-specific PSD and NSR rule on March 31, 1997, that applies only to Merck's Stonewall Plant. This rule also addresses the relevant provisions of RCRA air standards for air emission controls. EPA promulgated the final rule on October 8, 1997.
Issue a site-specific revision to Virginia's SIP that delegates authority to the Commonwealth of Virginia for implementing and enforcing the site-specific PSD rule, and that allows for an alternate means of compliance with newly applicable rules.	EPA proposed delegation of authority in the site-specific rule issued March 31, 1997. EPA delegated full authority to Virginia for implementing and enforcing the site-specific PSD rule on November 24, 1997.
Commonwealth of Virginia Commitments	
Request full delegation of authority for implementation and enforcement of the site-specific PSD rule for the Merck Stonewall Plant.	VADEQ requested full delegation from EPA on October 27, 1997; delegation was granted November 24, 1997.
Grant a PSD permit and variance to the Merck Stonewall Plant for implementing the XL project.	On September 11, 1997, the State Air Pollution Control Board of Virginia issued a variance containing site-specific PSD provisions consistent with those of EPA's final rule. VADEQ issued the PSD permit on January 7, 1998, with an effective date of February 10, 1998.
Issue a regulation to address EPA's final site-specific PSD rule.	The State Air Pollution Control Board of Virginia approved a regulation that incorporated by reference the provisions of EPA's final site-specific PSD rule on October 1, 1997.

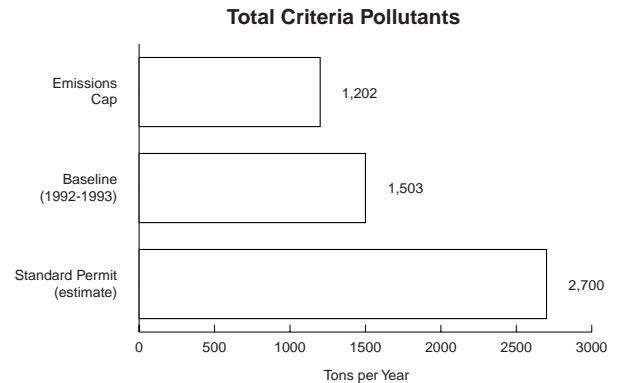
Commitment	Status
Merck & Co., Inc. Commitments	
Replace coal-fired boilers with natural gas boilers that can use distillate oil as backup fuel.	The new natural gas-fired boilers were installed during the summer of 1999, and will be fired when the natural gas supply to the equipment is completed. At one point, the conversion was anticipated to be complete in June 1999; however, the arrangements for a gas line took more time than expected. Now, completion of the new gas supply is anticipated in the spring of 2000. Conversion is still anticipated for completion before the August 2000 deadline in the PSD permit.
Implement a three-tiered system for monitoring, record keeping, and reporting.	The three-tiered monitoring, record keeping, and reporting requirements will become effective no later than 12 months after boiler conversion is completed.
Submit emission reports to all FPA signatories.	Semiannual reports required under the permit are scheduled for submission by March 1 and September 1 of each year, beginning in March 2001 (this start date is based on the anticipated completion date of the boiler conversion).
Provide XL progress reports to stakeholders annually upon initiation of operation of the natural gas boilers.	Annual reports required under the permit are scheduled for submission by March 1 of each year, beginning in March 2001 (this start date is based on the anticipated completion date of the boiler conversion).
Conduct stakeholder meetings to evaluate project effectiveness.	Meetings are to be conducted every 5 years beginning within 3 months of the 5-year anniversary of completion of the boiler conversion.

Environmental Performance

This section summarizes progress in meeting the environmental performance described in the FPA for Merck's Stonewall Plant. Detailed technical specifications are set forth in the new PSD permit issued by VADEQ.

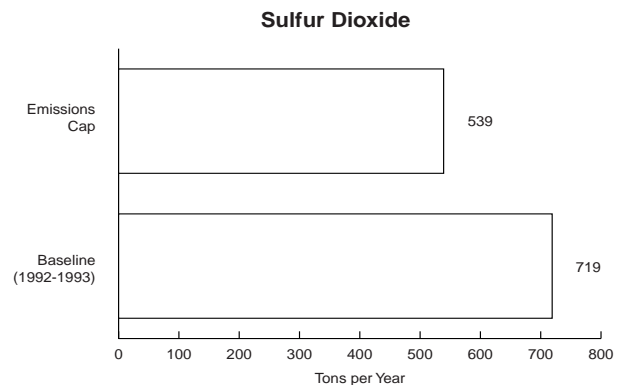
The total criteria pollutant and individual criteria pollutant emissions caps will be adjusted downward after boiler conversion is complete. Compliance with emission caps will be determined monthly, on a 12-month rolling total basis. Boiler conversion will significantly reduce criteria pollutant emissions and, therefore, will immediately reduce the 12-month rolling total. However, the 12-month rolling total will not be decreased below the emissions caps for some months following boiler conversion. Therefore, the new PSD permit's emission caps may not be enforceable until 12 months after boiler conversion is complete. Merck has the option of accepting the provisions of the new PSD permit and operating under the caps before this date. As soon as Merck begins operating under the emissions caps, they will be allowed to make changes to their processes that result in air emissions increases without prior approval, as long as they remain below the caps. Additionally, once the caps are in effect, the Stonewall Plant will be required to operate under the caps and increase the frequency of their monitoring, record keeping, and reporting if the 12-month rolling total of criteria pollutant emissions triggers the more frequent data-collection requirements.

Air Emissions of Total Criteria Pollutants: The Merck facility's total emissions of criteria pollutants (including all criteria pollutants except lead, which will be virtually eliminated by conversion to the natural gas boiler) will be capped below the level found to be representative of recent plant operations. The facility's actual emissions averaged over 1992 and 1993 provide a baseline level of 1,503 tons per year for total criteria pollutants. Under the new facilitywide cap, total criteria pollutant emissions will be maintained at levels below 1,202 tons per year (a 20% reduction). Merck estimates that up to 2,700 tons per year would be allowable at its facility under current regulatory standards.



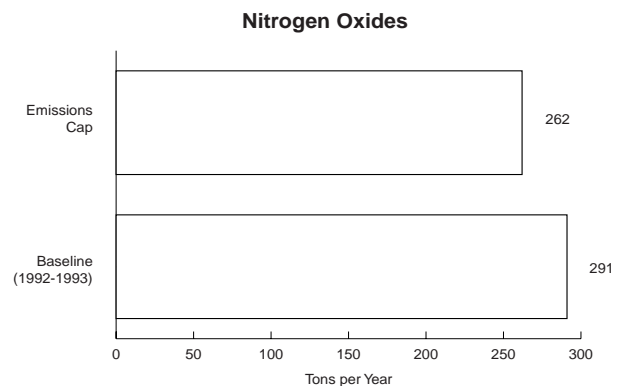
Progress: Following completion of the boiler conversion, facilitywide air emissions will be determined monthly. Progress in maintaining total criteria pollutant air emissions at levels below the new cap will be reported in permitting documentation and semiannual reports to FPA signatories.

Air Emissions of Sulfur Dioxide (SO₂): The facility's actual SO₂ emissions averaged over 1992 and 1993 provide a baseline level of 719 tons per year. The facility's PSD permit includes a facilitywide cap that limits SO₂ emissions following boiler conversion to 539 tons per year. The cap guarantees a minimum 25% reduction in SO₂ emissions as a result of the boiler conversion.



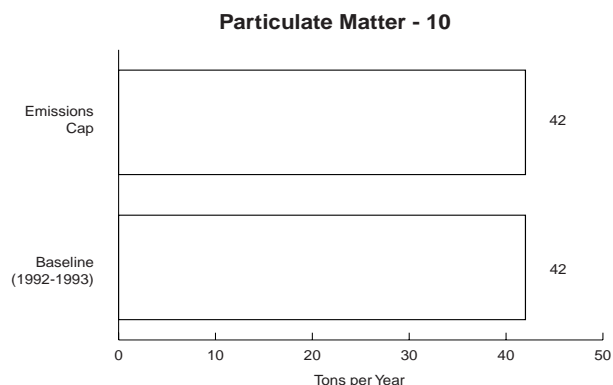
Progress: Following completion of the boiler conversion, air emissions will be determined monthly. Progress in maintaining SO₂ air emissions at levels below the new cap will be reported in permitting documentation and semiannual reports to FPA signatories.

Air Emissions of Nitrogen Oxides (NO_x): The facility's actual NO_x emissions averaged over 1992 and 1993 provide a baseline level of 291 tons per year. The facility's PSD permit includes a facilitywide cap that limits NO_x emissions following boiler conversion to 262 tons per year. The cap guarantees a minimum 10% reduction in NO_x emissions as a result of the boiler conversion.



Progress: Following completion of the boiler conversion, air emissions will be determined monthly. Progress in maintaining NO_x air emissions at levels below the new cap will be reported in permitting documentation and semiannual reports to FPA signatories.

Air Emissions of Particulate Matter (PM-10): The facility's actual emissions of PM-10 provide a baseline level (1992 and 1993 average) of 42 tons per year. Significant decreases in PM-10 emissions are not anticipated as a result of the boiler conversion because stringent PM-10 emission controls have already been placed on the coal-fired power plant. The PM-10 cap initially will be placed at the baseline level of 42 tons per year. Following conversion of the power plant to natural gas, the new boiler will be tested to determine emission levels at full capacity. So that the new gas-fired boilers can generate at their full capacity, there will be an automatic increase in the PM-10 cap of one to 10 tons per year to account for condensable PM-10 emissions. The cap on total criteria emissions will not be affected by this automatic increase in the PM-10 cap.



Progress: Following boiler conversion, air emissions will be determined monthly. Progress in maintaining PM-10 air emissions at levels below the new cap will be reported in permitting documentation and semiannual reports to FPA signatories.

Hazardous Waste Management Unit Emissions: The Merck PSD permit contains requirements for compliance with RCRA provisions on the control of air emissions from certain hazardous waste management units.

Progress: Compliance with hazardous waste management unit emission regulations is being maintained during conversion of the boiler. The requirements of these regulations will be replaced by alternative provisions contained in Merck's PSD permit after boiler conversion. Among these requirements: to control select units with a secondary brine condenser or thermal oxidizer, to continue the maintenance and repair program for equipment components that are in contact with VOCs, and to maintain and monitor specified covers on containers and hazardous waste treatment tanks.

Stakeholder Participation

The organizations directly involved in negotiating the FPA included Merck & Co., Inc., EPA, U.S. Department of the Interior National Park Service, VADEQ, Rockingham County Board of Supervisors, and private citizens. In addition to the efforts of the EPA and VADEQ to solicit and respond to public comments on the site-specific rule and variance issued as part of the project, Merck worked to ensure that stakeholders were involved in the planning of the XL project and were provided opportunities to participate in project development. Public meetings were held on

- May 23, 1996, at the Merck facility in Elkton, Virginia, to discuss development of Merck's proposed XL project and anticipated activities. The meeting was attended by approximately 30 people representing government, environmental, and community groups;
- February 27, 1997, in Harrisonburg, Virginia, to solicit comment on VADEQ's proposed PSD permit and variance. The meeting was attended by 30 to 50 people representing government, environmental, and community groups; and

- April 14, 1997, in Harrisonburg, Virginia, to solicit comment on EPA's proposed site-specific rule. The meeting was attended by 30 to 50 people representing government, environmental, and community groups.

A working committee of government and nongovernment stakeholders was established after the initial public meeting. The group met weekly for 7 months and frequently thereafter during FPA negotiations. Environmental organizations offering input during the stakeholder process included the Southern Environmental Law Center, the Virginia Consortium for Clean Air, and the Natural Resources Defense Council. Stakeholder concerns expressed during FPA negotiations included minimal opportunities for nonsignatory parties to participate in the project, shifting of risks associated with exchanging one type of pollutant for another, and the need to clarify VOC emission issues.

The PSD permit provides that nonsignatory stakeholders, including up to three community representatives and up to one representative from a regional public interest group, may be designated to participate in project implementation and review. These stakeholders would receive information and have the opportunity to participate in the periodic reviews of performance as described in the permit. The permit provides for a review of certain issues every 5 years and other reviews when specified emission levels are reached. The Merck XL project stakeholder group will convene every 5 years to evaluate the project's implementation and to mutually agree on whether project changes are needed.

On an ongoing basis, stakeholders will receive information to enable them to evaluate Merck's performance under the facilitywide emission caps. This will ensure that local stakeholders are well informed about facility operations and the impact of incentives to minimize facility emissions. Merck has discussed the project's progress with interested parties, including employees; Merck retirees; surrounding communities; local, state, and Federal government officials; and others that expressed interest in the project.

Six-Month Outlook

The key focus area for continued successful implementation of the FPA over the next six months will be to complete the natural gas supply to the new boilers.

Project Contacts

- Tedd Jett, Merck & Co., Inc., (540) 298-4869.
- Kathleen Henry, EPA Region 3, (215) 814-2175.
- Christi Gordon, U.S. Department of the Interior, National Park Service, (540) 999-3499.
- John Daniel, VADEQ, (804) 698-4311.
- William O'Brien, Rockingham County Board of Supervisors, (540) 564-3000.

Information Sources

The information sources used to develop this progress report include (1) discussions during a teleconference among representatives of the Federal and state regulatory agencies, Merck Stonewall Plant, and local stakeholders involved in the project; (2) the FPA for the Merck XL project; (3) a PSD permit issued by the Commonwealth of VA DEQ; (4) a report prepared by Merck & Co., Inc., *Merck Project XL PSD Permit Support Document*; and (5) a brief project update from Merck dated August 28, 1999. The information sources are current through August 1999.

Glossary

Baseline: The measure by which future environmental performance can be compared.

Class I Air Quality Area: Under the CAA, a Class I area is one in which visibility is protected more stringently than under the NAAQS. These areas include national parks, wilderness areas, monuments, and other areas of special national and cultural significance.

Clean Air Act (CAA): The CAA is the comprehensive Federal law that regulates air emissions from area, stationary, and mobile sources. This law authorizes the U.S. EPA to establish National Ambient Air Quality Standards (NAAQS) and other regulations to protect public health and the environment.

Condensable PM-10 Emissions: Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 microns which are condensed in a filter at ambient conditions.

Control Technology: Equipment, processes, or actions used to reduce air pollution. The extent of pollution reduction varies among technologies. In general, control technologies that do the best job of reducing pollution are required in areas with the worst pollution. For example, the best available control technology will be required in serious nonattainment areas for particulate matter, a criteria air pollutant. A similar high level of pollution reduction will be required by MACT regulations for sources releasing HAPs.

Criteria Air Pollutants: The CAA requires EPA to set NAAQS for certain pollutants known to be hazardous to human health. EPA has identified and set standards to protect human health and welfare for six criteria air pollutants—ozone (O₃), CO, particulate matter, SO₂, lead, and NO_x. EPA must describe the characteristics and potential health and welfare effects of these pollutants. It is on this basis that NAAQS are set or revised.

Emissions Cap: A provision designed to prevent projected growth in emissions from a facility's existing and future operations from a specified limit. Generally, such provisions require that emission increases from one operation be offset by reductions at other operations at the facility, under the same cap.

Final Project Agreement (FPA): The FPA outlines the details of the XL project and each party's commitments. The project's sponsors, EPA, State agencies, Tribal governments, other regulators, and direct participant stakeholders negotiate the FPA.

Hazardous Air Pollutants (HAP): Air pollutants that are not covered by NAAQS, but that may present a threat of adverse human health effects or adverse environmental effects. Examples of such pollutants include asbestos, beryllium, mercury, benzene, coke-oven emissions, radionuclides, and vinyl chloride.

Hazardous Waste Management Unit: A contiguous area of land on which hazardous waste is placed, or the largest area in which there is significant likelihood of mixing hazardous waste constituents in the same area.

Hydrogen Chloride: A colorless, pungent, poisonous gas that yields hydrochloric acid when dissolved in water.

Hydrogen Fluoride: A colorless, corrosive gas that yields a hydrofluoric acid when dissolved in water.

Maximum Achievable Control Technology (MACT): The emission standards for sources of HAPs requiring the maximum reduction of hazardous emissions, taking cost and feasibility into account. Under the CAA Amendments of 1990, the MACT standards must not be less than the average emission level achieved by controls on the best-performing 12% of existing sources, by category.

Media: Specific environments—air, water, soil—which are the subject of regulatory concern and activities.

Multi-media: Several environmental media, such as air, water, and land.

National Ambient Air Quality Standards (NAAQS): Regulations promulgated by EPA under the CAA for six criteria pollutants—SO₂, particulate matter, NO_x, CO, ozone, and lead—in order to protect the public from the impacts of these atmospheric emissions.

New Source Review (NSR): The NSR and Prevention of Significant Deterioration (PSD) provisions of the CAA strive to ensure that potential new sources of air pollution (new plants or facilities, or additions to existing ones) take proper steps to minimize pollution levels. The goals of the NSR program are (1) to ensure that an increase in emissions due to a new source or modification to an existing source does not significantly deteriorate air quality; (2) to ensure that source emissions are consistent with applicable state attainment plans; and (3) to establish control technology requirements that maximize production capacity while minimizing air-quality impacts.

Nitrogen Oxides (NO_x): An air pollutant that is the result of photochemical reactions of nitric oxide in ambient air. Typically, it is a product of combustion from transportation and stationary sources. It is a major contributor to the formation of ozone in the troposphere, photochemical smog, and acid deposition.

Ozone (O₃): Ozone is found in two layers of the atmosphere, the stratosphere and the troposphere. In the stratosphere (the atmospheric layer 10 miles or more above the earth's surface), ozone is a natural form of oxygen that provides a protective layer shielding the earth from ultraviolet radiation. On the other hand, in the troposphere (the layer extending up to 10 miles from the earth's surface), ozone is a major component of photochemical smog. It can seriously impair respiratory systems and is one of the most widespread of all the criteria pollutants. Ozone in the troposphere is produced through complex chemical reactions involving NO_x, VOCs, and sunlight.

Particulate Matter: Fine liquid or solid particles, such as dust, smoke, mist, fumes, or smog, found in air or emissions.

PM-10: Particulate matter with a diameter of less than 10 microns.

Pollution Prevention Act (PPA): The PPA focuses on enhancing industry, government, and public attention on reducing the amount of pollution through cost-effective changes in production, operation, and raw-materials use. Pollution prevention includes practices that increase efficiency in the use of energy, water, or other natural resources, and that protect resources through conservation. These practices include recycling, source reduction, and sustainable agriculture.

Precursor: In photochemistry, a compound antecedent to a pollutant. For example, VOCs and NO_x often react in sunlight to form ozone. As such, VOCs and NO_x are precursors to ozone.

Prevention of Significant Deterioration (PSD): The part of the NSR program in which state or Federal permits are required to restrict emissions for new or modified sources in locations where air quality already attains ambient air quality standards.

Resource Conservation and Recovery Act (RCRA): RCRA gives EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of nonhazardous wastes and underground storage tanks. RCRA focuses only on active and future facilities and does not address abandoned sites.

Significant Ambient Air Concentrations (SAAC): Regulations promulgated by the Commonwealth of Virginia under the State Air Pollution Control Law to protect the public from emissions of non-criteria air pollutants.

State Implementation Plans (SIP): EPA-approved state plans for the establishment, regulation, and enforcement of air pollution standards.

Sulfur Dioxide (SO₂): Sulfur dioxide gases are formed when fuel containing sulfur (mainly coal and oil) is burned during metal smelting and other industrial processes. Sulfur dioxide is associated with acidification of lakes and streams, accelerated corrosion of buildings and monuments, reduced visibility, and adverse health effects, including effects on breathing, respiratory illness, and aggravation of existing cardiovascular disease.

Thermal Oxidizer: An enclosed device that destroys organic compounds by thermal oxidation, i.e. reacting at elevated temperatures with oxygen.

Title V of the Clean Air Act: Title V establishes a Federal operating permit program that applies to any major stationary facility or source of air pollution. The purpose of the operating permits program is to ensure compliance with all applicable requirements of the CAA. Under the program, permits are issued by states or, when a state fails to carry out the CAA satisfactorily, by EPA. The permit includes information on which pollutants are being released, how much may be released, and what steps the source's owner or operator is taking to reduce pollution, including plans to monitor the pollution.

12-month Rolling Total Basis: The 12-month rolling total for an individual pollutant is calculated on a monthly basis as the sum of all actual emissions of the respective pollutant from the previous 12 months.

Variance: Government permission for a delay or exception in the application of a given law, ordinance, or regulation.

Virginia State Air Pollution Control Board: A regulatory board, composed of Virginia citizens appointed by the Governor, which is responsible for oversight of the adoption of Virginia's environmental air quality regulations. The board has statutory authority to promulgate regulations and to approve certain permits. Before promulgating regulations required by environmental statutes, the board seeks information from the public, the regulated community and advisory committees.

Volatile Organic Compound (VOC): Any organic compound that evaporates easily into the atmosphere and that participates in atmospheric photochemical reactions, except for those compounds designated by the EPA Administrator as having negligible photochemical reactivity. VOCs are a precursor to the formation of the total criteria air pollutant ozone, and as such, are subject to regulation under the NAAQS. VOCs also may be HAPs that are subject to regulation under the MACT standards.