

<h1>Regulatory Analysis Form</h1> <p>(Completed by Promulgating Agency)</p> <p>(All Comments submitted on this regulation will appear on IRRC's website)</p>		<p>INDEPENDENT REGULATORY REVIEW COMMISSION</p> <p>RECEIVED</p> <p>JUL 14 2021</p> <p>Independent Regulatory Review Commission</p>
<p>(1) Agency: Environmental Protection</p>		
<p>(2) Agency Number: 7</p> <p>Identification Number: 561</p>		<p>IRRC Number: 3310</p>
<p>(3) PA Code Cite: 25 Pa. Code Chapters 121 and 129</p>		
<p>(4) Short Title: Additional RACT Requirements for Major Sources of NO_x and VOCs for the 2015 Ozone NAAQS; and General Provisions</p>		
<p>(5) Agency Contacts (List Telephone Number and Email Address):</p> <p>Primary Contact: Laura Griffin, 717-783-8727, laurgriffi@pa.gov</p> <p>Secondary Contact: Jessica Shirley, 717-783-8727, jessshirley@pa.gov</p>		
<p>(6) Type of Rulemaking (check applicable box):</p> <p><input checked="" type="checkbox"/> Proposed Regulation</p> <p><input type="checkbox"/> Final Regulation</p> <p><input type="checkbox"/> Final Omitted Regulation</p>		<p><input type="checkbox"/> Emergency Certification Regulation;</p> <p><input type="checkbox"/> Certification by the Governor</p> <p><input type="checkbox"/> Certification by the Attorney General</p>
<p>(7) Briefly explain the regulation in clear and nontechnical language. (100 words or less)</p> <p>This proposed rulemaking would amend Chapter 129 (relating to standards for sources) to adopt additional presumptive reasonably available control technology (RACT) requirements and RACT emission limitations for certain major stationary sources of oxides of nitrogen (NO_x) and volatile organic compound (VOC) emissions in existence on or before August 3, 2018, to address the 2015 ozone National Ambient Air Quality Standards (NAAQS) in this Commonwealth and requirements of the Clean Air Act (CAA) (42 U.S.C.A. §§ 7401—7671q) as well as amend Chapter 121 (relating to general provisions) to add two definitions in § 121.1 (relating to definitions) to support the amendments to Chapter 129.</p>		
<p>(8) State the statutory authority for the regulation. Include <u>specific</u> statutory citation.</p> <p>This proposed rulemaking is authorized under section 5(a)(1) of the Air Pollution Control Act (APCA) (35 P.S. § 4005(a)(1)), which grants the Environmental Quality Board (Board) the authority to adopt rules and regulations for the prevention, control, reduction and abatement of air pollution in this Commonwealth; and section 5(a)(8), which grants the Board the authority to adopt rules and regulations designed to implement the provisions of the CAA.</p>		

(9) Is the regulation mandated by any federal or state law or court order, or federal regulation? Are there any relevant state or federal court decisions? If yes, cite the specific law, case or regulation as well as, any deadlines for action.

Yes, this proposed rulemaking is mandated by Federal law under sections 172, 182 and 184 of the CAA (42 U.S.C.A. §§ 7502, 7511a and 7511c) and the 2015 ozone implementation rule (40 CFR 51.1316).

Section 109(b) of the CAA (42 U.S.C.A. § 7409(b)) requires the U.S. Environmental Protection Agency (EPA) to establish permissible ambient air limits, or NAAQS, for criteria air pollutants, of which ozone is one, at levels that protect public health and welfare, including the environment. The limits to protect public health are called primary standards; the limits to protect public welfare, including the environment, are called secondary standards.

On April 30, 1971, the EPA promulgated primary and secondary NAAQS for photochemical oxidants, which include ozone, under section 109 of the CAA. See 36 FR 8186 (April 30, 1971). These were set at an hourly average of 0.08 parts per million (ppm) total photochemical oxidants not to be exceeded more than 1 hour per year. On February 8, 1979, the EPA announced a revision to the then-current 1-hour standard. See 44 FR 8202 (February 8, 1979). The final rulemaking revised the level of the primary 1-hour ozone standard from 0.08 ppm to 0.12 ppm and set the secondary standard identical to the primary standard. This revised 1-hour standard was reaffirmed on March 9, 1993. See 58 FR 13008 (March 9, 1993).

On July 18, 1997, the EPA concluded that revisions to the then-current 1-hour ozone primary standard to provide increased public health protection were appropriate at this time to protect public health with an adequate margin of safety. Further, the EPA determined that it was appropriate to establish a primary standard of 0.08 ppm averaged over 8 hours. At this time, the EPA also established a secondary standard equal to the primary standard. See 62 FR 38856 (July 18, 1997). In 2004, the EPA designated 37 counties in Pennsylvania as 8-hour ozone nonattainment areas for the 1997 8-hour ozone NAAQS. See 69 FR 23858, 23931 (April 30, 2004). The EPA lowered the 8-hour ozone standards in March 2008 to 0.075 ppm, and in October 2015 to 0.070 ppm. See 73 FR 16436 (March 27, 2008), and 80 FR 65292 (October 15, 2015).

Section 110(a) of the CAA (42 U.S.C.A. § 7410(a)) gives states the primary responsibility for achieving the NAAQS in nonattainment areas and maintaining NAAQS for areas in compliance. Section 110(a) of the CAA provides that each state shall adopt and submit to the EPA a state implementation plan (SIP) to implement measures to enforce the NAAQS or a revision to the NAAQS promulgated under section 109(b) of the CAA. A SIP includes the regulatory programs, actions and commitments a state will carry out to implement its responsibilities under the CAA. Once approved by the EPA, a SIP is legally enforceable under both Federal and state law.

Section 172(c)(1) of the CAA (42 U.S.C.A. § 7502(c)(1)) provides that SIPs for nonattainment areas must include "reasonably available control measures," including RACT, for affected sources of emissions. RACT is defined as the lowest emissions limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility. See 44 FR 53762 (September 17, 1979). Therefore, a re-evaluation of what constitutes RACT for affected sources must be fulfilled each time the EPA promulgates a new NAAQS (as was the case in 1997 for the 8-hour ozone standard), or revises a NAAQS (as was the case in 2008 and 2015 for the 8-hour ozone standard). State regulations to control emissions of NO_x and VOCs from

major stationary sources will be reviewed by the EPA to determine if the provisions meet the RACT requirements of the CAA and its implementing regulations designed to attain and maintain the ozone NAAQS.

On June 4, 2018, the EPA published finalized designations and classifications for the 2015 8-hour ozone NAAQS with an effective date of August 3, 2018. The following nonattainment area was classified as “marginal” ozone nonattainment: Philadelphia-Wilmington-Atlantic City (the Commonwealth portion of this area includes Bucks, Chester, Delaware, Montgomery and Philadelphia counties). The remainder of this Commonwealth was designated “unclassifiable/attainment.” See 83 FR 25776 (June 4, 2018).

Section 182 of the CAA (42 U.S.C.A. § 7511a) requires that, for areas which exceed the ozone NAAQS, states must develop and implement a program that mandates certain major stationary sources develop and implement a RACT emission reduction program. The entire Commonwealth is treated as a “moderate” ozone nonattainment area for RACT purposes, because the Commonwealth is included in the Ozone Transport Region (OTR) established by operation of law under sections 184 and 176A of the CAA (42 U.S.C.A. §§ 7511c and 7506a). Section 184(b) of the CAA addresses provisions for the SIP of a state included in the OTR. Section 184(b)(1)(B) of the CAA requires that states in the OTR, including Pennsylvania, submit a SIP revision requiring implementation of RACT for all major stationary sources of NO_x and VOC emissions in the state and not just for those sources that are located in designated nonattainment areas of the state. Consequently, the Commonwealth’s SIP must include regulations applicable statewide to affected major stationary sources of NO_x and VOC emissions.

The EPA’s past implementation of regulations for revised NAAQS ozone standards have required OTR states to submit RACT SIP revisions based on the timeframe provided in section 184 of the CAA as measured from the effective date of designations made for those revised NAAQS, rather than from November 15, 1990. This requirement was first codified in 40 CFR 51.916 (relating to what are the requirements for an Ozone Transport Region under the 8-hour NAAQS?) for the 1997 ozone NAAQS, later codified for the 2008 ozone NAAQS in 40 CFR 51.1116 (relating to requirements for an Ozone Transport Region) and most recently codified for the 2015 8-hour ozone NAAQS in 40 CFR 51.1316 (relating to requirements for an Ozone Transport Region). Under these provisions, states in the OTR are required to submit SIP revisions addressing the RACT requirements of section 184 of the CAA not later than 2 years after the effective date of designations for nonattainment areas for the revised 2015 ozone NAAQS, or by August 3, 2020.

The Commonwealth is therefore required to implement RACT requirements statewide for major stationary sources of NO_x and VOCs as part of a Federally approved SIP for attaining the 2015 ozone NAAQS and maintaining the 1997 and 2008 8-hour ozone NAAQS. These sources include combustion units, municipal solid waste landfills and municipal waste combustors, as well as other sources that are not regulated elsewhere in Chapter 129 through implementation of CTG (control technique guideline) recommendations for a source category. If the EPA finds that a state has failed to submit an acceptable SIP or has failed to implement the requirements of an approved SIP, sanctions will be imposed. However, sanctions cannot be imposed until 18 months after the EPA makes the determination, and sanctions cannot be imposed if a deficiency has been corrected within the 18-month period.

Section 179 of the CAA (42 U.S.C.A. § 7509) authorizes the EPA to use two types of sanctions: 1) withholding of certain Federal highway funds; and 2) imposing what are called “2:1 offsets” on new or modified sources of emissions. Under Section 179 and its implementing regulations, the Administrator first imposes offsets, and then, if the deficiency has not been corrected within 6 months, also applies

highway sanctions. See 40 CFR 52.31 (relating to selection of sequence of mandatory sanctions for findings made pursuant to section 179 of the Clean Air Act). The Commonwealth receives Federal transportation funding annually, \$1.8 billion in 2020.

(10) State why the regulation is needed. Explain the compelling public interest that justifies the regulation. Describe who will benefit from the regulation. Quantify the benefits as completely as possible and approximate the number of people who will benefit.

Why the regulation is needed

The requirement to adopt and implement RACT for the 2015 ozone NAAQS is Federally mandated. Section 110 of the CAA (42 U.S.C.A. § 7410) gives states the primary responsibility for achieving the NAAQS. The principal mechanism at the state level for complying with the CAA is the SIP. A SIP includes the regulatory programs, actions and commitments a State will carry out to implement its responsibilities under the CAA. Once approved by the EPA, a SIP is legally enforceable under both Federal and state law.

Section 172(c)(1) of the CAA provides that a SIP for an ozone nonattainment area must include “reasonably available control measures,” including RACT requirements, for major sources of NO_x and VOC emissions located in the ozone nonattainment area.

Section 182 of the CAA (42 U.S.C.A. § 7511a) requires that, for areas that exceed the NAAQS for ozone, states shall develop and implement a program that mandates that certain major stationary sources implement RACT. RACT is defined as the lowest emissions limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility. See 44 FR 53762 (September 17, 1979).

Under sections 182(f)(1) and 184(b)(2) of the CAA, these RACT requirements are applicable to all sources in this Commonwealth that emit or have a potential to emit greater than 100 tons per year (TPY) of NO_x. Under sections 182(b)(2) and 184(b)(2) of the CAA, these RACT requirements are applicable to all sources in this Commonwealth that emit or have a potential to emit greater than 50 TPY of VOCs. NO_x and VOC controls are required statewide because of the Commonwealth’s inclusion in the OTR.

If published in the *Pennsylvania Bulletin* as a final-form rulemaking, the final-form regulation will be submitted to the EPA as a revision to the SIP.

Compelling public interest that justifies the regulation

The EPA is required under section 109 of the CAA to establish NAAQS for six criteria pollutants, of which ozone is one. The EPA regulates ground-level ozone as a criteria air pollutant because of its widespread adverse public health and welfare and environmental effects.

Ground-level ozone is not emitted directly into the atmosphere but is formed by photochemical reactions between NO_x and VOCs in the presence of sunlight. Ozone is a highly reactive gas which at sufficient concentrations can produce a wide variety of harmful effects. At elevated concentrations, ground-level ozone can adversely affect human health, vegetation, materials, economic values, and personal comfort and well-being. It can cause damage to important food crops, forests, livestock and wildlife.

Repeated exposure to ground-level ozone pollution may cause a variety of adverse health effects for both healthy people and those with existing conditions including difficulty in breathing, chest pains, coughing, nausea, throat irritation and congestion. It can worsen bronchitis, heart disease, emphysema and asthma, and reduce lung capacity. Asthma is a significant and growing threat to children and adults. High levels of ground-level ozone can also affect animals including pets, livestock and wildlife, in ways similar to humans.

Exposure to high levels of ground-level ozone air pollution correlates to increased respiratory disease and higher mortality rates. Ozone can inflame and damage the lining of the lungs. Within a few days, the damaged cells are shed and replaced. Over a long time period, lung tissue may become permanently scarred, resulting in permanent loss of lung function and a lower quality of life. When ambient ozone levels are high, more people with asthma have attacks that require a doctor's attention or use of medication or even hospitalization. Ozone also makes people more sensitive to allergens including pet dander, pollen and dust mites, all of which can trigger asthma attacks. While children, the elderly and those with respiratory problems are most at risk, even healthy individuals may experience increased respiratory ailments and other symptoms when they are exposed to high levels of ambient ozone while engaged in activities that involve physical exertion. The EPA has concluded that there is an association between high levels of ambient ozone and increased hospital admissions for respiratory ailments including asthma.

This proposed rulemaking establishes presumptive RACT requirements and RACT emission limitations for the owners and operators of affected sources at facilities that are major NO_x emitting or major VOC emitting facilities, or both, not regulated elsewhere in Chapter 129. Emissions of NO_x and VOCs are precursors to the formation of ground-level ozone, a criteria air pollutant. High concentrations of ground-level ozone air pollution are a serious threat to public health and welfare. The measures in this proposed rulemaking are reasonably required to attain and maintain the health-and-welfare-based 2015 8-hour ozone NAAQS, protect the health and livelihoods of Pennsylvania's citizens and residents, and satisfies related CAA requirements.

Who will benefit from the regulation?

The Department estimates that implementation of the proposed control measures could reduce NO_x emissions by as much as 9,000 TPY from engines, turbines and municipal waste combustors. Implementation of the proposed NO_x and VOC control measures for the affected major sources would benefit the health and welfare of approximately 12 million residents and numerous animals, crops, vegetation and natural areas of this Commonwealth by reducing emissions of NO_x and VOCs. Ground-level ozone air pollution can also be transported downwind via regional air currents and meteorological events. Therefore, reductions of ground-level ozone in Pennsylvania will also benefit the residents of downwind states and environments.

The EPA estimated that the monetized health benefits of attaining the 2008 8-hour ozone NAAQS of 0.075 ppm, range from \$8.3 billion to \$18 billion on a National basis by 2020. Prorating that benefit to this Commonwealth, based on population, results in a public health benefit of \$337 million to \$732 million. Similarly, the EPA estimated that the monetized health benefits of attaining the 2015 8-hour ozone NAAQS of 0.070 ppm, range from \$1.5 billion to \$4.5 billion on a National basis by 2025. Prorating that benefit to this Commonwealth, based on population, results in a public health benefit of \$63 million to \$189 million. The Department is not stating that these estimated monetized health benefits would all be the result of implementing the proposed RACT measures, but the EPA estimates are

indicative of the benefits to Commonwealth residents of attaining and maintaining the 2008 and 2015 8-hour ozone NAAQS through the implementation of control measures to reduce ozone precursor emissions in the aggregate from different source categories.

In addition to causing adverse human and animal health effects, the EPA has concluded that ozone affects vegetation and ecosystems, leading to reductions in agricultural crop and commercial forest yields by destroying chlorophyll; reduced growth and survivability of tree seedlings; and increased plant susceptibility to disease, pests and other environmental stresses, including harsh weather. In long-lived species, these effects may become evident only after several years or even decades and have the potential for long-term adverse impacts on forest ecosystems. Ozone damage to the foliage of trees and other plants can decrease the aesthetic value of ornamental species used in residential landscaping, as well as the natural beauty of parks and recreation areas. These effects can have adverse impacts including loss of species diversity and changes to habitat quality and water and nutrient cycles. High levels of ground-level ozone can also cause damage to buildings and synthetic fibers, including nylon, and reduced visibility on roadways and in natural areas.

The economic value of some welfare losses due to ozone can be calculated, such as crop yield loss from both reduced seed production and visible injury to some leaf crops, including lettuce, spinach and tobacco, as well as visible injury to ornamental plants, including grass, flowers and shrubs. Other types of welfare loss may not be quantifiable, such as the reduced aesthetic value of trees growing in heavily visited parks.

Pennsylvania's 53,157 farms are the stewards of more than 7.3 million acres of farmland. With \$7.76 billion in cash receipts annually from production agriculture, Pennsylvania farmers and agribusinesses are the leading economic driver in the Commonwealth. See 2017 Census of Agriculture, Pennsylvania State Profile, United States Department of Agriculture https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Pennsylvania/cp99042.pdf. In addition to production agriculture, the industry also raises revenue and supplies jobs through support services such as food processing, marketing, transportation and farm equipment. In total, production agriculture and agribusiness contribute nearly \$135.7 billion to Pennsylvania's economy. See Pennsylvania Agriculture, A Look at the Economic Impacts and Future Trends, Version 1, January 2018, Pennsylvania Department of Agriculture, https://www.agriculture.pa.gov/Documents/PennsylvaniaAgriculture_EconomicImpactFutureTrends.pdf. These families, farms and related businesses benefit directly from the reduction of ground-level ozone air pollution concentrations.

The Pennsylvania Department of Conservation and Natural Resources (DCNR) is the steward of the 2.2 million acres of state-owned forests and 121 parks. DCNR awards millions of dollars in construction contracts each year to build and maintain the facilities in its parks and forests. From 2008 to 2015, Pennsylvania received income from timber sales averaging more than \$22 million. Hundreds of concessions throughout the park system help complete the park experience for both state and out-of-state visitors. (Source: Pennsylvania Department of Conservation and Natural Resources.)

Further, Pennsylvania leads the Nation in growing 123.2 billion board feet of standing sawtimber species, with 16.8 million acres in forest land. As the leading producer of hardwood lumber in the United States, Pennsylvania also leads in the export of hardwood lumber exporting nearly \$463 million in 2019, and over \$1.1 billion in lumber, logs, furniture and paper products to more than 70 countries around the world. Recent U.S. Forest Service data shows that the state's forest growth-to-harvest rate is better than 2

to 1. This vast renewable resource puts the hardwoods industry at the forefront of manufacturing in the Commonwealth. The total annual direct economic impact generated by Pennsylvania's wood industry was \$36.8 billion. The industry employed 65,699 people, with \$3.5 billion in wages and salaries earned. Production was 1 billion board feet of lumber annually. (Source: Pennsylvania Hardwoods Development Council.)

According to a study conducted by the American Farmland Trust, forestland and farmland yield an average of \$3 in taxes for every \$1 of required governmental services, while residential land costs \$1.11 in services for every \$1 collected in tax revenues. (Source: Forest Management and Timber Harvesting in Pennsylvania, PennState Extension, The Pennsylvania State University, 2019.)

The Department projects that the cost to the owner and operator of an affected source that would require installation of add-on control technology, for compliance with a proposed applicable presumptive RACT requirement or RACT emission limitation, would be less than \$3,750 maximum per ton of NO_x emission reductions no matter which source type and add-on control technology is considered, and very likely much less than \$3,750 per ton of NO_x emissions reduced. This cost is minimal compared to the monetized health benefits of attaining and maintaining the NAAQS and to the economic benefits generated by the Commonwealth's agricultural and hardwoods industries.

(11) Are there any provisions that are more stringent than federal standards? If yes, identify the specific provisions and the compelling Pennsylvania interest that demands stronger regulations.

No companion federal regulations exist for the proposed rulemaking requirements; therefore, there are no provisions in this proposed rulemaking that are more stringent than federal standards.

The owners and operators of sources at certain facilities that would be subject to the proposed RACT requirements or emission limitations should be able to meet presumptive RACT standards that do not require the installation of add-on control technology. For example, many of the Commonwealth's large municipal solid waste landfills and municipal waste combustors have adequate control technologies and are expected to be able to comply with the proposed presumptive RACT limitations or lower for these facilities, including the emission guidelines (40 CFR Part 60, Subparts Cc and Eb (relating to emission guidelines and compliance times for municipal solid waste landfills; and standards of performance for large municipal waste combustors for which construction is commenced after September 20, 1994 or for which modification or reconstruction is commenced after June 19, 1996)) promulgated by the EPA for large municipal solid waste landfills and municipal waste combustors. The Subpart Cc and Subpart Eb requirements, which are already in effect, were adopted and incorporated by reference in their entirety in 25 Pa. Code Chapter 122 (relating to National standards of performance for new stationary sources).

(12) How does this regulation compare with those of the other states? How will this affect Pennsylvania's ability to compete with other states?

New Jersey indicates that they are in the process of conducting their RACT analysis and have not determined if further RACT rules are required. Connecticut adopted their 2015 ozone NAAQS RACT SIP requirements in conjunction with their 2008 ozone NAAQS RACT SIP requirements and the 2015 ozone NAAQS RACT requirements remain unchanged. New York and Maryland are in the process of developing RACT regulations. No response was received from the other states in the OTR that were contacted (Delaware, Virginia, Massachusetts, Connecticut, Rhode Island, New Hampshire, Vermont and Maine).

This proposed rulemaking would improve the Commonwealth's ability to compete with other states by eliminating, in most cases, the time-consuming and costly case-by-case RACT review procedure that the owners and operators of affected facilities had to complete in the past to meet the RACT requirements implemented under §§ 129.91—129.95 (relating to stationary sources of NO_x and VOCs) for the 1-hour ozone standard and §§ 129.96—129.100 (relating to additional RACT requirements for major sources of NO_x and VOCs). See 24 Pa.B. 467 (January 15, 1994) and 46 Pa.B. 2036 (April 23, 2016).

The Ozone Transport Commission (OTC) has directed OTC Staff and the OTC Stationary and Area Source (SAS) Committee to perform technical analyses to assist OTC states in developing cost-effective strategies to reduce ozone-forming pollutants as required by the CAA. OTC staff and SAS members collect, compile and distribute technical information to support state RACT analyses. Information includes state data on control strategies, regulatory limits and cost-effectiveness. Where possible, SAS may recommend cost-effectiveness thresholds for presumptive and case-by-case basis RACT determinations.

(13) Will the regulation affect any other regulations of the promulgating agency or other state agencies? If yes, explain and provide specific citations.

No other regulations promulgated by this agency or other state agencies will be affected.

(14) Describe the communications with and solicitation of input from the public, any advisory council/group, small businesses and groups representing small businesses in the development and drafting of the regulation. List the specific persons and/or groups who were involved. ("Small business" is defined in Section 3 of the Regulatory Review Act, Act 76 of 2012.)

The overview of this RACT III rulemaking was discussed with the Air Quality Technical Advisory Committee (AQTAC) on October 17, 2019, and February 13, 2020. The proposed rulemaking draft Annex A was also discussed with AQTAC at its meeting of April 16, 2020. However, the AQTAC postponed voting and requested additional information for a special meeting on May 7, 2020. At that meeting, AQTAC voted 17-2-0 to concur with the Department's recommendation to move this proposed rulemaking forward to the Board for consideration as a proposed rulemaking. In addition, the proposed amendments were discussed with the Citizens Advisory Council (CAC) Policy and Regulatory Oversight Committee (Committee) on May 19, 2020. On the recommendation of the Committee, the CAC voted unanimously to concur with the Department's recommendation to forward this proposed rulemaking to the Board for consideration. This proposed rulemaking was discussed with the Small Business Compliance Advisory Committee (SBCAC) on April 22, 2020. The SBCAC voted 7-0-0 to concur with the Department's recommendation to forward this proposed rulemaking to the Board for consideration.

The Department will continue to work with the Department's provider of the Small Business Stationary Source Technical and Environmental Compliance Assistance services. These services are currently provided by the Environmental Management Assistance Program (EMAP) of the Pennsylvania Small Business Development Centers. The Department has partnered with EMAP to fulfill the Department's obligation to provide confidential technical and compliance assistance to small businesses as required by the APCA, section 507 of the CAA (42 U.S.C.A. § 7661f) and authorized by the Small Business and Household Pollution Prevention Program Act (35 P.S. §§ 6029.201—6029.209).

Owners or operators of small business can contact EMAP directly for assistance with air quality concerns or compliance. EMAP provides confidential, free one-on-one consulting assistance and onsite

assessments. EMAP also operates a toll-free phone line to field questions from small businesses, as well as from businesses wishing to start up in, or relocate to, this Commonwealth. EMAP operates and maintains a resource-rich environmental assistance web site and distributes an electronic newsletter to educate and inform small businesses about a variety of environmental compliance issues.

(15) Identify the types and number of persons, businesses, small businesses (as defined in Section 3 of the Regulatory Review Act, Act 76 of 2012) and organizations which will be affected by the regulation. How are they affected?

The CAA requires a re-evaluation of RACT requirements each time the EPA promulgates a NAAQS. Under the CAA, these RACT requirements are applicable to all major facilities and sources of NO_x and VOC emissions in this Commonwealth. This Federally mandated, proposed rulemaking affects the owner and operator of a major NO_x emitting facility or a major VOC emitting facility, or both, that was in existence on or before August 3, 2018, that is not regulated elsewhere in Chapter 129. The proposal also applies to a modification at an existing source after August 3, 2018, that results in the source or facility being considered a major NO_x or major VOC emitting source or facility.

There are at least ten source categories that would be affected by this proposed rulemaking: combustion units; municipal solid waste landfills; municipal waste combustors; process heaters; turbines; stationary internal combustion engines; Portland cement kilns; glass melting furnaces; lime kilns; direct-fired heaters, furnaces or ovens; and other sources that are not regulated elsewhere under Chapter 129. The sources included in these ten categories are located at various facility types including fossil fuel-burning and other electric generation; natural gas pipeline transport and distribution; petroleum refining; petroleum and coal products manufacturing; steam and air conditioning supply; fats and oils refining and blending; specialty canning; tobacco products manufacturing; carpet and rug milling; reconstituted wood product manufacturing; paper and paperboard products manufacturing; printing; medicinal and botanical products manufacturing; iron and steel milling, manufacturing and forging; ferroalloy manufacturing; nonferrous metal smelting and refining; semiconductor and related device manufacturing; aircraft manufacturing; chemicals manufacturing; Portland cement manufacturing; railroad rolling stock manufacturing; motorcycle manufacturing; wireless telecommunications carriers; colleges and universities; home health care services; hospitals; pharmaceuticals manufacturing; beer brewing; and biotechnology.

The owners and operators of facilities that would be subject to this proposed rulemaking are subject to the requirements of §§ 129.91—129.95 (RACT I) that were implemented for the 1-hour ozone standard. The RACT I requirements were effective upon publication in the *Pennsylvania Bulletin* on January 15, 1994 (24 Pa.B. 467).

On March 27, 2008, the EPA lowered the 8-hour standard from 0.08 ppm averaged over 8 hours to 0.075 ppm. See 73 FR 16436. The owners and operators of facilities that would be subject to this proposed rulemaking are also subject to Pennsylvania's RACT regulations at §§ 129.96—129.100 (RACT II). The RACT II regulations were promulgated to implement the 1997 and 2008 8-hour ozone standards and were effective upon publication in the *Pennsylvania Bulletin* on April 23, 2016 (46 Pa.B. 2036).

On October 26, 2015, the EPA lowered the 8-hour standard from 0.075 ppm to 0.070 ppm. See 80 FR 65292. This proposed rulemaking is designed to implement RACT requirements to meet the 2015 ozone standard. This proposed rulemaking would be applicable to the same businesses, including small businesses, that are already subject to the RACT II requirements. However, sources installed after

August 3, 2018, at these businesses are already subject to best available technology, so the Department would not propose additional requirements for these facilities.

RACT requirements are applicable to the owners and operators of all sources in Pennsylvania that emit or have a potential to emit greater than 100 TPY of NO_x or 50 TPY of VOCs. There are approximately 500 Title V facility owners and operators in Pennsylvania that may be subject to this proposed rulemaking. Generally, small business sources do not emit greater than 100 TPY of NO_x or 50 TPY of VOCs. This proposed rulemaking includes the following flexibilities for compliance:

- The requirements do not apply to the owner and operator of a NO_x air contamination source located at a major NO_x emitting facility that has the potential to emit less than 1 TPY of NO_x or of a VOC air contamination source located at a major VOC emitting facility that has the potential to emit less than 1 TPY of VOC.
- The requirements do not apply to the owner and operator of a facility that elects to take a limit below 100 TPY of NO_x or 50 TPY of VOC.
- The case-by-case requirements do not apply to the owner and operator with a potential emission rate less than 5.0 tons of NO_x per year or 2.7 tons of VOC per year.

The flexibility afforded to the owners and operators of potentially affected facilities, including small businesses, in this proposed rulemaking ensures minimal negative effect on their operations. The owners and operators of potentially affected facilities are familiar with the existing requirements for emissions control, emissions reporting and recordkeeping for their entity, and have the professional and technical skills needed for continued compliance with these requirements.

The Department reviewed its database of regulated facilities with RACT-related permit conditions to determine how many, and which, potentially meet the definition of small business now specified in Section 3 of the Regulatory Review Act, as “in accordance with the size standards described by the [Small Business Administration’s] SBA’s Small Business Size Regulations under 13 CFR Chapter 1 Part 121 (relating to Small Business Size Regulations) or its successor regulation.” The Department cross-referenced facility North American Industry Classification System (NAICS) information from its database with the “Table of Small Business Size Standards Matched to North American Industry Classification System Codes effective August 19, 2019,” obtained from the SBA website at <https://www.sba.gov/document/support--table-size-standards>. The SBA table gives different determination criteria for different NAICS codes. A small business may be defined, for example, by sales, number of employees, or electric generation capacity in the case of utilities. The Department then accessed the SBA Dynamic Small Business Search database which contains information about small businesses that have registered with the SBA. This self-certifying database incorporates the small business criteria contained in 13 CFR Chapter 1 Part 121, including NAICS codes, when the owners/operators of such companies register. This registration benefits the owners and operators of small businesses because the database assists government contracting officers in determining whether a company is eligible as a small business.

For electric generation facilities, the Department obtained yearly generation information from the Federal Energy Information Agency databases at <http://www.eia.gov/electricity/data/eia860/>. This information was correlated with the NAICS table definitions cited above to determine which electric generation facilities could be classified as small businesses.

From these sources, the Department preliminarily determined that the owners and operators of approximately 10-30 affected major facilities under the Department's jurisdiction meet the definition of "small business" now specified in Section 3 of the Regulatory Review Act. The Department expects that the negative impact on the owners and operators of these major facilities/small businesses will be minimal due to the flexibility provided in the proposed rulemaking to achieve compliance with the requirements. The Department will continue to work with EMAP with regard to small businesses.

Under proposed § 129.113 (relating to facility-wide or system-wide NO_x emissions averaging RACT operating permit modification general requirements), the owner or operator of an affected major NO_x emitting facility, including a small business-sized facility, that includes an air contamination source subject to a NO_x RACT requirement or NO_x RACT emission limitation in § 129.112 (relating to presumptive RACT requirements, RACT emission limitations and petition for alternative compliance schedule) that cannot meet the applicable presumptive NO_x RACT requirement or NO_x RACT emission limitation, may elect to meet the applicable presumptive NO_x RACT requirement or NO_x RACT emission limitation in § 129.112 by averaging NO_x emissions on either a facility-wide or system-wide basis. System-wide emissions averaging must be among sources under common control of the same owner or operator in this Commonwealth and within the same nonattainment area. Under proposed § 129.114 (relating to alternative RACT proposal and petition for alternative compliance schedule) the owner or operator of an air contamination source that cannot meet the applicable presumptive RACT requirement or RACT emission limitation of § 129.112 or participate in either a facility-wide or system-wide NO_x emissions averaging RACT operating permit modification under § 129.113 may propose an alternative NO_x RACT requirement, NO_x RACT emission limitation, VOC RACT requirement or VOC RACT emission limitation.

(16) List the persons, groups or entities, including small businesses, that will be required to comply with the regulation. Approximate the number that will be required to comply.

There are approximately 500 Title V facilities in Pennsylvania that may be subject to this proposed rulemaking. This proposed rulemaking would affect owners and operators of major NO_x emitting or VOC emitting facilities, or both, for which no RACT requirements for sources have been otherwise established in Chapter 129. These sources include those that are not regulated elsewhere in Chapter 129 or through implementation of CTG recommendations for a source category. The owners and operators of affected facilities existing on or before August 3, 2018, and currently subject to RACT requirements implemented under §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e, 129.54—129.63a, 129.64—129.69, 129.71, 129.72, 129.73, 129.75, 129.77 and 129.101—129.107 may already have the applicable RACT limitations included in their permit to comply with the applicable regulation. The requirements of this proposed rulemaking would also apply to a modification at an existing source after August 3, 2018, that results in the source or facility being considered a major NO_x or major VOC emitting source or facility.

As described in the response to question (15), the Department has preliminarily determined that the owners and operators of approximately 10-30 affected major facilities under the Department's jurisdiction meet the definition of "small business" specified in Section 3 of the Regulatory Review Act. Included in this group are petroleum and coal products manufacturers; electric power generators; paper mills; pharmaceuticals manufacturers; and colleges and universities. The Department expects that the negative impact on these small business-sized major facilities will be minimal. In those instances where the owner and operator of a small business-sized major facility is not able to comply with the specified presumptive RACT requirements, the owner and operator may submit a request to meet emission

limitations on either a facility-wide or system-wide NO_x emissions averaging basis. System-wide emissions averaging must be among sources under common control of the same owner or operator in this Commonwealth and within the same nonattainment area. The owner or operator of an air contamination source that cannot meet the applicable presumptive RACT requirement or RACT emission limitation may propose an alternative NO_x RACT requirement, NO_x RACT emission limitation, VOC RACT requirement or VOC RACT emission limitation under 25 Pa. Code § 129.114. The flexibility afforded by this proposed rulemaking ensures minimal negative effect on the owners and operators of affected major facilities/small businesses and their operations.

(17) Identify the financial, economic and social impact of the regulation on individuals, small businesses, businesses and labor communities and other public and private organizations. Evaluate the benefits expected as a result of the regulation.

Due to the diverse types of potentially affected source categories listed in the response to question (15), specific impacts of this proposed rulemaking on industry would vary. The implementation of §§ 129.91—129.95 for attaining and maintaining the 1-hour ozone standard required the Department to submit approximately 600 case-by-case RACT determinations from 1995 to 2006 to the EPA Administrator for Federal approval as revisions to Pennsylvania's SIP. The Department averted a similar issue with the implementation of presumptive RACT standards in §§ 129.96—129.100; whereby, optimization of existing control measures may have been necessary to meet the presumptive standards. However, the implementation of the RACT II presumptive standards in 2016 resulted in the Department evaluating and preparing approximately 135 individual case-by-case SIP submittals under §§ 129.96—129.100. This proposed rulemaking would establish applicability requirements for the implementation of specified RACT requirements for the ten identified source types for attaining the 2015 8-hour ozone standard and maintaining the 1997 and 2008 8-hour ozone standards. This proposed rulemaking would also establish presumptive, averaging and alternative RACT requirements for other subject source types. The measures in this proposed rulemaking are reasonably necessary to attain and maintain the applicable health-and welfare-based 8-hour ozone NAAQS in this Commonwealth and to establish consistent standards for the owners and operators of all affected facilities that are major NO_x emitting or VOC emitting facilities, or both.

Benefits of this proposed rulemaking to the affected owners and operators include implementation of consistent presumptive RACT requirements and RACT emission limitations across the Commonwealth. This would minimize the need for owners and operators to develop a case-by-case RACT permit application with the associated costs and time constraints. This would minimize the downtime to the operation and allow owners and operators to maintain and grow their operations, maintain jobs and staffing levels, and maintain or increase their revenues.

Benefits to the Department would include the minimization of case-by-case permit reviews and the associated demand on staff resources.

This proposed rulemaking may create economic opportunities for NO_x and VOC emission control technology innovators, manufacturers and distributors through an increased demand for new or improved equipment. In addition, the owners and operators of regulated facilities may be required to install and operate an emissions monitoring system or equipment necessary for an emissions monitoring method in order to comply with this proposed rulemaking, thereby creating an economic opportunity for the emissions monitoring industry.

Other than the significant environmental and health benefits due to emission reductions, the Department is not aware of any benefits of this proposed rulemaking to individuals, labor communities and other public and private organizations.

(18) Explain how the benefits of the regulation outweigh any cost and adverse effects.

Each time the EPA revises the ozone NAAQS, owners and operators of existing facilities subject to RACT are required to re-evaluate what constitutes RACT for their source to achieve the lowest emission limit for NO_x or VOCs that the source is capable of meeting, considering technological and economic feasibility. The Department began implementing RACT in 1994 under §§ 129.91—129.95 for the 1979 and 1993 1-hour ozone standard. See 24 Pa.B. 467 (January 15, 1994). The Department's case-by-case analysis process began in 1995 and was not completed until 2006 due to the need for EPA approval of SIP submittals for the case-by-case RACT determinations. The RACT program initiated by the Department in 2016, under §§ 129.96—129.100 for the 1997 and 2008 ozone standards, required 135 case-by-case submissions. See 46 Pa.B. 2036 (April 23, 2016). Many facility owners and operators had to hire consultants or additional staff to complete their case-by-case RACT analyses and proposals, and handle the permitting requirements. This proposed rulemaking would significantly reduce or eliminate these costs for most of the owners and operators of potentially affected facilities under §§ 129.111—129.115 due to the addition of more source categories that have presumptive RACT requirements.

Ozone precursor emission reductions achieved through the implementation of presumptive RACT requirements and RACT emission limitations for the affected sources would help the Commonwealth attain and maintain the 2015 8-hour ozone standard, and maintain the 1997 and 2008 8-hour ozone NAAQS. Given that implementation of RACT requirements is Federally required, the Department estimates that the proposed presumptive RACT requirements and RACT emission limitations would achieve greater emission reductions at a lower cost to the affected owners and operators and to the Commonwealth. Further, these reductions would occur in a timelier manner than implementation of another round of case-by-case determinations for every affected major source of NO_x or VOCs than occurred under §§ 129.91—129.95 and 129.96—129.100. For example, the averaging provisions proposed under § 129.113 would provide ozone precursor emission reductions at the lowest cost while preserving existing reductions or realizing additional reductions.

By establishing consistent presumptive RACT requirements and RACT emission limitations statewide for the owners and operators of affected major NO_x emitting or VOC emitting facilities, or both, and by providing flexibility in compliance through emissions averaging and case-specific options, the owners and operators of affected facilities would be able to achieve compliance in the most cost-effective manner. The proposed rulemaking would minimize the need for most case-by-case determinations and give the owners and operators of affected facilities the flexibility to achieve compliance by meeting the presumptive limits through an emission averaging protocol before having to resort to a time-consuming and costly case-by-case analysis.

Reduced ambient concentrations of ground-level ozone would reduce the incidences of hospital admissions for respiratory ailments including asthma, and improve the quality of life for citizens overall. While children, the elderly and those with respiratory problems are most at risk, even healthy individuals may experience increased respiratory ailments and other symptoms when they are exposed to high levels of ambient ground-level ozone while engaged in activities that involve physical exertion.

(19) Provide a specific estimate of the costs and/or savings to the **regulated community** associated with compliance, including any legal, accounting or consulting procedures which may be required. Explain how the dollar estimates were derived.

The Department conducted a generic RACT analysis of existing sources to determine if additional controls would represent RACT for the 2015 8-hour ozone NAAQS. That generic analysis identified existing affected source categories by size and fuel type; identified available feasible NO_x or VOC control options, or both, for each type of existing source; estimated emission reduction potential for each control technology; identified costs for technologies, using appropriate updates; evaluated cost-effectiveness using the guidance provided in the EPA Air Pollution Control Cost Manual, EPA/452/B-02-001, 6th edition, January 2002, for both uncontrolled and controlled sources (combinations of technologies); and proposed as RACT in this proposed rulemaking the emission limit that is achievable by cost-effective technologies using benchmark cost per ton of emissions reduced. The EPA is in the process of a revision to the 6th edition of the Air Pollution Control Cost Manual that is expected to be completed in January 2022, with individual chapters being released in stages.

Based on this analysis the Department has determined that cost-effective controls would represent RACT for the 2015 8-hour ozone NAAQS for ten existing source categories - combustion units; municipal solid waste landfills; municipal waste combustors; process heaters; turbines; stationary internal combustion engines; cement kilns; glass melting furnaces; lime kilns; and direct-fired heaters, furnaces or ovens; as well as other existing source categories that are not regulated elsewhere under Chapter 129. Compliance costs would vary for each source or facility depending on which compliance option is chosen by the owner and operator of the affected source or facility. This proposed rulemaking would include a provision for the owner and operator of an affected facility that cannot meet the applicable presumptive NO_x RACT requirement or emission limitation to elect to meet the applicable presumptive NO_x RACT requirement or NO_x RACT emission limitation by averaging NO_x emissions on either a facility-wide or system-wide basis. The owner and operator of an affected source that cannot meet the applicable presumptive RACT requirement or RACT emission limitation may propose an alternative NO_x RACT requirement, NO_x RACT emission limitation, VOC RACT requirement or VOC RACT emission limitation on a case-by-case basis.

Under these alternative compliance provisions, the owner or operator must demonstrate to the Department's satisfaction that it is economically or technically infeasible to meet the applicable proposed presumptive NO_x RACT requirement or emission limitation or VOC RACT requirement or emission limitation. The flexibility provided by these alternative compliance provisions may minimize compliance costs to the owner or operator of an affected facility. The owner and operator must bear the costs of public hearings and notifications, including newspaper notices, required for the SIP submittal, as well as application fees. These fees are estimated to be \$4,000 - \$6,000 per facility.

The Department anticipates that the owners and operators of most of the affected source units would be able to meet the presumptive RACT standard without the installation of additional add-on controls, so likely there will be little or no cost incurred by most of the affected owners and operators. Additionally, these owners and operators would not need to hire consultants or additional staff to perform a case-by-case analysis to determine what control measures are needed at the affected facility to comply with the proposed RACT requirements necessary to meet the 1997, 2008 and 2015 8-hour ozone NAAQS. Further, these owners and operators would not need to purchase and install add-on controls or submit a request for approval to implement a facility-wide or system-wide NO_x emissions averaging plan or

propose an alternative NO_x RACT requirement, NO_x RACT emission limitation, VOC RACT requirement or VOC RACT emission limitation on a case-by-case basis.

Compliance costs include the total capital investment of the add-on control equipment, the annual operating costs of the add-on control equipment and the cost-effectiveness of the add-on control equipment in reducing emissions from the source. The cost-effectiveness of the add-on control equipment is calculated by dividing the annual operating costs of the add-on control equipment by the amount of emission reductions achieved annually from operation of the add-on control equipment. It is not possible to provide a precise estimate of the costs that would be incurred by the owner or operator of a specific source due to not knowing what type of add-on control equipment the owner or operator may choose, and to the variability in capital investment costs and annual operating costs for the chosen add-on control equipment. Capital costs include the purchase and installation costs for the chosen add-on control technology and the costs of monitoring equipment that may be required for the add-on control equipment, along with delivery costs, start-up costs, initial testing and taxes. Annual operating costs include the costs of electricity or fuel to operate the add-on control technology and the monitoring equipment, if needed, as well as maintenance and repair costs, overhead, capital recovery and property taxes. Precisely estimating the cost-effectiveness of each add-on control technology for each affected source is not possible since the actual amount of emissions reduced would not be known until the add-on control equipment is installed and operated.

While developing a precise estimate of compliance costs for the affected owners and operators is not possible, the Department projected what control technology might be applied to each affected source. For the combustion units and process heaters, combustion turbines, stationary internal combustion engines, Portland cement kilns, glass furnaces, and municipal waste combustor source types, the Department reviewed its permit databases and cataloged existing sources subject to case-by-case NO_x and VOC emission limitations under the second round of RACT (RACT II) implemented under §§ 129.96—129.100. The information collected included the RACT II emission limitation and required emission control technology for each source. The RACT II uncontrolled emission limitations were used as a baseline to determine technical and economic feasibility for emission controls for the third round of RACT (RACT III) in this proposed rulemaking.

The Department adjusted the RACT II cost benchmarks of \$2,800 and \$5,500 per ton of NO_x or VOC emissions removed, respectively, by multiplying by the consumer price index (CPI) differential between 2014 and 2020 to arrive at benchmarks of \$3,000 and \$6,000 per ton of NO_x or VOC emissions removed, respectively, for RACT III. The Department further adjusted cost-effectiveness benchmarks to \$3,750 per ton of NO_x and \$7,500 per ton of VOC to ensure the implementation of RACT level controls similar to what was done for RACT II. See 46 Pa.B. 2044 (April 23, 2016). The Department concludes that the RACT presumptive limits included in the proposed RACT III Rule are reasonable as they reflect control levels achieved by the application and consideration of available control technologies, after considering both the economic and technological circumstances of Pennsylvania's sources. It should be noted that the presumptive benchmarks proposed in this rulemaking are higher than those used by EPA. For the proposed Cross-State Air Pollution (CSAPR) rule, EPA used a control stringency level set at a marginal cost of \$1,600 per ton of NO_x emission reductions to identify a uniform NO_x emission control stringency level at which EPA determines maximum cost-effective EGU NO_x emission reductions and downwind ozone air quality improvements. See 85 FR 68964 (October 30, 2020). Using these cost benchmarks as a guide, the Department evaluated technically feasible emission controls for cost-effectiveness and economic feasibility. The RACT III NO_x and VOC emission limitations included in this proposed rulemaking were determined from this evaluation.

Using these benchmarks, the Department projects that the cost of complying with the applicable presumptive RACT requirement or RACT emission limitation by installing add-on control technology or by complying through an averaging protocol would be less than \$3,750 per ton of NO_x emission reductions, no matter which source type and add-on control technology is considered.

The Department estimates that the projected maximum total cost of control for the owners and operators of affected sources needing add-on control technology would be \$25 million with sources operating continuously. The Department estimates that implementation of the proposed control measures could reduce NO_x emissions by as much as 9,000 TPY from engines, turbines and municipal waste combustors. The amount of actual NO_x emission reductions achieved could be less depending on whether a source is already controlled sufficiently to comply with the proposed RACT requirements or on what type of add-on control technology is implemented for a source that needs add-on control to achieve compliance with the proposed RACT requirements. The Department evaluated stack test results and current allowable emission limits for NO_x and VOC emissions. Based on this data, the Department assumed the population of sources that may require additional NO_x and/or VOC control to meet the RACT III emission limit. The Department estimated the cost for the resultant reduction using cost effectiveness thresholds for NO_x and VOC controls and multiplied them by the estimated tons per year reduced.

No new legal accounting or consulting procedures are anticipated.

(20) Provide a specific estimate of the costs and/or savings to the **local governments** associated with compliance, including any legal, accounting or consulting procedures which may be required. Explain how the dollar estimates were derived.

The Department identified 11 local government-owned permitted Title V landfills and boilers that would be subject to this proposed rulemaking. The Department found that all of the landfills already comply with the applicable new source performance standard. The RACT III requirements for landfills are the same as the new source performance standard. The remaining affected sources are boilers rated at less than 50 million British thermal units per hour, engines rated at less than 500 brake horsepower or engines with an operating-hours cap of 500 or fewer hours per year. The Department does not anticipate additional compliance costs or savings for these sources.

The Department does not anticipate any costs or savings to local governments due to this proposed rulemaking.

(21) Provide a specific estimate of the costs and/or savings to the **state government** associated with the implementation of the regulation, including any legal, accounting, or consulting procedures which may be required. Explain how the dollar estimates were derived.

The Department identified 24 state-owned permitted Title V sources that would be subject to this proposed rulemaking. None of the 24 sources would need to install add-on control equipment to comply with this proposed rulemaking.

The Department would realize administrative savings with regard to paid salaries and benefits compared to the previous case-by-case RACT determinations and permitting requirements implemented under §§ 129.96—129.100 due to the lower amount of review time required under the presumptive RACT

program in this proposed rulemaking. The Department could save more than \$3,500 for every 100 hours of review time that would be avoided under this proposed rulemaking. The flexibility provided in this proposed rulemaking is designed to minimize or even eliminate the number of case-by-case applications that would need to be processed without the proposed presumptive requirements. The review of case-by-case permit applications by the Department requires significantly greater time than review of permit applications that implement presumptive RACT limits or requirements.

The Department would incorporate the new RACT requirements into the Title V operating permits for each affected facility during the normal permit renewal process if less than 3 years remain in the permit term. However, if more than 3 years remain in the permit term, permit modifications would be necessary. No additional administrative costs are anticipated for the Department.

(22) For each of the groups and entities identified in items (19)-(21) above, submit a statement of legal, accounting or consulting procedures and additional reporting, recordkeeping or other paperwork, including copies of forms or reports, which will be required for implementation of the regulation and an explanation of measures which have been taken to minimize these requirements.

No additional legal, accounting or consulting procedures are expected for the groups identified in items (19)-(21) above. The proposed amendments do not add or change the existing reporting, recordkeeping or other paperwork requirements for the owners and operators of facilities that would be subject to this proposed rulemaking. The presumptive emission limitations established in this proposed rulemaking would not require the submission of applications for amendments to existing operating permits. These proposed requirements would be incorporated as applicable requirements at the time of permit renewal if less than 3 years remain in the permit term, as specified under 25 Pa. Code § 127.463(c) (relating to operating permit revisions to incorporate applicable standards). If 3 years or more remain in the permit term, the requirements would be incorporated as applicable requirements in the permit within 18 months of the promulgation of the final-form rulemaking, as required under § 127.463(b). The owners and operators of the affected facilities are familiar with the existing requirements for recordkeeping and reporting for their entity and have the professional and technical skills needed for continued compliance with these requirements.

(22a) Are forms required for implementation of the regulation?

No forms are required.

(22b) If forms are required for implementation of the regulation, **attach copies of the forms here**. If your agency uses electronic forms, provide links to each form or a detailed description of the information required to be reported. **Failure to attach forms, provide links, or provide a detailed description of the information to be reported will constitute a faulty delivery of the regulation.**

No further forms are required.

(23) In the table below, provide an estimate of the fiscal savings and costs associated with implementation and compliance for the regulated community, local government, and state government for the current year and five subsequent years.

	Current FY Year 20/21	FY +1 Year 21/22	FY +2 Year 22/23	FY +3 Year 23/24	FY +4 Year 24/25	FY +5 Year 25/26
SAVINGS:	\$	\$	\$	\$	\$	\$
Regulated Community	0.00	0.00	0.00	0.00	0.00	0.00
Local Government	0.00	0.00	0.00	0.00	0.00	0.00
State Government	0.00	0.00	0.00	0.00	0.00	0.00
Total Savings	0.00	0.00	0.00	0.00	0.00	0.00
COSTS:						
Regulated Community	0.00	0.00	38,500,000	77,000,000	77,000,000	77,000,000
Local Government	0.00	0.00	0.00	0.00	0.00	0.00
State Government	0.00	0.00	0.00	0.00	0.00	0.00
Total Costs	0.00	0.00	38,500,000	77,000,000	77,000,000	77,000,000
REVENUE LOSSES:						
Regulated Community	0.00	0.00	0.00	0.00	0.00	0.00
Local Government	0.00	0.00	0.00	0.00	0.00	0.00
State Government	0.00	0.00	0.00	0.00	0.00	0.00
Total Revenue Losses	0.00	0.00	0.00	0.00	0.00	0.00

(23a) Provide the past three year expenditure history for programs affected by the regulation.

Program	FY -3 17/18	FY -2 18/19	FY -1 19/20	Current FY 20/21
Environmental Program Management (161-10382)	\$29,413,000	\$30,932,000	\$28,420,000	\$35,504,000
Clean Air Fund Major Emission Facilities (215-20077)	\$17,480,000	\$17,878,000	\$18,759,000	\$20,801,000
Clean Air Fund Mobile and Area Facilities (233-20084)	\$8,727,000	\$9,369,000	\$9,900,000	\$11,290,000

(24) For any regulation that may have an adverse impact on small businesses (as defined in Section 3 of the Regulatory Review Act, Act 76 of 2012), provide an economic impact statement that includes the following:

(a) An identification and estimate of the number of small businesses subject to the regulation.

The Department reviewed its database of regulated facilities with RACT-related permit conditions to determine how many, and which, potentially meet the definition of small business now specified in Section 3 of the Regulatory Review Act, as “in accordance with the size standards described by the SBA’s Small Business Size Regulations under 13 CFR Chapter 1 Part 121 (relating to Small Business Size Regulations) or its successor regulation.” The Department cross-referenced facility North American Industry Classification System (NAICS) information from its database with the “Table of Small Business Size Standards Matched to North American Industry Classification System Codes effective January 7, 2013”, obtained from the SBA website at

[http://www.sba.gov/sites/default/files/files/Size_Standards_Table\(1\).pdf](http://www.sba.gov/sites/default/files/files/Size_Standards_Table(1).pdf). The SBA table gives different determination criteria for different NAICS codes. A small business may be defined by sales, number of employees, or generation capacity in the case of utilities. The Department then accessed the SBA Dynamic Small Business Search database which contains information about small businesses that have registered with the SBA. This self-certifying database incorporates the small business criteria contained in 13 CFR Chapter 1 Part 121, such as NAICS codes, when the owners/operators of such companies register. This registration benefits small businesses because the database assists government contracting officers in determining whether a company is eligible as a small business.

Finally, the Department contacted the Small Business Development Center and used its access to EMAP programs.

For power generation facilities, the Department obtained yearly generation information from the Federal Energy Information Agency databases at <http://www.eia.gov/electricity/data/cia860/>. This information was correlated with the NAICS table definitions cited above to determine which power generation facilities could be classified as small businesses.

From these sources of information, the Department determined that the owners and operators of approximately 10-30 facilities under the Department’s jurisdiction meet the definition of “small business” specified in Section 3 of the Regulatory Review Act. These facilities include petroleum and coal products manufacturers, electric power generators, paper mills, pharmaceutical preparation manufacturers, and colleges and universities. The Department expects that the impact on these small businesses will be minimal. In those cases where a small business is not able to comply with the specified presumptive RACT requirements, owners and operators may submit a request to meet emission limitations by facility-wide or system-wide averaging plan protocol, or may submit a request for an alternative case-specific emission limitation. The flexibility afforded small businesses in this proposed rulemaking ensures minimal negative effect on their operations.

(b) The projected reporting, recordkeeping and other administrative costs required for compliance with the proposed regulation, including the type of professional skills necessary for preparation of the report or record.

No new reporting, recordkeeping or other administrative procedures are required in this proposed rulemaking for small businesses. The proposed amendments do not add or change the existing reporting,

recordkeeping or other paperwork requirements for the owners and operators of facilities subject to this proposed rulemaking. The owners and operators of subject facilities are familiar with the existing requirements for reporting and recordkeeping for their entity and have the professional and technical skills needed for continued compliance with these requirements.

(c) A statement of probable effect on impacted small businesses.

By establishing consistent standards for all facilities that are major NO_x emitting or major VOC emitting facilities, or both, and by providing flexibility in compliance through emissions averaging and case-specific options, the owners and operators of these facilities will be able to achieve compliance in the most cost-effective manner. The effects on the regulated community should be very limited and are minimized through these alternative compliance provisions.

(d) A description of any less intrusive or less costly alternative methods of achieving the purpose of the proposed regulation.

The requirement to adopt and implement RACT requirements is Federally mandated. All businesses, whether or not meeting the designation of small business, that are major NO_x emitting or major VOC emitting facilities, or both, will be required to control emissions to meet the presumptive levels established in this proposed rulemaking. This proposed rulemaking incorporates flexibility to achieve the proposed presumptive RACT limits and requirements. By establishing consistent RACT standards for all facilities that are major NO_x emitting or major VOC emitting facilities, or both, and by providing flexibility in compliance through emissions averaging and case-specific options, the owners and operators of affected facilities will be able to achieve compliance in the most cost-effective manner. These options provide all owners or operators, whether small business or not, increased flexibility to meet Federally mandated RACT requirements in the most cost-effective manner.

Many owners or operators of major NO_x emitting or major VOC emitting facilities, or both, will not require additional control measures to comply with the proposed RACT requirements. The effects on any small business should be very limited and are minimized through these alternative compliance provisions including emissions averaging and case-specific options to demonstrate compliance with the proposed RACT requirements.

No new legal accounting or consulting procedures would be required.

(25) List any special provisions which have been developed to meet the particular needs of affected groups or persons including, but not limited to, minorities, the elderly, small businesses, and farmers.

RACT is Federally mandated and applies to the owners and operators of major air contamination sources of NO_x or VOCs emissions, or both. All businesses, whether or not they are considered a small business, that are major NO_x emitting or major VOC emitting facilities, or both, will be required to control emissions, if necessary, to meet the presumptive levels established in this proposed rulemaking. This proposed rulemaking provides flexibility for demonstrating compliance through emissions averaging and case-by-case RACT determination options. The owners and operators of affected facilities would be able to achieve compliance in the most cost-effective manner. These options provide all owners or operators, whether minorities or small businesses, with increased flexibility to meet Federal RACT requirements in the most cost-effective manner available.

Minorities, the elderly, small businesses and farmers who are not owners or operators of a major NO_x emitting or a major VOC emitting facility, or both, would not be affected by this proposed rulemaking.

(26) Include a description of any alternative regulatory provisions which have been considered and rejected and a statement that the least burdensome acceptable alternative has been selected.

This proposed rulemaking is considered the least burdensome acceptable method of ensuring compliance with the Federal RACT mandate. Many owners or operators of major NO_x emitting or major VOC emitting facilities, or both, will not need to do anything more to control emissions than they have already done. This proposed rulemaking incorporates flexibility to achieve the proposed RACT standards. This proposed rulemaking establishes consistent presumptive RACT standards throughout this Commonwealth for the owners and operators of facilities that are major NO_x emitting or VOC emitting facilities, or both. No new legal accounting or consulting procedures would be required.

(27) In conducting a regulatory flexibility analysis, explain whether regulatory methods were considered that will minimize any adverse impact on small businesses (as defined in Section 3 of the Regulatory Review Act, Act 76 of 2012), including:

- a) The establishment of less stringent compliance or reporting requirements for small businesses.

RACT is Federally mandated. Owners and operators of small business-sized major NO_x emitting or major VOC emitting facilities, or both, would have several options available to comply with the proposed RACT requirements. This proposed rulemaking incorporates flexibility to achieve the proposed presumptive RACT standards. By establishing consistent presumptive RACT standards for the owners and operators of all facilities that are major NO_x emitting or major VOC emitting facilities, or both, and by providing flexibility in compliance through emissions averaging and case-by-case RACT determinations, the owners and operators of affected facilities that are also small businesses would be able to achieve compliance in the most cost-effective manner. These options provide all owners or operators, whether small business-sized or not, increased flexibility to meet the Federally mandated RACT requirements in the most cost-effective manner available.

Many owners or operators of major NO_x emitting or major VOC emitting facilities, or both, will not need to do anything more to control emissions than they have already done. Others will be able to meet the requirements using the flexible compliance options provided in this proposed rulemaking. The negative effects on any small business should be very limited and would be minimized through these alternative compliance provisions.

- b) The establishment of less stringent schedules or deadlines for compliance or reporting requirements for small businesses.

This proposed rulemaking includes provisions for all owners or operators of small business-sized major NO_x emitting or major VOC emitting facilities, or both, to submit requests for alternative compliance schedules.

- c) The consolidation or simplification of compliance or reporting requirements for small businesses.

The owners and operators of subject small business-sized facilities are familiar with the existing requirements for recordkeeping and reporting for their entity and have the professional and technical skills needed for continued compliance with these requirements.

- d) The establishment of performance standards for small businesses to replace design or operational standards required in the regulation.

Many owners or operators of small business-sized major NO_x emitting or major VOC emitting facilities, or both, will not need to do anything more to control emissions than they have already done. Others will be able to meet the requirements using the flexible compliance options provided in this proposed rulemaking.

- e) The exemption of small businesses from all or any part of the requirements contained in the regulation.

RACT is Federally mandated. The owners and operators of all affected businesses, whether or not meeting the designation of small business, that are major NO_x emitting or major VOC emitting facilities, or both, will be required to control emissions to meet the presumptive RACT levels established in this proposed rulemaking. Alternatively, the owners and operators of affected facilities may participate in an averaging program as described in this proposed rulemaking or submit a case-by-case RACT analysis if the prior two options are not cost-effective. These alternative compliance options provide all owners or operators, whether small business or not, increased flexibility to meet the Federally mandated RACT requirements in the most cost-effective manner available.

This proposed rulemaking is considered the most flexible as well as least burdensome acceptable method of ensuring compliance with the Federal RACT mandate. This proposed rulemaking incorporates flexibility to achieve Federally mandated RACT standards and establishes consistent RACT standards for the owners and operators of all facilities that are major NO_x emitting or major VOC emitting facilities, or both.

(28) If data is the basis for this regulation, please provide a description of the data, explain in detail how the data was obtained, and how it meets the acceptability standard for empirical, replicable and testable data that is supported by documentation, statistics, reports, studies or research. Please submit data or supporting materials with the regulatory package. If the material exceeds 50 pages, please provide it in a searchable electronic format or provide a list of citations and internet links that, where possible, can be accessed in a searchable format in lieu of the actual material. If other data was considered but not used, please explain why that data was determined not to be acceptable.

RACT is Federally mandated. The Department has prepared a Technical Support Document to support this proposed rulemaking.

(29) Include a schedule for review of the regulation including:

- | | |
|---|--------------------------------|
| A. The length of the public comment period: | <u>66 days</u> |
| B. The date or dates on which any public meetings or hearings will be held: | <u>September 7, 8, 9, 2021</u> |
| C. The expected date of delivery of the final-form regulation: | <u>1st Quarter 2022</u> |
| D. The expected effective date of the final-form regulation: | <u>1st Quarter 2022</u> |
| E. The expected date by which compliance with the final-form regulation will be required: | <u>January 1, 2023</u> |
| F. The expected date by which required permits, licenses or other approvals must be obtained: | <u>Not Applicable</u> |

(30) Describe the plan developed for evaluating the continuing effectiveness of the regulations after its implementation.

The Board is not establishing a sunset date for this proposed rulemaking, since it is needed for the Department to carry out its statutory authority. The Department will closely monitor this proposed rulemaking after promulgation as a final-form rulemaking in the *Pennsylvania Bulletin* for its effectiveness and recommend updates to the Board as necessary.

**TECHNICAL SUPPORT DOCUMENT FOR
PROPOSED RULEMAKING
ENVIRONMENTAL QUALITY BOARD
[25 PA. CODE CHS. 121 and 129]
ADDITIONAL RACT REQUIREMENTS FOR
MAJOR SOURCES OF NO_x AND VOCs FOR THE 2015 OZONE NAAQS
(RACT III)**

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I. Introduction

The U.S. Environmental Protection Agency (EPA) is responsible for establishing National Ambient Air Quality Standards (NAAQS), which are maximum allowable concentrations in the ambient air for the following six pollutants: ground-level ozone; particulate matter; nitrogen dioxide (NO₂); carbon monoxide (CO); sulfur dioxide; and lead. These pollutants are identified as criteria pollutants by EPA and are considered harmful to public health and welfare, including the environment. Section 109 of the Clean Air Act (CAA) (42 U.S.C.A. § 7409) established two types of NAAQS: primary standards, which are limits set to protect public health; and secondary standards, which are limits set to protect public welfare and the environment, including protection against visibility impairment and from damage to animals, crops, vegetation and buildings. The EPA established primary and secondary ground-level ozone NAAQS to protect public health and welfare.

Ground-level ozone is formed in the atmosphere by photochemical reactions between volatile organic compounds (VOCs) and oxides of nitrogen (NO_x) in the presence of sunlight. In order to reduce ground-level ozone concentrations, the CAA (42 U.S.C.A. §§ 7401—7671q) requires control of sources of VOC and NO_x emissions to achieve emission reductions in nonattainment areas classified as “moderate” or higher. Among effective control measures, reasonably available control technology (RACT) air pollution controls significantly reduce VOC and NO_x emissions from major stationary sources. The CAA NO_x RACT requirements are described by the EPA in the “NO_x Supplement” notice titled, “State Implementation Plans; Nitrogen Oxides Supplement to the General Preamble; Clean Air Act Amendments of 1990 Implementation of Title I; Proposed Rule.” See 57 FR 55620 (November 25, 1992). In the NO_x Supplement notice, the EPA defined RACT as the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility. *Id.* at 55624; See also 44 FR 53762 (September 17, 1979).

Section 110(a)(1) of the CAA (42 U.S.C.A. § 7410(a)) requires states to submit, within 3 years after promulgation of a new or revised standard, a state implementation plan (SIP) revision meeting the applicable requirements of section 110(a)(2). Re-evaluation of RACT is required each time a revised ozone NAAQS is promulgated for nonattainment areas. Section 172(c)(1) of the CAA (42 U.S.C.A. § 7502(c)(1)), requires states to develop nonattainment plan provisions “as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at minimum of [RACT]) to provide for the attainment of the [NAAQS].”

A major source in an ozone nonattainment area is defined as any stationary source that emits or has the potential to emit (PTE) NO_x or VOC emissions above a certain applicability threshold that is based on the ozone nonattainment classification of the area: marginal, moderate, serious, or severe. Sections 182(b)(2) and 182(f)(1) of the CAA (42 U.S.C.A. §§ 7511a(b)(2) and 7511a(f)(1)) require states with moderate, or worse, ozone nonattainment areas to implement RACT controls on all stationary sources and source categories covered by a control technique guideline (CTG) document issued by the EPA, and on all major sources of VOC and NO_x emissions located in the nonattainment area. The EPA's CTGs establish presumptive RACT

control requirements for various VOC source categories. Presumptive RACT limits are category-wide requirements that are based on capabilities that are general to an emission source category. The CTGs typically identify a particular control level that the EPA recommends as RACT. In some cases, the EPA has issued Alternative Control Techniques (ACT) guidelines primarily for NO_x source categories, which in contrast to the CTGs, only present a range for possible control options but do not identify any particular option as the presumptive norm for what is RACT. States are required to implement RACT for the source categories covered by CTGs through a SIP. States may opt to require alternative controls rather than following the CTGs. See *Natural Resources Defense Council v. EPA*, 571 F.3d 1245, 1254 (D.C. Cir. 2009).

The CAA amendments of 1990 introduced the requirement for existing major stationary sources of NO_x in nonattainment areas to install and operate NO_x RACT. Specifically, section 182(b)(2) of the CAA requires states to adopt RACT provisions for all major sources of VOC in ozone nonattainment areas, and section 182(f) requires states to adopt RACT provisions for major stationary sources of NO_x.

Section 302 of the CAA (42 U.S.C.A. § 7602), defines a major stationary source (MSS) as any facility which has the PTE 100 tons per year (TPY) of any air pollutant. For serious ozone nonattainment areas, a major source is defined by section 182(c) of the CAA as a source that has the PTE 50 TPY of NO_x. For severe ozone nonattainment areas, a major source is defined by section 182(d) of the CAA as a source that has the PTE 25 TPY of any pollutant.

The Ozone Transport Region (OTR) has special provisions for major sources since section 184(a) of the CAA (42 U.S.C.A. § 7511c(a)) requires areas in the OTR to be treated as moderate (or higher) ozone nonattainment. Therefore, in marginal and moderate nonattainment areas and attainment areas in the OTR, a major NO_x source is one with the PTE 100 TPY or more of NO_x. Because the entire Commonwealth is in the OTR and is treated as a moderate nonattainment area, RACT is applicable to major sources of NO_x emissions or VOC emissions, or both, statewide.

II. 1971 Photochemical Oxidants NAAQS - 0.08 ppm and 1979 and 1993 Ozone NAAQS – 0.12 ppm, averaged over 1 hour (RACT I)

On April 30, 1971, the EPA promulgated primary and secondary NAAQS for photochemical oxidants under section 109 of the CAA. See 36 FR 8186 (April 30, 1971). These standards set an hourly average of 0.08 parts per million (ppm) total photochemical oxidants not to be exceeded more than 1 hour per year. On February 8, 1979, the EPA announced a revision to the then-current 1-hour standard. The final rulemaking revised the level of the primary 1-hour ozone standard from 0.08 ppm to 0.12 ppm and set the secondary standard identical to the primary standard. See 44 FR 8202 (February 8, 1979). This revised 1-hour standard was reaffirmed on March 9, 1993. See 58 FR 13008 (March 9, 1993).

Section 110(a) of the CAA gives states the primary responsibility for achieving the NAAQS. Section 110(a) of the CAA provides that each state shall adopt and submit to the EPA a plan to implement measures (a SIP) to enforce the NAAQS or a revision to the NAAQS promulgated under section 109(b) of the CAA. A SIP includes the regulatory programs, actions and

commitments a state will carry out to implement its responsibilities under the CAA. Once approved by the EPA, a SIP is legally enforceable under both Federal and state law.

Section 182 of the CAA requires that, for areas that exceed the NAAQS for ozone, states shall develop and implement a program that mandates that certain major stationary sources develop and implement a RACT program. Under sections 182(f)(1) and 184(b)(2) of the CAA, these RACT requirements are applicable to all sources in Pennsylvania that emit or have a PTE emit greater than 100 TPY of NO_x. Under sections 182(b)(2) and 184(b)(2) of the CAA, these RACT requirements are applicable to all sources in Pennsylvania that emit or have a PTE greater than 50 TPY of VOCs. NO_x and VOC controls are required statewide because of the Commonwealth's inclusion in the OTR established by Congress under section 184(a) of the CAA. Additionally, because the five-county Philadelphia area was designated as severe ozone nonattainment for the 1-hour standard in 1979, sources of greater than 25 TPY of either pollutant were required to implement RACT under section 182(d) of the CAA.

Section 182(b)(2) of the CAA provides that for moderate ozone nonattainment areas, a state must revise its SIP to include RACT for sources of VOC emissions covered by a CTG document issued by the EPA prior to the area's date of attainment; sources of VOC emissions covered by a CTG issued prior to November 15, 1990; and all other major stationary sources of VOC emissions located in the area. The EPA has issued RACT determinations in the form of CTGs for approximately 25 to 30 classes of VOC sources. The CTGs cover many types of sources, including large graphic arts facilities, industrial surface coating operations, petroleum refineries and gasoline marketing terminals. The Department incorporated the requirements of these CTGs into regulatory standards of source-specific emission limitations. Several sources subject to RACT regulations were adopted to implement CTG. See 25 Pa. Code §§ 129.96(a) and (b). These regulations are codified in §§ 129.51—129.52c, 129.54—129.69, 129.71—129.73, 129.75, 129.77, 129.101—129.107 and 129.301—129.310.

The Commonwealth's RACT regulations under §§ 129.91—129.95 (relating to stationary sources of NO_x and VOCs) were implemented statewide in January 1994 for the 1979 and 1993 1-hour ozone standard. See 24 Pa.B. 467 (January 15, 1994). These regulations imposed a requirement that the owners and operators of sources and facilities emitting VOCs and NO_x determine if they are MSS of VOCs or NO_x, or both. If a facility is a MSS, the owner or operator must develop and submit a RACT proposal to the Department and to the EPA for approval. Sources subject to the EPA's New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) are required to comply with all applicable requirements including emission limits that are more stringent than RACT limits.

The final amendments also authorized implementation of presumptive NO_x RACT requirements for three major classes of NO_x emitters. The owners and operators of small industrial boilers were required to make appropriate adjustments to the combustion process to minimize NO_x emissions. The owners and operators of small combustion units and certain other classes of fossil-fuel-burning equipment (<20 million Btu/hour) were required to operate the source in accordance with the manufacturer's specifications. The owners and operators of larger combustion units (equal to or greater than 20 million Btu/hour to < 50 million Btu/hour) were

required to perform an annual tune-up and make adjustments to provide for a low NO_x emitting operation; and the owners and operators of very large coal-fired combustion units (equal to or greater than 100 million Btu/hour) were required to install a low NO_x burner system with separated overfire air (LNB-SOFA). See 25 Pa. Code § 129.93.

On February 1, 1994, the Department developed guidance (Appendix 1) for submitting RACT proposals for major NO_x sources which were required to determine the RACT for NO_x emissions on a case-by-case basis. The guidance recommends that the RACT analysis should include a ranking of all applicable and available control technologies for the affected sources in descending order of control effectiveness. The applicant should examine the most stringent or “top” alternative. If the applicant could show that this level of control for the source under review is technically or economically infeasible based on the EPA’s Office of Air Quality Planning and Standards (OAQPS) Control Cost Manual, then the next most stringent level of control is determined and similarly evaluated. The analysis continues until the RACT level under consideration cannot be eliminated by any substantial or unique technical or economical objection.

In the guidance document, the Department indicated that most states have included presumptive limits for NO_x emissions in their regulations and control measures available to achieve these levels show a range of cost-effectiveness from about \$570 - \$1,500 per ton of NO_x removed. The guidance document also indicated that technologies available to meet the EPA’s preliminary presumptive RACT levels for electric utility boilers show a range of cost-effectiveness from about \$160 – \$1,300 per ton of NO_x removed. The EPA document “Evaluation and Costing of NO_x Controls for Existing Utility Boilers in the NESCAUM Region,” [EPA 453/R-92-010] shows that the control costs for Low NO_x Burner with Separate Overfire Air (LNB-SOFA) vary from \$270 to \$1,590 per ton of NO_x removed depending on site-specific factors (such as the type of boiler, size of the boiler and the amount of use) (Appendix 2). The control measures available to achieve the levels established as presumptive RACT for utility boilers by other states show a range of cost-effectiveness from about \$570 - \$1,500 per ton. Two NO_x RACT proposals using LNB-SOFA document costs of \$1,222 and \$1,298 per ton of NO_x reduced.

Based on the above information, the Department utilized \$1,500 per ton of NO_x reduced as a benchmark to consider the control option to be cost-effective. The Department suggested using \$1,500 as a benchmark because it was comparable, but lower than the control cost for sources of VOCs (the other major ozone precursor) to comply with existing RACT regulations based on EPA’s guidelines. For VOCs, the cost-effectiveness benchmark of \$3,000 per ton of VOC removed was used.

Under §§ 129.91—129.95, approximately 600 facilities case-by-case RACT determinations were made for attaining and maintaining the 1-hour ozone standard and were submitted to the EPA as RACT SIP revisions. The case-by-case analysis process began in 1995 and was not completed until 2006 due to the need for EPA approval of SIP submittals for the case-by-case RACT determinations. Many facility owners and operators had to hire consultants or additional staff to complete their case-by-case RACT analyses and proposals and handle the permitting requirements.

III. 1997 Ozone NAAQS – 0.08 ppm and 2008 Ozone NAAQS - 0.075 ppm, averaged over 8 hours (RACT II)

On July 18, 1997, the EPA concluded that revisions to the then-current 1-hour ozone primary standard to provide increased public health protection were appropriate at this time to protect public health with an adequate margin of safety. Further, the EPA determined that it was appropriate to establish a primary standard of 0.08 ppm averaged over 8 hours. The EPA at this time also established a secondary standard equal to the primary standard. See 62 FR 38856 (July 18, 1997). In 2004, the EPA designated 37 counties in Pennsylvania as 8-hour ozone nonattainment areas for the 1997 8-hour ozone NAAQS. See 69 FR 23858, 23931 (April 30, 2004).

On March 27, 2008, the EPA lowered the primary and secondary 8-hour ozone standards from 0.08 ppm to 0.075 ppm. See 73 FR 16436 (March 27, 2008). The EPA made designations for the 2008 8-hour ozone standards on April 30, 2012, with an effective date of July 20, 2012. The EPA designated all or portions of Allegheny, Armstrong, Beaver, Berks, Bucks, Butler, Carbon, Chester, Delaware, Fayette, Lancaster, Lehigh, Montgomery, Northampton, Philadelphia, Washington and Westmoreland counties as nonattainment for the 2008 8-hour ozone NAAQS, with the rest of Pennsylvania designated as unclassifiable/attainment. See 77 FR 30088, 30143 (May 21, 2012). The EPA's 2008 ozone implementation rule required the Department to submit a SIP revision that met the RACT requirements of CAA section 184(b)(2) for the entire Commonwealth. See 40 CFR 51.1112 and 51.1116.

Pennsylvania's RACT regulations under §§ 129.96—129.100 (relating to additional RACT requirements for major sources of NO_x and VOCs) (RACT II) were implemented in April 2016, for the 1997 and 2008 8-hour ozone standards. See 46 Pa.B. 2036 (April 23, 2016). EPA issued a partial approval and conditional approval of Pennsylvania's RACT II regulations on May 9, 2019 (84 FR 20274). The final rulemaking established applicability requirements for the implementation of specified RACT control measures for the nine identified source types for attaining and maintaining the 1997 and 2008 8-hour ozone standards. The Department used a top-down approach to determine presumptive NO_x and VOC RACT emissions limits for various source categories. This included searching and identifying the best methodology, technique, technology or other means for reducing NO_x or VOC emissions, while factoring environmental, energy and economic considerations into the analysis. The Department contacted various vendors, reviewed EPA's CTGs and ACTs documents. The Department also identified controls installed on existing air contaminant sources in Pennsylvania and identical air contaminant sources in other states. The Department estimated the capital, installation and annual operating costs using the EPA's OAQPS and Control Cost Manual (Sixth edition), vendor's quotes, as well as input from independent entities such as PJM Interconnection.

The Department used a specific dollar value per ton of NO_x or VOC reduced as a benchmark to consider a specific control's cost-effectiveness. In the absence of guidance for cost-effectiveness benchmark cut-off limits during the RACT II development, the Department determined the cost-effectiveness benchmark number based on the EPA's approved cost-effectiveness benchmark values in the 1990 RACT implementation and used the Consumer Price Index (CPI) to calculate the new cost-effectiveness benchmarks. The Department evaluated various NO_x and VOC

controls for technical and economical feasibility. The Department did not establish a bright-line cost-effectiveness threshold to determine economic feasibility for RACT II implementation. The Department had used cost-effectiveness benchmarks of \$1,500 and \$3,000 per ton of NO_x and VOC controlled, respectively, in 1990 dollars, for the implementation of RACT I requirements for the 1979 1-hour ozone NAAQS in §§ 129.91—129.95. The Department used the United States Bureau of Labor Statistics CPI and adjusted the \$1,500 in 1990 dollars to \$2,754 in 2014 dollars. The Department used a NO_x emission cost-effectiveness upper bound of \$2,800 per ton of NO_x emissions controlled and \$5,500 per ton of VOC emissions controlled.

Based on the uncontrolled emission rates and control efficiency of technically and economically feasible control option, the Department determined the presumptive RACT II emission limits for NO_x and VOCs. The RACT II final rulemaking also incorporated operational flexibility including the option to request approval to use facility-wide or system-wide NO_x emissions averaging, a source-specific NO_x or VOC emission limitation, or source-specific RACT NO_x or VOC requirement as alternative methods of compliance. See, 25 Pa. Code §§ 129.98-129.99.

The Department determined that certain add-on control technologies represented RACT for the 1997 and 2008 8-hour ozone NAAQS for nine existing source categories that did not have presumptive RACT requirements or emission limitations in Chapter 129. These nine source categories included combustion units; boilers; process heaters; turbines; stationary internal combustion engines; municipal solid waste landfills; municipal waste combustors; cement kilns; and certain other sources that were not regulated elsewhere under Chapter 129. RACT II final-form rulemaking amended Chapter 129 to adopt presumptive RACT requirements and RACT emission limitations for certain major stationary NO_x and VOC emissions that were subject to § 129.96. See 25 Pa. Code § 129.97.

IV. 2015 Ozone NAAQS - 0.070 ppm averaged over 8 hours (RACT III)

On October 26, 2015, the EPA lowered the primary and secondary 8-hour ozone standards from 0.075 ppm to 0.070 ppm. See 80 FR 65292 (October 26, 2015). The EPA issued the 2015 ozone implementation rule on December 6, 2018 (83 FR 62998). See, 40 CFR 51.1306—51.1318. The EPA's 2015 ozone implementation rule required the Department to submit a SIP revision that met the RACT requirements of CAA section 184(b)(2) for the entire Commonwealth. See 40 CFR 51.1312 and 51.1316.

On *****, 2021 [Date of publication], the Environmental Quality Board proposed to amend Chapters 121 and 129 (relating to general provisions; and standards for sources) with additional RACT requirements for major sources of NO_x and VOCs for the 2015 ozone NAAQS. The amendments to § 121.1 and the substantive provisions in §§ 129.111—129.115 are proposed to implement the RACT requirements for the 2015 8-hour ozone NAAQS.

(A) Applicability:

The RACT III regulation would be applicable to any owner or operator of a “major NO_x-emitting facility” or a “major VOC-emitting facility,” or both, in the Commonwealth, that existed on or before August 3, 2018.

Owners and operators of facilities that are major facilities solely for NO_x emissions are only subject to the NO_x RACT requirements. Likewise, owners and operators of facilities that are major facilities solely for VOC emissions are only subject to the VOC RACT requirements. The statewide RACT III applicability thresholds for NO_x and VOC are 100 and 50 TPY, respectively.

The RACT III regulation does not apply to sources that have a PTE less than one ton of NO_x and/or VOC, as applicable, on a 12-month rolling basis. [25 Pa. Code § 129.111]

Section 182(b)(2) of the CAA (42 U.S.C.A. § 7511a(b)(2)) provides that for moderate ozone nonattainment areas, a state must revise its SIP to include RACT for sources of VOC emissions covered by a CTG document issued by the EPA prior to the area's date of attainment; sources of VOC emissions covered by a CTG issued prior to November 15, 1990; and all other major stationary sources of VOC emissions located in the area.

The EPA has issued RACT determinations in the form of CTGs for various classes of VOC sources. The CTGs cover many types of sources, including large graphic arts facilities, industrial surface coating operations, petroleum refineries and gasoline marketing terminals. The Department has incorporated the requirements of these CTGs into regulatory standards of source-specific emission limitations.

Sources subject to regulations are adopted to implement Control Technique Guidelines (CTG) [25 Pa. Code §§ 129.96(a) and (b)]. These regulations are codified in 25 Pa. Code §§ 129.51—129.52c, 129.54—129.69, 129.71—129.73, 129.75, 129.77, and 129.101—129.107.

Sources subject to EPA's NSPS and NESHAP are required to comply with all applicable requirements including emission limits that are more stringent than RACT limits.

(B) Presumptive RACT source categories:

It is not possible to provide a specific and precise presumptive NO_x or VOC emission limit for each specific source, or estimate the control costs that may incur by the owner or operator, due to a wide range of source types, their size, fuel-burned and operating characteristics. Therefore, the Department has categorized the existing and affected sources into various source categories to evaluate, analyze and determine the presumptive RACT NO_x and/or VOC emission limits and requirements. These categories include combustion units; municipal solid waste landfills; municipal waste combustors; process heaters; turbines; stationary internal combustion engines; cement kilns; glass melting furnace; lime kiln; direct-fired heater, furnace or oven; and other sources that are not regulated elsewhere under Chapter 129.

The Department used a top-down approach in determining presumptive NO_x and/or VOC RACT emissions limits for various source categories. This included searching and identifying the reasonably available controls, methodology, technique, technology or other means for reducing NO_x or VOC emissions, while factoring technical and economic feasibility considerations into the analysis. The Department reviewed EPA guidance documents about air pollution control

technologies and associated costs, contacted various vendors for estimated costs for specific technologies, and neighboring states to learn about their proposed RACT III regulations.

The Department evaluated NO_x Control technologies such as Low NO_x Burner, Dry Low NO_x Combustor, Low Emission Combustion, Selective Catalytic Reduction, Selective Non-Catalytic Reduction, Non-Selective Catalytic Reduction and a VOC control technology, Oxidation Catalyst.

Low NO_x Burner (LNB): Low NO_x burners reduce NO_x by accomplishing the combustion process in stages. Staging partially delays the combustion process, resulting in a cooler flame which suppresses thermal NO_x formation. The two most common types of low NO_x burners being applied to natural gas-fired boilers are staged air burners and staged fuel burners. LNB retrofits typically achieve NO_x reduction in the range of 50 percent.

Dry Low NO_x Combustor (DLNC): This technology involves increasing the air-to-fuel ratio of the mixture so that the peak and average temperatures within the combustor will be less than that of the stoichiometric mixture, thus suppressing thermal NO_x formation. Introducing excess air not only creates a leaner mixture but it also can reduce residence time at peak temperatures. NO_x emissions reductions of up to 30 percent are achieved using lean primary zone combustion without increasing CO emissions.

Low Emission Combustion (LEC): NO_x emissions from natural gas combustion are formed from nitrogen and oxygen in the combustion air, and NO_x emissions increase significantly at higher combustion temperatures. LEC achieves lower NO_x by providing sufficient excess air to reduce the maximum combustion temperature and minimize NO_x formation. Engine manufacturers and regulatory agencies use the term “LEC” broadly and a number of technology approaches can be used depending on the engine and NO_x emission limit. In many cases, multiple LEC related technologies may be required (e.g., additional air through new or upgraded turbocharging, higher energy ignition/pre-combustion chambers, and enhanced mixing). NO_x emissions reductions of 30 to 50 percent are achieved using lean primary zone combustion without increasing CO emissions.

Selective Catalytic Reduction (SCR): SCR systems selectively reduce NO_x emissions by injecting ammonia (NH₃) into the exhaust gas stream upstream of a catalyst. NO_x, NH₃ and oxygen (O₂) react on the surface of the catalyst to form nitrogen (N₂) and water (H₂O). The exhaust gas must contain a minimum amount of O₂ and be within a particular temperature range (typically 450 °F to 850 °F) in order for the SCR system to operate properly. The temperature range is dictated by the catalyst material which is typically made from noble metals, including base metal oxides such as vanadium and titanium, or zeolite-based material. The removal efficiency of an SCR system in good working order is typically from 65 to 90 percent. Exhaust gas temperatures greater than the upper limit (850 °F) cause NO_x and NH₃ to pass through the catalyst unreacted. Ammonia emissions, called NH₃ slip, may be a consideration when specifying an SCR system.

Selective Noncatalytic Reduction (SNCR): SNCR is a post combustion emissions control technology for reducing NO_x by injecting ammonia or urea into the furnace at a properly

determined location without the need of a catalyst. Units with furnace exit temperatures of 1550-1950 °F, residence times of greater than one second, and high levels of uncontrolled NO_x are required for higher control efficiencies. SNCR reduction efficiencies vary over a wide range. Temperature, residence time, type of NO_x reducing reagent, reagent injection rate, uncontrolled NO_x level, distribution of the reagent in the flue gas, and CO and O₂ concentrations all affect the reduction efficiency of the SNCR. The median (as a measure of average) reductions for urea-based SNCR systems in various industry source categories range from 25 to 60 percent, while median reductions for ammonia-based SNCR systems range from 61 to 65 percent.

Nonselective Catalytic Reduction (NSCR): This technique uses the residual hydrocarbons and CO in the rich-burn engine exhaust as a reducing agent for NO_x. In an NSCR, hydrocarbons and CO are oxidized by O₂ and NO_x. The excess hydrocarbons, CO, and NO_x pass over a catalyst (usually a noble metal such as platinum, rhodium, or palladium) that oxidizes the excess hydrocarbons and CO to H₂O and CO₂, while reducing NO_x to N₂. NO_x reduction efficiencies are usually greater than 90 percent, while CO reduction efficiencies are approximately 90 percent. The NSCR technique is effectively limited to engines with normal exhaust oxygen levels of 4 percent or less. This includes 4-stroke rich-burn naturally aspirated engines and some 4-stroke rich-burn turbocharged engines. Engines operating with NSCR require tight air-to-fuel control to maintain high reduction effectiveness without high hydrocarbon emissions. To achieve effective NO_x reduction performance, the engine may need to be run with a richer fuel adjustment than normal. This exhaust excess oxygen level would probably be closer to 1 percent. Lean-burn engines could not be retrofitted with NSCR control because of the reduced exhaust temperatures.

Oxidation Catalyst: Oxidation catalysts (or two-way catalytic converters) are used to reduce hydrocarbon and CO emissions. Specifically, oxidation catalysts are effective for the control of CO, non-methane hydrocarbons, VOCs, formaldehyde and other Hazardous Air Pollutants. Oxidation catalysts consist of a substrate made up of thousands of small channels. Each channel is coated with a highly porous layer containing precious metal catalysts, such as platinum or palladium. As exhaust gas travels down the channel, hydrocarbons and CO react with oxygen within the porous catalyst layer to form CO₂ and water vapor. The resulting gases then exit the channels and flow through the rest of the exhaust system. Using an oxidation catalyst, VOC emissions can be reduced by 50 to 60 percent.

The Department then ranked all available control technologies in the order of their control effectiveness. After finding the most effective controls in the list, the Department evaluated the most stringent control for technical and economic feasibility. The Department eliminated the most stringent control and analyzed second control in the list if the most stringent control was determined to be technically infeasible or economically cost-prohibitive. The Department then reviewed the existing allowable NO_x or VOC emissions limits or actual test data to establish a baseline emission to determine economic feasibility for emission controls for the proposed RACT III regulation.

The Department then conducted a generic cost analysis for sources in each source category subject to presumptive NO_x and/or VOC RACT emissions limits to determine if additional NO_x and/or VOC controls would represent RACT for the 8-hour 2015 ozone NAAQS. The

Department performed cost analysis using guidance provided in the EPA Air Pollution Control Cost Manual, EPA/452/B-02-001, 6th edition, January 2002 and 7th edition, vendor's quote, and cost data compiled from previous installations inside and outside of Pennsylvania. The cost analysis includes the total capital investment of the add-on control equipment, the annual operating costs of the add-on control, and the cost-effectiveness of the control in reducing emissions from the source. Capital investments include costs associated with purchased equipment, installation, monitoring equipment, delivery, start-up and initial testing and taxes. Direct annual costs include the costs of electricity or fuel to operate the add-on control and the monitoring equipment, if needed, maintenance and repair costs. Indirect annual costs include overhead, administrative cost, property taxes, insurance and capital recovery cost. As per EPA's guidance in Control Cost Manual 7th edition (revised in 2019) the department used equipment life for SCR at 30 years, for SNCR and other control equipment at 20 years and an annual interest rate of 5.5 percent to calculate the capital recovery factor. The capital recovery factor is added to the annual cost to determine annualized cost. The cost-effectiveness of the control is calculated by dividing the annualized costs of the add-on control by the amount of emission reductions achieved annually from operation of the add-on control.

The Department adjusted the RACT II cost benchmarks of \$2,800 and \$5,500 per ton of NO_x or VOC emissions removed, respectively, by multiplying by the CPI differential between 2014 and 2020 to arrive at benchmarks of \$3,000 and \$6,000 per ton of NO_x or VOC emissions removed, respectively, for RACT III. The Department further adjusted cost-effectiveness benchmarks to \$3,750 per ton of NO_x and \$7,500 per ton of VOC to ensure the implementation of RACT level controls similar to what was done for RACT II. See 46 Pa.B. 2044 (April 23, 2016). The Department concludes that the RACT presumptive limits included in the proposed RACT III Rule are reasonable as they reflect control levels achieved by the application and consideration of available control technologies, after considering both the economic and technological circumstances of Pennsylvania's sources. It should be noted that for the proposed Cross-State Air Pollution (CSAPR) rule, EPA used a control stringency level set at a marginal cost of \$1,600 per ton of NO_x emission reductions to identify a uniform NO_x emission control stringency level at which EPA determines maximum cost-effective EGU NO_x emission reductions and downwind ozone air quality improvements. See 85 FR 68964 (October 30, 2020). Using these cost benchmarks as a guide, the Department evaluated technically feasible emission controls for cost-effectiveness and economic feasibility. The RACT III NO_x and VOC emission limitations included in this proposed rulemaking were determined from this evaluation.

Based on the uncontrolled emission rates and control efficiency of technically and economically feasible control option, the Department determined the presumptive RACT emission limits for NO_x and VOCs. The Department also compared these RACT emissions limits established by other states for identical sources.

Compliance costs may vary for each source or facility depending on the source size, type, operation limitation and which control option is selected by the owner and operator of the affected source or facility. An owner or operator of an affected source that cannot meet applicable presumptive RACT emission limitation, may participate in either a facility-wide or system-wide NO_x emissions averaging program or propose an alternative NO_x or VOC emission limitations or requirements, both, on a case-by-case basis.

(C) RACT analysis and proposed NO_x and VOC RACT emission limits for small source category:

Combustion units with a rated heat input equal to or greater than 20 million Btu/hour and less than 50 million Btu/hour:

The Department evaluated LNB technology for NO_x reduction and oxidation catalyst technology for VOC reduction for combustion units with a rated heat input equal to or greater than 20 million Btu/hour and less than 50 million Btu/hour that range \$3,536 - \$8,841 per ton of NO_x removed and \$260,750 - \$651,876 per ton of VOC removed. (Appendix 3)

Therefore, the Department is proposing that existing biennial tune-up requirements in accordance with 40 CFR Part 63 Subpart 63.11223 continue to represent RACT for the existing combustion unit with a rated heat input equal to or greater than 20 million Btu/hour and less than 50 million Btu/hour. [25 Pa. Code § 129.112(b)(i)]

Insignificant NO_x and VOC emitting source categories:

The Department evaluated LNB, SCR and SNCR technologies for NO_x reduction and oxidation catalyst technology for VOC reduction.

The Department performed cost-effectiveness analysis for a 50 million Btu/hour combustion unit with uncontrolled NO_x emission rate of 5.0 TPY using reference costs data for LNB and found the cost-effectiveness at \$30,981 per ton of NO_x removed. The Department also performed cost-effectiveness analysis for oxidation catalyst technology for a 50 million Btu/hour combustion unit with uncontrolled NO_x emission rate of 2.7 TPY using reference costs data for oxidation catalyst and found the cost-effectiveness at \$76,139 per ton of VOC removed. (Appendix 4)

Based on the above cost analysis the Department determined that NO_x and VOC emitting sources with NO_x and VOC emissions thresholds of 5 TPY and 2.7 TPY, respectively, with no add-on or inherent NO_x or VOC controls continue to be economically feasible.

Therefore, the Department is proposing that the source categories below shall continue to comply with the existing presumptive RACT requirements of installation, maintenance, and operation of the source in accordance with manufacturer's specifications and with good operating practices. [25 Pa. Code § 129.112(c)].

NO_x source with a PTE of less than 5 TPY of NO_x.

VOC source with a PTE of less than 2.7 TPY of VOC.

A boiler or other combustion source rated < 20 million British Thermal Units per hour (million Btu/hour).

A combustion turbine rated < 1,000 brake horsepower (bhp).

A lean burn or rich burn stationary internal combustion engine rated < 500 bhp (gross).

An incinerator, thermal oxidizer or catalytic oxidizer used primarily for air pollution control.

A fuel-burning unit with an annual capacity factor of less than 5%.

An emergency engine operating less than 500 hours per year in a 12-month rolling period.

An electric arc furnace.

A natural gas compression and transmission facility VOC air contamination source that has the potential to emit less than 2.7 TPY of VOC.

For natural gas compression and transmission facilities, a fugitive VOC air contamination source is the group of fugitive VOC emitting components associated with an individual stationary source. Each group of components is considered as an individual VOC emitting source and the VOC emissions from the components are not aggregated with the VOC emissions from the associated stationary source.

A combustion unit, brick kiln, cement kiln, lime kiln or other combustion source located at a major VOC emitting facility shall install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices for the control of the VOC emissions from the combustion unit or other combustion source. [25 Pa. Code § 129.112(d)]

(D) Municipal Solid Waste Landfills:

The Department is proposing that the owner and operator of a municipal solid waste (MSW) landfill constructed, reconstructed or modified on or before May 29, 1991, shall comply with the emission guidelines in 40 CFR Part 60, Subpart Cc. The control of collected MSW landfill emissions through the use of control devices meeting at least one of the following provisions: (1) An open flare designed and operated in accordance with the parameters established in § 60.18; or (2) A control system designed and operated to reduce non-methane organic compounds (NMOC) by 98 weight percent; or (3) An enclosed combustor designed and operated to reduce the outlet NMOC concentration to 20 ppm as hexane by volume, dry basis at 3% oxygen, or less. These control requirements are consistent with §60.33c and are adopted and incorporated by reference in §122.3, and the applicable Federal or state plans in 40 CFR Part 62. [25 Pa. Code § 129.112(e)(1)]

The Department is proposing that the owner and operator of a MSW landfill constructed, reconstructed or modified on or after May 30, 1991, but on or before July 17, 2014, shall comply with the New Source Performance Standards in 40 CFR Part 60, Subpart WWW (relating to standards of performance for municipal solid waste landfills) or the more stringent Subpart Cf. The control of collected MSW landfill emissions through the use of control devices meeting at

least one of the following provisions: (1) An open flare designed and operated in accordance with the parameters established in § 60.18; or (2) A control system designed and operated to reduce NMOC by 98 weight percent; or (3) An enclosed combustor designed and operated to reduce the outlet NMOC concentration to 20 ppm as hexane by volume, dry basis at 3% oxygen, or less. These control requirements are consistent with § 60.752 and § 60.33f and are adopted and incorporated by reference in §122.3. [25 Pa. Code § 129.112(e)(2)]

Therefore, the existing requirements continue to represent RACT.

The Department is also proposing that the owner and operator of a MSW landfill constructed, reconstructed or modified on or after July 18, 2014, shall comply with the New Source Performance Standards in 40 CFR Part 60, Subpart XXX (relating to standards of performance for municipal solid waste landfills). The control of collected MSW landfill emissions through the use of control devices meeting at least one of the following provisions: (1) An open flare designed and operated in accordance with the parameters established in § 60.18; or (2) A control system designed and operated to reduce NMOC by 98 weight percent; or (3) An enclosed combustor designed and operated to reduce the outlet NMOC concentration to 20 ppm as hexane by volume, dry basis at 3% oxygen, or less. These control requirements are consistent with § 60.762 and are adopted and incorporated by reference in § 122.3, and which are adopted and incorporated by reference in § 122.3. [25 Pa. Code § 129.112(e)(3)]

(E) Municipal Waste Combustors:

Region-wide, several states have proposed or revised NO_x RACT standards for Large Municipal Waste Combustors (MWCs). New Jersey adopted regulation that established a NO_x RACT emission rate of 150 parts per million by volume, dry basis (ppmvd) as determined on a calendar day average. Massachusetts and Maryland established a NO_x RACT of 150 ppmvd for large MWCs. Connecticut adopted a 150 ppm limit for mass burn waterwall combustors on a 24-hour daily average. The Department evaluated SCR technology for combustors firing municipal waste and found that performance of SCR can be detrimentally affected if the catalyst becomes de-activated due to poisoning or masking. Catalyst poisoning can occur if the catalyst is exposed to sufficient amounts of certain heavy metals that are present in the flue gas, as a result of MSW combustion. Catalyst masking can occur when the catalyst surface becomes coated with a foreign material, preventing the flue gas from physically coming into contact with the catalyst. The Department also evaluated whether any existing MWCs in OTR are equipped with SCR, but couldn't find any. Therefore, the Department determined that adding SCR NO_x emission control technology would likely not be considered RACT because of its technical infeasibility.

The Department evaluated cost-effectiveness for SNCR using estimated 500 tons per day throughput and using reference cost data from other MWC. The Department found that the cost-effectiveness to retrofit SNCR for MWC with 150 ppmvd corrected at 7% oxygen yields over \$3,946 per ton of NO_x removed (Appendix 5) and is therefore an economically infeasible option.

The Department analyzed actual Continuous Emission Monitoring System (CEMS) data for NO_x emissions for existing municipal waste combustors in Pennsylvania. Based on these results (Appendix 6) and cost-effectiveness analysis, the Department is proposing that the owner and

operator of a municipal waste combustor subject to § 129.111 shall comply with the presumptive RACT emission limitation of 150 ppmvd NO_x corrected at 7% oxygen. [25 Pa. Code § 129.112(f)]

(F) Combustion units or Process Heaters:

Natural gas-fired, propane-fired or liquid petroleum gas-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour:

Most natural gas-fired, propane-fired or liquid petroleum gas-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour units are equipped with LNB. The Department analyzed the actual stack test data for NO_x emissions that show as high as 0.99 lb NO_x/million Btu heat input. The Department evaluated SCR cost-effectiveness for various sizes of boilers that range from \$8,905 - \$18,334 per ton of NO_x removed (Appendix 7) and hence found SCR technology to be cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a natural gas-fired, propane-fired or liquid petroleum gas-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour shall continue to comply with the existing presumptive RACT emission limitation of 0.10 lb NO_x/million Btu heat input. [25 Pa. Code § 129.112(g)(1)(i)]

Distillate oil-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour:

Most oil-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour units are equipped with LNB. The Department analyzed the actual stack test data for NO_x emissions that show as high as 0.11 lb NO_x/million Btu heat input. The Department evaluated SCR cost-effectiveness for various sizes of boilers that range from \$6,719 - \$13,899 per ton of NO_x removed (Appendix 8) and found SCR technology to be cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a distillate oil-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour shall continue to comply with the existing presumptive RACT emission limitation of 0.12 lb NO_x/million Btu heat input. [25 Pa. Code § 129.112(g)(1)(ii)]

Residual oil-fired or other liquid fuel-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour:

Most residual oil-fired or other liquid fuel-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour units are equipped with LNB. The Department analyzed the actual stack test data for NO_x emissions that show as high as 0.37 lb NO_x/million Btu heat input. The Department evaluated SCR cost-effectiveness for various sizes of boilers that range from \$4,400 - \$8,552 per ton of NO_x removed (Appendix 9) and found SCR technology to be cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a residual oil-fired or other liquid fuel-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour shall continue to comply with the existing presumptive RACT emission limitation of 0.20 lb NO_x/million Btu heat input. [25 Pa. Code § 129.112(g)(1)(iii)]

Refinery gas-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour:

Most residual oil-fired or other liquid fuel-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour units are equipped with LNB. The Department analyzed the actual stack test data for NO_x emissions that show as high as 0.27 lb NO_x/million Btu heat input. The Department evaluated SCR cost-effectiveness for various sizes of boilers that range from \$3,730 - \$7,387 per ton of NO_x removed (Appendix 10) and found SCR technology to be cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a refinery gas-fired combustion unit or process heater, with a rated heat input equal to or greater than 50 million Btu/hour shall continue to comply with the existing presumptive RACT emission limitation of 0.25 lb NO_x/million Btu heat input. [25 Pa. Code § 129.112(g)(1)(iv)]

Coal-fired combustion unit with a rated heat input equal to or greater than 50 million Btu/hour and less than 250 million Btu/hour:

The Department has found only one unit in this category at a major NO_x emitting facility, which is a spreader stoker boiler. The Department analyzed the actual stack test data for NO_x emissions show as high as 0.36 lb NO_x/million Btu heat input. Most of the previous units were equipped with LNB. Test results for these coal-fired boilers show as high as 0.51 lb NO_x/million Btu heat input.

The Department evaluated SCR cost-effectiveness for various sizes of boilers that range from \$4,338 - \$8,247 per ton of NO_x removed (Appendix 11) and found SCR technology to be cost-prohibitive. The Department also evaluated SNCR cost-effectiveness ranging from \$5,409 - \$11,273 per ton of NO_x removed (Appendix 12) and found SNCR technology to be cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a coal-fired combustion unit with a rated heat input equal to or greater than 50 million Btu/hour and less than 250 million Btu/hour shall continue to comply with the existing presumptive RACT emission limitation of 0.45 lb NO_x/million Btu heat input. [25 Pa. Code § 129.112(g)(1)(v)]

Circulating fluidized bed primarily Bituminous waste (Gob)-fired or Anthracite waste (Culm)-fired combustion unit with a rated heat input equal to or greater than 250 million Btu/hour:

The Department analyzed CEMS NO_x emissions data for three years (2018-2020) for Bituminous waste (Gob)-fired CFBs using EPA's Clean Air Market Division (CAMD) which showed there is no consistency in NO_x emissions among units whether or not equipped with SNCR. These units are capable of achieving a NO_x emission rate as low as 0.16 lbs/MMBtu with adequate margin to include variability in waste.

The Department evaluated cost-effectiveness for SNCR for CFB units with baseline emission rate of 0.16 lb NO_x/million Btu heat input that range from \$4,747 - \$6,207 per ton of NO_x removed (Appendix 13), which determined to be economically infeasible option.

Selective catalytic reduction has been demonstrated to achieve high levels of NO_x reduction on several types of combustion sources, including pulverized coal and stoker-type coal-fired boilers, but has not been demonstrated on CFB boilers. This technology could potentially be transferred to a CFB boiler, but not without significant difficulty: SCR installation upstream of the baghouse is technically infeasible because the particulate matter loading upstream of the baghouse will contain a very high loading of alkaline particulate matter that would likely preclude effective SCR operation, and SCR installation downstream of the baghouse is technically infeasible because the exhaust gas temperature at that location is too low to support effective SCR operation. This would require an additional burner that would reduce the unit efficiency for generating electricity and also emit additional air pollutants.

The Department also evaluated cost-effectiveness for SCR for CFB units with baseline emission rate of 0.16 lb NO_x/million Btu heat input that range from \$5,507 - \$9,060 per ton of NO_x removed (Appendix 14), which determined to be economically infeasible option. These cost-effectiveness do not include additional costs for a burner that would require to heat the exhaust gas post bag house.

Therefore, the Department is proposing that the owner and operator of a Circulating fluidized bed primarily Bituminous waste (Gob)-fired or Anthracite waste (Culm)-fired combustion unit with a rated heat input equal to or greater than 250 million Btu/hour shall comply with the existing presumptive RACT emission limitation of 0.16 lb NO_x/million Btu heat input on daily average. [25 Pa. Code § 129.112(g)(1)(vi)]

The Department also analyzed CEMS NO_x emissions data for three years (2018-2020) for Culm-fired CFBs using EPA's Clean Air Market Division (CAMD) that ranges from 0.1 – 0.15 lb/MMBtu. The Department will solicit comments as to whether a separate Presumptive NO_x emission limit for Anthracite waste (Culm)-fired CFBs be included in the final rule.

A solid fuel-fired combustion unit that is not a coal-fired combustion unit with a rated heat input equal to or greater than 50 million Btu/hour:

The Department analyzed test results for existing solid fuel-fired combustion units that are not coal-fired combustion units with a rated heat input equal to or greater than 50 million Btu/hour. The test results analyzed show these units are complying with the existing NO_x limit of 0.25 lb NO_x/million Btu heat input.

The Department evaluated SCR cost-effectiveness for various sizes of boilers that range from \$7,562 - \$13,971 per ton of NO_x removed (Appendix 15) and found SCR technology to be cost-prohibitive. The Department evaluated SNCR cost-effectiveness for various sizes of boilers that range from \$7,840 - \$18,200 per ton of NO_x removed (Appendix 16) and determined SNCR technology to be cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of solid fuel-fired combustion unit that is not a coal-fired combustion unit with a rated heat input equal to or greater than 50 million Btu/hour shall continue to comply with the existing presumptive RACT emission limitation of 0.25 lb NO_x/million Btu heat input. [25 Pa. Code § 129.112(g)(1)(vii)]

Circulating fluidized bed coal-fired combustion unit with a selective non-catalytic reduction system:

The Department is proposing that the owner or operator of a circulating fluidized bed coal-fired combustion unit shall control the NO_x emissions each operating day by operating the installed air pollution control technology and combustion controls at all times consistent with the technological limitations, manufacturer specifications, good engineering and maintenance practices, and good air pollution control practices for controlling emissions. [25 Pa. Code § 129.112(g)(1)(viii)]

Presumptive VOC RACT requirements for a combustion unit or combustion source with a rated heat input equal to or greater than 50 million Btu/hour, brick kiln, cement kiln, lime kiln:

The typical VOC emission range from natural gas-fired, distillate oil-fired, residual oil-fired or other liquid fuel-fired, refinery gas-fired, coal-fired or solid fuel-fired combustion unit that is not a coal-fired combustion unit, combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour range from 0.002 to 0.05 lb NO_x/million Btu heat input. The Department evaluated oxidation catalyst technology for VOC emission control from these sources using an average uncontrolled VOC emission rate of 0.01 lb VOC/million Btu heat input with 60% VOC control efficiency. The cost-effectiveness ranged from \$46,853 to \$96,929 per ton of VOC removed (Appendix 17). Therefore, the Department determined oxidation catalyst technology to be an economical infeasible option as RACT.

The Department is proposing that presumptive VOC RACT for a combustion unit or combustion source with a rated heat input equal to or greater than 50 million Btu/hour, brick kiln, cement kiln, or lime kiln shall continue to comply with the existing presumptive RACT emission requirements of installation, maintenance and operation in accordance with the manufacturer's specifications and with good operating practices. [25 Pa. Code §129.112(d)]

(G) Combustion Turbines:

Natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 180 megawatts (MW):

Most of the turbines in this category are installed with DLNC.

The Department performed cost analysis for SCR for turbines between 1,000 and 60,000 bhp that range from \$8,524 - \$31,928 per ton of NO_x removed (Appendix 18). Because of its higher cost-effectiveness, SCR is determined to be a cost-prohibitive option.

The Department analyzed test results that included NO_x emissions as high as 40 ppm.

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 180 MW shall continue to comply with the existing presumptive RACT emission limitation of 42 ppmvd NO_x corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(i)(A)]

The Department evaluated oxidation catalyst technology for VOC control for turbines between 6,000 and 60,000 bhp. The cost-effectiveness ranged from \$13,201 to \$137,719 per ton of VOC removed (Appendix 19). Therefore, the Department found oxidation catalyst an economical infeasible option as RACT.

The Department also analyzed actual VOC emissions data and based on the test results, and found that existing natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 1,000 bhp are able to meet 5 ppm VOC or less (as propane) corrected at 15% oxygen.

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 180 MW shall continue to comply with the existing presumptive RACT emission limitation of 5 ppmvd VOC (as propane) corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(i)(B)]

Fuel oil-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 180 MW:

Based on the Department's record, there are no simple cycle or regenerative cycle combustion turbines with a rated output equal to or greater than 1,000 bhp and less than 180 MW and powered solely by fuel oil in the Commonwealth. There are turbines of this type that use oil as a start-up fuel before switching to natural gas. The existing requirements for these turbines are consistent with the requirement in the NSPS Part 60 Subpart KKKK.

Therefore, the Department is proposing that the owner and operator of a fuel oil-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 180 MW shall continue to comply with the existing presumptive RACT emission limitation of 96 ppmvd NO_x corrected at 15% oxygen [25 Pa. Code § 129.112(g)(2)(i)(C)] and existing presumptive RACT emission limitation of 9 ppmvd VOC (as propane) corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(i)(D)]

Natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW:

All natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW are equipped with DLNC and SCR. The Department analyzed NO_x emissions test results for natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW. The test results show these turbines are able to achieve 4 ppmvd NO_x corrected at 15% oxygen.

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW, shall continue to comply with the existing presumptive RACT emission limitation of 4 ppmvd NO_x corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(ii)(A)]

The Department analyzed test results for VOC emissions for natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbines with a rated output equal to or greater than 180 MW that show as high as 2 ppmvd VOC (as propane) corrected at 15% oxygen.

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired combined cycle or combined heat and power combustion turbine, with a rated output equal to or greater than 180 MW shall continue to comply with the existing presumptive RACT emission limitation of 2 ppmvd VOC (as propane) corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(ii)(B)]

Fuel oil-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW:

The existing NO_x RACT limit of 8 ppmvd corrected at 15% oxygen for fuel oil-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW is consistent with fuel oil emission limits for a turbine equipped with SCR.

Therefore, the Department is proposing that the owner and operator of a fuel oil-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW, shall continue to comply with the existing presumptive RACT emission limitation of 8 ppmvd NO_x corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(ii)(C)]

The Department analyzed test results for VOC emissions for fuel oil-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW that show as high as 2 ppmvd VOC (as propane) corrected at 15% oxygen.

Therefore, the Department is proposing that the owner and operator of a fuel oil-fired combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW, shall continue to comply with the existing presumptive RACT emission limitation of 2 ppmvd VOC (as propane) corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(ii)(D)]

Natural gas or a noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 3,000 bhp:

The Department performed cost analysis for SCR for turbines between 1,000 and 3,000 bhp with existing RACT II emission rate of 150 ppmvd NO_x corrected at 15% oxygen that range from \$21,206 - \$27,748 per ton of NO_x removed (Appendix 20). Therefore, SCR is determined to be a cost-prohibitive option.

Most natural gas or noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbines with a rated output equal to or greater than 1,000 bhp and less than 3,000 bhp are installed with DLNC, and analysis of test results of actual NO_x emissions show as high as 84 ppmvd corrected at 15% oxygen. The Department also performed cost analysis for SCR for turbines between 1,000 and 3,000 bhp with NO_x emission rate of 85 ppmvd NO_x corrected at 15% oxygen and determined it to be a cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 3,000 bhp, shall comply with the presumptive RACT emission limitation of 85 ppmvd NO_x corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(iii)(A)]

The Department analyzed test results for VOC emissions for natural gas or a noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbines with a rated output equal to or greater than 1,000 bhp and less than 3,000 bhp that show as high as 9 ppmvd VOC (as propane) corrected at 15% oxygen.

The Department evaluated oxidation catalyst technology for VOC control with uncontrolled VOC emission rate of 9 ppmvd (as propane) corrected at 15% oxygen. The cost-effectiveness ranged from \$68,488 to \$76,026 per ton of VOC removed (Appendix 21). The Department determined oxidation catalyst technology to be economically cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 3,000 bhp shall continue to comply with the existing presumptive RACT emission limitation of 9 ppmvd VOC (as propane) corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(iii)(B)]

Fuel oil-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 3,000 bhp:

Based on the Department's record, there are no simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 1,000 bhp and less than 3,000 bhp and powered solely by fuel oil in the Commonwealth. There are turbines of this type that use oil as a start-up fuel before switching to natural gas.

The Department performed cost analysis for SCR for turbines between 1,000 and 3,000 bhp with NO_x emission rate of 150 ppmvd NO_x corrected at 15% oxygen that range from \$21,206 - \$27,748 per ton of NO_x removed (Appendix 20). Therefore, SCR is determined to be a cost-prohibitive option.

Therefore, the Department is proposing that the owner and operator of a fuel oil-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 3,000 bhp shall continue to comply with the existing presumptive RACT emission limitation of 150 ppmvd NO_x corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(iii)(C)].

The Department evaluated oxidation catalyst technology for VOC control with uncontrolled VOC emission rate of 9 ppmvd (as propane) corrected at 15% oxygen. The cost-effectiveness ranged from \$68,488 to \$76,026 per ton of VOC removed (Appendix 21). The Department determined oxidation catalyst technology to be economically cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a fuel oil-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 3,000 bhp shall continue to comply with the existing presumptive RACT emission limitation of 9 ppmvd VOC (as propane) corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(iii)(D)]

Natural gas or a noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 3,000 bhp and less than 60,000 bhp:

All turbines in this category are installed with DLNC. The Department analyzed NO_x emissions test results for thirteen natural gas or a noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbines with a rated output equal to greater than 3,000 bhp and less than 6,000 bhp and found ten of them are able to achieve NO_x emission rate of 42 ppmvd corrected at 15% oxygen. Natural gas or a noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 6,000 bhp currently are required to meet with RACT II NO_x emission limit of 42 ppmvd corrected at 15% oxygen.

The Department evaluated cost analysis for SCR for turbines in this category with uncontrolled NO_x emission rate of 42 ppmvd corrected at 15% oxygen that range from \$8,524 – 24,195 per ton of NO_x removed (Appendix 22) and determined SCR to be a cost-prohibitive option.

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 3,000 bhp and less than 60,000 bhp shall comply with the presumptive RACT emission limitation of 42 ppmvd NO_x corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(iv)(A)]

Most of the turbines in this size category meet 9 ppmvd VOC (as propane) corrected at 15% oxygen. As shown in Appendix 20, add on control such as oxidation catalyst is cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 3,000 bhp and less than 60,000 bhp shall comply with the presumptive RACT emission limitation of 9 ppmvd VOC (as propane) corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(iv)(B)]

Fuel oil-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 3,000 bhp and less than 60,000 bhp:

Based on the Department's record, there are no fuel oil-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 3,000 bhp and less than 60,000 bhp and powered solely by fuel oil in the Commonwealth. There are turbines of this type that use oil as a start-up fuel before switching to natural gas.

The Department performed cost analysis for SCR for turbines between 3,000 and 60,000 fuel oil-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 3,000 bhp and less than 60,000 bhp and RACT II limit of 96 ppmvd NO_x corrected at 15% oxygen that range from \$7,813 – \$21,859 per ton of NO_x removed (Appendix 23). Therefore, SCR is determined to be a cost-prohibitive option.

Therefore, the Department is proposing that the owner and operator of a fuel oil-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 3,000 bhp and less than 60,000 bhp shall continue to comply with the existing presumptive RACT emission limitation of 96 ppmvd NO_x corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(iv)(C)]

Also, as shown in Appendix 20, add-on control such as oxidation catalyst is cost-prohibitive for the turbine with the existing presumptive RACT emission limitation of 9 ppmvd VOC (as propane) corrected at 15% oxygen.

Therefore, the Department is proposing that the owner and operator of a fuel oil-fired simple cycle or regenerative cycle combustion turbine with a rated output equal to greater than 3,000 bhp and less than 60,000 bhp shall continue to comply with the existing presumptive RACT

emission limitation of 9 ppmvd VOC (as propane) corrected at 15% oxygen. [25 Pa. Code § 129.112(g)(2)(iv)(D)]

(H) Stationary Internal Combustion Engines:

Natural gas or a noncommercial gaseous fuel-fired lean burn stationary internal combustion engine with a rating equal to or greater than 500 bhp and less than 3,500 bhp:

Most of these engines are equipped with LEC technology. Test results for natural gas engines above 500 bhp show NO_x emissions as high as 3.0 gram NO_x/bhp-hr. Engines manufactured on or after July 1, 2007, and subject to 40 CFR Part 60 Subpart JJJJ, are required to meet the emission limitation of 2 gram NO_x/bhp-hr; and, engines manufactured on or after July 1, 2010, are required to meet the emission limitation of 1 gram NO_x/bhp-hr. The Department performed cost analysis for SCR for engines rated between 500 and 3,500 bhp that range from \$3,871 to \$10,449 per ton of NO_x removed (Appendix 24) and determined SCR technology as a cost-prohibitive option.

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired lean burn stationary internal combustion engine with a rating equal to or greater than 500 bhp and less than 3,500 bhp shall continue to comply with the existing presumptive RACT emission limitation of 3.0 gram NO_x/bhp-hr. [25 Pa. Code § 129.112(g)(3)(i)(A)]

Natural gas or a noncommercial gaseous fuel-fired lean burn stationary internal combustion engine with a rating equal to or greater than 3,500 bhp

Most of these engines are equipped with LEC technology with 3.0 gram NO_x/bhp-hr limit. The Department performed cost analysis for SCR with 80% NO_x reduction efficiency for engines rated at greater than 3,500 bhp that range from \$3,326 - \$3,676 for ton of NO_x removed. (Appendix 25).

Therefore, the Department is proposing that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired lean burn stationary internal combustion engine with a rating equal to or greater 3,500 bhp shall comply with the presumptive RACT emission limitation of 0.6 grams NO_x/bhp-hr. [25 Pa. Code § 129.112(g)(3)(ii)(A)]

Liquid fuel or dual-fuel-fired stationary internal combustion engine with a rating equal to or greater than 500 bhp

The Department performed cost analysis for SCR with 80% is cost-effective for diesel engines between 500 to 5,000 bhp with existing RACT II limit of 8 gm NO_x/bhp-hr and found the cost range from \$2,543 - \$3,503 (Appendix 26).

Therefore, the Department is proposing that the owner and operator of a liquid fuel or dual-fuel-fired stationary internal combustion engine with a rating equal to or greater than 500 bhp shall

comply with the presumptive RACT emission limitation of 1.6 gram NO_x/bhp-hr. [25 Pa. Code § 129.112(g)(3)(iii)]

Natural gas or a noncommercial gaseous fuel-fired rich burn stationary internal combustion engine with a rating equal to or greater than 100 bhp:

Typical uncontrolled NO_x from natural gas-fired rich-burn engines range from 13 - 16 gram NO_x/bhp-hr. During RACT II development, the Department determined that NSCR with 80% NO_x removal efficiency is technically and economically feasible and established NO_x emission rate of 2.0 gram NO_x/bhp-hr for rich-burn engines rated at equal to or greater than 500 bhp.

Most of the rich-burn engines greater than 500 bhp are retrofitted with NSCR or equivalent technology that reduces NO_x emission at 2 gram NO_x/bhp-hr or less. The Department further evaluated economic feasibility for NSCR technology for engines rated at as low as 100 bhp. NO_x efficiency for NSCR technology varies from 80 – 95% depending on the small to large size engines. The cost analysis was performed with an average 80% NO_x and 50% VOC reduction efficiency that range from \$70 - \$616 for ton of NO_x and VOC removed (Appendix 27).

Therefore, the Department has expanded the applicability range to engines as small as 100 bhp and proposed that the owner and operator of a natural gas or a noncommercial gaseous fuel-fired rich burn stationary internal combustion engine with a rating equal to or greater than 100 bhp shall comply with the presumptive RACT emission limitation of 2.0 gram NO_x/bhp-hr [25 Pa. Code § 129.112(g)(3)(iv)(A)] and presumptive RACT emission limitation of 0.5 gram VOC/bhp-hr. [25 Pa. Code § 129.112(g)(3)(iv)(B)]

Presumptive VOC RACT requirements for all internal combustion engines:

The Department evaluated cost-effectiveness for oxidation catalyst technology for all internal combustion engines rated at equal to or greater than 500 bhp with existing limit of 1.0 gram VOC/bhp-hr and found to be between approximately \$2,000 to \$4,000 per ton of VOC removed (Appendix 28) and therefore determined to be an economically feasible option.

The Department further reviewed the stack test results for sample of internal combustion engines and found the VOC emission as high as 0.5 gram VOC/bhp-hr.

Therefore, the Department determined the presumptive VOC RACT for all lean-burn internal combustion engines rated at equal to greater than 500 bhp at 0.5 gram VOC/bhp-hr. excluding formaldehyde. [25 Pa. Code § 129.112(g)(3)(i)(B)] and [25 Pa. Code § 129.112(g)(3)(ii)(B)]

(I) Portland Cement Kilns:

EPA has evaluated SCR systems for use at cement kilns and has found that they are technically feasible. As per summary of comments received regarding Consent Decree between Lehigh Cement and EPA dated March 27, 2020, at many cement kilns, installation and operation of SCR is cost prohibitive and would increase the cost per ton of clinker to such an extent that it may

render the cement plant economically non-viable. Therefore, the Department believes that SCR technology for cement kilns are economically infeasible option.

Long wet-process cement kiln:

All long wet-process cement kilns in Pennsylvania are installed and operating with SNCR. The Department evaluated NO_x test results for a long-wet process cement kiln located at Armstrong Cement.

Based on the test results, the Department is proposing that the owner and operator of a long wet-process cement kiln shall continue to comply with the existing presumptive RACT emission limitation of 3.88 pounds of NO_x per ton of clinker produced. [25 Pa. Code § 129.112(h)(1)]

Long dry-process cement kiln:

All long dry-process cement kilns in Pennsylvania are installed and operating with SNCR. The Department evaluated NO_x test results for a long-wet process cement kiln located at Evansville Cement.

Per a consent decree between EPA and Lehigh Cement Evansville, a limit of 3.0 pounds of NO_x per ton of clinker produced is established.

Therefore, the Department is proposing that the owner and operator of a long dry-process cement kiln shall comply with the presumptive RACT emission limitation of 3.0 pounds of NO_x per ton of clinker produced. [25 Pa. Code § 129.112(h)(2)]

Preheater and Precalciner cement kiln:

Precalciner cement kilns are equipped with SNCR. SCR systems applied to cement preheater/precalciner (PH/PC) kilns can be either “low-dust” or “high-dust” systems depending on their location after or before the particulate matter control device. In both types of systems, capital costs include the cost of the SCR catalyst and reactor, the costs to upgrade or replace kiln ID fans when SCR is added to existing PH/PC kilns, and the costs of the reagent delivery system, storage, and instrumentation. Because of the problems of catalyst plugging, the high-dust system requires a catalyst cleaning mechanism, such as pressurized air nozzles or sonic horns. The low-dust system avoids costs associated with catalyst cleaning. Operating costs include operating labor and maintenance costs, reagent costs, and the electricity of reagent pumping. High-dust SCR systems incur higher energy costs for catalyst cleaning. Operating cost also include catalyst replacement every few years.

As per EPA’s “Alternative Control Techniques Document Update - NO_x Emissions from New Cement Kilns” (EPA-453/R-07-006 November 2007) document, the average cost-effectiveness of SCR for PH/PC kilns are approximately \$4,200 per ton of NO_x removed. Therefore, the Department has determined SCR to be a cost-prohibitive option for PH/PC cement kilns.

As per the consent decree, Lehigh Cement kiln at Nazareth's is limited to 2.30 pounds of NO_x per ton of clinker produced.

Therefore, the Department is proposing that the owner and operator of a Preheater and Precalciner cement kiln shall comply with the presumptive RACT emission limitation of 2.30 pounds of NO_x per ton of clinker produced. [25 Pa. Code § 129.112(h)(3)]

VOC RACT for all cement kilns:

Based on the cost analysis performed for CO Catalyst for combustion units and combustion sources, add-on control such as oxidation catalyst is cost-prohibitive for combustion units or sources located at all cement plants (Appendix 16). Therefore, the Department is proposing that an owner or operator of a cement kiln shall continue to comply with the existing presumptive VOC RACT requirements of installation, maintenance, and operation of the source in accordance with manufacturer's specifications and with good operating practices.

(J) Glass Melting Furnaces:

There are several glass melting furnaces in Pennsylvania that are major source emitters of NO_x. Most of the glass furnaces in Pennsylvania are equipped with SCR, LNB or Oxy-Firing and Air Staging controls.

Several alternative control technologies are available to glass manufacturing facilities to limit NO_x emissions. These options include combustion modifications (low NO_x burners, oxy-fuel firing, oxygen-enriched air staging), process modifications (fuel switching, batch preheat, electric boost), and post combustion modifications (fuel return, SNCR, SCR). Oxy-firing is effective NO_x emission reduction technique and is best implemented with a complete furnace rebuild. This strategy not only reduces NO_x emissions by as much as 85 percent, but reduces energy consumption, increases production rates by 10 to 15 percent, and improves glass quality by reducing defects. Oxy-firing is demonstrated technology and has penetrated all segments of the glass industry.

The Department performed cost analysis for SCR for those glass furnaces that are equipped with LNB or Oxy-Firing controls.

Container glass furnace:

All existing container glass furnaces are equipped with Oxy-firing and LNB. The Department performed cost analysis for SCR that range from \$4,356 - \$5,064 per ton of NO_x removed (Appendix 29) and determined to be cost-prohibitive.

Therefore, the Department is proposing that the owner and operator of a container glass furnace shall comply with the presumptive RACT emission limitation of 4.0 pounds of NO_x per ton of glass pulled, which is consistent with the recommended emission limit in OTC's (Ozone Transport Commission) "Identification and Evaluation of Candidate Control Measures Final Technical Support Document" and 25 Pa. Code §129.304. [25 Pa. Code § 129.112(i)(1)]

Pressed or Blown glass furnace:

All existing pressed or blown glass furnaces are equipped with SCR.

Therefore, the Department is proposing that the owner and operator of a pressed or blown glass furnace shall comply with the presumptive RACT emission limitation of 7.0 pounds of NO_x per ton of glass pulled, which is consistent with the recommended emission limit in OTC's "Identification and Evaluation of Candidate Control Measures Final Technical Support Document" and with 25 Pa. Code §129.304. [25 Pa. Code § 129.112(i)(2)]

Fiberglass furnace:

No fiberglass furnace is found in Pennsylvania subject to RACT. For any fiberglass furnace in Pennsylvania that becomes subject to RACT, the Department is proposing NO_x RACT limit for fiberglass furnace at 4.0 pounds of NO_x per ton of glass pulled. [25 Pa. Code § 129.112(i)(3)].

This emission limit is also consistent with recommended emission limit in OTC's "Identification and Evaluation of Candidate Control Measures Final Technical Support Document" and 25 Pa. Code §129.304.

Flat glass furnace:

Most flat glass furnaces in Pennsylvania are equipped with Oxy-firing and LNB or SCR with controlled emission rate of 7 lbs/ton of glass pulled. However, one glass furnace in Pennsylvania is operating with a NO_x limit of 26.75 lb/ton of glass pulled. This glass furnace is not able to meet proposed RACT III NO_x limit of 7 lbs/ton of glass pulled herefore. The Department evaluated a cost-analysis for SCR for flat glass furnace and found it to be less than \$1,000 approximately removed.

Since most flat glass furnaces are equipped with Oxy-firing and LNB or SCR, the Department is proposing that the owner and operator of a flat glass furnace shall comply with the presumptive RACT emission limitation of 7.0 pounds of NO_x per ton of glass pulled, which is consistent with the recommended emission limit in OTC's "Identification and Evaluation of Candidate Control Measures Final Technical Support Document" and 25 Pa. Code § 129.304. [25 Pa. Code § 129.112(i)(4)]

All other glass melting furnaces:

All other glass furnaces are equipped with LNB or Air Staging controls. The Department performed incremental cost analysis for SCR and found to be higher than \$3,950 per ton of NO_x removed and determined to be cost-prohibitive (Appendix 30).

The Department evaluated a test result for NO_x emissions for other glass melting furnace that shows NO_x emissions as high as 5.7 pounds of NO_x per ton of glass pulled. Therefore, the Department is proposing that the owner and operator of any other type of glass melting furnace

shall comply with the presumptive RACT emission limitation of 6.0 pounds of NO_x per ton of glass pulled on a 30-days rolling average basis that is consistent with 25 Pa. Code § 129.304. [25 Pa. Code § 129.112(i)(5)]

(K) Lime Kilns:

The Department evaluated SCR technology for long rotary kiln. U.S. EPA's (SCR) RACT/BACT/LAER Clearinghouse (RBLC) does not show this technology as being applied to either long rotary or preheater lime kiln. SCR is generally not considered technically feasible option for long rotary lime kiln because of particulate fouling, especially with calcium-based particulates. Optimum temperature for SCR is significantly higher than the exhaust gas temperatures from long rotary kiln (typically less than 500 deg. F) and exhaust gas temperature fluctuation and variability in long rotary kiln hinders control efficiency of SCR. Therefore, the Department has determined SCR to be a technically infeasible option.

SNCR technology has not been applied to a long rotary lime kiln where the reagent must be injected into the calcining zone of the kiln. The location of the injection point is critical to the level of reduction of NO_x. The optimal location of the injection point in a long rotary kiln is variable and the ability to match injection location to the NO_x concentration is difficult and inaccurate. Failure to match the required criteria could result in poor effectiveness and/or by-product generation of NO_x from the ammonia reagent. Application of the technology at a long rotary kiln has not been installed and currently not a reasonable control alternative. Therefore, the Department has determined SNCR technology to be a technically infeasible option.

Combustion/burner optimization techniques such as Low Excess Air, Overfire Air, Low NO_x Burner and Flue Gas Recirculation can reduce NO_x emissions by 5 to 60 percent. The goal of these control techniques is to optimize the efficiency of combustion while minimizing emissions of NO_x. The Department reviewed the operating permit for a long rotary lime kiln No. 5 at Carmeuse Lime, Inc. The kiln incorporates combustion controls using multi-channel, multi-fuel feed burners. Carmeuse has an on-going program designed to minimize NO_x emissions through combustion of various fuels. Where applicable, depending on fuel type, product mix, and process conditions, the program incorporates an appropriate combustion/burner optimization technique. During the RACT II evaluation, the Department revised the NO_x emission limit from 6 to 4.6 lb of NO_x per hour with combustion/burner optimization for Kiln No. 5 at Carmeuse Lime, Inc.

Therefore, the Department is proposing that the owner and operator of all lime kiln shall comply with the presumptive RACT emission limitation of 4.6 lb of NO_x per hour. [25 Pa. Code § 129.112(j)]

Direct-fired Heater, Furnace or Oven with a rated heat input equal to or greater than 20 million Btu/hour:

The Department has found that all direct-fired heaters, furnaces or ovens are natural gas-fired and should be able to achieve NO_x emission rate similar to natural gas, propane or LPG-fired combustion units or process heaters.

Therefore, the Department is proposing that the owner and operator of a direct-fired heater, furnace or oven with a rated heat input equal to or greater than 20 million Btu/hour shall comply with the presumptive RACT emission limitation of 0.10 lb. NO_x/million Btu heat input on a daily average basis or as determined based on actual stack test results. [25 Pa. Code §129.112(k)]

(L) Alternative RACT proposals:

Owners and operators of sources that cannot meet presumptive RACT requirements or emission limitations may elect to meet the applicable NO_x RACT emission limitation by averaging NO_x emissions on either a facility-wide or system-wide basis. [25 Pa. Code § 129.113(a)]

Owners and operators of sources that cannot meet presumptive RACT requirements or emission limitations or by averaging NO_x emissions on either a facility-wide or system-wide basis will be required to evaluate RACT requirements on a case-by-case basis for NO_x and/or VOCs. [25 Pa. Code § 129.114(a)]

Owners and operators of sources that are subject to the RACT III regulation but do not have presumptive RACT requirements for the sources must evaluate RACT requirements on a case-by-case for NO_x and VOCs as applicable.

Case-by-case RACT proposals must be submitted to appropriate regional offices by *****, ** 202*. [25 Pa. Code § 129.114(d)(1)]

The owner or operator must complete the implementation of the case-by-case RACT by *****, ** 202*. [25 Pa. Code § 129.114(d)(4)]

If an owner or operator is going to install a control device as part of case-by-case RACT, the owner or operator may petition the department for an alternate compliance schedule. [25 Pa. Code § 129.114(j)]

The procedure is identical to the alternate compliance schedule procedure for presumptive RACT, including interim RACT emission limitations.

The owner or operator must complete the implementation of the case-by-case RACT by ** **, 20***. [25 Pa. Code § 129.114(j)(2)(v)]

If an owner or operator proposes to permanently remove a subject source from operation, the final compliance date will be determined on a case-by-case basis and may be longer than 3 years from petition approval

The case-by-case RACT proposal shall be submitted in accordance with procedures in the case-by-case RACT requirements in [25 Pa. Code § 129.114(d)]

The proposal must also include testing, monitoring, recordkeeping, and reporting requirements to show compliance with the proposed case-by-case RACT.

(M) Compliance Demonstration:

An owner or operator must demonstrate compliance with the RACT III regulation by *****, **, 202*. An owner or operator subject to RACT III has two compliance options.

Compliance with presumptive RACT requirements and/or emission limitations.

Case-by-case RACT determinations.

The owner or operator of a source with CEMS shall show compliance with the presumptive RACT emission limitations on 30-day rolling average basis, as required. [25 Pa. Code § 129.115(b)(1)]

The clinker production rate for Portland cement kilns is calculated in accordance with 40 CFR Part 63, Subpart LLL § 63.1350(d). [25 Pa. Code § 129.115(b)(2)]

Compliance with the presumptive NO_x RACT emission limitation for municipal waste combustors with CEMS shall be shown as a daily rolling average, calculated in the same manner as currently applied to CEMS. [25 Pa. Code § 129.115(b)(3)]

The owner or operator of a source without CEMS shall show compliance with the presumptive RACT emission limitations with a department-approved emissions source test that meets the requirements of Chapter 139. The testing shall be conducted at least once in each 5-year calendar period. [25 Pa. Code § 129.115(b)(5)]

(N) Recordkeeping and Reporting:

The owner or operator of a source is required to all applicable recordkeeping and reporting requirements as established in 25 Pa. Code § 129.115.

APPENDIX 1

GUIDANCE DOCUMENT ON REASONABLY AVAILABLE CONTROL TECHNOLOGY FOR SOURCES OF NO_x EMISSIONS

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INTRODUCTION:

Pennsylvania's regulation, Title 25, Environmental Resources, Article III, Chapter 129, Standards for Sources, Section 129.91, requires Reasonably Available Control Technology (RACT) to be determined on a case-by-case basis for major sources or facilities. RACT is defined as: The lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility.

Presumptive RACT standards have been established in Section 129.93 for certain select source categories. In many states, presumptive standards are the norm with emission limitations or technologies established for most major categories. However, because Pennsylvania has more sources with a greater degree of diversity, the case-by-case RACT process is preferred.

This document is therefore intended to provide guidance and information needed to examine the case-by-case RACT determinations for the affected sources or facilities. In cases where the regulations have provided presumptive RACT, further details on the rationale for the presumptive standards will be given.

Section I contains a general discussion of the Clean Air Act Amendments (CAAA) and how it affects the Commonwealth. A discussion on the NO_x emission inventory is included. Section II describes the RACT submittal process and the subsequent case-by-case NO_x RACT determination procedures. Section III contains the criteria for allowing emission averaging. Section IV includes the guidance on the establishment of final RACT limitations using actual emission data.

Attachment 1 provides a general summary of various NO_x control strategies, followed by a series of Modules which describe in detail the application of NO_x RACT for various source categories. The modules are compilation of available information on these source categories. Depending upon the need, specific Modules may be requested by the interested parties. The Modules available are as follows:

- Module 1- Utility Boilers and Boilers \geq 100 MMBtu/hr
- Module 2- Industrial, Commercial, Institutional boilers
<100 MMBtu/hr
- Module 3- Internal Combustion Engines
- Module 4- Turbines
- Module 5- Glass Furnaces
- Module 6- Process Heaters
- Module 7- Iron and Steel Mills
- Module 8- Cement Manufacturing
- Module 9- Miscellaneous and Presumptive RACT Sources

APPENDIX 1

I. GENERAL DISCUSSION:

The Clean Air Act Amendments (CAAA) of 1990 require Pennsylvania to meet the health-related, ground level ozone National Ambient Air Quality Standard (NAAQS). In the presence of sunlight, oxides of nitrogen (NOx), and volatile organic compounds (VOC) react to form ground level ozone. Ozone is a known respiratory irritant, and may significantly reduce the yield of important food crops. Ozone may also cause degradation of paint, plastics, textiles and rubber. NOx is also a precursor to acid deposition. NOx, in the form of Nitrogen Dioxide, (NO2) is known to aggravate symptoms associated with asthma and bronchitis. NO2 can also increase susceptibility to respiratory infections. Ground level ozone should not be confused with stratospheric ozone which is beneficial and needed in the upper levels of the atmosphere to block harmful radiation from the sun.

Attaining the ozone air quality standard is a statewide problem for Pennsylvania. A number of counties are classified as nonattainment for not meeting the NAAQS. The CAAA created a special classification system of ozone nonattainment areas depending on the severity of the ozone levels within a consolidated metropolitan statistical area (CSMA). Figure 1 shows these classifications for Pennsylvania. Some counties are classified as nonattainment but are not part of a CSMA.

The five-county Pennsylvania portion of the Philadelphia CSMA is classified as a severe area. In fact, there are serious region-wide violations of the ozone standard throughout the entire northeastern United States. The CAAA address this problem of regional nonattainment through the establishment of the Ozone Transport Region (OTR), of which Pennsylvania has been designated as one of its 13 states or political entities. At a minimum, this action requires that any major VOC or NOx source in the entire state of Pennsylvania is subject to the requirements that apply to major sources in ozone areas classified as moderate, even though some Pennsylvania counties are achieving the NAAQS attainment levels. The major sources located in the Philadelphia Metropolitan Statistical Area are subject to the requirements of severe ozone nonattainment area.

The CAAA require areas which exceed NAAQS for ozone to implement NOx RACT programs for all major NOx facilities. The RACT programs are to apply to all facilities which emit or have the potential to emit greater than 100 tons per year of NOx. In the case of severe nonattainment areas such as the five-county Pennsylvania portion of Philadelphia CSMA facilities of greater than 25 tons per year of NOx are subject to RACT requirements.

Regarding the applicability, if the facility's "potential to emit" was above the RACT threshold (e.g 100 TPY) but the actual emissions for the year 1990 calendar year and for the subsequent years were below the threshold, the facility has the option to accept a federally enforceable condition to limit the emissions to be under the applicability

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NOx RACT GUIDANCE

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threshold. Such a condition would make the facility "synthetic minor" and would not be subject RACT requirements. Since the Pennsylvania's operating permit is not currently federally enforceable, the permit amendment with such conditions must be incorporated in to Pa's SIP as revisions in order to make them federally enforceable.

On the other hand, if the facility's actual emissions for the calendar year 1990 were above the RACT applicability threshold, the facility could never be made "synthetic minor" even if the facility is willing to limit the emissions in the future. Thus such facility would be subject to the RACT.

NOx Emissions Distribution By Source

Statewide, mobile sources make up 31% of the total NOx emissions. The remaining 69% comes from stationary sources. Of the latter, the utility industry accounts for 80% of the total NOx emissions. Natural gas transmission accounts for 5% of the total stationary source NOx emissions while the remaining 15% of NOx is derived from miscellaneous sources. Of these miscellaneous sources, glass manufacturing accounts for slightly greater than 1% of the total NOx emissions and asphalt plants less than 1% of the total. Other industries include miscellaneous utilities at 1%, metallurgical at 3%, chemical industry at less than 1%, refining at 2%, mineral industry at 3%, and all other sources at 5%. (See Figure 2 and Table 1) This information was extracted from Pennsylvania Emission Data System (PEDS). Due to thresholds established for including in the PEDS, all the sources in some source categories such as asphalt plants were not included in the PEDS.

The proposed NOx RACT standards are mandated for the ozone non-attainment areas and are part of the strategy to bring Pennsylvania into attainment of the NAAQS for ozone. Due to the implementation of RACT we anticipate the NOx emissions from stationary sources to be reduced by about 35-40 percent.

Preliminary emissions modeling via ROMNET indicates that the first stage RACT reductions may not be sufficient to achieve NAAQS by the stipulated deadlines. Therefore, additional emission reductions may be necessary to achieve attainment of ozone standard in Pennsylvania.

Other states are in various stages of developing their NOx RACT. A summary of their regulations may be found in Table 2 at the end of this document.

II. GUIDANCE FOR SUBMITTING RACT PROPOSALS FOR MAJOR NOX SOURCES:

The final regulation does establish presumptive RACT requirements for three major classes of NOx emitters. For certain small combustion units and certain other classes of fossil fuel burning equipment, presumptive RACT is determined to be the operation of the sources in accordance with

APPENDIX 1

the manufacturer's specifications. For certain larger combustion units, RACT is specified to be an annual tune-up and combustion adjustments to provide for low-NOx emitting operation. For very large coal fired combustion units, presumptive RACT is specified to be a low-NOx burner system with separate overfire air.

Although presumptive RACT requirements are contained in the final regulation for certain NOx sources, a source operator may elect to use a case-by-case analysis to establish RACT requirements.

Facilities which are subject to RACT are required to identify themselves within four months of the date of publication of the final regulations in the Pennsylvania Bulletin. These facilities are required to submit a written proposal for RACT for each source to the Department and EPA within six months of adoption of the regulations. All affected facilities must be in compliance with the NOx RACT regulations by May 31, 1995. This deadline is mandated by the CAAA. Therefore, the owner or operator of a source or facility for which RACT is required must obtain approval for a RACT proposal and implement it by May 31, 1995.

Implementing the plan includes obtaining the required permits, installing the approved NOx control, implementing process changes, and complying with all emission limits established by the Department. An owner or operator seeking a RACT determination, and installing an air pollution control device must also submit an application for a Plan Approval, as specified in Chapter 127.

Because the date of RACT implementation is fixed and not dependent upon intermediate events or other regulation promulgation, some facilities may be tempted to initiate control/process changes in the name of RACT without proper permitting. These industries run the risk of wasting money and time on projects which will not pass the review process. Therefore, facilities should obtain approval prior to proceeding with the implementation of the plan.

The case-by-case RACT determinations will require EPA approval as SIP revisions. The Department will coordinate its review of RACT proposals with EPA. The Department will expedite the SIP hearing and submission to assure EPA action as early as possible. After EPA's approval of the RACT regulation, the RACT program which implements the presumptive RACT requirements will not require SIP approval. Sources meeting the presumptive levels contained in the regulation do not have to prepare an alternative analysis identifying and evaluating different control scenarios.

Presumptive RACT requirements for oil/gas fired combustion units

It was brought to the Department's attention that the language in the regulation (§ 129.93 (b) (4) could be interpreted as the only presumptive RACT requirement for oil, gas and combination oil/gas fired units irrespective of heat input is recordkeeping. As indicated in the

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background material provided to EQB, the Department's intent was for the oil/gas fired units with rated heat inputs greater than 50 million Btu per hour to be handled through the case-by-case process. The record keeping requirement was intended to be applicable to the oil/gas fired units with rated heat inputs equal to or greater than 20 million Btu per hour. The regulation should be read as follows:

§129.93 (b) (4) (Add the underlined language)

(4) For oil, gas and combination oil/gas units subject to subsection (2), the owner and operator shall maintain records including a certification from the fuel supplier of the type of fuel and for each shipment of distillate oils number 1 or 2, a certification that the fuel complies with ASTM D396-78 "Standard Specifications for Fuel Oils". For residual oils minimum recordkeeping includes a certification from the fuel supplier, of the nitrogen content of the fuel, and identification of the sampling method and sampling protocol.

The Department is planning to clarify the intent of Section 129.93 (b) (4) through an amendment to the regulation. Content of RACT Proposal:

The RACT proposal shall include at a minimum:

- 1) A list of each unit subject to the NOx RACT regulations;
- 2) The size or capacity of each affected unit and the types of fuel or fuels combusted in each unit;
- 3) A complete description of each source;
- 4) Estimated NOx emissions and associated support documents;
- 5) RACT analysis including technical and economic support documentation for each affected source;
- 6) A schedule for the implementation of RACT including provisions for demonstrating periodic increments of progress and compliance with RACT
- 7) The testing, monitoring, record keeping and reporting procedures to be used to demonstrate compliance with RACT.
- 8) Additional information requested by the Department that is deemed necessary for the determination of RACT.

Guidance for the Case-by-Case RACT analysis:

RACT is defined as the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility.

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The RACT analysis must include a ranking of all applicable and available control technologies for the affected source in descending order of control effectiveness. The applicant first examines the most stringent or "top" alternative. If it can be shown that this level of control is technically or economically infeasible for the source under review, then the next most stringent level of control is determined and similarly evaluated. The analysis continues until the RACT level under consideration cannot be eliminated by any substantial or unique technical or economic objection.

Step-by-step summary of the RACT analysis process:

STEP 1 : Identify all applicable control technologies

The first step is to identify for each affected source all applicable and available control options. Available control options are those air pollution control technologies or techniques with a practical potential for application to the source. Air pollution control technologies and techniques include the application of production process or methods, control systems, and the fuel combustion techniques for the control of NOx. The control technologies shall include not only existing controls for the source category, but also technology transfer controls applied to similar source categories.

STEP 2: Eliminate technically infeasible options

In the second step, the technical feasibility of the available control options identified in Step 1 is to be evaluated with respect to the source-specific factors. A demonstration of technical infeasibility should be clearly documented based on physical, or chemical and engineering principles, that technical difficulties would preclude the successful use of the control option on the affected source.

Technically infeasible control options are then eliminated from further consideration in the RACT analysis.

Availability of Technically Feasible options: If a technically feasible option cannot be implemented by May 31, 1995 due to temporary inability (for example, manufacturer's inability to supply the equipment on required schedule) such a option cannot be eliminated from RACT consideration. This issue will be dealt as an enforcement issue rather than a RACT determination issue.

STEP 3: Rank remaining control technologies by control effectiveness

In step 3, all remaining control options not eliminated in Step 2 are ranked and then listed in order of overall control effectiveness for the NOx emissions. The list should present the array of control options and should include as a minimum the following information:

- 1) Baseline (before RACT) emissions

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- 2) control efficiencies
- 3) expected emissions after the application of the control option
- 4) economic impacts (both overall cost effectiveness and incremental cost effectiveness)

However, if the proposal selects the top control option the detailed cost analysis is not needed.

Cost-effectiveness:

Cost-effectiveness, in terms of dollars per ton of NOx emissions reduction, is the key criterion to be used in assessing the economic feasibility of a control option. In the economic impacts analysis, primary consideration should be given to quantifying the cost of control and not the economic situation of the affected facility. By expressing costs in terms of the amount of emission reduction achieved, comparisons can be more readily performed among the same type of sources for different facilities.

The cost-effectiveness calculations can be conducted on an average or incremental basis. Average cost-effectiveness is calculated as the annualized cost of the control option being considered divided by the baseline emissions minus the control option emission rate, as shown by the following formula:

Average cost effectiveness (\$/ton removed) =

$$\frac{\text{Control option annualized cost (\$/yr)}}{\text{Baseline emission rate - Control option rate (tons/yr)}}$$

The average cost-effectiveness is also referred to as overall or total cost effectiveness.

The baseline emissions rate represents the maximum emissions before the application of the RACT. It should be calculated using either continuous emission monitoring data (CEM), test results or approved emission factors and historic operating data.

The incremental cost effectiveness calculation compares the costs and emission level of a control option to those of the next most stringent option as shown in the following formula:

Incremental Cost (dollars per incremental ton removed) =

$$\frac{\text{Total cost (annualized) of control option - Total cost (annualized) of next option}}{\text{Next control option emission rate - control emission rate}}$$

Incremental cost-effectiveness comparisons should focus on annualized cost and emission reduction differences between dominant control options.

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The incremental cost-effectiveness should be examined in conjunction with the total cost effectiveness in order to justify elimination of a control option. The primary focus will be on the total cost effectiveness.

For the cost estimates to be used in the economic analysis the data supplied by an equipment vendor (i.e., budget estimates or bids) must be used as much as possible. The basis of the estimates must be thoroughly documented in the RACT analysis. The cost analysis must be consistent with QAOPS Control Cost Manual, (Fourth Edition), EPA 450/3-90-006, January 1990 or as revised.

STEP 4 : Selection of RACT

The Department will generally consider the control option to be cost effective if the total cost effectiveness is no greater than \$1500 per ton of NOx reduced.

In addition to the average cost effectiveness of \$1500/ton, other factors such as the incremental cost effectiveness and other environmental impacts will also be considered in the RACT determination. For example, a control option with average cost effectiveness less than \$1500/ton would not be automatically considered as a RACT option if it causes significant adverse impact on the other media. The adverse side effects of each control option must be factored in the RACT determination process.

We should caution that US EPA Region III has stated that establishing any dollar figure in RACT guidance will not provide for an "automatic" selection or rejection of a control technology or emission limitation as RACT for a source or source category. We also understand that EPA headquarters is planning to finalize a guidance document on cost effectiveness for NOx RACT analysis. The document will suggest that a cost effectiveness of up to \$2,500 is reasonable.

Rationale for selection of cost effectiveness criteria:

It should be noted that in Pennsylvania the number of affected sources and the types of sources are substantially greater than most of the states in Ozone Transport Region (OTR). Also, the baseline emissions of these sources vary widely. Thus, there is a need for a case-by-case RACT determination as opposed to one set of presumptive limits. While it is appropriate to establish site specific limits the degree of control must be comparable to the other states in OTR.

We applied the following criteria in establishing the cost-effectiveness level. First, the cost of control should be fair and equitable to all. Second, the acceptable control costs should be comparable to costs required to employ the presumptive technology requirements for the large coal fired boilers. Third, the cost effectiveness should be reasonable when compared to the acceptable costs

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established in the existing permitting or regulatory process such as the acceptable costs for BACT determination for new NOx sources and control cost for sources of volatile organic compounds (the other major ozone precursor) to comply with existing RACT regulations based on EPA's guidelines. Finally, the cost-effectiveness should be comparable to that established in other states in the OTR.

The presumptive RACT requirements included in our regulations for coal-fired combustion units with a rated heat input equal to or greater than 100 million Btus per hour, are the installation and operation of low-NOx burners with separated overfire air (LNB-SOFA). As per EPA document "Evaluation and Costing of NOx Controls for Existing Utility Boilers in the NESCAUM Region", the control costs for LNB-SOFA vary from \$270 to \$1,590 per ton of NOx removed depending on site specific factors (such as the type of boiler, size of the boiler and the amount of utilization). The control measures available to achieve the levels established as presumptive RACT for utility boilers by other states show a range of cost-effectiveness from about \$570-\$1500 per ton. In fact, two NOx RACT proposals using LNB-SOFA have documented cost of \$1,222 and \$1,298 per ton.

Therefore, we decided to apply an target limit of one level to all source categories and the level will be set at \$1500 per ton.

The Department suggests using \$1,500 because it is comparable, but, lower than the control cost for sources of volatile organic compounds (the other major ozone precursor) to comply with existing RACT regulations based on EPA's guidelines. For volatile organic compounds, required controls for existing sources are estimated to cost as much as \$3,000 per ton removed.

Also, the cost of presumptive RACT emission limitations for utility boilers in other states have been estimated as \$570 to \$1,500. Finally, the costs to comply with the presumptive NOx RACT emission levels for other sources in other states is as much as \$2,000 per ton removed. It should be noted for BACT determination for NOx emission sources the acceptable cost effectiveness have been as much as \$4,000.

In addition to the average cost effectiveness of \$1500/ton, the other factors such as the incremental cost effectiveness and other environmental impacts will also be considered in the RACT determination.

Therefore, the use of \$1,500 as a target value for one of criteria in the determination of RACT is reasonable.

STEP 5 : Establishment of RACT Emission Limit

If enough uncertainty exists in establishing a final RACT emission limit with the control option chosen by the above procedure, the Department may establish a never-to-exceed preliminary emission limit. The

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preliminary emission limits for the electric utilities must generally not be less stringent than the emission limits recommended in the EPA's preliminary presumptive RACT levels for electric utility boilers. The final limit is established after adequate actual data is collected with the application of approved technology. The presumptive RACT technology for the coal-fired units with a heat input greater than or equal to 100 Million BTU per hour is "low-NOx burner with a separate OFA". The final limit will be established prior to issuing an operating permit based on the CEM or predictive modeling system or periodic stack test results. In the case of combustion units with a heat input greater than or equal to 250 Million BTU per hour, only a Department-approved CEM system is acceptable for the establishment of the final limit. The CEM system is intended to be any system which meets the performance specification included in the Department's Continuous Source Monitoring Manual. In the case of combustion units with a heat input greater than 100 Million BTU per hour but less than 250 Million BTU per hour source test results may be used in the establishment of limits and the compliance with such limit will be based on the average of three consecutive test runs. A periodic source testing will be required for the verification of the limit. As a minimum, the source testing will be required on annual basis. As the emission data base is established and the data consistently show compliance by a significant margin the testing frequency may be altered. However, the source owner/operator may opt for a predictive modeling program or a CEM system in lieu of periodic testing. The predictive modeling system shall identify and correlate various operating parameters with NOx emission levels through source testing. This predictive modeling program must be approved by the Department. The final limit will be set based upon the available data with an adequate margin for the normal fluctuation of emission levels. The averaging period is generally limited to a 24-hour average in order to protect the hourly ozone standard. Especially for larger sources, a daily averaging may be necessary to accommodate the normal fluctuations of the emission levels. However, the Department may establish a 30-day rolling average in addition to a daily average. The 30-day rolling average may be used to calculate annual baseline emissions for future offset generation. In certain cases the Department may accept the averaging period of 24-hour during the ozone season and a 30 day averaging period during the non-ozone season provided a satisfactory technical/economic justification was made. For the purpose of RACT compliance, the ozone season is defined as the period between April 1 to October 31. The detailed procedure can be found in section IV of this document.

Guidance for coal-fired units proposing to employ the presumptive RACT

For coal-fired combustion units with a rated heat input equal to or greater than 100 million Btus per hour, presumptive RACT requirements are the installation and operation of low-NOx burners with separated overfire air. A low-NOx burner with separated overfire air is defined as a burner design capable of reducing the formation of oxides of nitrogen (NOx) emissions through sub-stoichiometric combustion of fuel by means of a burner assembly consisting of two or more stages and the addition of

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secondary combustion air introduced downstream of the burner location. It is intended that the system be designed to employ the highest degree of staging practicable.

For example, in the case of a tangentially fired (T-fired) combustion unit proposing ABB's Low-NOx Concentric Firing System (LNCFS), presumptive RACT technology is the LNCFS III version unless it is shown that LNCFS III is not feasible either technically or economically. If a LNCFS system or an equivalent low-NOx burner with a SOFA, is proposed as RACT for a T-fired unit the RACT analysis need not address the feasibility of post combustion technologies. However, if LNCFS III is not proposed as RACT the RACT analysis must demonstrate satisfactorily that LNCFS III is not feasible.

Procedure to generate Emission Reduction Credits:

Emission reduction credit (ERC) is defined as a permanent, enforceable, quantifiable and specific reduction which can be considered as a reduction for the purpose of offsetting increases.

"Surplus" emission reductions are reductions not otherwise required by the applicable state implementation plan (SIP) and not already relied upon for SIP planning purposes, and not used by the source to meet any other regulatory requirements. Thus, emission reductions necessary to meet RACT or other statutory requirements such as acid rain limitations are not considered surplus and may not be creditable for emission offsets. In order for NOx emission reductions to be creditable, a federally enforceable RACT determination must have been made. Any reduction beyond the reductions required by RACT is eligible as surplus and thus available for netting or ERC banking purposes. As stated earlier RACT is defined as the lowest emission limitation that a particular source is capable of meeting by application of a control technology that is reasonably available. Therefore, "surplus" cannot be created with the approved RACT control option by merely achieving a lower emission level than the final limit without implementing additional control measures (not including the measures needed to optimize the selected RACT control option) or curtailment of operation. The "surplus" reductions can be achieved by any method, including curtailment of operation (operational limitation, production limits), improved control technologies or measures, shutdown or some combination thereof.

The following procedures will be followed to quantify creditable ERC's generated through the installation of control measures which are determined by the Department to be clearly more stringent than the RACT requirements. The emission reductions achieved via this "overcontrol" must necessarily be greater than reductions that would reasonably be expected from RACT measures.

1. The initial and most important task is to determine the appropriate RACT control technology and estimated emission level reflecting the application of the chosen RACT technology. The Department will use the available technical information in defining this technology and estimating

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the corresponding emission levels. RACT level will be the lowest emission limitation that a particular source is capable of meeting by application of a control technology that is reasonably available. It is also important that these estimated emission levels accurately reflect the maximum degree of control achieved or capable of achievement by similar sources that actually employ similar controls as RACT.

2. After the installation and emission testing of the "overcontrol" technology and establishment of the final NOx emission limit, the comparison will be made between this final emission limit achieved through "overcontrol" and the emission level previously determined for the Department-approved RACT control system. The difference between these two emission rates will be the emission rate used with the fuel consumption data to calculate creditable emission reductions.

3. If an applicant wishes to bank the ERCs due to "overcontrol" prior to installation of "overcontrol" technology, a federally enforceable NOx emission limit reflecting the "overcontrol" will be included in the plan approval. The difference between the NOx limit and the emission level previously determined for the Department-approved RACT control system will be the emission rate used with the fuel consumption data to calculate creditable emission reductions.

It should be noted that the new source which intends to use the ERCs created by the "overcontrol" of this existing source cannot commence operation until the successful implementation of the "overcontrol" technology.

Example: A utility might opt to install an SCR system in lieu of the presumptive RACT technology of LNB-SOFA system on a tangentially-fired boiler with a baseline emission rate of 0.80lb NOx/MMBtu. The existing data on LNB-SOFA on T-fired boilers indicate that up to 50% emission reduction could be achieved by this system. Therefore the the projected emission level after the application of RACT technology is 0.40lb NOx/MMBtu. After the SCR retrofit, the unit achieves an emission rate of 0.13 lb NOx/MMBtu. The difference between 0.40 and 0.13 or 0.27 lb NOx/MMBtu is the rate used with the fuel analysis and consumption data to calculate the creditable NOx ERC's.

III. NOx EMISSION AVERAGING FOR RACT COMPLIANCE:

The Department may approve emission averaging among facilities to provide flexibility in complying with the RACT requirements provided the following criteria are met:

1) The NOx emission reductions achieved through the RACT averaging plan must be no less than the emission reductions that would be achieved by complying with the RACT requirement on a source specific basis.

2) The averaging program shall include a tons per year emission

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cap for each facility that in the aggregate is less than the aggregate of the emissions that would occur from each facility complying individually. In addition, each source shall have an emission rate limit such as lb/mmBTU to provide for independent verification and enforcement of the averaging program.

3) No credit shall be given for emission reductions that are achieved through the shutdown or curtailment of an operation included in the averaging program.

4) The ambient impact from the averaging program must be less than or equivalent to the impact from each source complying individually. This equivalence must be demonstrated both spatially and temporally.

5) The averaging program must be approved as a SIP revision prior to becoming effective.

6) The sources involved in the averaging program shall be required to continuously monitor and record the emissions. In addition the participating facilities are required to establish telemetry links between the facilities to provide real time emission data to all facilities affected by the averaging. For an averaging proposal involving sources at a single facility, the Department may approve alternate requirements provided the proposal demonstrates that the alternate methodologies are credible, workable, replicable and fully enforceable and adequately quantify emissions from all sources participating in the averaging program.

7) The emission averaging programs must be subject to an adequate enforcement mechanism. All the parties involved in the averaging should be held responsible for exceedances of the final RACT requirements.

Emission Averaging:

The emission averaging program may allow some emission sources to emit at a rate that is higher than the RACT rate (which was determined on a case-by-basis) as long as there is a compensating population of emission sources emitting at a rate that is lower than the RACT emission limitation. The allowable emission rate is proportional to the production level. The aggregate of actual emissions from the sources participating in the program must not exceed the aggregate of allowable emissions of those sources.

Air Quality Equivalence:

Traditionally, demonstrations of air quality equivalence required modeling. The modeling demonstrations may be waived, if:

1) the credit generating source in the averaging plan is located in an area with an equal or higher non-attainment designation than the credit consuming source; or,

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2) all sources included in the averaging plan are located within the attainment areas and located in the same broad vicinity; or,

3) all the sources included in the averaging plan are located within the same non-attainment area.

4) all the sources included in the averaging proposal which are not located within the same nonattainment area but are located less than 200 kilometers from any other source involved in the averaging proposal.

Step-by-Step Procedure:

1) Identify the RACT allowable emission levels for each source participating in the averaging plan through case-by-case analysis.

2) The Department sets an allowable source-specific emission rate for each source so that the following equation is met for the maximum allowable averaging period of 24 hours.

$$\sum_{i=1-N} (\text{Case-by-case RACT Allowable } ER_i) \times (\text{Projected Activity Level}_i) \geq \sum_{i=1-N} (\text{Source Specific Allowable } ER_i) \times (\text{Projected Activity Level}_i)$$

Where i = each emission source participating in the averaging plan
 N = the total number of emission units participating in the averaging plan.

Source Specific Allowable ER_i = Department imposed emission rate limit for emission source i .

Projected activity level i = Estimate of future activity level for emission source i

3) The aggregate of actual emissions from the sources participating in the plan must not exceed the aggregate of allowable emissions of those sources. The compliance will be verified by the following equation:

$$\sum_{i=1-N} (\text{Source Specific Allowable } ER_i) \times (\text{Actual Activity Level}_i) \geq \sum_{i=1-N} (\text{Actual Emission Rate}_i) \times (\text{Actual Activity Level}_i)$$

IV. ESTABLISHMENT OF EMISSION LIMITATIONS FOR COAL-FIRED COMBUSTION UNITS WITH RATED HEAT INPUT GREATER THAN 100 MMBTU/HR:

Following the installation of approved RACT technology, Section 129.91 (j) requires the Department to determine the RACT emission limitation for combustion units with rated heat inputs greater than 100 MMBtu/hr. The determination of this maximum limit is to be based upon emissions data obtained either from approved continuous emission monitoring system or an alternate approved methodology. The following

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procedure shall be used for establishing the final RACT emission limit. The Department may approve an alternate methodology if it was demonstrated that the alternate methodology is more appropriate than the one included in the guidance document. In cases involving multiple sources emitting through a single stack, the methodology to establish the individual emission limits will be approved on a case-by-case basis.

1. A minimum of 90% valid daily averages for a period not less than six months and no more than a year is required. Conventionally, arithmetic average of hourly emission rate (lb/mmBTU) is used calculate the daily average. As an alternate, the facility may use the mass-weighted method, i.e. dividing the total mass of NOx emitted for the day by the total heat input over the same period. The CEM must be certified for the approved method.

A longer period (longer than a year) may be approved if it is demonstrated that a longer period is necessary to represent the normal operation.

2. The data from step one is to be subjected to the Shapiro-Wilk Test of Normality. In this test, data is to be subjected to analysis in two formats. First, the raw data is tested for normal distribution. Second, the existing data is converted to natural logs and tested for log-normal distribution. Based upon these two analysis, the distribution with the highest resulting Shapiro-Wilk statistic will become the distribution for determining the emission limit.

Note: Shapiro-Wilk routines are available through the SAS statistical programs.

3. If the Shapiro-Wilk's test indicates normal distribution, the arithmetic mean of daily average of the data will be used in the final emission limit calculation. The arithmetic mean of the data is defined as follows:

$$\text{Arithmetic mean} = \frac{\sum_{i=1}^n X_i}{n} \quad \text{Where } n = \text{number of data points} \\ \text{and } X_i = \text{ith data point}$$

If the Shapiro-Wilk's test indicates log-normal is the best distribution, then the geometric mean of the data will be used in the final emission calculation. The geometric mean is defined as:

$$\text{Geometric mean} = \exp\left[\frac{\sum_{i=1}^n (\ln X_i)}{n} \right]$$

Where exp = the natural antilog of the expression

4. The final emission limit is then determined from the following equation (based on one exceedence per year):

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For normally distributed data:

Emission rate = Arithmetic mean + (2.777 * Standard Deviation)

*

For log normally distributed data:

Emission rate = Median * (Geometric dispersion)^{2.777}

Where Geometric dispersion = antilogarithm of standard deviation of the logarithm of data.

Median = 50th percentile of the distribution of x_i

The calculated emission limit must not generally exceed the preliminary limit imposed in the RACT approval.

Reference: Municipal Waste Combustion: Background Information for Promulgated Standards and Guidelines-Summary of Public Comments and Responses Appendices A to C, U.S. EPA, EPA-450/3-91-004, December 1990.

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NORTHEAST STATES FOR COORDINATED AIR USE MANAGEMENT (NESCAUM)

MEMBERS:

CONNECTICUT BUREAU OF AIR MANAGEMENT
MAINE BUREAU OF AIR QUALITY CONTROL
MASSACHUSETTS DIVISION OF AIR QUALITY CONTROL
NEW HAMPSHIRE AIR RESOURCES DIVISION

NEW JERSEY OFFICE OF ENERGY
NEW YORK DIVISION OF AIR RESOURCES
RHODE ISLAND DIVISION OF AIR AND HAZARDOUS MATERIALS
VERMONT AIR POLLUTION CONTROL DIVISION

NESCAUM Stationary Source Committee Recommendation On NO_x RACT for Industrial Boilers, Internal Combustion Engines and Combustion Turbines

September 18, 1992

The NESCAUM Stationary Source Review Committee is one of nine technical Committees established by the NESCAUM Board of Directors. The purpose of the committee is to provide an opportunity for engineers who review permits for new and existing sources to discuss common technical issues and provide some measure of consistency in the review of permits in the region. This recommendation has been developed in response to Sections 182(f) and 182(b)(2) of the Clean Air Act Amendments of 1990 (CAAA), which require states to impose Reasonably Available Control Technology (RACT) for sources that have the potential to emit nitrogen oxides (NO_x) in excess of specified threshold amounts and are located in ozone nonattainment areas or in the ozone transport region. RACT is defined as follows:

"the lowest emission limit that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility"

The CAAA requires states to develop and submit NO_x RACT regulations to the US EPA by November 15, 1992. All regulated sources must be in compliance with the NO_x RACT regulations by May 31, 1995.

In the Northeast, approximately 40 percent of the annual NO_x emissions are from stationary sources and 60 percent are from mobile sources. NO_x emissions react photochemically with volatile organic compounds (VOC) to form ground-level ozone. NO_x emissions also react to form gaseous and particulate acids and other toxic air pollutants. Large portions of the NESCAUM region are currently in nonattainment for ozone, and up to 35 million people are exposed to unhealthy ozone levels each summer in the Northeast. The US EPA's Regional Oxidant Modeling for Northeast Transport (ROMNET) Report (June 1991), which is regarded as the most sophisticated analysis of the regional ozone problem, indicates that a NO_x emission reduction of more than 55%, in conjunction with substantial VOC emission reductions, will be necessary to achieve the ozone health standard. In 1987, NO_x emissions from all sources in the NESCAUM region totaled approximately 1.6 million tons. NO_x emissions from the three source categories addressed in this recommendation constitute a large fraction of total NO_x emissions in the NESCAUM region (ranging from 10 to 15% of total NO_x emissions for individual states).

Based on this information and the requirement of 1990 CAAA, the committee has developed NO_x RACT recommendations for: (1) Industrial Boilers, (2) Internal

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Combustion Engines, and (3) Combustion Turbines. The NO_x RACT limits presented here attempt to account for variations in fuel type, design of combustion units and heat input rate.

For all units (industrial boilers, internal combustion engines, and combustion turbines) with high uncontrolled emission rates, which make a clear technical demonstration that NO_x RACT emission limits are not feasible, states may set higher unit-specific alternative emission limitations. Such limitations would be based on the capabilities of all available and applicable technology for combustion modification.

NO_x RACT for Industrial Boilers

Industrial boilers are steam-generating units that supply electric power and/or heat to an industrial, institutional or commercial operation, excluding boilers used by electric utilities to generate electricity.

The recommendation for NO_x RACT for industrial boilers takes into account the maximum heat input rate of the boilers (in million of Btus/hour) and is as follows.

1. Small Boilers (Boilers < 50 MMBtu/hr)

NO_x RACT for small boilers will require appropriate adjustment of combustion process to minimize NO_x emissions. The requirements for combustion adjustment will be developed by the individual states.

2. Medium-Size Boilers (Heat Input Rate ≥ 50 MMBtu/hr but less than 100 MMBtu/hr)

- a. For boilers in this size range burning wood, coal or some fuel other than oil or gas, NO_x RACT will be determined by the individual states on a case-by-case basis.
- b. For boilers in this size range burning natural gas, the recommended NO_x RACT limit is a performance-based standard of 0.10 lb/MMBtu, to be met on a 1-hour averaging basis.
- c. For boilers in this size range burning #2 oil, the recommended NO_x RACT limit is a performance-based standard of 0.12 lb/MMBtu, to be met on a 1-hour averaging basis.
- d. For boilers in this size range burning #4, #5, or #6 oil, the recommended NO_x RACT is a technology-based standard requiring joint application of low-NO_x burners and flue gas recirculation (with minimum circulation of 10 percent). In addition, sources will be required periodically to provide the states with data on nitrogen content of #4, #5 or #6 oil (percent weight basis).
- e. For b) and c) above, the performance-based standards are to be met on an annual, one-hour source test basis at steady state, maximum load conditions (average of three, one-hour stack tests).

3. Large Boilers (Boilers ≥ 100 MMBtu/hr)

The Committee recommends that all large industrial boilers, burning oil, gas coal or other fuels (for example wood), be treated the same as electric utility boilers and must

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comply with NO_x RACT for electric utilities boilers, as published by NESCAUM ("NESCAUM Stationary Source Committee Recommendation on NO_x RACT for Utility Boilers," August 12, 1992).

NO_x RACT for Internal Combustion Engines

The emission standards for internal combustion engines are for the control of NO_x from existing internal combustion engines with a maximum heat input rate exceeding 3 MMBtu/hr. All proposed levels are based on a one-hour averaging period. Lean-Burn engines are those in which the amount of oxygen in the engine exhaust gases is 1.0% or more, by weight. Rich-burn engines are those in which the amount of oxygen in the engine exhaust gases is less than 1.0%, by weight. Rated brake horsepower (bhp) is as specified by the manufacturer and listed on the nameplate.

1. Rich-Burn Engines
 - a. 1.5 grams per bhp-hr for gas-fired units
2. Lean-Burn Engines
 - a. 2.5 grams per bhp-hr for gas-fired units
 - b. 8 grams per bhp-hr for oil-fired units

The Stationary Source Review Committee believes that these NO_x RACT limits are achievable through the application of three-way catalysts for rich-burn engines, and through the use of retarded engine timing or separate circuit after-cooling for lean-burn engines.

NO_x RACT for Combustion Turbines

The emission standards outlined below are for the control of NO_x from existing combustion turbines. The recommendation applies to combustion turbines rated at 25 MMBtu/hr or above (maximum heat input rate).

The proposed levels are based on a one-hour averaging period.

1. Simple Cycle Combustion Turbines
 - a. 55 parts per million volume dry (ppmvd) (corrected to 15% oxygen) for gas-fired turbines without oil back-up.
 - b. 75 ppmvd (corrected to 15% oxygen) for oil-fired turbines
 - c. for gas-fired turbines with oil back-up:
 1. 55 ppmvd (15% oxygen) when operating on gas
 2. 75 ppmvd (15% oxygen) when operating on oil
2. Combined Cycle Combustion Turbines
 - a. 42 ppmvd (corrected to 15 % oxygen) for gas-fired turbines without oil back-up

APPENDIX 2

- b. 65 ppmvd (corrected to 15% oxygen) for oil-fired turbines
- c. For gas-fired turbines with oil back-up:
 - 1. 42 ppmvd (15% oxygen) when operating on gas
 - 2. 65 ppmvd (15% oxygen) when operating on oil

The Stationary Source Review Committee believes that these NO_x RACT limits are achievable through the application of water or steam injection and dry low-NO_x combustion technology. Higher emission limits may be specified for an individual unit, on a case-by-case basis, if the owner of the stationary combustion turbine can make a demonstration that water injection is not feasible or that low-NO_x combustors are not available for the make and model of turbine. Water injection not being feasible refers to either the unavailability of water (i.e., restrictions placed on water use), excessive costs associated with purifying the water (i.e., cleaning up salt water) or other factors associated with either the turbine or the location of the turbine, at the discretion of the states and the US EPA.

These recommendations were adopted by the NESCAUM Board of Directors on September 17, 1992.

APPENDIX 3

LNB Cost analysis for combustion unit greater than 20 and less than 50 MMBtu/hr			
Boiler Size (MMBtu/hr)	20	50	Reference
DIRECT COSTS			
Equipment Cost	\$128,700	\$128,700	Washington State Dept of Ecology (2006) adjusted with CPI for 2020
Instrumentation and Monitoring	\$12,870	\$12,870	(Typical 10% of EC)
Freight	\$7,722	\$7,722	6% of EC
Tax	\$7,722	\$7,722	6% of EC
Total Purchased Equipment Cost (TEC)	\$157,014	\$157,014	
Direct Installation Cost			
Foundation and Support	\$12,561	\$12,561	8% of TEC
Handling and Erection	\$21,982	\$21,982	14% of TEC
Electric	\$6,281	\$6,281	4% of TEC
Piping	\$3,140	\$3,140	2% of TEC
Painting	\$1,570	\$1,570	1% of TEC
Indirect Installation Costs			
Engineering and Supervision	\$15,701	\$15,701	10% of TEC
Construction and Field Expenses	\$7,851	\$7,851	5% of TEC
Contractor fees	\$15,701	\$15,701	10% of TEC
Contingencies	\$4,710	\$4,710	3% of TEC
Other Indirect Costs			
Startup and Testing	\$4,710	\$4,710	3% of TEC
TOTAL CAPITAL COST (TCC)	\$251,222	\$251,222	
Direct Annual Costs			
Electricity	\$26,280	\$26,280	Vendor's assumption of \$52,580 for 100 MMBtu/hr boiler
Material & Maintenance	\$12,561	\$12,561	5% of TCC (Most vendors)
Indirect Annual Costs			
Overhead	\$7,537	\$7,537	60% of Maintenance (EPA's OAQPS)
Property Tax+Ins.+Admn.	\$10,049	\$10,049	(4% of TCC - OAQPS)
Capital Recovery (5.5% @ 20 yrs)	\$21,027	\$21,027	
TOTAL ANNUALIZED COST	\$77,454	\$77,454	
Uncontrolled NOx emissions (lb/MMBtu)	0.2	0.2	
Uncontrolled NOx emissions (tons/year)	17.52	43.80	
NOx removed TPY (50% Eff.)	8.76	21.90	
COST EFFECTIVENESS (\$/Ton of NOx removed)	\$8,841.78	\$3,536.71	

Oxidation Catalyst cost analysis for combustion unit greater than 20 and less than 50 MMBtu/hr			
Boiler Size (MMBtu/hr)	20	50	Reference
DIRECT COSTS			
Equipment Cost	\$232,788	\$232,788	Grays Harbor Energy Project for 30 MMBtu/hr auxiliary boiler
Instrumentation and Monitoring	\$23,279	\$23,279	(Typical 10% of EC)
Freight	\$13,967	\$13,967	6% of EC
Tax	\$13,967	\$13,967	6% of EC
Total Purchased Equipment Cost (TEC)	\$284,002	\$284,002	
Direct Installation Cost			
Foundation and Support	\$22,720	\$22,720	8% of TEC
Handling and Erection	\$39,760	\$39,760	14% of TEC
Electric	\$11,360	\$11,360	4% of TEC
Piping	\$5,680	\$5,680	2% of TEC
Painting	\$2,840	\$2,840	1% of TEC
Indirect Installation Cost			
Engineering and Supervision	\$28,400	\$28,400	10% of TEC
Construction and Field Expenses	\$14,200	\$14,200	5% of TEC
Contractor fees	\$28,400	\$28,400	10% of TEC
Contingencies	\$8,520	\$8,520	3% of TEC
Other Indirect Costs			
Startup and Testing	\$8,520	\$8,520	3% of TEC
TOTAL CAPITAL COST (TCC)	\$454,403	\$454,403	
Direct Annual Costs			
Electricity	\$5,226	\$5,226	\$1,500 for 2500 hrs operation
Catalyst replacement	\$5,000	\$5,000	
Material & Maintenance	\$22,720	\$22,720	5% of TCC (Most vendors)
Indirect Annual Costs			
Overhead	\$13,632	\$13,632	60% of Maintenance (EPA's OAQPS)
Property Tax+Ins.+Admn.	\$18,176	\$18,176	(4% of TCC - OAQPS)
Capital Recovery (5.5% @ 20 yrs)	\$38,034	\$38,034	
TOTAL ANNUALIZED COST	\$102,788	\$102,788	
Uncontrolled VOC emissions (lb/MMBtu)	0.0036	0.0036	VOC emission at 3 ppm corrected at 3% oxygen
Uncontrolled VOC emissions (tons/year)	0.32	0.79	
VOC removed TPY (50% Eff.)	0.16	0.39	
COST EFFECTIVENESS (\$/Ton of VOC removed)	\$651,876.31	\$260,750.52	

APPENDIX 4

LNB Cost analysis for combustion unit with uncontrolled NOx emission at 5 tons per year		
Boiler Size (MMBtu/hr)	50	Reference
DIRECT COSTS		
Equipment Cost	\$128,700	Washington State Dept of Ecology (2006) adjusted with CPI for 2020
Instrumentation and Monitoring	\$12,870	(Typical 10% of EC)
Freight	\$7,722	6% of EC
Tax	\$7,722	6% of EC
Total Purchased Equipment Cost (TEC)	\$157,014	
Direct Installation Cost		
Foundation and Support	\$12,561	8% of TEC
Handling and Erection	\$21,982	14% of TEC
Electric	\$6,281	4% of TEC
Piping	\$3,140	2% of TEC
Painting	\$1,570	1% of TEC
Indirect Installation Cost		
Engineering and Supervision	\$15,701	10% of TEC
Construction and Field Expenses	\$7,851	5% of TEC
Contractor fees	\$15,701	10% of TEC
Contingencies	\$4,710	3% of TEC
Other Indirect Costs		
Startup and Testing	\$4,710	3% of TEC
TOTAL CAPITAL INVESTMENT (TCI)	\$251,222	
Direct Annual Costs		
Electricity	\$26,280	Vendor's assumption of \$52,560 for 100 MMBtu/hr boiler
Material & Maintenance	\$12,561	5% of TCI (Most vendors)
Indirect Annual Costs		
Overhead	\$7,537	60% of Maintenance (EPA's OAQPS)
Property Tax+Ins+Admn	\$10,049	(4% of TCI - OAQPS)
Capital Recovery (5.5% @ 20 yrs)	\$21,027	
TOTAL ANNUALIZED COST	\$77,454	
Uncontrolled NOx emissions (tons/year)	5.00	
NOx removed TPY (50% Eff)	2.50	
COST-EFFECTIVENESS (\$/Ton NOx removed)	\$30,981.60	
Oxidation Catalyst cost analysis for combustion unit with uncontrolled VOC emission at 2.7 tons per year		
Boiler Size (MMBtu/hr)	50	Reference
DIRECT COSTS		
Equipment Cost	\$232,788	Grays Harbor Energy Project for 30 MMBtu/hr auxiliary boiler
Instrumentation and Monitoring	\$23,279	(Typical 10% of EC)
Freight	\$13,967	6% of EC
Tax	\$13,967	6% of EC
Total Purchased Equipment Cost (TEC)	\$284,002	
Direct Installation Cost		
Foundation and Support	\$22,720	8% of TEC
Handling and Erection	\$39,760	14% of TEC
Electric	\$11,360	4% of TEC
Piping	\$5,680	2% of TEC
Painting	\$2,840	1% of TEC
Indirect Installation Cost		
Engineering and Supervision	\$28,400	10% of TEC
Construction and Field Expenses	\$14,200	5% of TEC
Contractor fees	\$28,400	10% of TEC
Contingencies	\$8,520	3% of TEC
Other Indirect Costs		
Startup and Testing	\$8,520	3% of TEC
TOTAL CAPITAL INVESTMENT (TCI)	\$454,403	
Direct Annual Costs		
Electricity	\$5,228	\$1,500 for 2500 hrs operation
Catalyst replacement	\$5,000	
Material & Maintenance	\$22,720	5% of TCI (Most vendors)
Indirect Annual Costs		
Overhead	\$13,632	60% of Maintenance (EPA's OAQPS)
Property Tax+Ins+Admn	\$18,176	(4% of TCI - OAQPS)
Capital Recovery (5.5% @ 20 yrs)	\$38,034	
TOTAL ANNUALIZED COST	\$102,788	
Uncontrolled VOC emissions (tons/year)	2.70	
VOC removed TPY (50% Eff)	1.35	
COST-EFFECTIVENESS (\$/Ton VOC removed)	\$76,139.15	

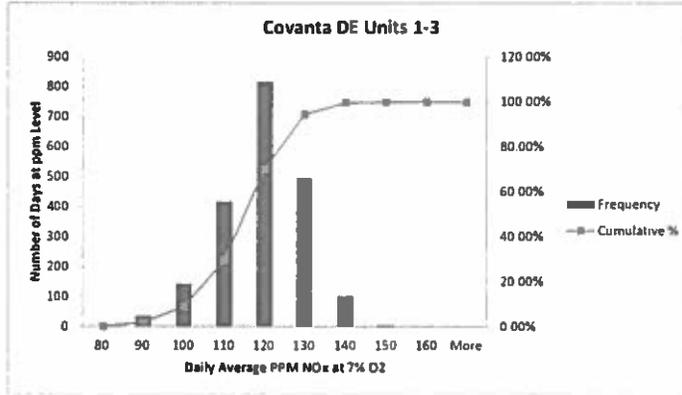
APPENDIX 5

Cost Analysis for SNCR for Municipal Waste Combustor		
Cost estimate	Assumed average large MWC in PA	Factors Used
Daily throughput municipal waste (tpd waste) Hrs/Yr	500 8760	Assumed average large combustor (Range 300 - 600 tpd)
Reference NOx emissions in lbs/hr NOx emissions in lbs/hr	109.00 90.80	Permit limit for Covanta Plymouth 109 lb/hr and 180 ppm@7%O2 Calculated from cell above for 150 ppm@7% O2
Total Capital Cost	\$1,392,000	Based on \$464,000 for 200 tpd MWC at Olmstead, MN for 2007
TOTAL CAPITAL COST (TCC)	\$1,726,080.00	With CPI from 2007 - 2020 (1.24)
Direct Annual Costs		
Electricity	\$95,124	\$0.0676 kw/hr
Chemical Cost (Urea/Ammonia)	\$88,500	Based on \$29,500 for 200 tpd MWC at Olmstead, MN for 2007
Administration (3% of maintenance+labor)	\$3,154	3% of maintenance +labor
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day	\$32,850	Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
Maintenance Material	\$32,850	100% of maintenance labor
Indirect Annual Costs		
Annulized Capital Recovery Cost (20 yrs at 5.5%)	\$144,473	TCC*0.0837
Property Taxes (1% of TCC-OAQPS)	\$17,261	1% of TCC (OAQPS)
Insurance (1% of TCC-OAQPS)	\$17,261	1% of TCC (OAQPS)
Overhead (44% of Labor cost + 12% Material Cost)	\$39,420.00	60% of Maintenance Cost (OAQPS)
TOTAL ANNUALIZED COST	\$470,892	This is close to Annual Operating cost*3 for Olmstead for 200 tpd MWC
Uncontrolled NOx TPY	397.70	
NOx removed TPY (30% Eff.)	119.31	
COST-EFFECTIVENESS (\$/Ton NOx removed)	\$3,946.75	

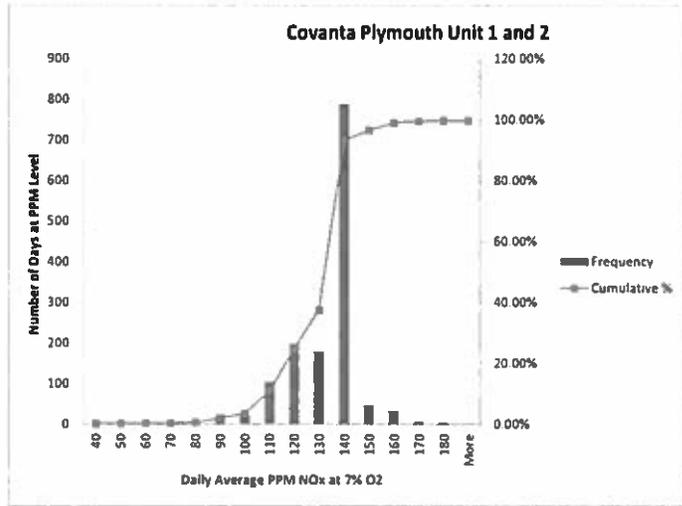
APPENDIX 6

NOx emission test results from all MWCs for 2018 and 2019

Bin	Frequency	Cumulative %
80	1	0.05%
90	35	1.78%
100	143	8.86%
110	418	29.55%
120	818	70.05%
130	496	94.60%
140	103	99.70%
150	5	99.95%
160	1	100.00%
More	0	100.00%

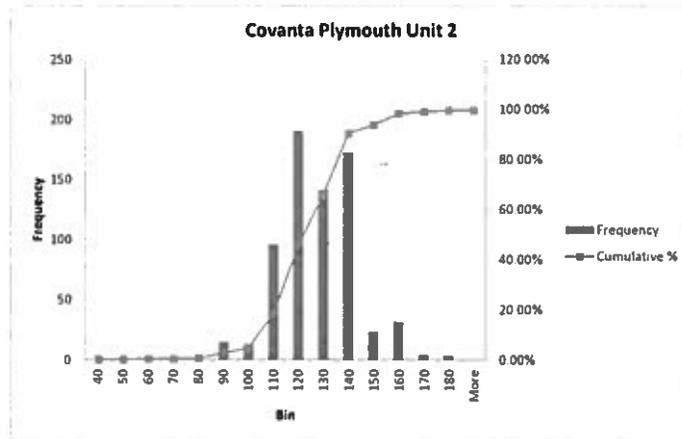


Bin	Frequency	Cumulative %
40	1	0.07%
50	1	0.14%
60	2	0.28%
70	0	0.28%
80	2	0.42%
90	21	1.91%
100	22	3.46%
110	104	10.80%
120	199	24.84%
130	180	37.54%
140	792	93.44%
150	48	96.82%
160	34	99.22%
170	7	99.72%
180	4	100.00%
More	0	100.00%



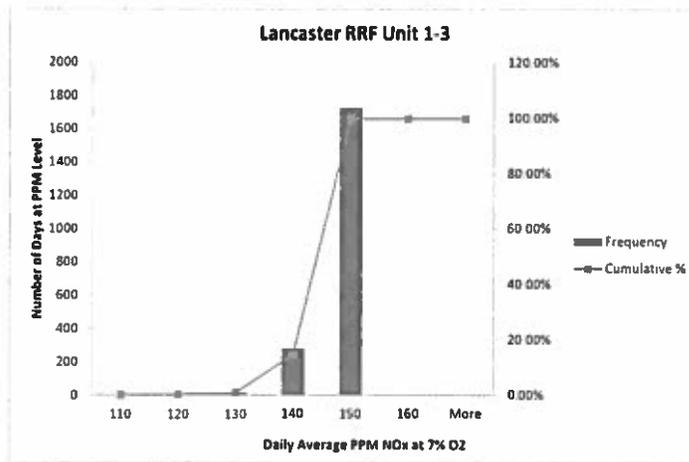
45 days over 150 PPM NOx
 41 days occurred on unit 2
 All but 5 of the 42 days occurred from 11/7/2019
 to 1/8/2020

Bin	Frequency	Cumulative %
40	0	0.00%
50	0	0.00%
60	2	0.29%
70	0	0.29%
80	2	0.57%
90	15	2.72%
100	13	4.58%
110	96	18.31%
120	191	45.64%
130	142	65.95%
140	173	90.70%
150	24	94.13%
160	32	98.71%
170	5	99.43%
180	4	100.00%
More	0	100.00%

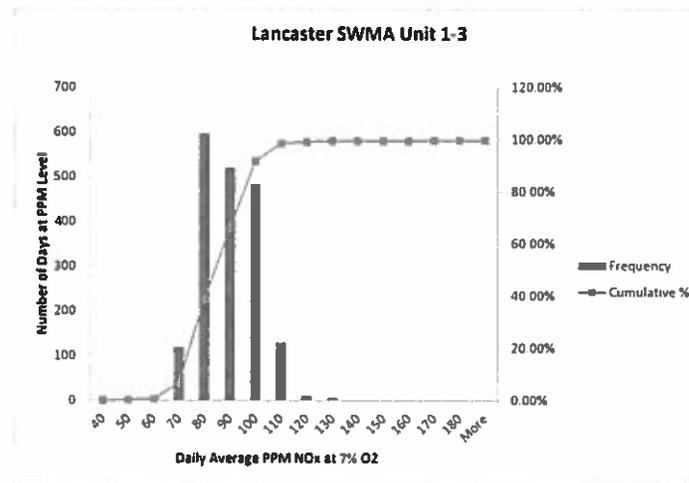


APPENDIX 6

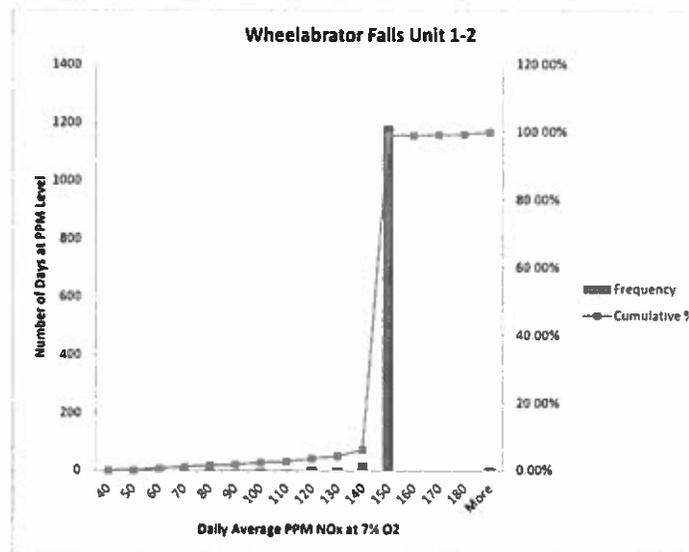
Bin	Frequency	Cumulative %
110	0	0.00%
120	1	0.05%
130	14	0.74%
140	281	14.57%
150	1733	99.85%
160	2	99.95%
More	1	100.00%



Bin	Frequency	Cumulative %
40	0	0.00%
50	2	0.11%
60	7	0.48%
70	120	6.83%
80	600	38.61%
90	523	66.31%
100	485	92.00%
110	130	98.89%
120	11	99.47%
130	6	99.79%
140	1	99.84%
150	0	99.84%
160	0	99.84%
170	2	99.95%
180	1	100.00%
More	0	100.00%



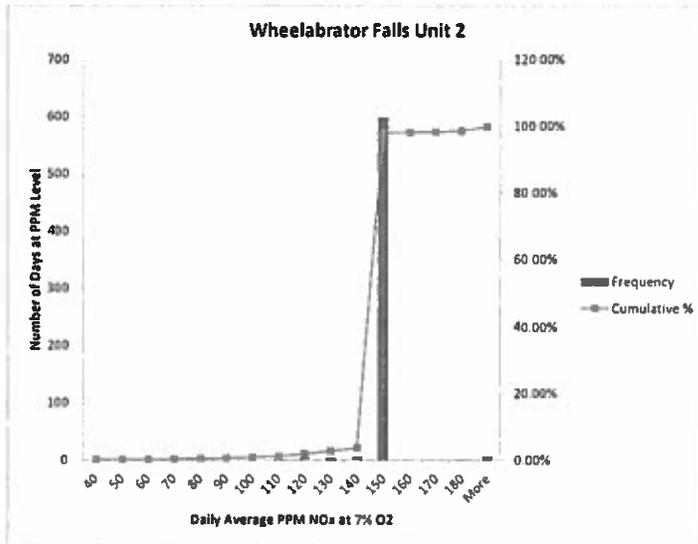
Bin	Frequency	Cumulative %
40	1	0.08%
50	1	0.16%
60	7	0.70%
70	5	1.09%
80	5	1.48%
90	4	1.79%
100	7	2.34%
110	4	2.65%
120	11	3.51%
130	10	4.29%
140	25	6.24%
150	1191	99.06%
160	1	99.14%
170	1	99.22%
180	2	99.38%
More	8	100.00%



12 days over 150 PPM NOx
AI occurred on unit 2

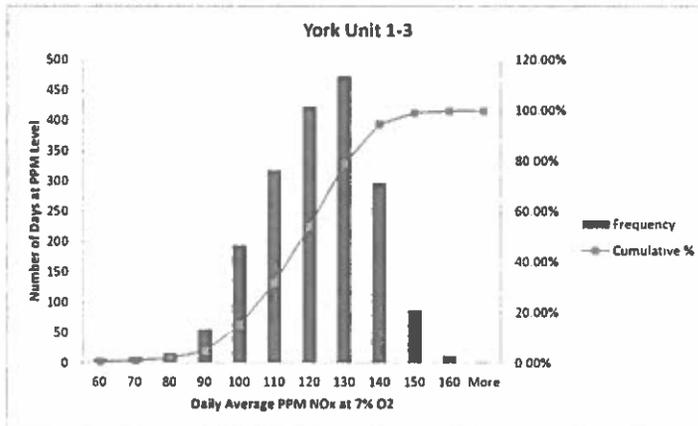
APPENDIX 6

Bin	Frequency	Cumulative %
40	1	0.16%
50	0	0.16%
60	0	0.16%
70	1	0.31%
80	1	0.47%
90	1	0.63%
100	1	0.79%
110	2	1.10%
120	5	1.89%
130	5	2.67%
140	7	3.77%
150	600	98.11%
160	1	98.27%
170	1	98.43%
180	2	98.74%
More	8	100.00%

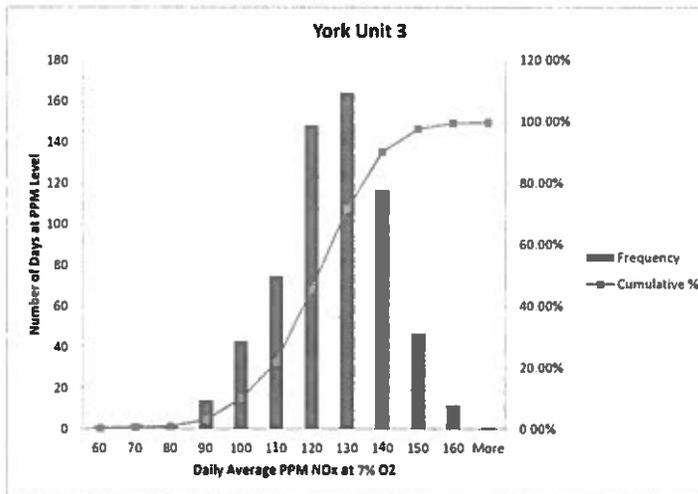


Bin	Frequency	Cumulative %
60	7	0.37%
70	10	0.90%
80	16	1.74%
90	55	4.64%
100	194	14.86%
110	319	31.66%
120	424	54.00%
130	474	78.98%
140	297	94.63%
150	88	99.26%
160	13	99.95%
More	1	100.00%

14 days over 150 PPM Nox
 13 days occurred on unit 3
 AI but 2 of the 13 days occurred from 4/18/2018 to 5/20/2018



Bin	Frequency	Cumulative %
60	1	0.16%
70	2	0.48%
80	2	0.80%
90	14	3.03%
100	43	9.87%
110	75	21.82%
120	149	45.54%
130	165	71.82%
140	117	90.45%
150	47	97.93%
160	12	99.84%
More	1	100.00%



APPENDIX 7

Cost Analysis for SCR for NG, propane, or liquid petroleum gas-fired combustion unit or process heater			
Boiler Capacity MMBtu/hr	50	250	Factors/Reference used
Hrs/Yr	8760	8760	
NOx emissions (lb/MMBtu)	0.1	0.1	
TOTAL CAPITAL COST (TCC) in 2016	\$1,884,950	\$5,365,750	EPA cost spreadsheet for 50 MMBtu and 250 MMBtu/hr for 2016
TOTAL CAPITAL COST (TCC)	\$2,054,596	\$5,848,668	TCC in 2020 with CPI 1.09 from 2016 to 2020
Direct Annual Costs			
Electricity	\$16,595.25	\$82,975.16	EPA cost spreadsheet for 50 MMBtu and 250 MMBtu/hr for 2016
Chemical Cost (Urea/Ammonia)	\$9,156.00	\$45,778.91	EPA cost spreadsheet for 50 MMBtu and 250 MMBtu/hr for 2016
Catalyst Replacement (costs/No. of years)	\$4,738.23	\$23,691.15	EPA cost spreadsheet for 50 MMBtu and 250 MMBtu/hr for 2016
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day	\$32,850	\$32,850	Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
Maintenance Material	\$32,850	\$32,850	100% of maintenance labor
Indirect Annual Costs			
Administration (3% of maintenance+labor)	\$3,154	\$3,154	3% of maintenance +labor
Annualized Capital Recovery Cost (30 yrs at 5.5%)	\$141,356	\$402,388	TCC*0.0688
Property Taxes (1% of TCC-OAQPS)	\$20,546	\$58,487	1% of TCC (OAQPS)
Insurance (1% of TCC-OAQPS)	\$20,546	\$58,487	1% of TCC (OAQPS)
Overhead (44% of Labor cost + 12% Material Cost)	\$39,420.00	\$39,420.00	60% of Maintenance Cost (OAQPS)
TOTAL ANNUALIZED COST	\$321,211	\$780,080	
Uncontrolled NOx TPy	21.90	109.50	
NOx removed TPy (80% Eff.)	18	88	
COST-EFFECTIVENESS (\$/Ton NOx removed)	\$18,334	\$8,905	

APPENDIX 8

SCR Cost Analysis for distillate oil-fired combustion unit or process heater greater than 50 MMBtu/hr			
Boiler Capacity MMBtu/hr	50	250	Factors/reference used
Hrs/Yr	8760	8760	
NOx emissions (lb/MMBtu)	0.12	0.12	
TOTAL CAPITAL COST (TCC) in 2016	\$1,557,377	\$4,433,271	EPA cost spreadsheet for 50 and 250 MMBtu
TOTAL CAPITAL COST (TCC) in 2020	\$1,697,541	\$4,832,265	With CPI 1.09 from 2016 to 2020
Direct Annual Costs			
Electricity	\$18,829.75	\$94,146.57	EPA cost spreadsheet for 50 and 250 MMBtu
Chemical Cost (Urea/Ammonia)	\$10,987.20	\$54,934.91	EPA cost spreadsheet for 50 and 250 MMBtu
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day	\$32,850	\$32,850	Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
Maintenance Material	\$32,850	\$32,850	100% of maintenance labor
Catalyst Replacement (costs/No. of years)	\$4,773.11	\$23,863.37	EPA cost spreadsheet for 50 and 250 MMBtu
Indirect Annual Costs			
Administration (3% of maintenance+labor)	\$3,154	\$3,154	3% of maintenance+labor
Property Taxes (1% of TCC-OAQPS)	\$16,975	\$48,323	1% of TCC (OAQPS)
Insurance (1% of TCC-OAQPS)	\$15,574	\$44,333	1% of TCC (OAQPS)
Annualized Capital Recovery Cost (30 yrs at 5.5%)	\$116,791	\$332,460	TCC*0.0688
Overhead (44% of Labor cost + 12% Material Cost)	\$39,420.00	\$39,420.00	60% of Maintenance Cost (OAQPS)
TOTAL ANNUALIZED COST	\$292,204	\$706,334	
Uncontrolled NOx TPY			
NOx removed TPY (80% Ef.)	26.28	131.40	
COST-EFFECTIVENESS (\$/ton NOx removed)	21	105	
	\$13,899	\$6,719	

APPENDIX 9

SCR Cost Analysis for residual oil or other liquid-fired combustion unit or process heater greater than 50 MMBtu/hr		
Boiler Capacity MMBtu/hr	50	250
Hrs/Yr	8760	8760
NOx emissions (lb/MMBtu)	0.2	0.2
Factors/reference used		
TOTAL CAPITAL COST (TCC) in 2016	\$1,557,377	\$4,433,271
TOTAL CAPITAL COST (TCC) in 2020	\$1,697,541	\$4,832,265
With CPI 1.09		
Direct Annual Costs		
Electricity	\$18,829.75	\$94,146.57
Chemical Cost (Urea/Ammonia)	\$18,312.00	\$114,446.73
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day	\$32,850	\$32,850
Maintenance Material	\$32,850	\$32,850
Catalyst Replacement (costs/No. of years)	\$4,910.45	\$24,980.62
Indirect Annual Costs		
Administration (3% of maintenance+labor)	\$3,154	\$3,154
Property Taxes (1% of TCC-OAQPS)	\$16,975	\$48,323
Insurance (1% of TCC-OAQPS)	\$15,574	\$48,323
Annulized Capital Recovery Cost (30 yrs at 5.5%)	\$116,791	\$332,460
Overhead (44% of Labor cost + 12% Material Cost)	\$39,420.00	\$39,420.00
TOTAL ANNUALIZED COST	\$299,666	\$770,953
Uncontrolled NOx TPY		
NOx removed TPY (80% Eff.)	43.80	219.00
COST-EFFECTIVENESS (\$/Ton NOx removed)	35	175
	\$8,552	\$4,400
EPA cost spreadsheet for 50 and 250 MMBtu for 2016		
EPA cost spreadsheet for 50 and 250 MMBtu for 2016		
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day		
100% of maintenance labor		
EPA cost spreadsheet for 50 and 250 MMBtu for 2016		
EPA cost spreadsheet for 50 and 250 MMBtu for 2016		
3% of maintenance+labor		
1% of TCC (OAQPS)		
1% of TCC (OAQPS)		
TCC*0.0688		
60% of Maintenance Cost (OAQPS)		

APPENDIX 10

SCR Cost Analysis for refinery gas-fired combustion unit or process heater				
Boiler Capacity MMBtu/hr	50	250	500	Factors/Reference used
Hrs/Yr	8760	8760	8760	
NOx emissions (lb/MMBtu)	0.25	0.25	0.25	
TOTAL CAPITAL COST (TCC) in 2016	\$1,884,950	\$5,365,750	\$10,731,500	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
TOTAL CAPITAL COST (TCC) in 2020	\$2,054,596	\$5,848,688	\$11,697,335	With CPI 1.09 from 2016 to 2020
Direct Annual Costs				
Electricity	\$16,595.25	\$82,975	\$165,950.32	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day	\$32,850	\$32,850	\$32,850	Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
Maintenance Material	\$32,850	\$32,850	\$32,850	100% of maintenance labor
Chemical Cost (Urea/Ammonia)	\$22,888.91	\$114,447	\$228,893.46	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Catalyst Replacement (costs/No. of years)	\$4,996.56	\$24,981	\$49,961.24	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Indirect Annual Costs				
Administration (3% of maintenance+labor)	\$3,154	\$3,154	\$3,154	3% of maintenance + labor
Property Taxes (1% of TCC-OAQPS)	\$20,546	\$58,487	\$107,315	1% of TCC (OAQPS)
Insurance (1% of TCC-OAQPS)	\$20,546	\$58,487	\$107,315	1% of TCC (OAQPS)
Annualized Capital Recovery Cost (30 yrs at 5.5%)	\$129,685	\$369,164	\$795,497	TCC*0.0688
Overhead (44% of Labor cost + 12% Material Cost)	\$39,420.00	\$39,420.00	\$39,420.00	60% of Maintenance Cost (OAQPS)
TOTAL ANNUALIZED COST	\$323,531	\$816,813	\$1,567,205	
Uncontrolled NOx TPY	54.75	273.75	547.50	
NOx removed TPY (80% Eff.)	44	219	438	
COST-EFFECTIVENESS (\$/Ton NOx removed)	\$7,387	\$3,730	\$3,578	

APPENDIX 11

SCR Cost Analysis for coal-fired combustion unit between 50 - 250 MMBtu/hr			
Boiler Capacity MMBtu/hr	50	250	Factors/Reference used
Hrs/Yr	8760	8760	
NOx emissions (lb/MMBtu)	0.45	0.45	
TOTAL CAPITAL COST (TCC) in 2016	\$4,806,258	\$13,280,762	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
TOTAL CAPITAL COST (TCC) in 2020	\$5,238,821	\$14,476,031	With CPI 1.09 from 2016 to 2020
Direct Annual Costs			
Annualized Capital Recovery Cost (30 yrs at 5.5%)	\$360,431	\$995,951	TCC*0.0688
Electricity	\$18,073.29	\$90,366	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day	\$32,850	\$32,850	Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
Maintenance Material	\$32,850	\$32,850	100% of maintenance labor
Chemical Cost (Urea/Ammonia)	\$41,200.91	\$206,005	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Catalyst Replacement (costs/No. of years)	\$17,468.34	\$19,763	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Indirect Annual Costs			
Administration (3% of maintenance+labor)	\$3,154	\$3,154	3% of maintenance +labor
Property Taxes (1% of TCC-OAQPS)	\$52,388	\$144,760	1% of TCC (OAQPS)
Insurance (1% of TCC-OAQPS)	\$52,388	\$144,760	1% of TCC (OAQPS)
Overhead (44% of Labor cost + 12% Material Cost)	\$39,420.00	\$39,420.00	60% of Maintenance Cost (OAQPS)
TOTAL ANNUALIZED COST	\$650,223	\$1,709,879	
Uncontrolled NOx TPY			
NOx removed TPY (80% Eff.)	98.55	492.75	
	79	394	
COST-EFFECTIVENESS (\$/Ton NOx removed)	\$8,247	\$4,338	

APPENDIX 12

SNCR Cost Analysis for coal-fired combustion unit between 50 - 250 MMBtu/hr			
Boiler Capacity MMBtu/hr	50	250	Factors/Reference used
Hrs/Yr	8760	8760	
NOx emissions (lb/MMBtu)	0.45	0.45	
TOTAL CAPITAL COST (TCC) in 2016	\$1,766,776	\$4,045,623	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
TOTAL CAPITAL COST (TCC) in 2020	\$1,925,786	\$4,409,729	With CPI 1.09 from 2016 to 2020
Direct Annual Costs			
Electricity	\$832.76	\$4,164	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Additional Water Cost	\$883.43	\$3,419	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Additional Ash Cost	\$263.78	\$1,318	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Additional Fuel Cost	\$3,325.59	\$16,628	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Chemical Cost (Urea/Ammonia)	\$59,838.82	\$299,196	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day	\$32,850	\$32,850	Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
Maintenance Material	\$32,850	\$32,850	100% of maintenance labor
Indirect Annual Costs			
Administration (3% of maintenance+labor)	\$3,154	\$3,154	3% of maintenance +labor
Property Taxes (1% of TCC-OAQPS)	\$19,258	\$44,097	1% of TCC (OAQPS)
Insurance (1% of TCC-OAQPS)	\$19,258	\$44,097	1% of TCC (OAQPS)
Annualized Capital Recovery Cost (30 yrs at 5.5%)	\$121,554	\$278,339	TCC*0.0688
Overhead (44% of Labor cost + 12% Material Cost)	\$39,420.00	\$39,420.00	60% of Maintenance Cost (OAQPS)
TOTAL ANNUALIZED COST	\$333,288	\$799,532	
Uncontrolled NOx TPY	98.55	492.75	
NOx removed TPY (30% Eff.)	30	148	
COST-EFFECTIVENESS (\$/Ton NOx removed)	\$11,273	\$5,409	

APPENDIX 13

Control technology	Control efficiency	Uncontrolled emission level lb/Mmbtu	Size of boiler Mmbtu/hr	Cost per ton of NOx 2016	Cost per ton of NOx 2020
SNCR	30%	0.16	250	\$5,747	\$6,207
SNCR	30%	0.16	500	\$4,395	\$4,747

SAMPLE CALCULATION
Data Inputs

Enter the following data for your combustion unit:

Is the combustion unit a utility or industrial boiler? Utility Industrial

What type of fuel does the unit burn? Coal Gas Oil Other

Is the SNCR for a new boiler or retrofit of an existing boiler? New Retrofit

Please enter a retrofit factor equal to or greater than 0.84 based on the level of difficulty. Enter 1 for projects of average retrofit difficulty.

Complete all of the highlighted data fields.

What is the maximum heat input?

What is the highest heating value?

What is the maximum actual annual fuel input (excluding process gas)?

Is the boiler a fluid bed boiler? Yes No

Enter the net plant heat rate:

If the boiler is not a fluid bed boiler, provide the following information for coal-fired boilers:

Type of coal burned:
 Enter the sulfur content (%S) or approximate SO₂ emission rate:
 Select the sulfur content (%S) or approximate SO₂ emission rate:
 Ash content (%Ash):
 Net electric generating cost (\$/MWh):

Note: The table below is pre-calculated with default values for only %S, %Ash and cost. Please enter the actual values for these parameters in the table below. If the actual value for any parameter is not known, you may use the default values provided.

Boiler input	High sulfur content	High ash content	Cost
1.84 percent by weight	9.33 percent by weight	\$/MWh	

Enter the following design parameters for the proposed SNCR:

Number of days the SNCR is used:

Inlet NO_x Emissions (NO_x):

Outlet NO_x Emissions (NO_x):

Estimated Normal Load Size:

Concentration of reagent:

Density of reagent at start:

Concentration of reagent at end:

Number of days reagent is used:

Estimated reagent life:

Select the reagent used:

Plant location:

Number of boiler SNCR reagents:

30% urea solution	71 lb/yr ³
29.4% aqueous NH ₃	66 lb/yr ³

Enter the cost data for the proposed SNCR:

2016	2017	2018	2019	2020
Desired dollar per year CEPI for 2016	5417			
Annual Interest Rate (%)	5.9 Percent			
Fuel Cost (\$/MMBtu)	2.40 \$/MMBtu			
Reagent Cost (\$/ton)	0.29 \$/ton			
Water Cost (\$/gal)	0.0013 \$/gal			
Electricity Cost (\$/kWh)	0.0076 \$/kWh			
Ash Disposal (per coal lbs)	49.30 \$/ton			

CEPI = Chemical Engineering Plant Cost Index

Note: The use of CEPI in this spreadsheet is not an endorsement of the index, but is merely a means for availability of a well known cost index to spreadsheet users. Use of other well-known cost indexes (e.g. ENR) is acceptable.

Maintenance and Administrative Charges Cost Factors:

Maintenance Cost Factor:

Administrative Charge Factor:

Data Sources for Default Values Used in Calculations:

Cost Element	Default Value	Source for Default Value	If you used your own site-specific values, please enter the value used and the reference source.
Reagent Cost (\$/gal)	\$0.29/gallon of 29% Ammonia	U.S. Geological Survey, Mineral Commodity Summaries, January 2017 https://www.usgs.gov/minerals/pubs/commodity/nitrogen/mcs-2017-nitro.pdf	
Water Cost (\$/gal)	0.0013	Average water rates for industrial facilities in 2013 compiled by Black & Veatch (see 2012/2013 "50 Largest Cities Water/Wastewater Rate Survey". Available at http://www.sas.org/wha_us_110/community/RAC/50LARGESTCITIESWATERWASTEWATER-RATE-SURVEY.pdf	
Electricity Cost (\$/kWh)	0.0076	U.S. Energy Information Administration, Electric Power Monthly, Table 5.3, Published December 2017. Available at: https://www.eia.gov/electricity/monthly/tepm_table_grapher.php?comp=5_6_e	
Fuel Cost (\$/MMBtu)	2.40	U.S. Energy Information Administration, Electric Power Annual 2016, Table 7.4, Published December 2017. Available at: https://www.eia.gov/electricity/annual/pdf/eap.pdf	
Ash Disposal Cost (\$/ton)	49.30	Ashe's Business Journal, The Cost to Landfill MSW Continues to Rise Despite Soft Demand, July 11, 2017. Available at: http://www.ashebusinessjournal.com/news/0711170711a.htm	
Average sulfur content for Coal (% weight)	1.84	Average sulfur content based on U.S. coal data for 2016 compiled by the U.S. Energy Information Administration (EIA) from data reported on EIA Form EA-911, Power Plant Operations Report. Available at http://www.eia.gov/electricity/data/ea911/	
Average ash content for Coal (% weight)	9.33	Average ash content based on U.S. coal data for 2016 compiled by the U.S. Energy Information Administration (EIA) from data reported on EIA Form EA-911, Power Plant Operations Report. Available at http://www.eia.gov/electricity/data/ea911/	
Higher heating value (HHV)	11,841	HHV coal data compiled by the Office of Oil, Gas, and Coal Supply Statistics, U.S. Energy Information Administration (EIA) from data reported on EIA Form EA-911, Power Plant Operations Report. Available at http://www.eia.gov/electricity/data/ea911/	
Interest Rate (%)	5.9	Default bank prime rate	

APPENDIX 13

SNCR Design Parameters

The following design parameters for the SNCR were calculated based on the values entered on the *Data Inputs* tab. These values were used to prepare the costs shown on the *Cost Estimate* tab.

Parameter	Equation	Calculated Value	Units
Maximum Annual Heat Input Rate (Q_h) =	HHV x Max. Fuel Rate =	250	MMBtu/hour
Maximum Annual fuel consumption (m_{fuel}) =	$Q_h \times 1.0E6 \text{ Btu/MMBtu} \times 8760 / \text{HHV} =$	365,000,000	lbs/year
Actual Annual fuel consumption (M_{actual}) =		365,000,000	lbs/year
Heat Rate Factor (HRF) =	$\text{NPHR} / 10 =$	1.00	
Total System Capacity Factor (CF_{total}) =	$(M_{actual} / M_{fuel}) \times (\text{tSNCR} / 365) =$	1.00	fraction
Total operating time for the SNCR (t_{op}) =	$CF_{total} \times 8760 =$	8760	hours
NOx Removal Efficiency (EF) =	$(\text{NO}_{x_{in}} - \text{NO}_{x_{out}}) / \text{NO}_{x_{in}} =$	30	percent
NOx removed per hour =	$\text{NO}_{x_{in}} \times \text{EF} \times Q_h =$	12.00	lb/hour
Total NO _x removed per year =	$(\text{NO}_{x_{in}} \times \text{EF} \times Q_h \times t_{op}) / 2000 =$	52.56	tons/year
Coal Factor (Coal _f) =	1 for bituminous, 1.05 for sub-bituminous, 1.07 for lignite (weighted average is used for coal blends)	1.07	
SO ₂ Emission rate =	$(\%S / 100) \times (64 / 32) \times (1 \times 10^6) / \text{HHV} =$	> 3	lbs/MMBtu
Elevation Factor (ELEV F) =	14.7 psia/P =		
Atmospheric pressure at 250 feet above sea level (P) =	$2116 \times \{ [59 - (0.00356 \times h) + 459.7] / 518.6 \}^{2.54} \times (1 / 144)^{0.5} =$	14.6	psia
Retrofit Factor (RF) =	Retrofit to existing boiler	1.00	

Not applicable; elevation factor does not apply to plants located at elevations below 500 feet.

* Equation is from the National Aeronautics and Space Administration (NASA), Earth Atmosphere Model. Available at <https://spaceflight.nasa.gov/education/rocket/atmos.html>.

Reagent Data:

Type of reagent used: Ammonia
 Molecular Weight of Reagent (MW) = 17.03 g/mole
 Density = 56 lb/gallon

Parameter	Equation	Calculated Value	Units
Reagent consumption rate ($m_{reagent}$) =	$(\text{NO}_{x_{in}} \times Q_h \times \text{NSR} \times \text{MW}_r) / (\text{MW}_{\text{NO}_x} \times \text{SR}) =$ (where SR = 1 for NH ₃ , 2 for Urea)	18	lb/hour
Reagent Usage Rate (m_{ur}) =	$m_{reagent} / C_{inj} =$	62	lb/hour
Estimated tank volume for reagent storage =	$(m_{ur} \times 7.4805) / \text{Reagent Density} =$	8.3	gal/hour
	$(m_{ur} \times 7.4805 \times t_{storage} \times 24 \text{ hours/day}) / \text{Reagent Density} =$	2,800	gallons (storage needed to store a 14 day reagent supply rounded up to the nearest 100 gallons)

Capital Recovery Factor:

Parameter	Equation	Calculated Value
Capital Recovery Factor (CRF) =	$i(1+i)^n / [(1+i)^n - 1] =$	0.0688
	Where n = Equipment Life and i = Interest Rate	

Parameter	Equation	Calculated Value	Units
Electricity Usage:			
Electricity Consumption (P) =	$(0.47 \times \text{NO}_{x_{in}} \times \text{NSR} \times Q_h) / \text{NPHR} =$	2.3	kW/hour
Water Usage:			
Water consumption (q_w) =	$(m_{ur} / \text{Density of water}) \times ((C_{injected} / C_{inj}) - 1) =$	14	gallons/hour
Fuel Data:			
Additional Fuel required to evaporate water in injected reagent (ΔFuel) =	$\text{HV} \times m_{reagent} \times ((1 / C_{inj}) - 1) =$	0.15	MMBtu/hour
Ash Disposal:			
Additional ash produced due to increased fuel consumption (Δash) =	$(\Delta \text{fuel} \times \% \text{Ash} \times 1 \times 10^6) / \text{HHV} =$	2.3	lb/hour

APPENDIX 13

Cost Estimate

Total Capital Investment (TCI)

For Coal-Fired Boilers:

$$TCI = 1.3 \times (SNCR_{cost} + APH_{cost} + BOP_{cost})$$

For Fuel Oil and Natural Gas-Fired Boilers:

$$TCI = 1.3 \times (SNCR_{cost} + BOP_{cost})$$

Capital costs for the SNCR ($SNCR_{cost}$) =	\$682,343 in 2016 dollars
Air Pre-Heater Costs (APH_{cost}) [*] =	\$895,698 in 2016 dollars
Balance of Plant Costs (BOP_{cost}) =	\$935,477 in 2016 dollars
Total Capital Investment (TCI) =	\$3,267,573 in 2016 dollars

* This factor applies because the boiler burns bituminous coal and emits equal to or greater than 0.3lb/MMBtu of sulfur dioxide.

SNCR Capital Costs ($SNCR_{cost}$)

For Coal-Fired Utility Boilers:

$$SNCR_{cost} = 220,000 \times (B_{fuel} \times HRF)^{0.42} \times CoalIF \times BTF \times ELEVF \times RF$$

For Fuel Oil and Natural Gas-Fired Utility Boilers:

$$SNCR_{cost} = 147,000 \times (B_{fuel} \times HRF)^{0.42} \times ELEVF \times RF$$

For Coal-Fired Industrial Boilers:

$$SNCR_{cost} = 220,000 \times (0.1 \times C_b \times HRF)^{0.42} \times CoalIF \times BTF \times ELEVF \times RF$$

For Fuel Oil and Natural Gas-Fired Industrial Boilers:

$$SNCR_{cost} = 147,000 \times ((C_b/NPHR) \times HRF)^{0.42} \times ELEVF \times RF$$

SNCR Capital Costs ($SNCR_{cost}$) =	\$682,343 in 2016 dollars
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Air Pre-Heater Costs (APH_{cost})^{*}

For Coal-Fired Utility Boilers:

$$APH_{cost} = 69,000 \times (B_{fuel} \times HRF \times CoalIF)^{0.79} \times AHF \times RF$$

For Coal-Fired Industrial Boilers:

$$APH_{cost} = 69,000 \times (0.1 \times C_b \times HRF \times CoalIF)^{0.79} \times AHF \times RF$$

Air Pre-Heater Costs (APH_{cost}) =	\$895,698 in 2016 dollars
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* This factor applies because the boiler burns bituminous coal and emits equal to or greater than 0.3lb/MMBtu of sulfur dioxide.

Balance of Plant Costs (BOP_{cost})

For Coal-Fired Utility Boilers:

$$BOP_{cost} = 320,000 \times (B_{fuel})^{0.13} \times (NO_x \text{ Removed/hr})^{0.12} \times BTF \times RF$$

For Fuel Oil and Natural Gas-Fired Utility Boilers:

$$BOP_{cost} = 213,000 \times (B_{fuel})^{0.13} \times (NO_x \text{ Removed/hr})^{0.12} \times RF$$

For Coal-Fired Industrial Boilers:

$$BOP_{cost} = 320,000 \times (0.1 \times C_b)^{0.13} \times (NO_x \text{ Removed/hr})^{0.12} \times BTF \times RF$$

For Fuel Oil and Natural Gas-Fired Industrial Boilers:

$$BOP_{cost} = 213,000 \times (C_b/NPHR)^{0.13} \times (NO_x \text{ Removed/hr})^{0.12} \times RF$$

Balance of Plant Costs (BOP_{cost}) =	\$935,477 in 2016 dollars
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Annual Costs

Total Annual Cost (TAC)

$$TAC = \text{Direct Annual Costs} + \text{Indirect Annual Costs}$$

Direct Annual Costs (DAC) =	\$75,802 in 2016 dollars
Indirect Annual Costs (IDAC) =	\$226,279 in 2016 dollars
Total annual costs (TAC) = DAC + IDAC	\$302,081 in 2016 dollars

Direct Annual Costs (DAC)

$$DAC = (\text{Annual Maintenance Cost}) + (\text{Annual Reagent Cost}) + (\text{Annual Electricity Cost}) + (\text{Annual Water Cost}) + (\text{Annual Fuel Cost}) + (\text{Annual Ash Cost})$$

Annual Maintenance Cost =	$0.015 \times TCI =$	\$49,014 in 2016 dollars
Annual Reagent Cost =	$Q_{reagent} \times Cost_{reagent} \times t_{op} =$	\$21,355 in 2016 dollars
Annual Electricity Cost =	$P \times Cost_{electric} \times t_{op} =$	\$1,358 in 2016 dollars
Annual Water Cost =	$Q_{water} \times Cost_{water} \times t_{op} =$	\$518 in 2016 dollars
Additional Fuel Cost =	$\Delta Fuel \times Cost_{fuel} \times t_{op} =$	\$3,076 in 2016 dollars
Additional Ash Cost =	$\Delta Ash \times Cost_{ash} \times t_{op} \times (1/2000) =$	\$481 in 2016 dollars
Direct Annual Cost =		\$75,802 in 2016 dollars

Indirect Annual Cost (IDAC)

$$IDAC = \text{Administrative Charges} + \text{Capital Recovery Costs}$$

Administrative Charges (AC) =	$0.03 \times \text{Annual Maintenance Cost} =$	\$1,470 in 2016 dollars
Capital Recovery Costs (CR) =	$CRF \times TCI =$	\$224,809 in 2016 dollars
Indirect Annual Cost (IDAC) =	AC + CR =	\$226,279 in 2016 dollars

Cost Effectiveness

$$\text{Cost Effectiveness} = \text{Total Annual Cost} / \text{NO}_x \text{ Removed/year}$$

Total Annual Cost (TAC) =	\$302,081 per year in 2016 dollars
NO _x Removed =	53 tons/year
Cost Effectiveness =	\$5,747 per ton of NO_x removed in 2016 dollars

APPENDIX 14

Cost Estimate		
Total Capital Investment (TCI)		
TCI for Coal-Fired Boilers		
For Coal-Fired Boilers: $TCI = 1.3 \times (SCR_{total} + RPC + APHC + BPC)$		
Capital costs for the SCR (SCR_{total}) *	\$188,238,031	in 2016 dollars
Reagent Preparation Cost (RPC) *	\$3,373,507	in 2016 dollars
Air Pre-Heater Costs (APHC) *	\$0	in 2016 dollars
Balance of Plant Costs (BPC) *	\$10,157,840	in 2016 dollars
Total Capital Investment (TCI) *	\$262,300,191	in 2016 dollars
* Not applicable - This factor applies only to coal-fired boilers that burn bituminous coal and emits equal to or greater than 3lb/MMBtu of sulfur dioxide.		
SCR Capital Costs (SCR_{total})		
For Coal-Fired Utility Boilers >25 MW: $SCR_{total} = 310,000 \times (NRF)^{0.3} \times (B_{low} \times HRF \times CoalF)^{0.82} \times ELEV \times RF$		
For Coal-Fired Industrial Boilers >250 MMBtu/hour: $SCR_{total} = 310,000 \times (NRF)^{0.3} \times (0.1 \times Q_0 \times CoalF)^{0.82} \times ELEV \times RF$		
SCR Capital Costs (SCR_{total}) =		\$188,238,031 in 2016 dollars
Reagent Preparation Costs (RPC)		
For Coal-Fired Utility Boilers >25 MW: $RPC = 564,000 \times (NO_{x,m} \times B_{low} \times NPHR \times EF)^{0.25} \times RF$		
For Coal-Fired Industrial Boilers >250 MMBtu/hour: $RPC = 564,000 \times (NO_{x,m} \times Q_0 \times EF)^{0.25} \times RF$		
Reagent Preparation Costs (RPC) =		\$3,373,507 in 2016 dollars
Air Pre-Heater Costs (APHC) *		
For Coal-Fired Utility Boilers >25MW: $APHC = 69,000 \times (B_{low} \times HRF \times CoalF)^{0.78} \times AHF \times RF$		
For Coal-Fired Industrial Boilers >250 MMBtu/hour: $APHC = 69,000 \times (0.1 \times Q_0 \times CoalF)^{0.78} \times AHF \times RF$		
Air Pre-Heater Costs (APHC) =		\$0 in 2016 dollars
* Not applicable - This factor applies only to coal-fired boilers that burn bituminous coal and emit equal to or greater than 3lb/MMBtu of sulfur dioxide.		
Balance of Plant Costs (BPC)		
For Coal-Fired Utility Boilers >25MW: $BPC = 529,000 \times (B_{low} \times HRF \times CoalF)^{0.42} \times ELEV \times RF$		
For Coal-Fired Industrial Boilers >250 MMBtu/hour: $BPC = 529,000 \times (0.1 \times Q_0 \times CoalF)^{0.42} \times ELEV \times RF$		
Balance of Plant Costs (BPC) =		\$10,157,840 in 2016 dollars
Annual Costs		
Total Annual Cost (TAC)		
TAC = Direct Annual Costs + Indirect Annual Costs		
Direct Annual Costs (DAC) =		\$10,520,850 in 2016 dollars
Indirect Annual Costs (IDAC) =		\$18,064,619 in 2016 dollars
Total annual costs (TAC) = DAC + IDAC		\$28,585,469 in 2016 dollars
Direct Annual Costs (DAC)		
DAC = (Annual Maintenance Cost) + (Annual Reagent Cost) + (Annual Electricity Cost) + (Annual Catalyst Cost)		
Annual Maintenance Cost =	$0.005 \times TCI =$	\$1,311,501 in 2016 dollars
Annual Reagent Cost =	$m_{reagent} \times Cost_{reagent} \times t_{op} =$	\$2,687,923 in 2016 dollars
Annual Electricity Cost =	$P \times Cost_{electricity} \times t_{op} =$	\$3,316,186 in 2016 dollars
Annual Catalyst Replacement Cost =		\$3,205,240 in 2016 dollars
For coal-fired boilers, the following methods may be used to calculate the catalyst replacement cost.		
Method 1 (for all fuel types):	$n_{scr} \times Vol_{scr} \times (CC_{catalyst}/R_{catalyst}) \times FWF$	* Calculation Method 2 selected
Method 2 (for coal-fired industrial boilers):	$(Q_0/NPHR) \times 0.4 \times (CoalF)^{2.3} \times (NRF)^{0.78} \times (CC_{catalyst}) \times 35.3$	
Direct Annual Cost =		\$10,520,850 in 2016 dollars
Indirect Annual Cost (IDAC)		
IDAC = Administrative Charges + Capital Recovery Costs		
Administrative Charges (AC) =	$0.03 \times (\text{Operator Cost} + 0.4 \times \text{Annual Maintenance Cost}) =$	\$18,366 in 2016 dollars
Capital Recovery Costs (CR) =	$CRF \times TCI =$	\$18,046,253 in 2016 dollars
Indirect Annual Cost (IDAC) =	$AC + CR =$	\$18,064,619 in 2016 dollars
Cost Effectiveness		
Cost Effectiveness = Total Annual Cost/ NOx Removed/year		
Total Annual Cost (TAC) =		\$28,585,469 per year in 2016 dollars
NOx Removed =		5,606 tons/year
Cost Effectiveness =		\$5,099 per ton of NOx removed in 2016 dollars
Cost Effectiveness =		\$5,507 per ton of NOx removed in 2020 dollars

APPENDIX 15

SCR Cost Analysis for other solid fuel-fired combustion unit greater than 50 MMBtu/hr			
Boiler Capacity MMBtu/hr	50	250	Factors/Reference used
Hrs/Yr	8760	8760	
NOx emissions (lb/MMBtu)	0.25	0.25	
TOTAL CAPITAL COST (TCC) in 2016	\$4,599,871	\$12,972,142	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
TOTAL CAPITAL COST (TCC) in 2020	\$5,013,859	\$14,139,635	With CPI 1.09 from 2016 to 2020
Direct Annual Costs			
Electricity	\$18,073.29	\$90,366	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Chemical Cost (Urea/Ammونيا)	\$22,888.91	\$114,447	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Catalyst Replacement (costs/No. of years)	\$17,468.34	\$87,343	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day	\$32,850	\$32,850	Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
Maintenance Material	\$32,850	\$32,850	100% of maintenance labor
Indirect Annual Costs			
Administration (3% of maintenance+labor)	\$3,154	\$3,154	3% of maintenance +labor
Property Taxes (1% of TCC-OAQPS)	\$50,139	\$141,396	1% of TCC (OAQPS)
Insurance (1% of TCC-OAQPS)	\$50,139	\$141,396	1% of TCC (OAQPS)
Annualized Capital Recovery Cost (30 yrs at 5.5%)	\$344,954	\$972,807	TCC*0.0688
Overhead (44% of Labor cost + 12% Material Cost)	\$39,420.00	\$39,420.00	60% of Maintenance Cost (OAQPS)
TOTAL ANNUALIZED COST	\$611,935	\$1,656,029	
Uncontrolled NOx TPy			
NOx removed TPy (80% Efi.)	54.75	273.75	
COST-EFFECTIVENESS (\$/Ton NOx removed)	44	219	
	\$13,971	\$7,562	

APPENDIX 16

SNCR Cost Analysis for other solid fuel-fired combustion unit greater than 50 MMBtu/hr			
Boiler Capacity MMBtu/hr	50	250	Factors/Reference used
Hrs/Yr	8760	8760	
NOx emissions (lb/MMBtu)	0.25	0.25	
TOTAL CAPITAL COST (TCC) in 2016	\$1,706,180	\$3,920,603	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
TOTAL CAPITAL COST (TCC) in 2020	\$1,859,736	\$4,273,457	With CPI 1.09 from 2016 to 2020
Direct Annual Costs			
Electricity	\$462.16	\$2,313	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Additional Water Cost	\$380.41	\$1,900	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Additional Ash Cost	\$146.06	\$732	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Additional Fuel Cost	\$1,847.55	\$9,238	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day	\$32,850	\$32,850	Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
Maintenance Material	\$32,850	\$32,850	100% of maintenance labor
Chemical Cost (Urea/Ammonia)	\$33,243.91	\$166,221	EPA spreadsheet for 50 and 250 mmbtu/hr boilers
Indirect Annual Costs			
Administration (3% of maintenance+labor)	\$3,154	\$3,154	3% of maintenance +labor
Property Taxes (1% of TCC-OAQPS)	\$18,597	\$42,735	1% of TCC (OAQPS)
Insurance (1% of TCC-OAQPS)	\$18,597	\$42,735	1% of TCC (OAQPS)
Annulized Capital Recovery Cost (30 yrs at 5.5%)	\$117,385	\$269,737	TCC*0.0688
Overhead (44% of Labor cost + 12% Material Cost)	\$39,420.00	\$39,420.00	60% of Maintenance Cost (OAQPS)
TOTAL ANNUALIZED COST	\$298,934	\$643,884	
Uncontrolled NOx TPY			
NOx removed TPY (30% Eff.)	54.75	273.75	
COST-EFFECTIVENESS (\$/Ton NOx removed)	16	82	
	\$18,200	\$7,840	

APPENDIX 17

Cost Analysis for Oxidation Catalyst for combustion units and process heaters greater than 50 MMBtu/hr							
Boiler Size (MMBtu/hr)	30	50	100	150	200	250	Factors/References
TOTAL CAPITAL COST							
TOTAL CAPITAL COST (TCC)	\$273,400	\$455,667	\$911,333	\$1,367,000	\$1,822,667	\$2,278,333	
Catalyst Replacement	\$26,000	\$26,000	\$26,000	\$26,000	\$26,000	\$26,000	Company Estimate
Taxes, Insurance, Administration	\$10,936	\$18,227	\$36,453	\$54,680	\$72,907	\$91,133	4% of TEC
Capital Recovery (5.5% @ 20 yrs)	\$22,884	\$38,139	\$76,279	\$114,418	\$152,557	\$190,697	TCC*0.0837
TOTAL ANNUALIZED COST	\$76,419	\$82,366	\$138,732	\$195,098	\$251,464	\$307,830	
Uncontrolled VOC emissions (lb/MMBtu)	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	An average uncontrolled VOC emission rate
Uncontrolled VOC emissions (tons/year)	1.31	2.19	4.38	6.57	8.76	10.95	
VOC removed TPY (60% Eff.)	0.79	1.31	2.63	3.94	5.26	6.57	
COST-EFFECTIVENESS (\$/ton NOx removed)	\$96,929.22	\$62,683.38	\$52,789.93	\$49,492.11	\$47,843.20	\$46,853.86	

APPENDIX 19

Cost Analysis for oxidation catalyst for combustion turbines rated between 1,000 - 60,000 Bhp					
	Cost	Costs	Costs	Costs	Costs
Uncontrolled NMNEC as propane (ppm @ 15% O2)	5	5	5	5	5
HP	1,000	15,900	30,000	60,000	60,000
MW	0.708215297	11.26062323	21.24645892	42.49291785	42.49291785
Hrs/Yr	8760	8760	8760	8760	8760
Fuel Consumption (MMBtu/h)	10.99	117.58	190.8	309.1	309.1
NMNEHC Emission Rate (lb/MMBtu)	0.017659376	0.017659376	0.017659376	0.017659376	0.017659376
Total Uncontrolled NMNEHC emissions in Tons per Year	0.85	9.09	14.76	23.91	23.91
Total NMNEHC Removed in Tons per Year (60%)	0.51	5.46	8.85	14.34	14.34
TOTAL CAPITAL COST					
Oxidation Catalyst Purchased Equipment Costs	\$96,785	\$205,918	\$215,090	\$215,090	\$215,090
Direct Installation Costs (0.30PEC)	\$29,035	\$61,775	\$64,527	\$64,527	\$64,527
Total Indirect Installation Costs (0.27PEC)	\$26,132	\$55,598	\$58,074	\$58,074	\$58,074
Project Contingency (0.15(DIC+IIC))	\$8,275	\$17,606	\$18,390	\$18,390	\$18,390
Total Capital Investment	\$160,227	\$340,897	\$356,082	\$356,082	\$356,082
Direct Annual Costs					
Operating and Supervisory Labor Costs	\$18,889	\$18,889	\$18,889	\$18,889	\$18,889
Maintenance Cost	\$2,904	\$6,178	\$6,453	\$6,453	\$6,453
Natural Gas Penalty	\$12,553	\$28,325	\$45,964	\$45,964	\$45,964
Catalyst Disposal	\$130	\$338	\$637	\$637	\$637
Annual Catalyst Replacement Cost	\$14,204	\$36,841	\$69,512	\$69,512	\$69,512
Indirect Annual Costs					
Overhead (60% of Maintenance (EPA OAQPS))	\$1,742	\$3,707	\$3,872	\$3,872	\$3,872
Property Tax+Ins.+Admn. (4% of TCI - OAQPS)	\$6,409	\$13,636	\$14,243	\$14,243	\$14,243
Capital Recovery (5.5% @ 20 yrs)	\$13,411	\$28,533	\$29,804	\$29,804	\$29,804
TOTAL ANNUALIZED COST	\$70,242	\$136,446	\$189,373	\$189,373	\$189,373
COST-EFFECTIVENESS (\$/Ton NMNEHC removed)	\$137,719.59	\$25,004.91	\$21,386.45	\$13,201.34	\$13,201.34

APPENDIX 20

Cost Analysis for SCR for NG-fired simple cycle turbines between 1000 and 3000 HP				
Turbine Horsepower (bhp)	HP		1000	3000
Operating Hours (h)	H		8760	8760
Fuel Consumption (MMBtu/h)	FC		10.99	21.99
TOTAL CAPITAL INVESTMENT (TCI)				
SCR Catalyst Housing and Control System	A	Based on vendors quote	\$2,829,336.46	\$3,019,834.33
Reductant Storage Tank	A'	Based on vendor's Quote	\$70,585.47	\$102,499.12
Total Purchased Equipment Costs	B	PA sales tax of 8% (1.08*(A+A'))	\$2,861,917.25	\$3,309,873.48
Direct Installation Costs	0.30B	OAQPS	\$858,575.18	\$992,902.04
Indirect Installation Costs	0.31B	OAQPS	\$887,194.35	\$1,025,998.77
Contingencies	0.24B	OAQPS 24% of equipment	\$688,860.14	\$794,321.83
Total Capital Costs	C	Sum(Row 8 Row 11)*1.11 (CPI)	\$5,876,947.08	\$6,796,414.45
Direct Annual Costs				
Power Costs		PC*H*PP	\$1,122.45	\$3,387.36
Reductant Costs		RC*H*RC	\$20,006.53	\$60,019.58
SCR Catalyst Replacement Costs		H*SCL*SCC	\$6,589.79	\$19,709.36
Replacement Parts		Vendor's quote	\$4,976.13	\$4,976.13
Operating Labor		OW*OH*SY	\$11,804.10	\$11,804.10
Maintenance Labor		MW*MH*SY	\$6,493.35	\$6,493.35
Total Direct Annual Costs	E	Sum(Row 15 Row 20)	\$50,972.34	\$106,369.87
Indirect Annual Costs				
Overhead	0.6D	OAQPS	\$3,898.01	\$3,898.01
Property Tax	0.02C	OAQPS using PA property tax of 2%	\$52,588.73	\$60,396.69
Insurance	0.01C	OAQPS	\$26,293.36	\$30,198.34
Administrative	0.02C	OAQPS	\$52,588.73	\$60,396.69
Capital Recovery		5.5% for 30 years= 0.688	\$404,333.96	\$641,581.52
Total Indirect Annual Costs	F	Sum(Row 23 Row 27)	\$539,898.79	\$796,469.25
TOTAL ANNUALIZED COST				
	G	E+F	\$590,689.13	\$902,839.12
Control Efficiency	CE		80%	80%
Potential to Emit (TPY)	PTE	NER*FC*H	26.81	53.22
Annual Estimated NOx Removal (TPY)	NR	PTE*CE	21.29	42.57
COST-EFFECTIVENESS (\$/ton NOx removed)		G/NR	\$27,748.47	\$21,208.80
Assumptions				
Power Consumption Rate (kW)	PC	Cost Manual Estimate (GP5A Turbine Ref sheet)	1.73	5.19
Industrial Retail Power Price (\$/kWh)	PP	EIA Data		\$0.0741
Reductant Consumption Rate (gal/h)	RC	Cost Manual Estimate (GP5A Turbine Ref sheet)	0.914	2.741
Reductant Price (\$/gal)	RP	Vendor quote (Ref-Reductant consumption price)		\$2.50
SCR Catalyst Cost (\$)	SCC	Cost Manual Estimate (GP5A Turbine Ref sheet)	\$14,999.51	\$44,998.53
SCR Catalyst Life (h)	SCL	Vendor's quote		20,000
Operator Wages (\$/h)	OW	MSC quote (Ref-Reductant consumption price)		\$21.56
Operator Hours per Shift (h)	OH			0.50
Shifts per Year	SY	3 shifts/day*365 days/year		1,095
Maintenance Wages (\$/h)	MW	MSC quote (Ref-Reductant consumption price)		\$23.72
Maintenance Hours per Shift	MH			0.25
Interest Rate	IR			5.50%
Equipment Life (y)	EL			30
NOx Emission Rate (ppm)	N		1.50E-04	1.5E-04
Molar Volume @ 14.7 psi and 70 F (scf/lb-mol)	MV			386.80
Molecular Weight of NO2 (lb/lb-mol)	MW			46.01
Fuel Volume (scf/MMBtu)	FD	For 1050 Btu/scf Natural Gas @ 70 F		8.743
Oxygen Content	OC			15%
NOx Emission Rate (lb/MMBtu)	NER		0.5526	0.5526

APPENDIX 21

Cost Analysis for oxidation catalyst for combustion turbines between 1000 - 3000 BHP			
	Cost	Costs	Costs
Uncontrolled NMNEC as propane (ppm @ 15% O2)	9	9	9
HP	1,000	1,500	3,000
MW	0.708215297	1.062322946	2.124645892
Hrs/Yr	8760	8760	8760
Heat Input (MMBtu/h)	11.06	16.59	33.1
NMNEHC Emission Rate (lb/MMBtu)	0.031786877	0.031786877	0.031786877
Total Uncontrolled NMNEHC emissions in Tons per Year	1.54	2.31	4.61
Total NMNEHC Removed in Tons per Year (60%)	0.92	1.39	2.77
TOTAL CAPITAL COST			
Oxidation Catalyst Purchased Equipment Costs	\$96,785	\$205,918	\$215,090
Direct Installation Costs (0.30PEC)	\$29,035	\$61,775	\$64,527
Total Indirect Installation Costs (0.27PEC)	\$26,132	\$55,598	\$58,074
Project Contingency (0.15(DIC+IIC))	\$8,275	\$17,606	\$18,390
Total Capital Investment	\$160,227	\$340,897	\$356,082
Direct Annual Costs			
Operating and Supervisory Labor Costs	\$18,889	\$18,889	\$18,889
Maintenance Cost	\$2,904	\$6,178	\$6,453
Natural Gas Penalty	\$12,553	\$28,325	\$45,964
Catalyst Disposal	\$130	\$338	\$637
Annual Catalyst Replacement Cost	\$14,204	\$36,841	\$69,512
Indirect Annual Costs			
Overhead (60% of Maintenance - EPA's OAQPS)	\$1,742	\$3,707	\$3,872
Property Tax+Ins +Admn. (4% of TCI - EPA OAQPS)	\$6,409	\$13,636	\$14,243
Capital Recovery (5.5% @ 20 yrs)	\$13,411	\$28,533	\$29,804
Direct Annual Costs	\$48,679	\$90,570	\$141,454
Indirect Annual Costs	\$21,562	\$45,875	\$47,919
TOTAL ANNUALIZED COST	\$70,242	\$136,446	\$189,373
COST-EFFECTIVENESS (\$/Ton NMNEHC removed)	\$76,026.63	\$98,455.46	\$68,488.34

APPENDIX 22

Cost Analysis for SCR for NG-fired simple cycle turbines between 3000 and 80000 HP									
Turbine Horsepower (bhp)	HP	3000	11150	15900	30000	60000	8760	16080	30910
Operating Hours (h)	H	8760	8760	8760	8760	8760	8760	8760	8760
Fuel Consumption (MMBtu/h)	FC	21.99	80.17	117.58	190.80	359.10			
TOTAL CAPITAL INVESTMENT (TCI)									
SCR Catalyst Housing and Control System									
A		\$845,553.81	\$1,291,111.68	\$1,550,782.76	\$2,321,635.56	\$3,061,729.60			
B	Based on vendor's quote	\$28,699.75	\$65,113.22	\$86,335.80	\$149,333.33	\$263,370.64			
C	PA sales tax of 8% (1.08*(A+B))	\$928,708.57	\$1,437,598.40	\$1,735,358.27	\$2,619,227.02	\$4,489,803.08			
D	Direct Installation Costs	\$278,012.57	\$431,279.52	\$520,606.66	\$785,786.11	\$1,348,940.92			
E	Indirect Installation Costs	\$287,278.66	\$445,655.50	\$537,960.44	\$811,860.38	\$1,394,935.98			
F	Contingencies	\$222,410.06	\$345,023.82	\$416,485.51	\$628,614.49	\$1,079,952.74			
G	Sum(Row 8 Row 11)*1.11 (CPI)	\$1,902,998.04	\$2,952,108.31	\$3,563,554.11	\$5,378,562.69	\$9,240,345.63			
Direct Annual Costs									
Power Costs									
H	PC*H*PP	\$2,822.23	\$8,872.44	\$9,005.94	\$14,814.11	\$28,228.22			
I	RC*H*RC	\$16,784.78	\$52,814.87	\$77,481.83	\$125,696.71	\$251,397.42			
J	HSCL*SCC	\$19,709.38	\$54,532.38	\$68,471.44	\$90,531.72	\$181,063.43			
K	Vendor's quote	\$4,978.13	\$4,978.13	\$4,978.13	\$4,978.13	\$4,978.13			
L	OW*OH*SY	\$11,804.10	\$11,804.10	\$11,804.10	\$11,804.10	\$11,804.10			
M	MW*MH*SY	\$6,493.35	\$6,493.35	\$6,493.35	\$6,493.35	\$6,493.35			
N	Sum(Row 15 Row 20)	\$62,599.93	\$138,493.28	\$178,212.78	\$254,118.12	\$484,982.95			
Indirect Annual Costs									
O	Overhead	\$3,696.01	\$3,696.01	\$3,696.01	\$3,696.01	\$3,696.01			
P	Property Tax	\$18,911.07	\$25,822.23	\$31,015.86	\$46,432.71	\$79,234.53			
Q	Insurance	\$9,455.54	\$12,911.12	\$15,507.93	\$23,216.36	\$39,617.27			
R	Administrative	\$18,911.07	\$25,822.23	\$31,015.86	\$46,432.71	\$79,234.53			
S	Capital Recovery	\$178,842.83	\$278,679.02	\$336,399.51	\$507,739.21	\$872,288.63			
T	5.5% for 30 years* D688	\$225,816.52	\$347,130.82	\$417,835.16	\$627,715.99	\$1,074,270.87			
U	Sum(Row 23 Row 27)	\$488,116.44	\$740,622.90	\$898,470.95	\$1,318,334.11	\$2,224,728.62			
TOTAL ANNUALIZED COST									
V	E*F	\$288,416.44	\$466,623.80	\$596,047.95	\$881,834.11	\$1,559,233.62			
W	CE	80%	80%	80%	80%	80%			
X	PTE	14.90	54.33	78.69	129.31	209.48			
Y	NER*F*H	11.92	43.46	63.75	103.45	187.58			
Z	PTE*CE	\$24,195.08	\$11,195.82	\$9,350.01	\$8,524.61	\$9,304.30			
AA	G*NR								
COST-EFFECTIVENESS (\$/ton NOx removed)									
Assumptions:									
AB	Power Consumption Rate (kW)	4.35	13.67	13.87	22.51	45.03			
AC	Industrial Retail Power Price (\$/kWh)	\$0.0741							
AD	Reductant Consumption Rate (gph)	0.767	2.412	3.537	5.740	11.478			
AE	Reductant Price (\$/gal)	\$2.50							
AF	SCR Catalyst Cost (\$)	\$44,996.53	\$124,503.18	\$156,327.48	\$266,893.42	\$413,308.84			
AG	SCR Catalyst Life (h)	20,000							
AH	Operator Wages (\$/h)	\$21.56							
AI	Operator Hours per Shift (h)	0.50							
AJ	Shifts per Year	3 shifts/day*365 days/year							
AK	Maintenance Wages (\$/h)	\$23.72							
AL	Maintenance Hours per Shift	0.25							
AM	Interest Rate	5.50%							
AN	Equipment Life (y)	30							
AO	NOx Emission Rate (ppm)	4.2E-05	4.2E-05	4.2E-05	4.2E-05	4.2E-05			
AP	Molar Volume @ 14.7 psi and 70 F (sc3/lb-mol)	368.80							
AQ	Molecular Weight of NO2 (lb/lb-mol)	46.01							
AR	Fuel Volume (sc/MMBtu)	8.743							
AS	NOx Content	15%							
AT	NOx Emission Rate (lb/MMBtu)	0.1547	0.1547	0.1547	0.1547	0.1547			

APPENDIX 25

Cost Analysis for SCR for natural gas-fired lean-burn engines rated at Greater than 3500 BHP

Engine Horsepower (bhp)	HP	3500	4000	4500	4735	5000
Operating Hours (h)	H	8760	8760	8760	8760	8760
SCR Catalyst Housing and Control System	A	OAQPS	\$563,503.89	\$610,776.25	\$632,994.26	\$658,048.62
Reductant Storage Tank	A'	Vendor's quote	\$25,824.80	\$28,654.80	\$29,984.90	\$31,484.80
Total Purchased Equipment Costs	B	OAQPS with PA sales tax of 6%	\$589,328.69	\$639,431.05	\$662,979.16	\$689,533.42
Direct Installation Costs	0.30B	OAQPS	\$179,562.37	\$196,246.45	\$220,772.06	\$229,614.63
Indirect Installation Costs	0.31B	OAQPS	\$185,547.78	\$202,788.00	\$228,131.13	\$237,268.45
Contingencies	0.24B	OAQPS (0.15*(B+0.30B+0.31B))	\$143,649.89	\$156,997.16	\$176,617.65	\$183,691.70
TOTAL CAPITAL COST (TCC)	C	SUM ROW 7 - 10 with CPI	\$1,729,104.40	\$1,843,306.98	\$1,958,106.60	\$2,033,128.20
Direct Annual Costs						
Power Costs	PC*H*PP	\$5,547.07	\$6,160.27	\$6,773.47	\$7,061.67	\$7,386.66
Reductant Costs	RC*H*RC	\$98,472.75	\$112,540.29	\$126,607.83	\$133,219.57	\$140,675.36
SCR Catalyst Replacement Costs	HISCL*SCC*1.11	\$13,572.71	\$14,337.03	\$15,101.35	\$15,460.59	\$15,865.68
Operating Labor plus 15% for Supervisor	OW*OH*SY*1.15	\$13,574.72	\$13,574.72	\$13,574.72	\$13,574.72	\$13,574.72
Maintenance Labor plus Materials	MW*MH*SY*2	\$12,986.70	\$12,986.70	\$12,986.70	\$12,986.70	\$12,986.70
Total Direct Annual Costs	E	Sum(Row 12,Row17)	\$144,153.95	\$159,599.00	\$175,044.06	\$182,303.24
Indirect Annual Costs						
Overhead	0.6D	OAQPS	\$7,792.02	\$7,792.02	\$7,792.02	\$7,792.02
Property Tax	0.02C	OAQPS using PA property tax of 2%	\$24,582.09	\$26,866.14	\$29,150.19	\$30,223.70
Insurance	0.01C	OAQPS	\$12,291.04	\$13,433.07	\$14,575.10	\$15,111.85
Administrative	0.02C	OAQPS	\$24,582.09	\$26,866.14	\$29,150.19	\$30,223.70
Capital Recovery (5.5% @ 30 yrs)			\$84,569.01	\$92,426.76	\$100,284.51	\$103,977.66
Total Indirect Annual Costs	F	Sum(Row 20,Row24)	\$153,816.25	\$167,384.13	\$180,952.01	\$187,328.91
TOTAL ANNUALIZED COST	G	E+F	\$297,970.19	\$326,983.13	\$355,996.07	\$385,009.01
Control Efficiency	CE		80%	80%	80%	80%
Potential to Emit (TPY)	PTE	ER*HP*H/(454 g/lb*2000 lb/ton)	101.30	115.77	130.24	144.71
Annual Estimated NOx Removal (TPY)	NR	PTE*CE	81.04	92.62	104.19	115.77
COST EFFECTIVENESS (\$/Ton of NOx removed)		G/NR	\$3,676.84	\$3,530.50	\$3,417	\$3,326
Assumptions:						
Power Consumption Rate (kW)	PC	OAQPS	8.55	9.49	10.43	11.38
Industrial Retail Power Price (\$/MWh)	PP	EIA Data				
Reductant Consumption Rate (gal/h)	RC	OAQPS	4.496	5.139	5.781	6.424
Reductant Price (\$/gal)	RP	Vendor's quote				
SCR Catalyst Cost (\$)	SCC	OAQPS	\$27,917.04	\$29,489.14	\$31,061.24	\$32,633.34
SCR Catalyst Life (h)	SCL	Vendor's quote				
Operator Wages (\$/h)	OW	MSC quote (\$21.56/hr)				
Operator Hours per Shift (h)	OH					
Shifts per Year	SY	3 shifts/day*365 days/year				
Maintenance Wages (\$/h)	MW	MSC quote				
Maintenance Hours per Shift	MH					
Interest Rate	IR					
Equipment Life (y)	EL					
NOx Emission Rate (g/bhp-h)	NER	Uncontrolled NOx Emissions > 500 bhp				

APPENDIX 27

Cost Analysis for NSCR for rich-burn engines

Based on E - C/R INC's Cost-Analysis done for EPA in June 2010									
HP	100	300	800	1500	3000				
Hrs	8760	8760	8760	8760	8760				
Total Capital Cost (TCC) in 2010									
Total Capital Cost (TCC) in 2020 (CPI 1.18)	\$15,139.00	\$17,240.00	\$33,103.00	\$44,223.00	\$89,644.00				
Total Annual Operating Cost (TAOC)	\$17,864.02	\$20,343.20	\$39,061.54	\$52,183.14	\$105,779.92				
Total Annual Operating Cost (TAOC) in 2020 (CPI 1.18)	\$5,466.00	\$8,465.00	\$10,723.00	\$12,306.00	\$18,773.00				
	\$6,449.88	\$9,988.70	\$12,653.14	\$14,521.08	\$22,152.14				
Uncontrolled NOx Gms/bhp-hr									
Uncontrolled NMHC Gms/bhp-hr	16	16	16	16	16				
	1.00	1.00	1.00	1.00	1.00				
Uncontrolled NOx tons per year									
Uncontrolled NMHC tons per year	15.44	46.31	123.49	231.54	463.08				
	0.96	2.89	7.72	14.47	28.94				
NOx removed TPY (80% Eff.)									
NMHC removed TPY (50% Eff.)	12.35	37.05	98.79	185.23	370.47				
	0.48	1.45	3.86	7.24	14.47				
Total NOx, NMHC removed									
	12.83	38.49	102.65	192.47	384.94				
Cost-Effectiveness (\$/Ton NOx removed) 2010 Dollars									
Cost-Effectiveness in 2020 Dollars with CPI 1.18	\$522.30	\$269.62	\$128.08	\$78.39	\$59.80				
	\$616.32	\$318.16	\$151.13	\$92.50	\$70.56				
Uncontrolled NOx Emissions used for this cost analysis - 16 gms/bhp-hr									
Uncontrolled NMHC Emissions used for this cost analysis - 1.0 gms/bhp-hr									
Typical NOx Control Efficiency 80%									
HC Control Efficiency 50%									
TCC = Direct Costs (DC) + Indirect Costs (IC)									
DC = Purchased Equipment Cost (PEC) + Direct Installation Costs (DIC)									
PEC includes Costs for Control Device and Auxiliary Equipment (EC), Instrumentation (10% of EC), and Sales Tax and Freight (6% each of EC)									
DIC includes Foundation and Supports (8% of PEC), Handling and Erection (14% of PEC), and Electric (4% of PEC), Piping (2% of PEC), insulation (1% of PEC), and painting (1% of PEC)									
IC Indirect Installation Costs (ICC) + Contingencies (C)									
ICC includes Engineering (10% of PEC), Construction and Field expenses (5% of PEC), Contractor Fees (10% of PEC), Startup (2% of PEC), and Performance test (1% of PEC)									
C is assumed to be 3% of PEC									
TAC = DAC + IAC									
DAC includes Utilities, Operating Labor, maintenance, Annual Compliance test, Catalytic Cleaning Catalyst replacement, Catalyst Disposal									
IAC includes Overhead, Fuel Penalty, Property Tax, Insurance, Administrative Charges, and Capital Recovery (10% for 10 years)									

APPENDIX 28

Cost Analysis for oxidation catalyst for IC engines

	Cost	Costs	Costs	Costs	Costs	Costs
Uncontrolled NMHC gms/hp-hr	1	1	1	1	1	1
HP	2500	2000	1500	1000	750	500
Hrs/Yr	8760	8760	8760	8760	8760	8760
Capital Cost:						
TOTAL CAPITAL COST (TCC) (2009)	\$35,069.00	\$28,669.00	\$22,269.00	\$15,869.00	\$12,669.00	\$9,469.00
Direct Annual Costs						
On-Site Testing	\$5,000.00	\$5,000.00	\$5,000.00	\$5,000.00	\$5,000.00	\$5,000.00
Catalyst replacement (3 yrs Operating life)	\$11,689.67	\$9,556.33	\$7,423.00	\$5,289.67	\$4,223.00	\$3,156.33
Maintenance (5% of TCC)	\$1,753.45	\$1,433.45	\$1,113.45	\$793.45	\$633.45	\$473.45
Indirect Annual Costs						
Capital Recovery (5.5 % @ 20 yrs)	\$2,935.28	\$2,399.60	\$1,863.92	\$1,328.24	\$1,060.40	\$792.56
Overhead (60% of Maintenance - OAQPS)	\$1,052.07	\$860.07	\$668.07	\$476.07	\$380.07	\$284.07
Property Tax+Ins.+Admn. (4% of TCC - OAQPS)	\$1,402.76	\$1,146.76	\$890.76	\$634.76	\$506.76	\$378.76
TOTAL ANNUALIZED COST	\$23,833.22	\$20,396.21	\$16,959.20	\$13,522.18	\$11,803.68	\$10,085.17
Total Uncontrolled NMHC emissions in Tons per Year	24.12	19.30	14.47	9.65	7.24	4.82
Total NMHC Removed in Tons per Year (60%)	14.47	11.58	8.68	5.79	4.34	2.89
Cost-Effectiveness (\$/Ton NMHC removed) in 2009	\$1,646.92	\$1,761.77	\$1,953.19	\$2,336.02	\$2,718.86	\$3,484.53
COST-EFFECTIVENESS (\$/Ton NMHC removed) in 2020 with CPI	\$1,976.31	\$2,114.13	\$2,343.83	\$2,803.23	\$3,262.63	\$4,181.43

Reference: June 29, 2010-Control Costs for Existing Stationary SI RICE
 From: Bradley Nelson, EC/R, Inc. To: Melanie King, EPA OAQPS/SPPD/ESG
https://19january2017snapshot.epa.gov/sites/production/files/2014-02/documents/5_2011_circostmemo_exist_si.pdf

APPENDIX 29

Cost Analysis for SCR for container glass and fiber glass furnace			
	OWENS-BROCKWAY GLASS CONTAINER INC./CRENSHAW starting at 4 lbs/ton	OWENS BROCKWAY GLASS/CHERRY ST container starting at 4 lbs/ton	ARDACH GLASS PORT ALLEGANY PLT container starting at 4 lbs/ton
Boiler Capacity MMBtu/hr	70.2	66.3	51.65
Hrs/Yr	8760	8760	8760
NOx emissions (lb/MMBtu)	0.77	0.78	0.91
TOTAL CAPITAL COST			
DIRECT CAPITAL COST	\$2,975,852.00	\$2,975,852.00	\$2,975,852.00
Equipment Cost (EC) = (1)			
Auxiliaries = (2)			
Installation & Controls = (3)	\$297,585	\$297,585	\$297,585
Sales Tax (6% of EC) = (4)	\$178,551	\$178,551	\$178,551
Freight (6% of EC) = (5)	\$178,551	\$178,551	\$178,551
Total Equipment Cost (TEC) = (6) = (1)+(2)+(3)+(4)+(5)	\$3,630,539	\$3,630,539	\$3,630,539
INSTALLATION COSTS			
Direct Installation			
Foundation and Support = (7)	\$290,443	\$290,443	\$290,443
Handling and Erection = (8)	\$508,276	\$508,276	\$508,276
Electrical = (9)	\$145,222	\$145,222	\$145,222
Piping (10)	\$72,611	\$72,611	\$72,611
Insulation for duct work (11)	\$36,305	\$36,305	\$36,305
Painting (12)	\$36,305	\$36,305	\$36,305
Total Direct Installation Cost = (13) = (7)+(8)+(9)+(10)+(11)+(12)	\$1,089,162	\$1,089,162	\$1,089,162
Indirect Installation			
Engineering and Supervision = (14)	\$363,054	\$363,054	\$363,054
Construction, Field = (15)	\$181,527	\$181,527	\$181,527
Construction or Contractor Fees = (16)	\$363,054	\$363,054	\$363,054
Contingencies = (17)	\$108,916	\$108,916	\$108,916
Startup and performance Tests = (18)	\$108,916	\$108,916	\$108,916
Total Indirect Cost = (19) = (14)+(15)+(16)+(17)+(18)	\$1,125,467	\$1,125,467	\$1,125,467
TOTAL CAPITAL COST (TCC) = 20 = (6) + (13) + (19)	\$5,845,168	\$5,845,168	\$5,845,168
Direct Annual Costs			
Electricity = (22)	\$76,124	\$76,124	\$76,124
Chemical Cost (Urea/Ammonia) = (23)	\$103,303	\$103,303	\$103,303
Catalyst Replacement (costs/No. of years) = (24)	\$23,764	\$23,764	\$23,764
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day = (28)	\$32,850	\$32,850	\$32,850
Maintenance Material = (29)	\$32,850	\$32,850	\$32,850
Indirect Annual Costs			
Administration (3% of maintenance+labor) = (25)	\$3,154	\$3,154	\$3,154
Property Taxes (1% of TCC-OAQPS) = (26)	\$58,452	\$58,452	\$58,452
Insurance (1% of TCC-OAQPS) = (27)	\$58,452	\$58,452	\$58,452
Annualized Capital Recovery Cost (30 yrs at 5.5%) = (21)	\$402,148	\$402,148	\$402,148
Overhead (44% of Labor cost + 12% Material Cost) = (30)	\$39,420.00	\$39,420.00	\$39,420.00
TOTAL ANNUALIZED COST = (31) = Sum from (21) through (30)	\$830,515	\$830,515	\$830,515
Uncontrolled NOx TPy = (32)	238.27	227.76	204.98
NOx removed TPy (80% Ef.) = (33)	190.62	182.21	163.99
COST EFFECTIVENESS (\$/ton of NOx removed) = (34) = (31)/(33)	\$4,356.97	\$4,558.06	\$5,064.51
Calculated theoretical emissions after control (lbs NOx/ton glass)	0.80	0.80	0.80
RACT II emission limit (lbs NOx/ton glass) and \$129,304	4.00	4.00	4.00
			% remainder after control/uncontrolled

Factors Used
From EPA Alternate Control Glass 1994
container 12 lb/ton: flat 22: pressed 22
other 1B
manipulated to agree with line 32 for 250 mmbtu

10% of EC
6% of EC
6% of EC
8% of TEC
14% of TEC
4% of TEC
2% of TEC
1% of TEC
1% of TEC
10% of TEC
5% of TEC
10% of TEC
3% of TEC
3% of TEC
EPA cost spreadsheet for 250 MMBtu (Appendix 7)
\$0.0676 kw/hr (prorated from 200 MMBtu quote,
from EPA cost spreadsheet for 250 MMBtu
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
100% of maintenance labor
3% of maintenance + labor
1% of TCC (OAQPS)
1% of TCC (OAQPS)
TCC*0.0688
60% of Maintenance Cost (OAQPS)

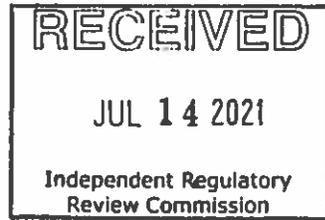
APPENDIX 30

Cost Analysis for SCR for all other glass furnaces		
Cost estimate	PQ CORP/CHESTER other starting at 6 lbs/ton	Factors Used
Boiler Capacity MMBtu/hr	51.65	From EPA Alternate Control Glass 1994
Hrs/Yr	8760	
NOx emissions (lb/MMBtu)	1.35	container 12 (lb/ton) flat 22; pressed 22 other 18
DIRECT CAPITAL COST		
Equipment Cost (EC) = (1)	\$2,975,952.00	manipulated to agree with line 32 for 250 mmbtu
Auxiliaries = (2)		
Instrumentation & Controls = (3)	\$297,585	10% of EC
Sales Tax (6% of EC) = (4)	\$178,551	6% of EC
Freight (6% of EC) = (5)	\$178,551	6% of EC
Total Equipment Cost (TEC) = (6) = (1)+(2)+(3)+(4)+(5)	\$3,630,539	
INSTALLATION COSTS		
Direct Installation		
Foundation and Support = (7)	\$290,443	8% of TEC
Handling and Erection = (8)	\$508,276	14% of TEC
Electrical = (9)	\$145,222	4% of TEC
Piping (10)	\$72,611	2% of TEC
Insulation for duct work (11)	\$36,305	1% of TEC
Painting (12)	\$36,305	1% of TEC
Total Direct Installation Cost = (13) = (7)+(8)+(9)+(10)+(11)+(12)	\$1,089,162	
Indirect Installation		
Engineering and Supervision = (14)	\$363,054	10% of TEC
Construction Field = (15)	\$181,527	5% of TEC
Construction or Contractor Fees = (16)	\$363,054	10% of TEC
Contingencies = (17)	\$108,916	3% of TEC
Startup and performance Tests = (18)	\$108,916	3% of TEC
Total Indirect Cost = (19) = (14)+(15)+(16)+(17)+(18)	\$1,125,467	
TOTAL CAPITAL COST (TCC) = 20 = (6) + (13) + (19)	\$5,845,168	EPA cost spreadsheet for 250 MMBtu (Appendix 7)
Direct Annual Costs		
Electricity = (22)	\$76,124	\$0.0676 kw/hr (pro-rated from 200 MMBtu quote)
Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day = (28)	\$32,950	Maintenance Labor - \$60/hr, 30 min/shift, 3 shifts/day
Maintenance Material = (29)	\$32,950	100% of maintenance labor
Chemical Cost (Urea/Ammonia) = (23)	\$103,303	from EPA cost spreadsheet for 250 MMBtu
Catalyst Replacement (costs/No. of years) = (24)	\$23,764	from EPA cost spreadsheet for 250 MMBtu
Indirect Annual Costs		
Administration (3% of maintenance+labor) = (25)	\$3,154	3% of maintenance+labor
Property Taxes (1% of TCC-OAQPS) = (26)	\$58,452	1% of TCC (OAQPS)
Insurance (1% of TCC-OAQPS) = (27)	\$58,452	1% of TCC (OAQPS)
Annualized Capital Recovery Cost (5.5% @ 30 yrs) = (21)	\$402,148	TCC*0.0698
Overhead (44% of Labor cost + 12% Material Cost) = (30)	\$39,420.00	60% of Maintenance Cost (OAQPS)
TOTAL ANNUALIZED COST = (31) = Sum from (21) through (30)	\$830,515	
Uncontrolled NOx TPy = (32)	304.85	
NOx removed TPy (80% Eff.) = (33)	243.88	
COST-EFFECTIVENESS (\$/T on NOx removed) = (34) = (31)/(33)	\$3,405.45	
Calculated theoretical emissions after control (lbs NOx/ton glass)	1.20	% remainder after control/uncontrolled
RACT II emission limit (lbs NOx/ton glass) and \$129,304	6.00	

CDL-1

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email=am Elliott1@attorneygeneral.gov,
c=US
Date: 2021.07.16 08:08:04 -0400
Amy M. Elliott
(Deputy Attorney General)

7/16/2021
DATE OF APPROVAL

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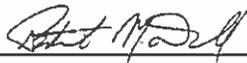
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PROTECTION
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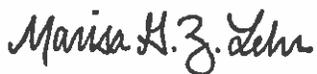
(AGENCY)

DOCUMENT/FISCAL NOTE NO. 7-561

DATE OF ADOPTION May 19, 2021

BY 
TITLE **PATRICK MCDONNELL
CHAIRPERSON**
EXECUTIVE OFFICER CHAIRPERSON OR SECRETARY

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Executive or Independent Agencies

BY 

June 7, 2021
DATE OF APPROVAL

(Deputy General Counsel)
(Chief Counsel - Independent Agency)
(Strike inapplicable title)

Check if applicable No Attorney General Approval
or objection within 30 days after submission.

NOTICE OF PROPOSED RULEMAKING

**DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL QUALITY BOARD**

**Additional RACT Requirements for Major Sources of NO_x and VOCs
for the 2015 Ozone NAAQS**

25 Pa. Code Chapters 121 and 129

**PROPOSED RULEMAKING
ENVIRONMENTAL QUALITY BOARD
[25 PA. CODE CHS. 121 and 129]
Additional RACT Requirements for Major Sources of NO_x and VOCs
for the 2015 Ozone NAAQS**

The Environmental Quality Board (Board) proposes to amend Chapters 121 and 129 (relating to general provisions; and standards for sources) to read as set forth in Annex A. This proposed rulemaking would amend Chapter 129 to adopt additional presumptive reasonably available control technology (RACT) requirements and RACT emission limitations for certain major stationary sources of oxides of nitrogen (NO_x) and volatile organic compound (VOC) emissions in existence on or before August 3, 2018, to address the 2015 8-hour ozone National Ambient Air Quality Standards (NAAQS).

This proposed rulemaking would revise § 121.1 (relating to definitions) to add the terms “combustion source” and “natural gas compression and transmission facility fugitive VOC air contamination source” to support the proposed amendments to Chapter 129.

This proposed rulemaking will be submitted to the United States Environmental Protection Agency (EPA) for approval as a revision to the Commonwealth’s State Implementation Plan (SIP) following promulgation of the final-form rulemaking.

This proposed rulemaking was adopted by the Board at its meeting on May 19, 2021.

A. Effective Date

This proposed rulemaking will be effective upon final-form publication in the *Pennsylvania Bulletin*.

B. Contact Persons

For further information, contact Viren Trivedi, Chief, Division of Permits, Bureau of Air Quality, Rachel Carson State Office Building, P.O. Box 8468, Harrisburg, PA 17105-8468, (717) 783-9476; or Jesse C. Walker, Assistant Counsel, Bureau of Regulatory Counsel, Rachel Carson State Office Building, P.O. Box 8464, Harrisburg, PA 17105-8464, (717) 787-7060. Information regarding submitting comments on this proposed rulemaking appears in section J of this preamble. Persons with a disability may use the Pennsylvania Hamilton Relay Service, (800) 654-5984 (TDD users) or (800) 654-5988 (voice users). This proposed rulemaking is available on the Department of Environmental Protection’s (Department) web site at www.dep.pa.gov (select “Public Participation,” then “Environmental Quality Board”).

C. Statutory Authority

This proposed rulemaking is authorized under section 5(a)(1) of the Air Pollution Control Act (APCA) (35 P.S. § 4005(a)(1)), which grants the Board the authority to adopt rules and regulations for the prevention, control, reduction and abatement of air pollution in this Commonwealth; and section 5(a)(8) of the APCA, which grants the Board the authority to adopt

rules and regulations designed to implement the provisions of the Clean Air Act (CAA) (42 U.S.C.A. §§ 7401—7671q).

D. Background and Purpose

This proposed rulemaking would establish §§ 129.111—129.115 (relating to additional RACT requirements for major sources of NO_x and VOCs for the 2015 ozone NAAQS) to meet CAA requirements. Emissions of NO_x and VOCs are precursors for ground-level ozone formation. Ground-level ozone, a public health and welfare hazard, is not emitted directly to the atmosphere from air contamination sources, but forms from the photochemical reaction between emissions of VOCs and NO_x in the presence of sunlight.

Ground-level ozone is a highly reactive gas which at sufficient concentrations can produce a wide variety of harmful effects. At elevated concentrations, ground-level ozone can adversely affect human health, vegetation, materials, economic values, and personal comfort and well-being. It can cause damage to important food crops, forests, livestock and wildlife. Repeated exposure to ground-level ozone pollution may cause a variety of adverse health effects for both healthy people and those with existing conditions including difficulty in breathing, chest pains, coughing, nausea, throat irritation and congestion. It can worsen bronchitis, heart disease, emphysema and asthma, reduce lung capacity and lead to increased morbidity. Asthma is a significant and growing threat to children and adults. High levels of ground-level ozone also affect animals including pets, livestock and wildlife in ways similarly to humans.

The EPA is responsible for establishing NAAQS, or maximum allowable concentrations in the ambient air, for six criteria pollutants considered harmful to public health and welfare, including the environment: ground-level ozone; particulate matter; NO_x; carbon monoxide; sulfur dioxide; and lead. Section 109 of the CAA (42 U.S.C.A. § 7409) established two types of NAAQS: primary standards, which are limits set to protect public health; and secondary standards, which are limits set to protect public welfare and the environment, including protection against visibility impairment and from damage to animals, crops, vegetation and buildings. The EPA established primary and secondary ground-level ozone NAAQS to protect public health and welfare.

On April 30, 1971, the EPA promulgated primary and secondary NAAQS for photochemical oxidants, which include ozone, under section 109 of the CAA. See 36 FR 8186 (April 30, 1971). These were set at an hourly average of 0.08 parts per million (ppm) total photochemical oxidants not to be exceeded more than 1 hour per year. On February 8, 1979, the EPA announced a revision to the then-current 1-hour standard. See 44 FR 8202 (February 8, 1979). The final rulemaking revised the level of the primary 1-hour ozone standard from 0.08 ppm to 0.12 ppm and set the secondary standard identical to the primary standard. This revised 1-hour standard was reaffirmed on March 9, 1993. See 58 FR 13008 (March 9, 1993).

Section 110(a) of the CAA (42 U.S.C.A. § 7410(a)) gives states the primary responsibility for achieving the NAAQS. Section 110(a) of the CAA provides that each state shall adopt and submit to the EPA a plan to implement measures (a SIP) to enforce the NAAQS or a revision to the NAAQS promulgated under section 109(b) of the CAA. A SIP includes the regulatory programs, actions and commitments a state will carry out to implement its responsibilities under

the CAA. Once approved by the EPA, a SIP is legally enforceable under both federal and state law.

Section 172(c)(1) of the CAA (42 U.S.C.A. § 7502(c)(1)) provides that SIPs for nonattainment areas must include “reasonably available control measures,” including RACT, for affected sources of emissions. RACT is defined as the lowest emissions limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility. See 44 FR 53762 (September 17, 1979). Section 182 of the CAA (42 U.S.C.A. § 7511a) requires that, for areas that exceed the NAAQS for ozone, states shall develop and administer a program that mandates that certain major stationary sources implement RACT. Under sections 182(f)(1) and 184(b)(2) of the CAA (42 U.S.C.A. §§ 7511a(f)(1) and 7511c(b)(2)), these RACT requirements are applicable to all sources in this Commonwealth that emit or have a potential to emit 100 tons per year (TPY) or more of NO_x. Under sections 182(b)(2) and 184(b)(2) of the CAA (42 U.S.C.A. §§ 7511a(b)(2) and 7511c(b)(2)), these RACT requirements are applicable to all sources in this Commonwealth that emit or have a potential to emit at least 50 TPY of VOCs.

For RACT implementation purposes, the entire Commonwealth is treated as a “moderate” ozone nonattainment area, because the Commonwealth is included in the Ozone Transport Region (OTR) established by operation of law under sections 176A and 184 of the CAA (42 U.S.C.A. §§ 7506a and 7511c). Section 184(b) of the CAA addresses provisions for the SIP of a state included in the OTR. Section 184(b)(1)(B) of the CAA (42 U.S.C.A. § 7511c(b)(1)(B)) requires that states in the OTR, including this Commonwealth, submit a SIP revision requiring implementation of RACT for all major stationary sources of NO_x and VOC emissions in the state and not just for those sources that are located in designated nonattainment areas of the state. The proposed RACT requirements would apply to all major facilities or sources in this Commonwealth that emit or have a potential to emit equal to or greater than 100 TPY of NO_x or 50 TPY of VOCs, as required under section 184 of the CAA for states in the OTR. Consequently, the Commonwealth’s SIP must include RACT regulations applicable Statewide to affected major stationary sources of NO_x and VOC emissions. The Commonwealth’s RACT regulations under §§ 129.91—129.95 (relating to stationary sources of NO_x and VOCs) were implemented Statewide in January 1994 for the 1979 and 1993 1-hour ozone standard. See 24 Pa.B. 467 (January 15, 1994). Additionally, because the five-county Philadelphia area was designated as severe ozone nonattainment for the 1979 1-hour standard, existing sources of 25 TPY or more of either pollutant in the five-county Philadelphia area were required under section 182(d) of the CAA to implement the RACT requirements in §§ 129.91—129.95. These requirements remain applicable to these sources of 25 TPY or more in the five-county Philadelphia area.

On July 18, 1997, the EPA concluded that revisions to the then-current 1-hour ozone primary standard to provide increased public health protection were appropriate at this time to protect public health with an adequate margin of safety. Further, the EPA determined that it was appropriate to establish a primary standard of 0.08 ppm averaged over 8 hours. At this time, the EPA also established a secondary standard equal to the primary standard. See 62 FR 38856 (July 18, 1997). In 2004, the EPA designated 37 counties in this Commonwealth as 8-hour ozone nonattainment areas for the 1997 8-hour ozone NAAQS. See 69 FR 23858, 23931 (April 30, 2004).

On March 27, 2008, the EPA lowered the primary and secondary 8-hour ozone standards from 0.08 ppm to 0.075 ppm. See 73 FR 16436 (March 27, 2008). The EPA made designations for the 2008 8-hour ozone standards on April 30, 2012, with an effective date of July 20, 2012. The EPA designated all or portions of Allegheny, Armstrong, Beaver, Berks, Bucks, Butler, Carbon, Chester, Delaware, Fayette, Lancaster, Lehigh, Montgomery, Northampton, Philadelphia, Washington and Westmoreland counties as nonattainment for the 2008 8-hour ozone NAAQS, with the rest of this Commonwealth designated unclassifiable/attainment. See 77 FR 30088, 30143 (May 21, 2012).

The Commonwealth's RACT regulations under §§ 129.96—129.100 (relating to additional RACT requirements for major sources of NO_x and VOCs) were implemented in April 2016 for the 1997 and 2008 8-hour ozone standards. See 46 Pa.B. 2036 (April 23, 2016).

On October 26, 2015, the EPA lowered the primary and secondary 8-hour ozone standards from 0.075 ppm to 0.070 ppm. See 80 FR 65292 (October 26, 2015). The EPA made designations for the 2015 8-hour ozone standards on June 4, 2018, with an effective date of August 3, 2018. On June 4, 2018, the EPA designated Bucks, Chester, Delaware, Montgomery and Philadelphia Counties as “marginal” nonattainment, with the rest of this Commonwealth designated attainment/unclassifiable. See 83 FR 25776, 25828 (June 4, 2018). The Department's preliminary analysis of the 2020 ambient air ozone season monitoring data shows that all ozone samplers in this Commonwealth are monitoring attainment of the 2015 8-hour ozone NAAQS except these three: the Bristol sampler in Bucks County and the Philadelphia Air Management Services Northeast Airport and Northeast Waste samplers in Philadelphia County; all ozone samplers in this Commonwealth are projected to monitor attainment of the 2008 and 1997 8-hour ozone NAAQS.

The EPA's final rules to implement the 2008 and 2015 8-hour ozone NAAQS require states with areas classified as “moderate” nonattainment or higher to submit a demonstration, as a revision to the SIP, that their current regulations fulfill 8-hour ozone RACT requirements for all control technique guideline (CTG) categories and all major non-CTG sources. See 80 FR 12264 (March 6, 2015) and 83 FR 62998 (December 6, 2018). Therefore, a re-evaluation of what constitutes RACT for affected sources must be fulfilled each time the EPA revises a NAAQS. This was the case in 1997 when the EPA replaced the 1993 1-hour ozone standard with the 8-hour ozone standard and was the case in 2008 and 2015 for the 8-hour ozone standard. State regulations to control emissions of NO_x and VOCs from major stationary sources will be reviewed by the EPA to determine if the provisions meet the RACT requirements of the CAA and its implementing regulations designed to attain and maintain the ozone NAAQS. Therefore, the Commonwealth must submit a SIP revision to demonstrate how it will attain and maintain the 2015 8-hour ozone standard in the nonattainment areas.

The EPA's past implementation of regulations for revised NAAQS ozone standards have required OTR states to submit RACT SIP revisions based on the timeframe provided in section 184 of the CAA as measured from the effective date of designations made for those revised NAAQS, rather than from November 15, 1990. This requirement was first codified in 40 CFR 51.916 (relating to what are the requirements for an Ozone Transport Region under the 8-hour NAAQS?) for the 1997 8-hour ozone NAAQS, later codified for the 2008 8-hour ozone NAAQS

in 40 CFR 51.1116 (relating to requirements for an Ozone Transport Region) and most recently codified for the 2015 8-hour ozone NAAQS in 40 CFR 51.1316 (relating to requirements for an Ozone Transport Region). Under these provisions, states in the OTR are required to submit SIP revisions addressing the RACT requirements of section 184 of the CAA not later than 2 years after the effective date of designations for nonattainment areas for the revised 2015 8-hour ozone NAAQS, or by August 3, 2020.

The Department must ensure that the 1997, 2008 and 2015 8-hour ozone NAAQS are attained and maintained by implementing permanent and Federally-enforceable control measures. Reductions in ozone precursor emissions that are achieved following the adoption and implementation of RACT emission control measures for source categories covered by this proposed rulemaking will assist the Commonwealth in making substantial progress in achieving and maintaining the 1997, 2008 and 2015 8-hour ozone NAAQS. The Board has determined that the proposed requirements are reasonably necessary to attain and maintain the health-based and welfare-based 8-hour ozone NAAQS in this Commonwealth and to satisfy related CAA requirements.

The Department conducted a generic RACT analysis to determine if additional controls would represent RACT for the 2015 8-hour ozone NAAQS. That generic analysis identified existing affected source categories by size and fuel type; identified available feasible NO_x or VOC control options, or both, for each type of existing source; estimated emission reduction potential for each control technology; identified costs for technologies, using appropriate updates; and evaluated cost-effectiveness using the guidance provided in the EPA Air Pollution Control Cost Manual, EPA/452/B-02-001, 6th edition, January 2002, for both uncontrolled and controlled sources (combinations of technologies). After conducting this analysis, the Department determined the RACT for each source category.

Based on this analysis, the Board has determined that additional cost-effective controls represent RACT for the 2015 8-hour ozone NAAQS. There are ten existing source categories that would be affected by this proposed rulemaking: combustion units; municipal solid waste landfills; municipal waste combustors; process heaters; turbines; stationary internal combustion engines; cement kilns; glass melting furnaces; lime kilns; and direct-fired heaters, furnaces or ovens; as well as other existing source categories that are not regulated elsewhere under Chapter 129.

The proposed RACT requirements would apply to all sources in this Commonwealth that emit or have a potential to emit 100 TPY or more of NO_x or 50 TPY of VOCs. There are approximately 500 Title V facilities in this Commonwealth under the Department's jurisdiction that may be subject to this proposed rulemaking. The Department preliminarily determined that the owners and operators of approximately 10-30 affected major facilities under the Department's jurisdiction meet the definition of "small business" specified in Section 3 of the Regulatory Review Act. The owners and operators of the affected facilities are familiar with the existing requirements for emissions control, recordkeeping and reporting for their entity and have the professional and technical skills needed for continued compliance with these requirements.

The Board has determined that this proposed rulemaking would fulfill requirements for re-evaluation and be less resource intensive than imposing case-by-case analysis for affected facilities in the covered categories. As more fully discussed in Section E of this preamble, the

Board proposes a compliance option hierarchy whereby the owner or operator of a subject source that cannot meet the presumptive RACT emission limitations and requirements under proposed § 129.112 (relating to presumptive RACT requirements, RACT emission limitations and petition for alternative compliance schedule) may apply for a facility-wide or system-wide NO_x emissions averaging plan under proposed § 129.113 (relating to facility-wide or system-wide NO_x emissions averaging plan general requirements) or an alternative case-by-case RACT determination under proposed § 129.114 (relating to alternative RACT proposal and petition for alternative compliance schedule).

The Department consulted with the Air Quality Technical Advisory Committee (AQTAC) in the development of this proposed rulemaking. On October 17, 2019, the Department presented an overview of this proposed rulemaking to AQTAC. On February 13, 2020, the Department presented more refined concepts of this proposed rulemaking to AQTAC. The draft proposed Annex A was presented to AQTAC as an action item at its meeting on April 16, 2020. However, the AQTAC postponed voting and requested additional information for a special meeting on May 7, 2020. After discussion at its meeting of May 7, 2020, the AQTAC voted 17-2-0 to concur with the Department's recommendation to move this proposed rulemaking forward to the Board for consideration as proposed rulemaking. The draft proposed Annex A was presented to the Small Business Compliance Advisory Committee (SBCAC) on April 22, 2020. The SBCAC voted 7-0-0 to concur with the Department's recommendation to move this proposed rulemaking forward to the Board for consideration as proposed rulemaking. The Department also conferred with the Citizens Advisory Council's (CAC) Policy and Regulatory Oversight Committee concerning this proposed rulemaking on May 8, 2020. On May 19, 2020, the full CAC concurred with the Department's recommendation to move this proposed rulemaking forward to the Board for consideration.

The Department made revisions to this proposed rulemaking after presentations were made to the AQTAC, SBCAC and CAC, which are explained more thoroughly in Section E. The Department revised § 129.112(g)(1)(xv) to correct a cross-reference. The Department deleted § 129.112(g)(1)(xvi) and (xvii), which specified emission rates for the electric generating units at the Brunner Island Steam Electric Plant. The Department deleted § 129.112(g)(1)(vii), (viii) and (x)—(xiv) because the presumptive NO_x RACT emission limitations and requirements were no longer deemed approvable by the EPA as a result of the United State Court of Appeals for the Third Circuit's decision in *Sierra Club v. EPA*, (“*Sierra Club*”) 972 F.3d 290 (3d Cir. 2020). The Department also deleted plant-specific Portland cement kiln and lime kiln emission rates in § 129.112(h) and (j). Section 129.112(g)(1), (h) and (j) are revised as explained in Section E. The Department also deleted § 129.112(g)(2)(v) for simple cycle or regenerative cycle combustion turbines with a rated output equal to or greater than 60,000 bhp to evaluate emerging NO_x control technology as explained in Section E. The Department also revised § 129.112(g)(3)(i) and (ii) from 2500 bhp to 3500 bhp due to a correction made to the cost analysis.

E. Summary of Regulatory Requirements

§ 121.1. Definitions

This proposed rulemaking would revise § 121.1 to add the terms “combustion source” and “natural gas compression and transmission facility fugitive VOC air contamination source” to

support the proposed amendments to Chapter 129. The term originally presented to the AQTAC on May 7, 2020, was “natural gas compression and transmission facility VOC air contamination source.” That term has been revised in this proposed rulemaking to “natural gas compression and transmission facility fugitive VOC air contamination source” and the definition has also been revised from what was presented to AQTAC on May 7, 2020, based on a comment received from a member of the AQTAC.

A natural gas compression and transmission facility fugitive VOC air contamination source is defined as the group of fugitive-VOC-emitting components associated with an individual stationary source. As defined in 25 Pa. Code § 121.1, fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. The group of fugitive-VOC-emitting components is considered an individual VOC emitting source and the fugitive VOC emissions from the group of fugitive-VOC-emitting components are not aggregated with the VOC emissions from the associated individual stationary source. For example, a dehydrator unit would be an individual stationary source. All fugitive-VOC-emitting components such as flanges, crankcase vents, compressor seals, seal vents, valves and connectors associated with this dehydrator unit would be grouped together as a separate natural gas compression and transmission facility fugitive VOC air contamination source. Additionally, all pipeline pigging operations at the natural gas compression or transmission facility would be grouped together as one individual fugitive-VOC-emitting source.

If a natural gas compression and transmission facility fugitive VOC air contamination source has a potential to emit VOCs greater than 2.7 TPY, then a VOC RACT presumptive requirement or limitation under § 129.112 would not apply. The owner or operator would be subject to § 129.114 and required to submit a case-by-case VOC RACT proposal.

§ 129.111. Applicability

Subsection (a) provides that, except as specified in subsection (c), the NO_x requirements of this section and §§ 129.112—129.115 would apply Statewide to the owner and operator of a major NO_x emitting facility, and the VOC requirements of this section and §§ 129.112—129.115 would apply Statewide to the owner and operator of a major VOC emitting facility that were in existence on or before August 3, 2018, for which a requirement or emission limitation, or both, has not been established in §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e, 129.54—129.63a, 129.64—129.69, 129.71, 129.72, 129.73, 129.75, 129.77 and 129.101—129.107. The owner or operator shall identify and list the sources in paragraphs (1) and (2) in the written notification required under § 129.115(a) (relating to written notification, compliance demonstration and recordkeeping and reporting requirements).

Subsection (b) provides that, except as specified in subsection (c), the NO_x requirements of this section and §§ 129.112—129.115 would apply Statewide to the owner and operator of a NO_x emitting facility, and the VOC requirements of this section and §§ 129.112—129.115 would apply Statewide to the owner and operator of a VOC emitting facility when the installation of a new source or a modification or change in operation of an existing source after August 3, 2018, results in the source or facility meeting the definition of a major NO_x emitting facility or a major VOC emitting facility and for which a requirement or an emission limitation, or both, has not been established in §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e,

129.54—129.63a, 129.64—129.69, 129.71, 129.72, 129.73, 129.75, 129.77 and 129.101—129.107. The owner or operator shall identify and list the sources in paragraphs (1) and (2) in the written notification required under § 129.115(a).

Subsection (c) establishes that §§ 129.112—129.114 do not apply to the owner and operator of a NO_x air contamination source that has the potential to emit less than 1 TPY of NO_x located at a major NO_x emitting facility subject to subsection (a) or (b), or of a VOC air contamination source that has the potential to emit less than 1 TPY of VOC located at a major VOC emitting facility subject to subsection (a) or (b). The owner or operator shall identify and list these sources in the written notification required under § 129.115(a).

Subsection (d) establishes that this section and §§ 129.112—129.115 do not apply to the owner and operator of a facility that is not a major NO_x emitting facility or a major VOC emitting facility on or before the effective date of the final-form rulemaking.

§ 129.112. Presumptive RACT requirements, RACT emission limitations and petition for alternative compliance schedule

Subsection (a) establishes that the owner and operator of a source listed in one or more of subsections (b)—(k) located at a major NO_x emitting facility or major VOC emitting facility subject to § 129.111 (relating to applicability) shall comply with the applicable presumptive RACT requirement or RACT emission limitation, or both, beginning with the specified compliance date in paragraph (1) or (2), unless an alternative compliance schedule is submitted and approved under subsections (n)—(p) or under § 129.114. Paragraph (1) specifies the compliance date of January 1, 2023, for a source subject to § 129.111(a). Paragraph (2) specifies the compliance date of January 1, 2023, or 1 year after the date the source meets the definition of a major NO_x emitting facility or major VOC emitting facility, whichever is later, for a source subject to § 129.111(b). The owner or operator shall meet the applicable standards or regulations within the time frame required by standards or regulations even if the permit is not revised to incorporate the standards or regulations.

Subsection (b) establishes that the owner and operator of the combustion unit types listed in subparagraphs (1)(i) and (ii) that are located at a major NO_x emitting facility or major VOC emitting facility subject to § 129.111 shall comply with the applicable presumptive RACT requirement for that source, which includes, among other things, inspection and adjustment requirements. Paragraph (3) specifies that compliance with the applicable presumptive RACT requirements in paragraph (1) and recordkeeping and reporting requirements in paragraph (2) assures compliance with the provisions in §§ 129.93(b)(2), (3), (4) and (5) and 129.97(b)(1), (2) and (3) (relating to presumptive RACT emissions limitations; and presumptive RACT requirements, RACT emission limitations and petition for alternative compliance schedule).

Subsection (c) establishes that the owner and operator of a source listed in this subsection located at a major NO_x emitting facility or major VOC emitting facility subject to § 129.111 shall comply with the applicable presumptive RACT requirements, which is the installation, maintenance and operation of the source in accordance with the manufacturer's specifications and with good operating practices.

Subsection (d) establishes that, except as specified in subsection (c), the owner and operator of a combustion unit, brick kiln, cement kiln, lime kiln or other combustion source located at a major VOC emitting facility subject to § 129.111 shall comply with the specified presumptive RACT requirement, which is the installation, maintenance and operation of the source in accordance with the manufacturer's specifications and with good operating practices for the control of the VOC emissions from the combustion unit or other combustion source.

Subsection (e) establishes that the owner and operator of a municipal solid waste landfill subject to § 129.111 shall comply with the applicable presumptive RACT requirement specified in paragraphs (1)—(3). Paragraph (2) was revised and paragraph (3) was added after the advisory committee meetings to incorporate new Federal requirements for municipal solid waste landfills.

Subsection (f) establishes that the owner and operator of a municipal waste combustor subject to § 129.111 shall comply with the presumptive RACT emission limitation of 150 ppmvd NO_x @ 7% oxygen. The presumptive NO_x emission limitation presented to the AQTAC on May 7, 2020, was 180 ppmvd NO_x @ 7% oxygen. After the advisory committee meetings, the Ozone Transport Commission provided updated information on the emissions from municipal waste combustors. The Department re-analyzed continuous emissions monitoring system (CEMS) data for NO_x emissions from these sources in this Commonwealth in light of the additional information from the Ozone Transport Commission, and revised the presumptive RACT emission limitation to 150 ppmvd NO_x @ 7% oxygen in Annex A of this proposed rulemaking. The Board is specifically seeking comment on the presumptive RACT emission limitation of 150 ppmvd NO_x @ 7% oxygen.

Subsection (g) establishes that, except as specified in subsection (c), the owner and operator of a NO_x air contamination source listed in this subsection that is located at a major NO_x emitting facility or a VOC air contamination source listed in this subsection that is located at a major VOC emitting facility subject to § 129.111 may not cause, allow or permit NO_x or VOCs to be emitted from the air contamination source in excess of the applicable presumptive RACT emission limitation specified in paragraphs (1)—(4). Subsection (g)(1) was revised after the advisory committee and CAC meetings. Subparagraphs (xvi) and (xvii) as presented to the advisory committees and the CAC specified limitations for the electric generating units at the Brunner Island Steam Generating Plant based on the requirements expressed in the consent decree signed on May 16, 2018, between the Sierra Club, Talen Energy Corporation and Brunner Island, LLC. The Department determined that the requirements of subparagraphs (xvi) and (xvii) are not RACT for the Brunner Island facility and deleted these subparagraphs in this proposed rulemaking. The Department deleted § 129.112(g)(1)(vii), (viii) and (x)—(xiv) because the form of these presumptive NO_x RACT provisions was no longer deemed to be approvable by the EPA as a result of the Third Circuit Court of Appeals *Sierra Club* decision. In *Sierra Club*, the Third Circuit issued an opinion vacating and remanding three aspects of the EPA's May 9, 2019, approval of the Commonwealth's 2016 RACT II Rule based on the administrative record. See 84 FR 20274 (May 9, 2019). Because of operating parameter variability and other plant-specific characteristics of large coal-fired combustion units, the Department concludes that a case-by-case approach for NO_x RACT is more appropriate than setting a presumptive NO_x RACT emission limitation for all large coal-fired combustion units. Case-by-case RACT determinations include a top-down analysis. The Department will review the proposed case-by-case determinations and incorporate the final determinations and associated conditions into the

facility's Title V operating permit upon consideration of public comments. The RACT determinations incorporated into the Title V operating permit would then be submitted to the EPA as part of the SIP revision. A coal-fired combustion unit with a rated heat input equal to or greater than 250 million Btu/hour that is not a circulating fluidized bed coal-fired combustion unit is currently required to submit an alternative RACT proposal under § 129.99 (relating to Alternative RACT proposal and petition for alternative compliance schedule). The enumerator for subparagraph (ix) in § 129.112(g)(1) was revised to subparagraph (vii). The enumerators for subparagraphs (xiv) and (xv) in § 129.112(g)(1) were revised to subparagraphs (vii) and (viii). The Department added clarification that § 129.112(g)(1)(viii) only applies to circulating fluidized bed coal-fired combustion units. The Department made minor clarifying revisions to § 129.112(g)(1)(vi) and (vii). After the advisory committee meetings, the Department revised § 129.112(g)(1)(vi) to establish two different fuel categories for circulating fluidized bed boilers. The categories are gob and culm, which are types of waste coal or coal refuse. The Department is seeking comment on the presumptive NO_x RACT emission limitation for circulating fluidized bed boilers firing primarily culm. After the advisory committee meetings, the Department deleted § 129.112(g)(2)(v) for simple cycle or regenerative cycle combustion turbines with a rated output equal to or greater than 60,000 bhp. The Department determined that the baseline NO_x emission rates for this category are wide-ranging, and therefore, not appropriate to establish a presumptive NO_x RACT emission limit at this time. In addition, it is more appropriate for owners and operators of turbines in this category to submit case-by-case RACT proposals that employ emerging retrofit NO_x reduction technologies, such as can-annular, reverse-flow combustion systems. After the advisory committee meetings, the Department revised § 129.112(g)(3)(i) and (ii) from 2500 bhp to 3500 bhp due to a correction made to the cost analysis.

Subsection (h) establishes that the owner and operator of a Portland cement kiln subject to § 129.111 shall comply with the applicable presumptive RACT emission limitation in paragraphs (1)—(3). The draft proposed rulemaking Annex A presented to the advisory committees and the CAC included paragraphs (1)—(5). After the advisory committee and CAC meetings, paragraph (1) was revised from what was presented to the advisory committees and the CAC based on a comment received from a member of AQTAC. The proposed NO_x RACT emission limitation for a long wet-process cement kiln in paragraph (1) was revised from 2.30 to 3.88 pounds of NO_x per ton of clinker produced. Also, after the advisory committee and CAC meetings, the Department determined that the plant-specific cement kiln emission rates in paragraphs (4) and (5) were unnecessary and paragraphs (4) and (5) were deleted in this proposed rulemaking.

Subsection (i) establishes that the owner and operator of a glass melting furnace subject to § 129.111 shall comply with the applicable presumptive RACT emission limitation in paragraphs (1)—(5).

Subsection (j) establishes that the owner and operator of a lime kiln subject to § 129.111 shall comply with the applicable presumptive RACT emission limitation. Subsection (j) was revised after the advisory committee and CAC meetings. The draft proposed rulemaking Annex A presented to the advisory committees and the CAC included paragraphs (1)—(4). When expressed as pounds of NO_x per ton of lime produced rather than pounds of NO_x per hour, the applicable operating permit plant-specific lime kiln emission rates for the three lime kilns in paragraphs (1)—(3) comply with the presumptive RACT emission limitation in paragraph (4) of

4.6 pounds of NO_x per ton of lime produced. Therefore, the Department deleted paragraphs (1)—(4) and revised subsection (j) to only specify the presumptive RACT emission limitation of 4.6 pounds of NO_x per ton of lime produced.

Subsection (k) establishes that the owner and operator of a direct-fired heater, furnace or oven with a rated heat input equal to or greater than 20 million Btu/hour subject to § 129.111 shall comply with the applicable presumptive RACT emission limitation.

Subsection (l) provides that the requirements and emission limitations of this section would supersede the requirements and emission limitations of a RACT permit issued to the owner or operator of an air contamination source subject to one or more of subsections (b)—(k) prior to the effective date of the final-form rulemaking under §§ 129.91—129.95 or under §§ 129.96—129.100 to control, reduce or minimize NO_x emissions or VOC emissions, or both, from the air contamination source unless the RACT permit contains more stringent requirements or emission limitations, or both.

Subsection (m) provides that the requirements and emission limitations of this section would supersede the requirements and emission limitations of §§ 129.201—129.205, 145.111—145.113 and 145.141—145.146 (relating to additional NO_x requirements; emissions of NO_x from stationary internal combustion engines; and emissions of NO_x from cement manufacturing) unless the requirements or emission limitations of §§ 129.201—129.205, §§ 145.111—145.113 or §§ 145.141—145.146 are more stringent.

Subsection (n) establishes that the owner or operator of a major NO_x emitting facility or a major VOC emitting facility subject to § 129.111 that includes an air contamination source subject to one or more of subsections (b)—(k) that cannot meet the applicable presumptive RACT requirement or RACT emission limitation without installation of an air cleaning device may submit a petition to the Department or appropriate approved local air pollution control agency, in writing, requesting an alternative compliance schedule in accordance with paragraphs (1) and (2).

Subsection (o) provides that the Department or appropriate approved local air pollution control agency would review the timely and complete written petition requesting an alternative compliance schedule submitted in accordance with subsection (n) and approve or deny the petition in writing.

Subsection (p) provides that approval or denial under subsection (o) of the timely and complete petition for an alternative compliance schedule submitted under subsection (n) would be effective on the date the letter of approval or denial of the petition is signed by the authorized representative of the Department or appropriate approved local air pollution control agency.

Subsection (q) provides that the Department will submit each petition for an alternative compliance schedule approved under subsection (o) to the Administrator of the EPA for approval as a revision to the Commonwealth's SIP. The owner and operator of the facility shall bear the costs of public hearings and notifications, including newspaper notices, required for the SIP submittal. Subsection (q) was added after the advisory committee meetings to address concerns from the EPA.

§ 129.113. Facility-wide or system-wide NO_x emissions averaging plan general requirements

Subsection (a) provides that the owner or operator of a major NO_x emitting facility subject to § 129.111 that includes an air contamination source subject to a NO_x RACT emission limitation in § 129.112 that cannot meet the applicable NO_x RACT emission limitation may elect to meet the applicable NO_x RACT emission limitation in § 129.112 by averaging NO_x emissions on either a facility-wide or system-wide basis. System-wide emissions averaging must be among sources under common control of the same owner or operator within the same ozone nonattainment area in this Commonwealth.

Subsection (b) provides that the owner or operator of each facility that elects to comply with subsection (a) shall submit a written NO_x emissions averaging plan to the Department or appropriate approved local air pollution control agency as part of an application for an operating permit modification or a plan approval, if otherwise required. The application incorporating the requirements of this section shall be submitted by the applicable date specified in paragraph (1) or (2).

Subsection (c) provides that each NO_x air contamination source included in the application for an operating permit modification or a plan approval, if otherwise required, for averaging NO_x emissions on either a facility-wide or system-wide basis submitted under subsection (b) must be an air contamination source subject to a NO_x RACT emission limitation in § 129.112.

Subsection (d) provides that the application for the operating permit modification or the plan approval, if otherwise required, for averaging NO_x emissions on either a facility-wide or system-wide basis submitted under subsection (b) must demonstrate that the aggregate NO_x emissions emitted by the air contamination sources included in the facility-wide or system-wide NO_x emissions averaging plan are not greater than the NO_x emissions that would be emitted by the group of included sources if each source complied with the applicable NO_x RACT emission limitation in § 129.112 on a source-specific basis.

Subsection (e) provides that the application for the operating permit modification or a plan approval, if otherwise required, specified in subsections (b)—(d) may include facility-wide or system-wide NO_x emissions averaging only for NO_x emitting sources or NO_x emitting facilities that are owned or operated by the applicant.

Subsection (f) provides that the application for the operating permit modification or a plan approval, if otherwise required, specified in subsections (b)—(e) must include the information identified in paragraphs (1)—(3). Paragraph (1) specifies that the application must identify each air contamination source included in the NO_x emissions averaging plan. Paragraph (2) specifies that the application must list each air contamination source's applicable emission limitation in § 129.112. Paragraph (3) specifies that the application must include methods for demonstrating compliance and recordkeeping and reporting requirements in accordance with § 129.115 for each source included in the NO_x emissions plan submitted under subsection (b).

Subsection (g) provides that an air contamination source or facility included in the facility-wide or system-wide NO_x emissions averaging plan submitted in accordance with subsections (b)—(f) may be included in only one facility-wide or system-wide NO_x emissions averaging plan.

Subsection (h) provides that the Department or appropriate approved local air pollution control agency will review the timely and complete NO_x emissions averaging plan submitted in accordance with subsection (b) and approve, deny or modify the NO_x emissions averaging plan, in writing.

Subsection (i) provides that the proposed NO_x emissions averaging plan submitted under subsection (b) will be approved, denied or modified by the Department or appropriate approved local air pollution control agency in accordance with subsection (h) in writing through the issuance of a plan approval or operating permit modification prior to the owner or operator implementing the NO_x emissions averaging plan.

Subsection (j) provides that the owner or operator of an air contamination source or facility included in the facility-wide or system-wide NO_x emissions averaging plan submitted in accordance with subsections (b)—(g) shall submit the reports and records specified in subsection (f)(3) to the Department or appropriate approved local air pollution control agency to demonstrate compliance with § 129.115.

Subsection (k) provides that the owner or operator of an air contamination source or facility included in a facility-wide or system-wide NO_x emissions averaging plan submitted in accordance with subsections (b)—(g) that achieves emission reductions in accordance with other emission limitations required under the APCA or the CAA, or regulations adopted under the APCA or the CAA, that are not NO_x RACT emission limitations may not substitute those emission reductions for the emission reductions required by the facility-wide or system-wide NO_x emissions averaging plan submitted to the Department or appropriate approved local air pollution control agency under subsection (b).

Subsection (l) provides that the owner or operator of an air contamination source subject to a NO_x RACT emission limitation in § 129.112 that is not included in a facility-wide or system-wide NO_x emissions averaging plan submitted under subsection (b) shall operate the source in compliance with the applicable NO_x RACT emission limitation in § 129.112.

Subsection (m) provides that the owner and operator of the air contamination source included in a facility-wide or system-wide NO_x emissions averaging plan submitted under subsection (b) shall be liable for a violation of an applicable NO_x RACT emission limitation at each source included in the NO_x emissions averaging plan.

Subsection (n) provides that the Department will submit each NO_x emissions averaging plan approved under subsection (i) to the Administrator of the EPA for approval as a revision to the SIP. The owner and operator of the facility shall bear the costs of public hearings and notifications, including newspaper notices, required for the SIP submittal.

§ 129.114. Alternative RACT proposal and petition for alternative compliance schedule

Subsection (a) provides that the owner or operator of an air contamination source subject to § 129.112 located at a major NO_x emitting facility or major VOC emitting facility subject to § 129.111 that cannot meet the applicable presumptive RACT requirement or RACT emission limitation of § 129.112 may propose an alternative RACT requirement or RACT emission limitation in accordance with subsection (d).

Subsection (b) provides that the owner or operator of a NO_x air contamination source with a potential emission rate equal to or greater than 5.0 tons of NO_x per year that is not subject to § 129.112 or §§ 129.201—129.205 (relating to additional NO_x requirements) located at a major NO_x emitting facility subject to § 129.111 shall propose a NO_x RACT requirement or RACT emission limitation in accordance with subsection (d).

Subsection (c) provides that the owner or operator of a VOC air contamination source with a potential emission rate equal to or greater than 2.7 tons of VOC per year that is not subject to § 129.112 located at a major VOC emitting facility subject to § 129.111 shall propose a VOC RACT requirement or VOC RACT emission limitation in accordance with subsection (d).

Subsection (d) provides that the owner or operator proposing an alternative RACT requirement or RACT emission limitation under subsection (a), (b) or (c) shall comply with all of the requirements in paragraphs (1)—(7).

Subsection (e) provides that the Department or appropriate approved local air pollution control agency will review the timely and complete alternative RACT proposal submitted in accordance with subsection (d) and approve, modify or deny in writing the application as specified in paragraphs (1)—(3).

Subsection (f) provides that the proposed alternative RACT requirement or RACT emission limitation and the implementation schedule will be approved, denied or modified by the Department or appropriate approved local air pollution control agency in accordance with subsection (e) in writing through the issuance of a plan approval or operating permit modification prior to the owner or operator implementing the alternative RACT requirement or RACT emission limitation.

Subsection (g) provides that the emission limit and requirements specified in the plan approval or operating permit issued by the Department or appropriate approved local air pollution control agency under subsection (f) supersede the emission limit and requirements in the existing plan approval or operating permit issued to the owner or operator of the source prior to the effective date of the final-form rulemaking, on the date specified in the plan approval or operating permit issued by the Department or appropriate approved local air pollution control agency under subsection (f), except to the extent the existing plan approval or operating permit contains more stringent requirements.

Subsection (h) provides that the Department will submit each alternative RACT requirement or RACT emission limitation approved under subsection (f) to the Administrator of the EPA for

approval as a revision to the SIP. The owner and operator of the facility shall bear the costs of public hearings and notifications, including newspaper notices, required for the SIP submittal.

Subsection (i) provides that compliance with the requirements in § 129.99(a)—(h) (relating to alternative RACT proposal and petition for alternative compliance schedule) assures compliance with the provisions in subsections (a)—(h), except for sources subject to § 129.112(b)(11), (h)(4), (h)(5) or (i)—(k).

Subsection (j) provides that the owner and operator of a facility proposing to comply with the applicable RACT requirement or RACT emission limitation under subsection (a), (b) or (c) through the installation of an air cleaning device may submit a petition, in writing, requesting an alternative compliance schedule in accordance with paragraphs (1) and (2).

Subsection (k) provides that the Department or appropriate approved local air pollution control agency will review the timely and complete written petition requesting an alternative compliance schedule submitted in accordance with subsection (j) and approve or deny the petition in writing.

Subsection (l) provides that the emission limit and requirements specified in the plan approval or operating permit issued by the Department or appropriate approved local air pollution control agency under subsection (k) supersede the emission limit and requirements in the existing plan approval or operating permit issued to the owner or operator of the source prior to the effective date of the final-form rulemaking, on the date specified in the plan approval or operating permit issued by the Department or appropriate approved local air pollution control agency under subsection (k), except to the extent the existing plan approval or operating permit contains more stringent requirements.

Subsection (m) provides that approval or denial under subsection (k) of the timely and complete petition for an alternative compliance schedule submitted under subsection (j) will be effective on the date the letter of approval or denial of the petition is signed by the authorized representative of the Department or appropriate approved local air pollution control agency.

Subsection (n) provides that the Department will submit each petition for an alternative compliance schedule approved under subsection (k) to the Administrator of the EPA for approval as a revision to the Commonwealth's SIP. The owner and operator of the facility shall bear the costs of public hearings and notifications, including newspaper notices, required for the SIP submittal. Subsection (n) was added after the advisory committee meetings to address concerns from the EPA.

§ 129.115. Written notification, compliance demonstration and recordkeeping and reporting requirements

Subsection (a) provides that the owner and operator of an air contamination source subject to this section and § 129.111 shall submit a written notification to the appropriate Regional Manager by 6 months after the effective date of the final-form rulemaking that proposes how the owner and operator intend to comply with the requirements of this section and §§ 129.111—129.114. This written notification shall include the information specified in paragraphs (1)—(6). After the

advisory committee meetings, the language of subsection (a)(1), (2), (4) and (5) was revised to clarify the information that is required to be included in the written notification.

Subsection (b) provides that, except as specified in subsection (d), the owner and operator of an air contamination source subject to a NO_x RACT requirement or RACT emission limitation or VOC RACT requirement or RACT emission limitation, or both, listed in § 129.112 shall demonstrate compliance with the applicable RACT requirement or RACT emission limitation by performing the monitoring or testing procedures under paragraphs (1)—(5). Due to the deletion of § 129.112(g)(1)(vii), (viii) and (x)—(xiv), the Department revised § 129.115(b)(1) to reference all of § 129.112(g)(1) and deleted § 129.115(b)(1)(i). The enumerators for subparagraphs (ii) and (iii) in § 129.115(b)(1) were revised to subparagraphs (i) and (ii). The Department also revised § 129.115(b)(4) to reference all of § 129.112(g)(1). After the advisory committee meetings, the Department revised § 129.115(b)(5) to require stack testing to demonstrate initial compliance and subsequently on a schedule set forth in the applicable permit.

Subsection (c) provides that the owner or operator of a combined-cycle combustion turbine may comply with the requirements in § 129.112(g)(2)(ii) on a mass-equivalent basis. The actual emissions during the compliance period must be less than the allowable emissions during the compliance period. The allowable emissions are calculated by multiplying actual heat input in million Btu during the compliance period by the applicable factor listed in paragraphs (1)—(4).

The draft proposed Annex A presented to the advisory committees contained a typographical error such that the enumerator for subsection (c) was used twice. The Annex A published with this proposed rulemaking has been revised to correct this error.

Subsection (d) provides that, except as specified in §§ 129.112(n) and 129.114(j), the owner and operator of an air contamination source subject to subsection (a) shall demonstrate compliance with the applicable RACT requirement or RACT emission limitation in accordance with the procedures in subsection (a) not later than the applicable date in paragraphs (1) and (2).

Subsection (e) provides that an owner or operator of an air contamination source subject to this section and §§ 129.111—129.113 may request a waiver from the requirement to demonstrate compliance with the applicable emission limitation listed in § 129.112 if the requirements in paragraphs (1)—(4) are met.

Subsection (f) provides that the owner and operator of an air contamination source subject to this section and §§ 129.111—129.114 shall keep records to demonstrate compliance with §§ 129.111—129.114 as set forth in paragraphs (1)—(3). This subsection clarifies the owners' and operators' reporting obligations for an air contamination source as a result of the Third Circuit Court of Appeals ruling in *Sierra Club*. Due to the deletion of § 129.112(g)(1)(vii), (viii) and (x)—(xiv), the Department deleted § 129.115(f)(3).

Subsection (g) provides that, beginning with the compliance date specified in § 129.112(a), the owner or operator of an air contamination source claiming that the air contamination source is exempt from the applicable NO_x emission rate threshold specified in § 129.114(b) and the requirements of § 129.112 based on the air contamination source's potential to emit shall maintain records that demonstrate to the Department or appropriate approved local air pollution

control agency that the air contamination source is not subject to the specified emission rate threshold.

Subsection (h) provides that, beginning with the compliance date specified in § 129.112(a), the owner or operator of an air contamination source claiming that the air contamination source is exempt from the applicable VOC emission rate threshold specified in § 129.114(c) and the requirements of § 129.112 based on the air contamination source's potential to emit shall maintain records that demonstrate to the Department or appropriate approved local air pollution control agency that the air contamination source is not subject to the specified emission rate threshold.

Subsection (i) provides that the owner or operator of a combustion unit subject to § 129.112(b) shall record each adjustment conducted under the procedures in § 129.112(b). This record must contain, at a minimum, the information specified in paragraphs (1)—(6).

Subsection (j) provides that the owner or operator of a Portland cement kiln subject to § 129.112(h) shall maintain a daily operating log for each Portland cement kiln. The record for each kiln must include the information specified in paragraphs (1)—(4).

Subsection (k) provides that the records shall be retained by the owner or operator for 5 years and made available to the Department or appropriate approved local air pollution control agency upon receipt of a written request from the Department or appropriate approved local air pollution control agency.

F. Benefits, Costs and Compliance

Benefits

The Department estimates that implementation of the proposed control measures could reduce NO_x emissions by as much as 9,000 TPY from engines, turbines and municipal waste combustors. These reductions in NO_x emissions would benefit the health and welfare of approximately 12.8 million residents and numerous animals, crops, vegetation and natural areas of this Commonwealth by reducing the amount of ground-level ozone air pollution. Reduced ambient concentrations of ground-level ozone would reduce the incidences of hospital admissions for respiratory ailments, including asthma, and improve the quality of life for citizens overall. While children, the elderly and those with respiratory problems are most at risk, even healthy individuals may experience increased respiratory ailments and other symptoms when they are exposed to high levels of ambient ground-level ozone while engaged in activities that involve physical exertion.

Adoption of the presumptive RACT limitations and RACT requirements in this proposed rulemaking would allow this Commonwealth to make substantial progress in achieving and maintaining the 1997, 2008 and 2015 8-hour ozone NAAQS Statewide. Implementation of and compliance with the proposed RACT control measures would assist the Commonwealth in reducing the levels of ozone precursor emissions that contribute to potential nonattainment of the 2015 8-hour ozone NAAQS. As a result, the proposed RACT control measures are reasonably

necessary to attain and maintain the health-based and welfare-based 8-hour ozone NAAQS in this Commonwealth and to satisfy related CAA requirements.

The EPA estimated that the monetized health benefits of attaining the 2008 8-hour ozone NAAQS of 0.075 ppm, range from \$8.3 billion to \$18 billion on a National basis by 2020. Prorating that benefit to this Commonwealth, based on population, results in a public health benefit of \$337 million to \$732 million. Similarly, the EPA estimated that the monetized health benefits of attaining the 2015 8-hour ozone NAAQS of 0.070 ppm, range from \$1.5 billion to \$4.5 billion on a National basis by 2025. Prorating that benefit to this Commonwealth, based on population, results in a public health benefit of \$63 million to \$189 million. The Department is not stating that these estimated monetized health benefits would all be the result of implementing the proposed RACT measures, but the EPA estimates are indicative of the benefits to Commonwealth residents of attaining and maintaining the 2008 and 2015 8-hour ozone NAAQS through the implementation of control measures to reduce ozone precursor emissions in the aggregate from different source categories.

This proposed rulemaking may create economic opportunities for NO_x and VOC emission control technology innovators, manufacturers and distributors through an increased demand for new or improved equipment. In addition, the owners and operators of regulated facilities may be required to install and operate an emissions monitoring system or equipment necessary for an emissions monitoring method in order to comply with this proposed rulemaking, thereby creating an economic opportunity for the emissions monitoring industry.

Compliance Costs

Compliance costs will vary for each facility depending on which compliance option is chosen by the owners and operators of a facility. This proposed rulemaking would include two alternative compliance options: a provision allowing the owner and operator of an affected facility that cannot meet the applicable NO_x RACT or VOC RACT emission limitation to elect to meet the applicable NO_x RACT requirement or NO_x RACT emission limitation in § 129.112 by averaging NO_x emissions on either a facility-wide or system-wide basis; and, a provision allowing the affected owner and operator to submit a case-specific RACT proposal for an alternative RACT requirement or RACT emission limitation to the Department for approval.

Under proposed § 129.113, the owner or operator of an affected major NO_x emitting facility that includes an air contamination source subject to a NO_x RACT requirement or emission limitation in § 129.112 that cannot meet the applicable presumptive NO_x RACT requirement or NO_x RACT emission limitation may elect to meet the requirement or emission limitation by averaging NO_x emissions on either a facility-wide or system-wide basis. System-wide emissions averaging must be among sources under common control of the same owner or operator in this Commonwealth and within the same nonattainment area.

Under proposed § 129.114, the owner or operator of an air contamination source that cannot meet the applicable presumptive RACT requirement or RACT emission limitation of § 129.112 may propose an alternative NO_x RACT requirement, NO_x RACT emission limitation, VOC RACT requirement or VOC RACT emission limitation.

Under these alternative compliance provisions, the owner or operator is required to demonstrate to the Department's satisfaction that it is economically or technically infeasible to meet the applicable proposed NO_x RACT or VOC RACT emission limitation. As such, these provisions may minimize compliance costs to the owner or operator of an affected facility.

The RACT emission limitations and RACT requirements established by this proposed rulemaking will not require the owner or operator to submit an application for amendments to an existing operating permit. These requirements will be incorporated when the permit is renewed if less than 3 years remain in the permit term, as specified under 25 Pa. Code § 127.463(c) (relating to operating permit revisions to incorporate applicable standards). If 3 years or more remain in the permit term, the requirements would be incorporated as applicable requirements in the permit within 18 months of the promulgation of the final-form rulemaking, as required under § 127.463(b). The owner or operator shall meet the applicable standards or regulations within the time frame required by standards or regulations even if the permit is not revised to incorporate the standards or regulations.

Compliance Assistance Plan

The Department plans to educate and assist the public and the regulated community in understanding the proposed requirements and how to comply with them. The Department will continue to work with the Department's provider of the Small Business Stationary Source Technical and Environmental Compliance Assistance services. These services are currently provided by the Environmental Management Assistance Program (EMAP) of the Pennsylvania Small Business Development Centers. The Department has partnered with EMAP to fulfill the Department's obligation to provide confidential technical and compliance assistance to small businesses as required by the APCA, section 507 of the CAA (42 U.S.C.A. § 7661f) and authorized by the Small Business and Household Pollution Prevention Program Act (35 P.S. §§ 6029.201—6029.209).

In addition to providing one-on-one consulting assistance and onsite assessments, EMAP also operates a toll-free phone line to field questions from small businesses, as well as businesses wishing to start up in, or relocate to, this Commonwealth. EMAP operates and maintains a resource-rich environmental assistance web site and distributes an electronic newsletter to educate and inform small businesses about a variety of environmental compliance issues.

Paperwork Requirements

The recordkeeping and reporting requirements for owners and operators of applicable sources under this proposed rulemaking are minimal because the records required are in line with the records already required to be kept for emission inventory purposes and for other federal and state requirements.

G. Pollution Prevention

The Pollution Prevention Act of 1990 (42 U.S.C.A. §§ 13101—13109) established a National policy that promotes pollution prevention as the preferred means for achieving state environmental protection goals. The Department encourages pollution prevention, which is the

reduction or elimination of pollution at its source, through the substitution of environmentally friendly materials, more efficient use of raw materials and the incorporation of energy efficiency strategies. Pollution prevention practices can provide greater environmental protection with greater efficiency because they can result in significant cost savings to facilities that permanently achieve or move beyond compliance. Implementation of the proposed RACT requirements would allow the Department and approved local air pollution control agencies to maintain or increase the reductions of NO_x and VOC emissions from the regulated sources in this Commonwealth, sustain the gains made in healthful air quality and ensure continued protection of the environment and the public health and welfare of the citizens of this Commonwealth.

H. Sunset Review

This Board is not establishing a sunset date for this proposed rulemaking, since it is needed for the Department to carry out its statutory authority. The Department will closely monitor this proposed rulemaking after promulgation as a final-form rulemaking in the *Pennsylvania Bulletin* for its effectiveness and recommend updates to the Board as necessary.

I. Regulatory Review

Under section 5(a) of the Regulatory Review Act (71 P.S. § 745.5(a)), on July 14, 2021, the Department submitted a copy of this proposed rulemaking to the Legislative Reference Bureau for publication in the *Pennsylvania Bulletin* and to the Independent Regulatory Review Commission (IRRC) and the Chairpersons of the House and Senate Environmental Resources and Energy Committees. In addition to submitting this proposed rulemaking, the Department has provided IRRC and the House and Senate Committees with a copy of a detailed Regulatory Analysis Form prepared by the Department. A copy of this material is available to the public upon request.

Under section 5(g) of the Regulatory Review Act, IRRC may convey any comments, recommendations or objections to the proposed rulemaking within 30 days of the close of the public comment period. The comments, recommendations or objections must specify the regulatory review criteria in section 5.2 of the Regulatory Review Act (71 P.S. § 745.5b) which have not been met. The Regulatory Review Act specifies detailed procedures for review, prior to final publication of the rulemaking by the Department, the General Assembly and the Governor.

J. Public Comments

Interested persons are invited to submit to the Board written comments, suggestions, support or objections regarding this proposed rulemaking. Comments, suggestions, support or objections must be received by the Board by October 12, 2021.

Comments may be submitted to the Board by accessing the Board's online comment system at <http://www.ahs.dep.pa.gov/eComment>.

Comments may also be submitted by e-mail to RegComments@pa.gov. A subject heading of this proposed rulemaking and a return name and address must be included in each transmission.

If an acknowledgement of comments submitted online or by e-mail is not received by the sender within 2 working days, the comments should be retransmitted to the Board to ensure receipt. Comments submitted by facsimile will not be accepted.

Comments may also be submitted to the Board by mail or express mail. Written comments should be mailed to the Environmental Quality Board, P.O. Box 8477, Harrisburg, PA 17105-8477. Express mail should be sent to the Environmental Quality Board, Rachel Carson State Office Building, 16th Floor, 400 Market Street, Harrisburg, PA 17101-2301.

K. Public Hearings

The Board will hold three public hearings for the purpose of accepting comments on this proposed rulemaking. The hearings will be held at 1 p.m. on the following dates:

September 7, 2021 Department of Environmental Protection
Southwest Regional Office
Waterfront Conference Rooms A&B
400 Waterfront Drive
Pittsburgh, PA 15222

September 8, 2021 Department of Environmental Protection
Southeast Regional Office
Schuylkill Conference Rooms
2 East Main Street
Norristown, PA 19401

September 9, 2021 Department of Environmental Protection
Southcentral Regional Office
Susquehanna Conference Rooms A&B
909 Elmerton Avenue
Harrisburg, PA 17110

Persons wishing to present testimony at a hearing are requested to contact the Environmental Quality Board, P.O. Box 8477, Harrisburg, PA 17105-8477, (717) 787-4526, RA-EPEQB@pa.gov, at least 1 week in advance of the hearing to reserve a time to present testimony. Language interpretation services are available upon request. Persons in need of language interpretation services must contact Jennifer Swan at (717) 787-4526 by 5 p.m. on August 30, 2021.

Verbal testimony is limited to 5 minutes for each witness. Witnesses are requested to submit two written copies of their oral testimony to the hearing chairperson at the hearing. Organizations are limited to designating one witness to present testimony on their behalf at each hearing.

Persons in need of accommodations as provided for in the Americans with Disabilities Act of 1990 should contact the Board at (717) 787-4526 or through the Pennsylvania Hamilton Relay Service at (800) 654-5984 (TDD) or (800) 654-5988 (voice users) to discuss how the Board may accommodate their needs.

PATRICK McDONNELL,
Chairperson

Annex A
TITLE 25. ENVIRONMENTAL PROTECTION
PART I. DEPARTMENT OF ENVIRONMENTAL PROTECTION
Subpart C. PROTECTION OF NATURAL RESOURCES
ARTICLE III. AIR RESOURCES
CHAPTER 121. GENERAL PROVISIONS

§ 121.1. Definitions.

The definitions in section 3 of the act (35 P. S. § 4003) apply to this article. In addition, the following words and terms, when used in this article, have the following meanings, unless the context clearly indicates otherwise:

* * * * *

Combustion efficiency—A measure of the extent of a combustion reaction, abbreviated C. E. and computed as follows:

$$\text{C. E.} = \frac{[\text{CO}_2]}{[\text{CO}_2] + [\text{CO}]} \times 100\%$$

where: [CO₂] = concentration of carbon dioxide and
[CO] = concentration of carbon monoxide

Combustion source—

(i) A stationary device that combusts solid, liquid or gaseous fuel used to produce heat or energy for industrial, commercial or institutional use by direct heat transfer.

(ii) The term does not include:

(A) Brick kilns.

(B) Cement kilns.

(C) Lime kilns.

Combustion unit—A stationary equipment used to burn fuel primarily for the purpose of producing power or heat by indirect heat transfer.

* * * * *

Natural-finish hardwood plywood panel—A panel on which the original grain pattern is enhanced by an essentially transparent finish frequently supplemented by filler and toner.

Natural gas compression and transmission facility fugitive VOC air contamination source—The group of fugitive-VOC-emitting components associated with an individual stationary source. Both of the following apply:

(i) The group of fugitive-VOC-emitting components is considered an individual VOC-emitting source.

(ii) Fugitive VOC emissions from the group of fugitive-VOC-emitting components are not aggregated with the VOC emissions from the associated individual stationary source.

Necessary preconstruction approvals or permits—Those permits or approvals required under the Clean Air Act or the act and regulations adopted under the acts, which are part of the applicable SIP.

* * * * *

CHAPTER 129. STANDARDS FOR SOURCES

SOURCES OF VOCs

**ADDITIONAL RACT REQUIREMENTS FOR MAJOR SOURCES OF NO_x AND VOCs
FOR THE 2015 OZONE NAAQS**

(Editor's Note: The following sections are proposed to be added and printed in regular type to enhance readability.)

§ 129.111. Applicability.

(a) Except as specified in subsection (c), the NO_x requirements of this section and §§ 129.112—129.115 apply Statewide to the owner and operator of a major NO_x emitting facility and the VOC requirements of this section and §§ 129.112—129.115 apply Statewide to the owner and operator of a major VOC emitting facility that were in existence on or before August 3, 2018, for which a requirement or emission limitation, or both, has not been established in §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e, 129.54—129.63a, 129.64—129.69, 129.71, 129.72, 129.73, 129.75, 129.77 and 129.101—129.107. The owner or operator shall identify and list the following sources and facilities in the written notification required under § 129.115(a) (relating to compliance demonstration and recordkeeping and reporting requirements):

(1) The sources and facilities for which a requirement or emission limitation has not been established in §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e, 129.54—129.63a, 129.64—129.69, 129.71, 129.72, 129.73, 129.75, 129.77 and 129.101—129.107.

(2) The sources and facilities subject to §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e, 129.54—129.63a, 129.64—129.69, 129.71, 129.72, 129.73, 129.75, 129.77 and 129.101—129.107.

(b) Except as specified in subsection (c), the NO_x requirements of this section and §§ 129.112—129.115 apply Statewide to the owner and operator of a NO_x emitting facility and the VOC requirements of this section and §§ 129.112—129.115 apply Statewide to the owner and operator of a VOC emitting facility when the installation of a new source or a modification or change in

operation of an existing source after August 3, 2018, results in the source or facility meeting the definition of a major NO_x emitting facility or a major VOC emitting facility and for which a requirement or an emission limitation, or both, has not been established in §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e, 129.54—129.63a, 129.64—129.69, 129.71, 129.72, 129.73, 129.75, 129.77 and 129.101—129.107. The owner or operator shall identify and list the following sources and facilities in the written notification required under § 129.115(a):

(1) The sources and facilities for which a requirement or emission limitation has not been established in §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e, 129.54—129.63a, 129.64—129.69, 129.71, 129.72, 129.73, 129.75, 129.77 and 129.101—129.107.

(2) The sources and facilities subject to §§ 129.51, 129.52(a)—(k) and Table I categories 1—11, 129.52a—129.52e, 129.54—129.63a, 129.64—129.69, 129.71, 129.72, 129.73, 129.75, 129.77 and 129.101—129.107.

(c) Sections 129.112—129.114 do not apply to the owner and operator of a NO_x air contamination source that has the potential to emit less than 1 TPY of NO_x located at a major NO_x emitting facility subject to subsection (a) or (b) or a VOC air contamination source that has the potential to emit less than 1 TPY of VOC located at a major VOC emitting facility subject to subsection (a) or (b). The owner or operator shall identify and list these sources in the written notification required under § 129.115(a).

(d) This section and §§ 129.112—129.115 do not apply to the owner and operator of a facility that is not a major NO_x emitting facility or a major VOC emitting facility on or before blank (*Editor's note: The blank refers to the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*).

§ 129.112. Presumptive RACT requirements, RACT emission limitations and petition for alternative compliance schedule.

(a) The owner and operator of a source listed in one or more of subsections (b)—(k) located at a major NO_x emitting facility or major VOC emitting facility subject to § 129.111 (relating to applicability) shall comply with the applicable presumptive RACT requirement or RACT emission limitation, or both, beginning with the specified compliance date as follows, unless an alternative compliance schedule is submitted and approved under subsections (n)—(p) or § 129.114 (relating to alternative RACT proposal and petition for alternative compliance schedule):

(1) January 1, 2023, for a source subject to § 129.111(a).

(2) January 1, 2023, or 1 year after the date the source meets the definition of a major NO_x emitting facility or major VOC emitting facility, whichever is later, for a source subject to § 129.111(b).

(b) The owner and operator of a source listed in this subsection that is located at a major NO_x emitting facility or major VOC emitting facility subject to § 129.111 shall comply with the applicable presumptive RACT requirements in paragraph (1) and recordkeeping and reporting requirements in paragraph (2).

(1) The owner or operator of a:

(i) Combustion unit with a rated heat input equal to or greater than 20 million Btu/hour and less than 50 million Btu/hour shall conduct a biennial tune-up in accordance with the procedures in 40 CFR 63.11223 (relating to how do I demonstrate continuous compliance with the work practice and management practice standards?).

(A) Each biennial tune-up shall occur not less than 3 months and not more than 24 months after the date of the previous tune-up.

(B) The biennial tune-up must include, at a minimum, the following:

(I) Inspection and cleaning or replacement of fuel-burning equipment, including the burners and components, as necessary, for proper operation as specified by the manufacturer.

(II) Inspection of the flame pattern and adjustment of the burner, as necessary, to optimize the flame pattern to minimize total emissions of NO_x and, to the extent possible, emissions of CO.

(III) Inspection and adjustment, as necessary, of the air-to-fuel ratio control system to ensure proper calibration and operation as specified by the manufacturer.

(ii) Combustion unit with an oxygen trim system that maintains an optimum air-to-fuel ratio that would otherwise be subject to a biennial tune-up shall conduct a tune-up of the boiler one time in each 5-year calendar period in accordance with the following:

(A) Each tune-up shall occur not less than 3 months and not more than 60 months after the date of the previous tune-up.

(B) The tune-up must include, at a minimum, the following:

(I) Inspection and cleaning or replacement of fuel-burning equipment, including the burners and components, as necessary, for proper operation as specified by the manufacturer.

(II) Inspection of the flame pattern and adjustment of the burner, as necessary, to optimize the flame pattern to minimize total emissions of NO_x and, to the extent possible, emissions of CO.

(III) Inspection and adjustment, as necessary, of the air-to-fuel ratio control system to ensure proper calibration and operation as specified by the manufacturer.

(2) The applicable recordkeeping and reporting requirements of § 129.115(e), (f) or (g) (relating to compliance demonstration and recordkeeping requirements).

(3) Compliance with the applicable presumptive RACT requirements in paragraph (1) and recordkeeping and reporting requirements in paragraph (2) assures compliance with the provisions in §§ 129.93(b)(2), (3), (4) and (5) and 129.97(b)(1), (2) and (3) (relating to presumptive RACT emissions limitations; and presumptive RACT requirements, RACT emission limitations and petition for alternative compliance schedule).

(c) The owner and operator of a source listed in this subsection that is located at a major NO_x emitting facility or major VOC emitting facility subject to § 129.111 shall install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices:

(1) A NO_x air contamination source that has the potential to emit less than 5 TPY of NO_x.

(2) A VOC air contamination source that has the potential to emit less than 2.7 TPY of VOC.

(3) A natural gas compression and transmission facility fugitive VOC air contamination source that has the potential to emit less than 2.7 TPY of VOC.

(4) A boiler or other combustion source with an individual rated gross heat input less than 20 million Btu/hour.

(5) A combustion turbine with a rated output less than 1,000 bhp.

(6) A lean burn stationary internal combustion engine rated at less than 500 bhp (gross).

(7) A rich burn stationary internal combustion engine rated at less than 100 bhp (gross).

(8) An incinerator, thermal oxidizer or catalytic oxidizer used primarily for air pollution control.

(9) A fuel-burning unit with an annual capacity factor of less than 5%.

(i) For a combustion unit, the annual capacity factor is the ratio of the unit's heat input (in million Btu or equivalent units of measure) to the unit's maximum rated hourly heat input rate (in million Btu/hour or equivalent units of measure) multiplied by 8,760 hours during a period of 12 consecutive calendar months.

(ii) For an electric generating unit, the annual capacity factor is the ratio of the unit's actual electric output (expressed in mwe/hr) to the unit's nameplate capacity (or maximum observed hourly gross load (in mwe/hr) if greater than the nameplate capacity) multiplied by 8,760 hours during a period of 12 consecutive calendar months.

(iii) For any other unit, the annual capacity factor is the ratio of the unit's actual operating level to the unit's potential operating level during a period of 12 consecutive calendar months.

(10) An emergency standby engine operating less than 500 hours in a 12-month rolling period.

(11) An electric arc furnace.

(d) Except as specified in subsection (c), the owner and operator of a combustion unit, brick kiln, cement kiln, lime kiln or other combustion source located at a major VOC emitting facility subject to § 129.111 shall install, maintain and operate the source in accordance with the manufacturer's specifications and with good operating practices for the control of the VOC emissions from the combustion unit or other combustion source.

(e) The owner and operator of a municipal solid waste landfill subject to § 129.111 shall comply with the following applicable presumptive RACT requirements. The owner or operator of a:

(1) Municipal solid waste landfill constructed, reconstructed or modified on or before May 29, 1991, shall comply with the emission guidelines and compliance times in 40 CFR Part 60, Subpart Cc (relating to emission guidelines and compliance times for municipal solid waste landfills), which are adopted and incorporated by reference in § 122.3 (relating to adoption of standards), and the applicable Federal or state plans in 40 CFR Part 62 (relating to approval and promulgation of state plans for designated facilities and pollutants).

(2) Municipal solid waste landfill constructed, reconstructed or modified on or after May 30, 1991, but on or before July 17, 2014, shall comply with the New Source Performance Standards in 40 CFR Part 60, Subpart WWW (relating to standards of performance for municipal solid waste landfills), which are adopted and incorporated by reference in § 122.3.

(3) Municipal solid waste landfill constructed, reconstructed or modified on or after July 18, 2014, shall comply with the New Source Performance Standards in 40 CFR Part 60, Subpart XXX (relating to standards of performance for municipal solid waste landfills that commenced construction, reconstruction, or modification after July 17, 2014), which are adopted and incorporated by reference in § 122.3.

(f) The owner and operator of a municipal waste combustor subject to § 129.111 shall comply with the presumptive RACT emission limitation of 150 ppmvd NO_x @ 7% oxygen.

(g) Except as specified in subsection (c), the owner and operator of a NO_x air contamination source listed in this subsection that is located at a major NO_x emitting facility or a VOC air contamination source listed in this subsection that is located at a major VOC emitting facility subject to § 129.111 may not cause, allow or permit NO_x or VOCs to be emitted from the air contamination source in excess of the applicable presumptive RACT emission limitation specified in the following paragraphs:

(1) The owner or operator of:

(i) A natural gas-fired, propane-fired or liquid petroleum gas-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour shall comply with 0.10 lb NO_x/million Btu heat input.

(ii) A distillate oil-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour shall comply with 0.12 lb NO_x/million Btu heat input.

(iii) A residual oil-fired or other liquid fuel-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour shall comply with 0.20 lb NO_x/million Btu heat input.

(iv) A refinery gas-fired combustion unit or process heater with a rated heat input equal to or greater than 50 million Btu/hour shall comply with 0.25 lb NO_x/million Btu heat input.

(v) A coal-fired combustion unit with a rated heat input equal to or greater than 50 million Btu/hour and less than 250 million Btu/hour shall comply with 0.45 lb NO_x/million Btu heat input.

(vi) A circulating fluidized bed combustion unit firing waste products of coal mining, physical coal cleaning and coal preparation operations that contain coal, matrix material, clay and other organic and inorganic material with a rated heat input equal to or greater than 250 million Btu/hour shall comply with the following presumptive RACT emission limitations as applicable:

(A) 0.16 lb NO_x/million Btu heat input when firing primarily bituminous waste such as gob.

(B) 0.16 lb NO_x/million Btu heat input when firing primarily anthracite waste such as culm.

(vii) A solid fuel-fired combustion unit that is not a coal-fired combustion unit with a rated heat input equal to or greater than 50 million Btu/hour shall comply with 0.25 lb NO_x/million Btu heat input.

(viii) A circulating fluidized bed coal-fired combustion unit subject to subparagraph (vi) shall control the NO_x emissions each operating day by operating the installed air pollution control technology and combustion controls at all times consistent with the technological limitations, manufacturer specifications, good engineering and maintenance practices, and good air pollution control practices for controlling emissions.

(2) The owner or operator of a:

(i) Combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 180 MW shall comply with the following presumptive RACT emission limitations as applicable:

(A) 42 ppmvd NO_x @ 15% oxygen when firing natural gas or a noncommercial gaseous fuel.

(B) 5 ppmvd VOC (as propane) @ 15% oxygen when firing natural gas or a noncommercial gaseous fuel.

(C) 96 ppmvd NO_x @ 15% oxygen when firing fuel oil.

(D) 9 ppmvd VOC (as propane) @ 15% oxygen when firing fuel oil.

(ii) Combined cycle or combined heat and power combustion turbine with a rated output equal to or greater than 180 MW shall comply with the following presumptive RACT emission limitations as applicable:

(A) 4 ppmvd NO_x @ 15% oxygen when firing natural gas or a noncommercial gaseous fuel.

(B) 2 ppmvd VOC (as propane) @ 15% oxygen when firing natural gas or a noncommercial gaseous fuel.

(C) 8 ppmvd NO_x @ 15% oxygen when firing fuel oil.

(D) 2 ppmvd VOC (as propane) @ 15% oxygen when firing fuel oil.

(iii) Simple cycle or regenerative cycle combustion turbine with a rated output equal to or greater than 1,000 bhp and less than 3,000 bhp shall comply with the following presumptive RACT emission limitations as applicable:

(A) 85 ppmvd NO_x @ 15% oxygen when firing natural gas or a noncommercial gaseous fuel.

(B) 9 ppmvd VOC (as propane) @ 15% oxygen when firing natural gas or a noncommercial gaseous fuel.

(C) 150 ppmvd NO_x @ 15% oxygen when firing fuel oil.

(D) 9 ppmvd VOC (as propane) @ 15% oxygen when firing fuel oil.

(iv) Simple cycle or regenerative cycle combustion turbine with a rated output equal to or greater than 3,000 bhp and less than 60,000 bhp shall comply with the following presumptive RACT emission limitations as applicable:

(A) 42 ppmvd NO_x @ 15% oxygen when firing natural gas or a noncommercial gaseous fuel.

(B) 9 ppmvd VOC (as propane) @ 15% oxygen when firing natural gas or a noncommercial gaseous fuel.

(C) 96 ppmvd NO_x @ 15% oxygen when firing fuel oil.

(D) 9 ppmvd VOC (as propane) @ 15% oxygen when firing fuel oil.

(3) The owner or operator of a:

(i) Lean burn stationary internal combustion engine with a rating equal to or greater than 500 bhp and less than 3500 bhp shall comply with the following presumptive RACT emission limitations as applicable:

(A) 3.0 grams NO_x/bhp-hr when firing natural gas or a noncommercial gaseous fuel.

(B) 0.5 gram VOC/bhp-hr excluding formaldehyde when firing natural gas or a noncommercial gaseous fuel, liquid fuel or dual-fuel.

(ii) Lean burn stationary internal combustion engine with a rating equal to or greater than 3500 bhp shall comply with the following presumptive RACT emission limitations as applicable:

(A) 0.6 gram NO_x/bhp-hr when firing natural gas or a noncommercial gaseous fuel.

(B) 0.5 gram VOC/bhp-hr excluding formaldehyde when firing natural gas or a noncommercial gaseous fuel, liquid fuel or dual-fuel.

(iii) Stationary internal combustion engine with a rating equal to or greater than 500 bhp shall comply with 1.6 grams NO_x/bhp-hr when firing liquid fuel or dual-fuel.

(iv) Rich burn stationary internal combustion engine with a rating equal to or greater than 100 bhp shall comply with the following presumptive RACT emission limitations as applicable:

(A) 0.6 gram NO_x/bhp-hr when firing natural gas or a noncommercial gaseous fuel.

(B) 0.5 gram VOC/bhp-hr when firing natural gas or a noncommercial gaseous fuel.

(4) Except as specified in subparagraph (ii), the owner or operator of a unit firing multiple fuels shall comply with:

(i) The applicable RACT multiple fuel emission limit determined on a total heat input fuel weighted basis in accordance with the following:

(A) Using the following equation:

$$E_{HI\text{weighted}} = \frac{\sum_{i=1}^n E_i H_i}{\sum_{i=1}^n H_i}$$

Where:

$E_{HI\text{weighted}}$ = The heat input fuel weighted multiple fuel emission rate or emission limitation for the compliance period, expressed in units of measure consistent with the units of measure for the emission limitation.

E_i = The emission rate or emission limit for fuel i during the compliance period, expressed in units of measure consistent with the units of measure for the emission limitation.

HI_i = The total heat input for fuel i during the compliance period.

n = The number of different fuels used during the compliance period.

(B) Excluding a fuel representing less than 2% of the unit's annual fuel consumption on a heat input basis when determining the applicable RACT multiple fuel emission limit calculated in accordance with clause (A).

(ii) The determination in subparagraph (i) does not apply to a stationary internal combustion engine that is subject to the RACT emission limits in paragraph (3).

(h) The owner and operator of a Portland cement kiln subject to § 129.111 shall comply with the following presumptive RACT emission limitations as applicable:

(1) 3.88 pounds of NO_x per ton of clinker produced for a long wet-process cement kiln as defined in § 145.142 (relating to definitions).

(2) 3.0 pounds of NO_x per ton of clinker produced for a long dry-process cement kiln as defined in § 145.142.

(3) 2.30 pounds of NO_x per ton of clinker produced for:

(i) A preheater cement kiln as defined in § 145.142.

(ii) A precalciner cement kiln as defined in § 145.142.

(i) The owner and operator of a glass melting furnace subject to § 129.111 shall comply with the following presumptive RACT emission limitations as applicable:

(1) 4.0 pounds of NO_x per ton of glass pulled for container glass furnaces.

(2) 7.0 pounds of NO_x per ton of glass pulled for pressed or blown glass furnaces.

(3) 4.0 pounds of NO_x per ton of glass pulled for fiberglass furnaces.

(4) 7.0 pounds of NO_x per ton of glass pulled for flat glass furnaces.

(5) 6.0 pounds of NO_x per ton of glass pulled for all other glass melting furnaces.

(j) The owner and operator of a lime kiln subject to § 129.111 shall comply with the presumptive RACT emission limitation of 4.6 pounds of NO_x per ton of lime produced.

(k) The owner and operator of a direct-fired heater, furnace or oven with a rated heat input equal to or greater than 20 million Btu/hour subject to § 129.111 shall comply with the presumptive

RACT emission limitation of 0.10 lb NO_x/million Btu heat input on a daily average basis or as determined through a stack test.

(l) The requirements and emission limitations of this section supersede the requirements and emission limitations of a RACT permit issued to the owner or operator of an air contamination source subject to one or more of subsections (b)—(k) prior to blank (*Editor's note: The blank refers to the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), under §§ 129.91—129.95 (relating to stationary sources of NO_x and VOCs) or under §§ 129.96—129.100 (relating to additional RACT requirements for major sources of NO_x and VOCs) to control, reduce or minimize NO_x emissions or VOC emissions, or both, from the air contamination source unless the permit contains more stringent requirements or emission limitations, or both.

(m) The requirements and emission limitations of this section supersede the requirements and emission limitations of §§ 129.201—129.205, 145.111—145.113 and 145.141—145.146 (relating to additional NO_x requirements; emissions of NO_x from stationary internal combustion engines; and emissions of NO_x from cement manufacturing) unless the requirements or emission limitations of §§ 129.201—129.205, §§ 145.111—145.113 or §§ 145.141—145.146 are more stringent.

(n) The owner or operator of a major NO_x emitting facility or a major VOC emitting facility subject to § 129.111 that includes an air contamination source subject to one or more of subsections (b)—(k) that cannot meet the applicable presumptive RACT requirement or RACT emission limitation without installation of an air cleaning device may submit a petition, in writing, requesting an alternative compliance schedule in accordance with the following:

(1) The written petition shall be submitted to the Department or appropriate approved local air pollution control agency as soon as possible but not later than:

(i) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), for a source subject to § 129.111(a).

(ii) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), or 6 months after the date that the source meets the definition of a major NO_x emitting facility or a major VOC emitting facility, whichever is later, for a source subject to § 129.111(b).

(2) The written petition must include:

(i) A description, including make, model and location, of each affected source subject to a RACT requirement or a RACT emission limitation in one or more of subsections (b)—(k).

(ii) A description of the proposed air cleaning device to be installed.

(iii) A schedule containing proposed interim dates for completing each phase of the required work to install the air cleaning device described in subparagraph (ii).

(iv) A proposed interim emission limitation that will be imposed on the affected source until compliance is achieved with the applicable RACT requirement or RACT emission limitation.

(v) A proposed final compliance date that is as soon as possible but not later than 3 years after the written approval of the petition by the Department or the appropriate approved local air pollution control agency. The approved petition shall be incorporated in an applicable operating permit or plan approval.

(o) The Department or appropriate approved local air pollution control agency will review the timely and complete written petition requesting an alternative compliance schedule submitted in accordance with subsection (n) and approve or deny the petition in writing.

(p) Approval or denial under subsection (o) of the timely and complete petition for an alternative compliance schedule submitted under subsection (n) will be effective on the date the letter of approval or denial of the petition is signed by the authorized representative of the Department or appropriate approved local air pollution control agency.

(q) The Department will submit each petition for an alternative compliance schedule approved under subsection (o) to the Administrator of the EPA for approval as a revision to the Commonwealth's SIP. The owner and operator of the facility shall bear the costs of public hearings and notifications, including newspaper notices, required for the SIP submittal.

§ 129.113. Facility-wide or system-wide NO_x emissions averaging plan general requirements.

(a) The owner or operator of a major NO_x emitting facility subject to § 129.111 (relating to applicability) that includes at least one air contamination source subject to a NO_x RACT emission limitation in § 129.112 (relating to presumptive RACT requirements, RACT emission limitations and petition for alternative compliance schedule) that cannot meet the applicable NO_x RACT emission limitation may elect to meet the applicable NO_x RACT emission limitation in § 129.112 by averaging NO_x emissions on either a facility-wide or system-wide basis. System-wide emissions averaging must be among sources under common control of the same owner or operator within the same ozone nonattainment area in this Commonwealth.

(b) The owner or operator of each facility that elects to comply with subsection (a) shall submit a written NO_x emissions averaging plan to the Department or appropriate approved local air pollution control agency as part of an application for an operating permit modification or a plan approval, if otherwise required. The application incorporating the requirements of this section shall be submitted by the applicable date as follows:

(1) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), for a source subject to § 129.111(a).

(2) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), or 6 months

after the date that the source meets the definition of a major NO_x emitting facility, whichever is later, for a source subject to § 129.111(b).

(c) Each NO_x air contamination source included in the application for an operating permit modification or a plan approval, if otherwise required, for averaging NO_x emissions on either a facility-wide or system-wide basis submitted under subsection (b) must be an air contamination source subject to a NO_x RACT emission limitation in § 129.112.

(d) The application for the operating permit modification or the plan approval, if otherwise required, for averaging NO_x emissions on either a facility-wide or system-wide basis submitted under subsection (b) must demonstrate that the aggregate NO_x emissions emitted by the air contamination sources included in the facility-wide or system-wide NO_x emissions averaging plan are not greater than the NO_x emissions that would be emitted by the group of included sources if each source complied with the applicable NO_x RACT emission limitation in § 129.112 on a source-specific basis.

(e) The application for the operating permit modification or a plan approval, if otherwise required, specified in subsections (b)—(d) may include facility-wide or system-wide NO_x emissions averaging only for NO_x emitting sources or NO_x emitting facilities that are owned or operated by the applicant.

(f) The application for the operating permit modification or a plan approval, if otherwise required, specified in subsections (b)—(e) must include the following information:

(1) Identification of each air contamination source included in the NO_x emissions averaging plan.

(2) Each air contamination source's applicable emission limitation in § 129.112.

(3) Methods for demonstrating compliance and recordkeeping and reporting requirements in accordance with § 129.115 (relating to compliance demonstration and recordkeeping requirements) for each source included in the NO_x emissions averaging plan submitted under subsection (b).

(g) An air contamination source or facility included in the facility-wide or system-wide NO_x emissions averaging plan submitted in accordance with subsections (b)—(f) may be included in only one facility-wide or system-wide NO_x emissions averaging plan.

(h) The Department or appropriate approved local air pollution control agency will:

(1) Review the timely and complete NO_x emissions averaging plan submitted in accordance with subsection (b).

(2) Approve the NO_x emissions averaging plan submitted under subsection (b), in writing, if the Department or appropriate approved local air pollution control agency is satisfied that the NO_x emissions averaging plan complies with the requirements of subsection (b) and that the proposed NO_x emissions averaging plan is RACT for the air contamination sources.

(3) Deny or modify the NO_x emissions averaging plan submitted under subsection (b), in writing, if the proposal does not comply with the requirements of subsection (b).

(i) The proposed NO_x emissions averaging plan submitted under subsection (b) will be approved, denied or modified by the Department or appropriate approved local air pollution control agency in accordance with subsection (h) in writing through the issuance of a plan approval or operating permit modification prior to the owner or operator implementing the NO_x emissions averaging plan.

(j) The owner or operator of an air contamination source or facility included in the facility-wide or system-wide NO_x emissions averaging plan submitted in accordance with subsections (b)—
(g) shall submit the reports and records specified in subsection (f)(3) to the Department or appropriate approved local air pollution control agency to demonstrate compliance with § 129.115.

(k) The owner or operator of an air contamination source or facility included in a facility-wide or system-wide NO_x emissions averaging plan submitted in accordance with subsections (b)—
(g) that achieves emission reductions in accordance with other emission limitations required under the act or the Clean Air Act, or regulations adopted under the act or the Clean Air Act, that are not NO_x RACT emission limitations may not substitute those emission reductions for the emission reductions required by the facility-wide or system-wide NO_x emissions averaging plan submitted to the Department or appropriate approved local air pollution control agency under subsection (b).

(l) The owner or operator of an air contamination source subject to a NO_x RACT emission limitation in § 129.112 that is not included in a facility-wide or system-wide NO_x emissions averaging plan submitted under subsection (b) shall operate the source in compliance with the applicable NO_x RACT emission limitation in § 129.112.

(m) The owner and operator of the air contamination sources included in a facility-wide or system-wide NO_x emissions averaging plan submitted under subsection (b) shall be liable for a violation of an applicable NO_x RACT emission limitation at each source included in the NO_x emissions averaging plan regardless of each individual facilities' NO_x emission rate.

(n) The Department will submit each NO_x emissions averaging plan approved under subsection (i) to the Administrator of the EPA for approval as a revision to the SIP. The owner and operator of the facility shall bear the costs of public hearings and notifications, including newspaper notices, required for the SIP submittal.

§ 129.114. Alternative RACT proposal and petition for alternative compliance schedule.

(a) The owner or operator of an air contamination source subject to § 129.112 (relating to presumptive RACT requirements, RACT emission limitations and petition for alternative compliance schedule) located at a major NO_x emitting facility or major VOC emitting facility subject to § 129.111 (relating to applicability) that cannot meet the applicable presumptive

RACT requirement or RACT emission limitation of § 129.112 may propose an alternative RACT requirement or RACT emission limitation in accordance with subsection (d).

(b) The owner or operator of a NO_x air contamination source with a potential emission rate equal to or greater than 5.0 tons of NO_x per year that is not subject to § 129.112 or §§ 129.201—129.205 (relating to additional NO_x requirements) located at a major NO_x emitting facility subject to § 129.111 shall propose a NO_x RACT requirement or RACT emission limitation in accordance with subsection (d).

(c) The owner or operator of a VOC air contamination source with a potential emission rate equal to or greater than 2.7 tons of VOC per year that is not subject to § 129.112 located at a major VOC emitting facility subject to § 129.111 shall propose a VOC RACT requirement or RACT emission limitation in accordance with subsection (d).

(d) The owner or operator proposing an alternative RACT requirement or RACT emission limitation under subsection (a), (b) or (c) shall:

(1) Submit a written RACT proposal in accordance with the procedures in § 129.92(a)(1)—(5), (7)—(10) and (b) (relating to RACT proposal requirements) to the Department or appropriate approved local air pollution control agency as soon as possible but not later than:

(i) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), for a source subject to § 129.111(a).

(ii) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), or 6 months after the date that the source meets the definition of a major NO_x emitting facility or major VOC emitting facility, whichever is later, for a source subject to § 129.111(b).

(2) Be in receipt of an approval issued by the Department or appropriate approved local air pollution control agency in writing through a plan approval or operating permit modification for a RACT proposal submitted under paragraph (1)(ii) prior to the installation, modification or change in the operation of the existing air contamination source that will result in the source or facility meeting the definition of a major NO_x emitting facility or major VOC emitting facility.

(3) Include in the RACT proposal the proposed alternative NO_x RACT requirement or RACT emission limitation or VOC RACT requirement or RACT emission limitation developed in accordance with the procedures in § 129.92(a)(1)—(5) and (b).

(4) Include in the RACT proposal a schedule for completing implementation of the RACT requirement or RACT emission limitation as soon as possible but not later than:

(i) blank (*Editor's note: The blank refers to the date 1 year after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), for a source subject to § 129.111(a).

(ii) blank (*Editor's note*: The blank refers to the date 1 year after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.), or 1 year after the date that the source meets the definition of a major NO_x emitting facility or major VOC emitting facility, whichever is later, for a source subject to § 129.111(b).

(5) Include interim dates in the schedule required under paragraph (4) for the:

(i) Issuance of purchase orders.

(ii) Start and completion of process, technology and control technology changes.

(iii) Completion of compliance testing.

(6) Include in the RACT proposal methods for demonstrating compliance and recordkeeping and reporting requirements in accordance with § 129.115 (relating to compliance demonstration and recordkeeping requirements) for each air contamination source included in the RACT proposal.

(7) Demonstrate to the satisfaction of the Department or the appropriate approved local air pollution control agency that the proposed requirement or RACT emission limitation is RACT for the air contamination source.

(e) The Department or appropriate approved local air pollution control agency will:

(1) Review the timely and complete alternative RACT proposal submitted in accordance with subsection (d).

(2) Approve the alternative RACT proposal submitted under subsection (d), in writing, if the Department or appropriate approved local air pollution control agency is satisfied that the alternative RACT proposal complies with the requirements of subsection (d) and that the proposed alternative requirement or RACT emission limitation is RACT for the air contamination source.

(3) Deny or modify the alternative RACT proposal submitted under subsection (d), in writing, if the proposal does not comply with the requirements of subsection (d).

(f) The proposed alternative RACT requirement or RACT emission limitation and the implementation schedule submitted under subsection (d) will be approved, denied or modified by the Department or appropriate approved local air pollution control agency in accordance with subsection (e) in writing through the issuance of a plan approval or operating permit modification prior to the owner or operator implementing the alternative RACT requirement or RACT emission limitation.

(g) The emission limit and requirements specified in the plan approval or operating permit issued by the Department or appropriate approved local air pollution control agency under subsection (f) supersede the emission limit and requirements in the existing plan approval or operating permit issued to the owner or operator of the source prior to blank (*Editor's note*: The

blank refers to the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.), on the date specified in the plan approval or operating permit issued by the Department or appropriate approved local air pollution control agency under subsection (f), except to the extent the existing plan approval or operating permit contains more stringent requirements.

(h) The Department will submit each alternative RACT requirement or RACT emission limitation approved under subsection (f) to the Administrator of the EPA for approval as a revision to the SIP. The owner and operator of the facility shall bear the costs of public hearings and notifications, including newspaper notices, required for the SIP submittal.

(i) Compliance with the requirements in § 129.99(a)—(h) (relating to alternative RACT proposal and petition for alternative compliance schedule) assures compliance with the provisions in subsections (a)—(h), except for sources subject to § 129.112(b)(11), (h)(4), (h)(5) or (i)—(k).

(j) The owner and operator of a facility proposing to comply with the applicable RACT requirement or RACT emission limitation under subsection (a), (b) or (c) through the installation of an air cleaning device may submit a petition, in writing, requesting an alternative compliance schedule in accordance with the following:

(1) The written petition requesting an alternative compliance schedule shall be submitted to the Department or appropriate approved local air pollution control agency as soon as possible but not later than:

(i) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), for a source subject to § 129.111(a).

(ii) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), or 6 months after the date that the source meets the definition of a major NO_x emitting facility, whichever is later, for a source subject to § 129.111(b).

(2) The written petition must include:

(i) A description, including make, model and location, of each air contamination source subject to a RACT requirement or RACT emission limitation in one or more of subsections (a)—(c).

(ii) A description of the proposed air cleaning device to be installed.

(iii) A schedule containing proposed interim dates for completing each phase of the required work to install the air cleaning device described in subparagraph (ii).

(iv) A proposed interim emission limitation that will be imposed on the affected air contamination source until compliance is achieved with the applicable RACT requirement or RACT emission limitation.

(v) A proposed final compliance date that is as soon as possible but not later than 3 years after the approval of the petition by the Department or the appropriate approved local air pollution control agency. If the petition is for the replacement of an existing source, the final compliance date will be determined on a case-by-case basis. The approved petition shall be incorporated in an applicable operating permit or plan approval.

(k) The Department or appropriate approved local air pollution control agency will review the timely and complete written petition requesting an alternative compliance schedule submitted in accordance with subsection (j) and approve or deny the petition in writing.

(l) The emission limit and requirements specified in the plan approval or operating permit issued by the Department or appropriate approved local air pollution control agency under subsection (k) supersede the emission limit and requirements in the existing plan approval or operating permit issued to the owner or operator of the source prior to blank (*Editor's note: The blank refers to the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), on the date specified in the plan approval or operating permit issued by the Department or appropriate approved local air pollution control agency under subsection (k), except to the extent the existing plan approval or operating permit contains more stringent requirements.

(m) Approval or denial under subsection (k) of the timely and complete petition for an alternative compliance schedule submitted under subsection (j) will be effective on the date the letter of approval or denial of the petition is signed by the authorized representative of the Department or appropriate approved local air pollution control agency.

(n) The Department will submit each petition for an alternative compliance schedule approved under subsection (k) to the Administrator of the EPA for approval as a revision to the Commonwealth's SIP. The owner and operator of the facility shall bear the costs of public hearings and notifications, including newspaper notices, required for the SIP submittal.

§ 129.115. Written notification, compliance demonstration and recordkeeping and reporting requirements.

(a) The owner and operator of an air contamination source subject to this section and § 129.111 (relating to applicability) shall submit a written notification to the appropriate Regional Manager by blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), that proposes how the owner and operator intend to comply with the requirements of this section and §§ 129.111—129.114. This written notification shall include the following information:

(1) The air contamination sources identified in § 129.111(a) as one of the following:

(i) Subject to a RACT requirement or RACT emission limitation in §§ 129.112—129.114.

- (ii) Exempted from §§ 129.112—129.114.
- (2) The air contamination sources identified in § 129.111(b) as one of the following:
 - (i) Subject to a RACT requirement or RACT emission limitation in §§ 129.112—129.114.
 - (ii) Exempted from §§ 129.112—129.114.
- (3) The air contamination sources identified in § 129.111(c) that have a potential to emit less than 1 TPY of NO_x located at a major NO_x emitting facility subject to § 129.111(a) or (b) or a VOC air contamination source that has the potential to emit less than 1 TPY of VOC located at a major VOC emitting facility subject to § 129.111(a) or (b).
- (4) The following information for each air contamination source listed in paragraph (1):
 - (i) A description, including make, model and location, of each source.
 - (ii) The applicable RACT requirement or RACT emission limitation, or both, in §§ 129.112—129.114 for each source listed in accordance with paragraph (1)(i).
 - (iii) How the owner or operator shall comply with subparagraph (ii) for each source listed in subparagraph (i).
 - (iv) The reason why the source is exempt from the RACT requirements and RACT emission limitations in §§ 129.112—129.114 for each source listed in accordance with paragraph (1)(ii).
- (5) The following information for each air contamination source listed in paragraph (2):
 - (i) A description, including make, model and location, of each source.
 - (ii) The applicable RACT requirement or RACT emission limitation, or both, in §§ 129.112—129.114 for each source listed in paragraph (2)(i).
 - (iii) How the owner or operator shall comply with subparagraph (ii) for each source listed in subparagraph (i).
 - (iv) The reason why the source is exempt from the RACT requirements and RACT emission limitations in §§ 129.112—129.114 for each source listed in accordance with paragraph (2)(ii).
- (6) The following information for each air contamination source listed in paragraph (3):
 - (i) A description, including make, model and location, of each source.
 - (ii) Information sufficient to demonstrate that the source has a potential to emit less than 1 TPY of NO_x or 1 TPY of VOC, as applicable.

(b) Except as specified in subsection (d), the owner and operator of an air contamination source subject to a NO_x RACT requirement or RACT emission limitation or VOC RACT requirement or RACT emission limitation, or both, listed in § 129.112 (relating to presumptive RACT requirements, RACT emission limitations and petition for alternative compliance schedule) shall demonstrate compliance with the applicable RACT requirement or RACT emission limitation by performing the following monitoring or testing procedures:

(1) For an air contamination source with a CEMS, monitoring and testing in accordance with the requirements of Chapter 139, Subchapter C (relating to requirements for source monitoring for stationary sources) using a 30-operating day rolling average, except for municipal waste combustors subject to § 129.112(f) and combustion units or process heaters subject to § 129.112(g)(1).

(i) A 30-operating day rolling average emission rate for each applicable RACT emission limitation shall be calculated for an affected air contamination source for each consecutive operating day.

(ii) Each 30-operating day rolling average emission rate for an affected air contamination source must include the emissions that occur during the entire operating day, including emissions from start-ups, shutdowns and malfunctions.

(2) For a Portland cement kiln with a CEMS, monitoring of clinker production rates in accordance with 40 CFR 63.1350(d) (relating to monitoring requirements).

(3) For a municipal waste combustor with a CEMS, monitoring and testing in accordance with the requirements in Chapter 139, Subchapter C, using a daily rolling average.

(4) For a combustion unit or process heater subject to § 129.112(g)(1) with a CEMS, monitoring and testing in accordance with the requirements in Chapter 139, Subchapter C, using a daily average.

(5) For an air contamination source without a CEMS, monitoring and testing in accordance with a Department-approved emissions source test that meets the requirements of Chapter 139, Subchapter A (relating to sampling and testing methods and procedures). The source test shall be conducted to demonstrate initial compliance and subsequently on a schedule set forth in the applicable permit.

(c) The owner or operator of a combined-cycle combustion turbine may comply with the requirements in § 129.112(g)(2)(ii) on a mass-equivalent basis. The actual emissions during the compliance period must be less than the allowable emissions during the compliance period. The allowable emissions are calculated by multiplying actual heat input in million Btu during the compliance period by the following:

(1) 0.015 lb NO_x/million Btu for sources subject to § 129.112(g)(2)(ii)(A).

(2) 0.031 lb NO_x/million Btu for sources subject to § 129.112(g)(2)(ii)(B).

(3) 0.014 lb VOC/million Btu for sources subject to § 129.112(g)(2)(ii)(C).

(4) 0.030 lb VOC/million Btu for sources subject to § 129.112(g)(2)(ii)(D).

(d) Except as specified in § 129.112(n) and § 129.114(j) (relating to alternative RACT proposal and petition for alternative compliance schedule), the owner and operator of an air contamination source subject to subsection (a) shall demonstrate compliance with the applicable RACT requirement or RACT emission limitation in accordance with the procedures in subsection (a) not later than:

(1) January 1, 2023, for a source subject to § 129.111(a) (relating to applicability).

(2) January 1, 2023, or 1 year after the date that the source meets the definition of a major NO_x emitting facility or major VOC emitting facility, whichever is later, for a source subject to § 129.111(b).

(e) An owner or operator of an air contamination source subject to this section and §§ 129.111, 129.112 and 129.113 (relating to facility-wide or system-wide NO_x emissions averaging plan general requirements) may request a waiver from the requirement to demonstrate compliance with the applicable emission limitation listed in § 129.112 if the following requirements are met:

(1) The request for a waiver is submitted, in writing, to the Department not later than:

(i) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), for a source subject to § 129.111(a).

(ii) blank (*Editor's note: The blank refers to the date 6 months after the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), or 6 months after the date that the source meets the definition of a major NO_x emitting facility or major VOC emitting facility, whichever is later, for a source subject to § 129.111(b).

(2) The request for a waiver demonstrates that a Department-approved emissions source test was performed in accordance with the requirements of Chapter 139, Subchapter A, on or after:

(i) blank (*Editor's note: The blank refers to the date 1 year before the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), for a source subject to § 129.111(a).

(ii) blank (*Editor's note: The blank refers to the date 1 year before the effective date of adoption of this proposed rulemaking when published as a final-form rulemaking.*), or within 12 months prior to the date that the source meets the definition of a major NO_x emitting facility or major VOC emitting facility, whichever is later, for a source subject to § 129.111(b).

(3) The request for a waiver demonstrates to the satisfaction of the Department that the test results show that the source's rate of emissions is in compliance with the source's applicable NO_x emission limitation or VOC emission limitation.

(4) The Department approves, in writing, the request for a waiver.

(f) The owner and operator of an air contamination source subject to this section and §§ 129.111—129.114 shall keep records to demonstrate compliance with §§ 129.111—129.114 and submit reporting to the Department in the following manner:

(1) The records shall include sufficient data and calculations to demonstrate that the requirements of §§ 129.111—129.114 are met.

(2) Data or information required to determine compliance shall be recorded and maintained in a time frame consistent with the averaging period of the requirement.

(3) The records necessary to determine compliance shall be reported to the Department on a schedule specified in the Title 25, Subpart C, Article III regulations or as otherwise specified in the operating permit or plan approval for the air contamination source.

(g) Beginning with the compliance date specified in § 129.112(a), the owner or operator of an air contamination source claiming that the air contamination source is exempt from the applicable NO_x emission rate threshold specified in § 129.114(b) and the requirements of § 129.112 based on the air contamination source's potential to emit shall maintain records that demonstrate to the Department or appropriate approved local air pollution control agency that the air contamination source is not subject to the specified emission rate threshold.

(h) Beginning with the compliance date specified in § 129.112(a), the owner or operator of an air contamination source claiming that the air contamination source is exempt from the applicable VOC emission rate threshold specified in § 129.114(c) and the requirements of § 129.112 based on the air contamination source's potential to emit shall maintain records that demonstrate to the Department or appropriate approved local air pollution control agency that the air contamination source is not subject to the specified emission rate threshold.

(i) The owner or operator of a combustion unit subject to § 129.112(b) shall record each adjustment conducted under the procedures in § 129.112(b). This record must contain, at a minimum:

(1) The date of the tuning procedure.

(2) The name of the service company and the technician performing the procedure.

(3) The final operating rate or load.

(4) The final NO_x and CO emission rates.

(5) The final excess oxygen rate.

(6) Other information required by the applicable operating permit.

(j) The owner or operator of a Portland cement kiln subject to § 129.112(h) shall maintain a daily operating log for each Portland cement kiln. The record for each kiln must include:

(1) The total hours of operation.

(2) The type and quantity of fuel used.

(3) The quantity of clinker produced.

(4) The date, time and duration of a start-up, shutdown or malfunction of a Portland cement kiln or emissions monitoring system.

(k) The records shall be retained by the owner or operator for 5 years and made available to the Department or appropriate approved local air pollution control agency upon receipt of a written request from the Department or appropriate approved local air pollution control agency.



July 14, 2021

David Sumner
Executive Director
Independent Regulatory Review Commission
333 Market Street, 14th Floor
Harrisburg, PA 17120

Re: Proposed Rulemaking: Additional RACT Requirements for Major Sources of NO_x and VOCs for the 2015 Ozone NAAQS (#7-561)

Dear Mr. Sumner:

Pursuant to Section 5(a) of the Regulatory Review Act, please find enclosed a copy of the Additional RACT Requirements for Major Sources of NO_x and VOCs for the 2015 Ozone NAAQS (#7-561) proposed rulemaking for review by the Independent Regulatory Review Commission (Commission). This proposal is scheduled for publication in the *Pennsylvania Bulletin* on August 7, 2021, with a 66-day public comment period ending on October 12, 2021. The Environmental Quality Board adopted this proposal on May 19, 2021.

This proposed rulemaking would amend the Chapter 129 regulations to add presumptive reasonably available control technology (RACT) requirements and RACT emission limitations for certain major stationary sources of oxides of nitrogen (NO_x) and volatile organic compound (VOC) emissions in existence on or before August 3, 2018, to address the 2015 8-hour ozone National Ambient Air Quality Standards (NAAQS).

As set forth in the Regulatory Review Act, the Department will consider any comments and recommendations made by the Commission, as well as the House and Senate Environmental Resources and Energy Committees and the public, prior to final adoption of the enclosed rulemaking.

Please contact me by e-mail at laurgriffi@pa.gov or by telephone at 717.783.8727 if you have any questions or need additional information.

Sincerely,

A handwritten signature in black ink that reads "Laura E. Griffin".

Laura Griffin
Regulatory Coordinator

Enclosures

**TRANSMITTAL SHEET FOR REGULATIONS SUBJECT TO
 THE REGULATORY REVIEW ACT**

I.D. NUMBER: 7-561

SUBJECT: Additional RACT Requirements for Major Sources of NOx and VOCs for the 2015 Ozone NAAQS

AGENCY: DEPARTMENT OF ENVIRONMENTAL PROTECTION

TYPE OF REGULATION

- Proposed Regulation
- Final Regulation
- Final Regulation with Notice of Proposed Rulemaking Omitted
- 120-day Emergency Certification of the Attorney General
- 120-day Emergency Certification of the Governor
- Delivery of Tolled Regulation
 - a. With Revisions
 - b. Without Revisions

RECEIVED

 JUL 14 2021

 Independent Regulatory
 Review Commission

FILING OF REGULATION

DATE

SIGNATURE

DESIGNATION

7/14/21 *Dan Neuford*

Majority Chair, HOUSE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY
 Representative Rusk Metcalfe

7/14/21 *[Signature]*

Minority Chair, HOUSE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY
 Representative Greg Vitali

7/14/21 electronic submitted

Majority Chair, SENATE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY
 Senator Gene Yaw

7/14/21 electronic submitted

Minority Chair, SENATE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY
 Senator Carolyn Comitta

INDEPENDENT REGULATORY REVIEW COMMISSION
 David Sumner

ATTORNEY GENERAL (for Final Omitted only)

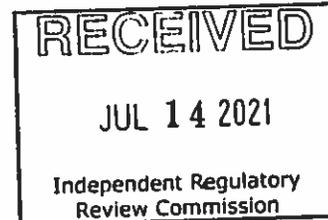
7/14/21 electronic submitted

LEGISLATIVE REFERENCE BUREAU (for Proposed only)
 Leah Brown

Stephen Hoffman

From: Troutman, Nick <ntroutman@pasen.gov>
Sent: Wednesday, July 14, 2021 10:55 AM
To: Griffin, Laura
Cc: Shirley, Jessica; Reiley, Robert A.; Kauffman, Gregory
Subject: RE: Delivery of Proposed Rulemaking - Additional RACT Requirements for Major Sources of NOx and VOCs for the 2015 Ozone NAAQS (7-561)

Received. Thanks Laura



From: Griffin, Laura <laurgriffi@pa.gov>
Sent: Wednesday, July 14, 2021 10:12 AM
To: Troutman, Nick <ntroutman@pasen.gov>
Cc: Shirley, Jessica <jessshirley@pa.gov>; Reiley, Robert A. <rreiley@pa.gov>; Kauffman, Gregory <grekauffma@pa.gov>
Subject: Delivery of Proposed Rulemaking - Additional RACT Requirements for Major Sources of NOx and VOCs for the 2015 Ozone NAAQS (7-561)

Ⓢ CAUTION : External Email Ⓢ

Good morning,

Pursuant to Section 5(a) of the Regulatory Review Act, please find attached the Additional RACT Requirements for Major Sources of NOx and VOCs for the 2015 Ozone NAAQS (#7-561) proposed rulemaking for review by the Senate Environmental Resources and Energy Committee. Due to the file size of the documents, the rulemaking documents and cover letter are attached in a compressed (zip) folder.

Also attached is the transmittal sheet showing delivery to the House Environmental Resources and Energy Committee this morning.

Please confirm receipt of this rulemaking by replying to all recipients.

Thank you,
Laura

Laura Griffin | Regulatory Coordinator
she/her/hers
Department of Environmental Protection | Policy Office
Rachel Carson State Office Building
400 Market Street | Harrisburg, PA
Phone: 717.772.3277 | Fax: 717.783.8926
Email: laurgriffi@pa.gov
www.dep.pa.gov

Connect with DEP on: [Twitter](#) | [Facebook](#) | [LinkedIn](#) | [YouTube](#) | [Instagram](#)

Stephen Hoffman

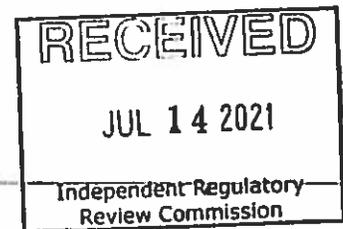
From: Bulletin <bulletin@palrb.us>
Sent: Wednesday, July 14, 2021 12:07 PM
To: Griffin, Laura; Code&Bulletin
Cc: Leah Brown; Adeline E. Gaydosh
Subject: [External] Re: Delivery of Proposed Rulemaking - Additional RACT Requirements for Major Sources of NOx and VOCs for the 2015 Ozone NAAQS (7-561)

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Good afternoon Laura!

Thank you for sending this proposed rulemaking for publication in the 8/7 issue of the *Pennsylvania Bulletin*.

Have a terrific afternoon!
Adeline



From: Griffin, Laura <laurgriffi@pa.gov>
Sent: Wednesday, July 14, 2021 11:53 AM
To: Code&Bulletin <codeandbulletin@palrb.us>; Bulletin <bulletin@palrb.us>
Cc: Leah Brown <lbrown@palrb.us>; Adeline E. Gaydosh <agaydosh@palrb.us>
Subject: Delivery of Proposed Rulemaking - Additional RACT Requirements for Major Sources of NOx and VOCs for the 2015 Ozone NAAQS (7-561)

Good morning,

Please see the attached documents, including Word versions of the Preamble and Annex A, for Proposed Rulemaking – Additional RACT Requirements for Major Sources of NOx and VOCs for the 2015 Ozone NAAQS (#7-561), for publication on **August 7, 2021**.

The transmittal sheet confirming receipt of the rulemaking by the House ERE Committee and email confirmation of receipt by both the Senate ERE Committee chairs is attached.

Please confirm that you received the rulemaking documents for publication.

Thank you!
Laura

Laura Griffin | Regulatory Coordinator
she/her/hers
Department of Environmental Protection | Policy Office
Rachel Carson State Office Building
400 Market Street | Harrisburg, PA
Phone: 717.772.3277 | Fax: 717.783.8926
Email: laurgriffi@pa.gov
www.dep.pa.gov

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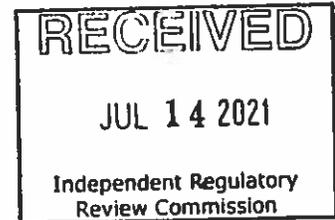
Stephen Hoffman

From: Eyster, Emily <Emily.Eyster@pasenate.com>
Sent: Wednesday, July 14, 2021 10:15 AM
To: Griffin, Laura; Fuller, Lisa
Cc: Shirley, Jessica; Reiley, Robert A.; Kauffman, Gregory; Hartman, Michael
Subject: Re: Delivery of Proposed Rulemaking - Additional RACT Requirements for Major Sources of NOx and VOCs for the 2015 Ozone NAAQS (7-561)

Received.

Thank you!

Emily Eyster
Legislative Director, Office of Senator Carolyn T. Comitta
Executive Director, Environmental Resources and Energy Committee
Cell: (717) 756-4702
Phone: (717) 787-5709
www.pasenatorecomitta.com



From: Griffin, Laura <laurgriffi@pa.gov>
Sent: Wednesday, July 14, 2021 10:11 AM
To: Eyster, Emily <Emily.Eyster@pasenate.com>; Fuller, Lisa <Lisa.Fuller@pasenate.com>
Cc: Shirley, Jessica <jessshirley@pa.gov>; Reiley, Robert A. <rreiley@pa.gov>; Kauffman, Gregory <grekauffma@pa.gov>; Hartman, Michael <Michael.Hartman@pasenate.com>
Subject: Delivery of Proposed Rulemaking - Additional RACT Requirements for Major Sources of NOx and VOCs for the 2015 Ozone NAAQS (7-561)

■ EXTERNAL EMAIL ■

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Thank you,
Laura

Laura Griffin | Regulatory Coordinator
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