Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

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June 1, 2016

Gina McCarthy, Administrator
United States Environmental Protection Agency
Office of the Administrator
Mail Code 1101A
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

**RE: Petition of the State of Connecticut Pursuant to Section 126 of the Clean Air Act**

Dear Administrator McCarthy:

Over the past forty years, the federal Clean Air Act (CAA) has benefited hundreds of millions of Americans by reducing air pollution and improving public health while our nation's economy prospered. This success story is largely due to the state-federal partnership embodied in this landmark environmental law by which states cooperatively work with the United States Environmental Protection Agency (EPA) to adopt common sense, cost-effective programs to reduce air pollution within their jurisdictions and to prevent adverse impacts of air pollution emanating from their states on downwind jurisdictions.

Sadly, and through no direct fault of EPA's diligent efforts under your leadership, there are still millions of people in Connecticut who are not fully realizing the public health benefits of the CAA's promise of clean air for everyone, every day because of unlawful interstate air pollution transport. The State of Connecticut has worked with our partners in the Ozone Transport Region (OTR) over many years to reduce harmful regional emissions. We have also collaborated with upwind states outside of the OTR to voluntarily reduce transport emissions. However, these efforts have come up short. Connecticut still fails to meet the 2008 ozone national ambient air quality standard (NAAQS). Furthermore, because Connecticut failed to attain this standard on time, EPA reclassified the entire state to moderate nonattainment effective June 3, 2016. This means that Connecticut is subject to additional administrative planning and regulatory costs over and above the economic and health impact costs we suffer due to our continued nonattainment of the 2008 ozone NAAQS.

Connecticut's options at this point are significantly constrained by the framework of the CAA. Reluctantly, and based on the evidence set out in the enclosed petition, the Connecticut Department of Energy and Environmental Protection, on behalf of the State of Connecticut, files the attached petition pursuant to CAA section 126, 42 U.S.C. § 7426, seeking a finding by EPA that emissions from the Brunner Island Generation Station in Pennsylvania are significantly contributing to the nonattainment of, and are interfering with maintenance of, the 2008 ozone NAAQS in Connecticut.

The attached petition lays out the strong technical basis for this action. Connecticut seeks a finding from EPA under CAA Section 126 on the enclosed petition, and requests that, pursuant to CAA Section 126, EPA order Brunner Island Station to discontinue the prohibited emissions. I welcome the opportunity to discuss this matter with you. I can be contacted at (860) 424-3000.

Sincerely,

Robert J. Klee
Commissioner

cc: Shawn Garvin, Regional Administrator, Region 3
Curt Spalding, Regional Administrator, Region 1

**Petition to the United States Environmental Protection Agency Pursuant to Section 126 of the Clean Air Act for Abatement of Emissions from the Brunner Island Coal Fired Generating Units in Pennsylvania, as Such Generating Units Significantly Contribute to Nonattainment of, and Interfere with Maintenance of, the 2008 Ozone National Ambient Air Quality Standard in the State of Connecticut**

## I. Introduction, Summary of Conclusion and Requested Remedy[1]

The State of Connecticut, through the Department of Energy & Environmental Protection ("DEEP"), hereby petitions the United States Environmental Protection Agency ("EPA") pursuant to section 126(b) of the Clean Air Act, 42 U.S.C. § 7426(b), to abate the emissions from the Brunner Island Steam Electric Station owned by Talen Energy ("Brunner Island" or "the Plant"). Emissions from Brunner Island, which is located in York County, Pennsylvania, about 175 miles from the Connecticut border, significantly contribute to ozone levels that exceed the 2008 8-hour ozone National Ambient Air Quality Standard ("NAAQS") at six out of twelve ozone monitors in Connecticut, and therefore interfere with both attainment and maintenance of this NAAQS. In addition, by EPA's own projections, four Connecticut ozone monitors will continue to be nonattainment or maintenance sites in 2017 even after full implementation of the proposed Cross-State Air Pollution Rule Update (CSAPR Update).[2] Modeling made available to Connecticut shows, based on 2011 emissions of nitrogen oxides (NOx) that are consistent with current allowable emission levels, Brunner Island emissions alone are sufficient to significantly contribute to ozone levels in Connecticut that exceed the 2008 ozone NAAQS.

This petition clearly demonstrates in a manner consistent with EPA's own regulatory approach under Clean Air Act section 110(a)(2)(D)(i)(I), 42 U.S.C. § 7410(a)(2)(D)(i)(I), that emissions from Brunner Island are linked to downwind nonattainment and maintenance ozone receptor sites in Connecticut at contribution levels one percent or greater of the 2008 ozone NAAQS. Further, these emissions can be reduced at reasonable cost and Brunner Island has readily available control options to do so. Therefore, based on EPA's past approaches in establishing significant contributions,[3] NOx emissions from Brunner Island significantly

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[1] This petition focuses solely on emissions from the coal-fired boilers at Brunner Island Steam Electric Station. Connecticut reserves its right to submit an additional petition or petitions under CAA Section 126 for other stationary sources or groups of stationary sources in Pennsylvania and other States.

[2] 80 Fed. Reg. at 75725-75726, Tables V.C-1 and V.C-2.

[3] *See, e.g.,* 63 Fed. Reg. 57356-57538 ("NOx SIP Call"); 76 Fed. Reg. 48208-48483 ("Cross-State Air Pollution Rule" (CSAPR)); 80 Fed. Reg. 75706-75778 ("CSAPR Update").

contribute to nonattainment and interfere with maintenance of the 2008 ozone NAAQS in Connecticut.

As Brunner Island is physically located in Pennsylvania, the State of Connecticut is without other recourse to limit or otherwise address the ozone pollution that results from the NOx emissions at the Plant. In light of this reality, the State of Connecticut petitions EPA for a finding pursuant to section 126 of the Clean Air Act that Brunner Island is operated in a manner that directly significantly contributes to nonattainment and interferes with maintenance of the 2008 ozone NAAQS in Connecticut, despite the existence of cost-effective and readily available control strategies to eliminate the significant contribution. DEEP further seeks a federally enforceable order from EPA directing the operators of Brunner Island to reduce NOx emissions such that the Plant can no longer significantly contribute to nonattainment and interfering with maintenance of the 2008 NAAQS in Connecticut. Such reductions must occur as expeditiously as practicable but in no event later than the maximum timeframe of three years permitted by section 126 of the Act, 42 U.S.C. § 7426.

## II. Brunner Island Emissions

Brunner Island is a bituminous coal-fired electricity generating facility located in York County in southeastern Pennsylvania on the Susquehanna River. The Plant has three major boiler units that commenced operating in 1961, 1965 and 1969, and have a combined capacity of over 1500 MW. The Plant's operation is governed by a Title V operating permit (P.A. No. 67-05005J) issued by the Pennsylvania DEP (PADEP), pursuant to EPA's delegation of Clean Air Act enforcement. The Plant is currently undergoing construction to add the capacity to combust natural gas, but retains the ability to burn coal without limitation.[4]

[4] Although the permit does include annual limits on the mass of NOx emitted per unit, the NOx emission limitations are higher than actual historical emissions levels, as illustrated with 2014 NOx emissions in Table II-1. The permit includes no restrictions that would require the owners of Brunner Island to limit full-year operation on coal. The permit also includes no ozone season restrictions on NOx emissions or fuel use.

**Table II-1. Brunner Island Station Annual NOx Emissions.**

| Brunner Island | P.A. No. 67-05005J NOx Limits (Tons per Year) | 2014 NOx Actual Emissions[5] (Tons) | 2011 NOx Actual Emissions (Tons) |
|---|---|---|---|
| Facility | 14,254 | 11,053 | 16,887 |
| Unit 1 | 3,751 | 2,627 | 3,447 |
| Unit 2 | 4,261 | 2,914 | 4,414 |
| Unit 3 | 8,186 | 5,512 | 9,026 |

Brunner Island has no post-combustion pollution controls in place to limit the release of the ozone precursor pollutant NOx. As a result, the Plant emits extremely high levels of NOx,[6] which react with volatile organic compounds ("VOCs") in the presence of sunlight to form ozone, that can and does result in the significant contribution to nonattainment of, and interference with maintenance of, the 2008 8-hour ozone NAAQS in Connecticut. 42 U.S.C. § 7426(b). PADEP's recently promulgated NOx RACT Rule[7] will not require Brunner Island to operate on natural gas, install post-combustion controls, or otherwise limit NOx emissions beyond those previously allowable.

Monitoring data for 2012-2014 shows that nearly all (ten of twelve) monitors in Connecticut violate the 2008 NAAQS. Preliminary data for 2013-2015 show nine of the twelve monitors continue to violate the 2008 NAAQS. Furthermore, EPA predicts that four Connecticut monitors will be nonattainment or maintenance sites for the 2008 NAAQS in 2017 even under its recently proposed CSAPR Update.[8]

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[5] EPA's Air Markets Program Database, http://ampd.epa.gov/ampd/

[6] Modeling shows that Brunner Island alone caused ozone impacts of as high 10.58 ppb in Pennsylvania. *See* Kenneth J. Craig & Stephen B. Reid, *Ozone Impacts from Brunner Island Power Plant in 2011* (2015) (hereinafter "Brunner Island Modeling Report").

[7] Additional RACT Requirements for Major Sources of NOx and VOCs. *See* Final-form Rulemaking Annex A, *available at* http://files.dep.state.pa.us/PublicParticipation/Public%20Participation%20Center/PubPartCenterPortalFiles/Environmental%20Quality%20Board/2015/November%2017/1_RACT/6_RACT%202%20Final_Annex.pdf

[8] 80 Fed. Reg. at 75725-75726, Tables V.C-1 and V.C-2.

## III. Brunner Island Emissions Significantly Contribute to Nonattainment of the 2008 Ozone NAAQS and Interfere with Maintenance of the 2008 Ozone NAAQS in Connecticut

This section reviews modeling results that demonstrate the contribution that Brunner Island's emissions have on Connecticut's monitored ozone concentrations. In addition, some of the technically and economically available options to limit Brunner Island's NOx emissions are summarized.

### A. Modeling Demonstrates that Brunner Island Emissions Are Linked to Ozone Nonattainment and Maintenance Receptor Sites in Connecticut

EPA directs states to use photochemical grid modeling "to simulate the effects of strategies to reduce ozone." *See* Envtl. Prot. Agency, *Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze*, 135 (Apr. 2007). EPA states that any modeling used by states in an attainment demonstration should be publicly available, peer-reviewed, and used with a database adequate to support its application. *Id.* at 136-37. One such model is the Comprehensive Air Quality Model with extensions ("CAMx"), which "simulates the numerous physical and chemical processes involved in the formation, transport, and destruction of ozone, particulate matter and air toxics." Envtl. Prot. Agency, *Air Quality Modeling Technical Support Document: Ozone Source Apportionment Application in Support of the Designation Process for the Ozone NAAQS*, 2 (Nov. 2010). CAMx is designed to approach air quality as a whole, with capabilities that allow for modeling several air quality issues. EPA has itself used this model to support its ozone designation process. *See Id.* CAMx also includes source apportionment tools such as Ozone Source Apportionment Technology ("OSAT"). *See Id.* at 2. CAMx OSAT modeling can be used to estimate the contributions of specific sources to ozone concentrations. *See* ENVIRON International Corporation, *CAMx User's Guide Version 5.40* (Sept. 2011).

CAMx OSAT modeling made available to Connecticut and attached to this petition (Attachment 1) quantifies the role that Brunner Island's emissions are playing in Connecticut's high ozone levels. *See* Kenneth J. Craig & Stephen B. Reid, *Ozone Impacts from Brunner Island Power Plant in 2011* (2015) (hereinafter "Brunner Island Modeling Report"). CAMx OSAT source apportionment modeling was conducted on the NOx emissions from Brunner Island. The

source apportionment modeling used EPA's 2011 National Emission Inventory, the most recent quality assured data set that covers all emission source categories.

Simulations of the 2011 ozone season were conducted to ascertain the impact of the facility's operation on the air quality in Connecticut. The CAMx OSAT modeling shows that Brunner Island's emissions are linked to contributions exceeding the one percent threshold (0.75 ppb) of the ozone NAAQS at nonattainment and maintenance receptor ozone monitoring sites in Connecticut. *See* Brunner Island Modeling Report at 11. Impacts considered "linked" are those exceeding the one percent of the NAAQS threshold established by EPA in its multi-step approach for determining the significance of interstate contributions for the 2008 ozone NAAQS. *See EPA v. EME Homer City Generation, L.P.*, 134 S.Ct. 1584, 1596 (Apr. 29, 2014).

Brunner Island NOx emissions are linked to six nonattainment and maintenance monitoring sites in Connecticut for the 2008 ozone NAAQS. Brunner Island Modeling Report at 11. EPA projects three of those six sites will continue to be nonattainment or maintenance in 2017 after implementation of the CSAPR Update.[9] Table III-1 presents the ozone contributions in excess of 0.75 ppb linked to these downwind ozone receptor sites. The average linked ozone contribution at these monitors is 0.87 ppb, or 1.16 percent of the 2008 NAAQS, while the peak ozone contribution was 0.93 ppb, or 1.24 percent of the 2008 NAAQS. *Id.* Thus even from hundreds of miles away, Brunner Island is linked to ozone contributions to nonattainment and interference with maintenance of the 2008 ozone NAAQS in Connecticut.

[9] 80 Fed. Reg. at 75725-75726, Tables V.C-1 and V.C-2.

**Table III-1. Brunner Island Contributions to Connecticut Monitoring Sites[10]**

| *Connecticut Monitoring Site* | Maximum Contribution from Brunner Island (ppb) | Brunner Island Contribution Exceeding the >0.75ppb (1%) Threshold | EPA's CSAPR Update Modeling - Attainment Projections in 2017 for CT monitors |
|---|---|---|---|
| *Madison* | 0.929 | Yes (1.24%) | Non-Attainment |
| *Westport* | 0.916 | Yes (1.22%) | Non-Attainment |
| *Stratford* | 0.875 | Yes (1.17%) | Non-Attainment |
| *Cornwall* | 0.853 | Yes (1.14%) | Attainment |
| *New Haven* | 0.831 | Yes (1.11%) | Attainment |
| *Groton* | 0.822 | Yes (1.10%) | Attainment |
| *Danbury* | 0.732 | No | Attainment |
| *Middletown* | 0.676 | No | Attainment |
| *Greenwich* | 0.673 | No | Non-Attainment |
| *East Hartford* | 0.559 | No | Attainment |
| *Abington* | 0.500 | No | *Not modeled* |
| *Stafford* | 0.484 | No | Attainment |

## B. Brunner Island Station's Linked Ozone Contributions to Connecticut's Ozone Nonattainment and Maintenance Receptor Sites Are Significant Because the Plant Has Cost-Effective and Readily Available Control Options to Reduce its NOx Emissions

### *i. PADEP issued a permit authorizing combustion of natural gas at Brunner Island Station*

PADEP issued a permit (P.A. No. 67-05005H) to Brunner Island on October 27, 2014 authorizing the combustion of natural gas fuel by Unit Nos. 1, 2, and 3. The permit did not contain any operational limits or seasonal restrictions on fuel use. A recent amendment to the permit (P.A. No. 67-05005J, supersedes and replaces P.A. No. 67-05005H) only applies a facility-wide NOx annual emission limit and NOx emission limits on each unit – on an *annual* basis. The amendment does not place any specific restriction on fuel use. The $100 million project is expected to be in operation by the spring of 2017.[11] Brunner Island's investment to add natural gas to the fuel mix allows for readily available NOx emission reductions. Firing natural gas can reduce NOx emissions by approximately 60% compared to burning coal. However, without a federally enforceable limitation to require the Plant to fire on natural gas during the ozone season (May 1 through September 30), such ozone benefits are not guaranteed

[10] Kenneth J. Craig & Stephen B. Reid, *Ozone Impacts from Brunner Island Power Plant in 2011* (2015) ("Brunner Island Modeling Report").

[11] http://lancasteronline.com/news/local/brunner-island-power-plant-to-burn-cleaner-natural-gas/article_4814e7fc-3f9d-11e5-b795-2365c06bfa61.html

and may not be realized at all, should Brunner Island find it less expensive to operate on coal. Federal rules that apply to Brunner Island such as the Utility Mercury and Air Toxics Standards and the CSAPR Update do not ensure that Brunner Island will operate on natural gas or otherwise reduce NOx emissions during the ozone season. A federally enforceable order requiring Brunner Island to fire on natural gas during ozone season is a near-zero additional cost control strategy that would expeditiously eliminate Brunner Island's significant contribution to ozone levels monitored in Connecticut.

### *ii. Other technically and economically available methods to reduce NOx emissions from Brunner Island Station are available*

For fuel-burning equipment, there are generally three options for limiting NOx emissions: fuel switching, combustion controls and post-combustion controls. Combinations of the three options are often desirable as combined approaches may produce more effective NOx control than the application of a stand-alone technology.

A summary of commonly available NOx control technology options for EGU boilers are shown in Table III-2. Combustion modifications can vary from simple "tuning" or optimization efforts to the deployment of dedicated technologies such as Low NOx Burners ("LNB"), Overfire Air ("OFA") or Flue Gas Recirculation ("FGR"). Conventional, commercial post-combustion NOx controls include SNCR and SCR. SCR and SNCR are fundamentally similar, in that they use an ammonia-containing reagent to react with the NOx produced in the boiler to convert it to harmless nitrogen and water. SNCR accomplishes this at higher temperatures (1700°F-2000°F) in the upper furnace region of the boiler, while SCR operates at lower temperatures (about 700°F) and hence, needs a catalyst to produce the desired reaction. SNCR can be installed and operated within a year and best done during gas burner installation. SCR and SNCR control technologies are widely used to limit NOx from coal-fired boilers, such as Brunner Island Units 1-3.

**Table III-2. NOx Control Options for EGU Boilers.**[12,13,14]

| Technology | Description | Applicability | Performance |
|---|---|---|---|
| Switch to natural gas | Replace coal or oil combustion with natural gas. Natural gas contains low fuel-bound nitrogen content and requires lower excess air for combustion, resulting in lower uncontrolled NOx emissions. | Potential control measure for all coal-fired EGUs and most oil-fired EGUs, depending on other control options deployed. | 50 to 80% reduction in NOx emissions. May still require NOx combustion and or post-combustion controls. |
| Combustion Controls | Modifications to the boiler furnace burners and combustion air systems to lower flame temperatures and oxygen concentrations to reduce thermal NOx formation. | Potential control measure for most types of coal-fired EGU boilers. Dependent on boiler and fuel type. | 10 to 60% reduction in NOx emissions. |
| Selective Noncatalytic Reduction (SNCR) | Ammonia or urea reagent is injected into the flue gas stream and reduces NOx to $N_2$ and $H_2O$ without a catalyst. | Potential control measure for all EGU boilers. Costs for retrofitting a plant smaller than 100 MW increase rapidly due to the economy of size. Also, older power plants in the 50 MW range tend to have compact plant sites with limited room for retrofit equipment. | 25% - 50% reduction in NOx emissions. |
| Selective Catalytic Reduction (SCR) | Ammonia vapor injected into the flue gas upstream of a catalyst that assists the reduction reaction of NOx to $N_2$ and $H_2O$. | Potential control measure for all EGU boilers ($\geq$ 25 MW). Costs for retrofitting a plant smaller than 100 MW increase rapidly due to the economy of size. | 90% reduction in NOx emissions. |

Switching from coal to natural gas can be a cost-effective strategy for reducing NOx emissions. The per Btu NOx emissions for coal are about double those of natural gas (e.g., uncontrolled NOx emissions for coal are generally 0.4 – 0.8 lbs/MMBtu, and 0.1 – 0.2 lbs/MMBtu for natural gas). Switching fuels will be most feasible from a technological

[12] NESCAUM, 2011. Northeast States for Coordinated Air Use Management. *Control Technologies to Reduce Conventional and Hazardous Air Pollutants from Coal-Fired Power Plants*. March 2011. Downloaded from: http://www.nescaum.org/topics/air-pollution-control-technologies

[13] EPA, 2013. U.S. Environmental Protection Agency. *Documentation for Base Case v.5.13: Emission Control Technologies*. November 2013. Downloaded from: http://www.epa.gov/airmarkets/documentation-base-case-v513-emission-control-technologies

[14] EPA, 2015b. U.S. Environmental Protection Agency. *EPA Control Cost Manual: Selective Noncatalytic Reduction Draft for Public Comment*. June 2015. Downloaded from: http://www3.epa.gov/ttn/ecas/models/SCRCostManualchapter_Draftforpubliccomment6-5-2015.pdf

perspective for a boiler already designed to combust more than one type of fuel. Capital cost components include the costs of boiler modifications and the cost of extending natural gas lateral pipeline spurs to a natural gas main pipeline. Operating and maintenance costs, fixed and variable are less after the conversion due to reduced need for operators, maintenance materials, maintenance staff, and waste disposal. There is a heat rate penalty due to lower stack temperature and higher moisture loss.

### *iii. Connecticut is applying NOx requirements for its own in-state coal-fired power plants that are the same as it requests for Brunner Island Station*

Connecticut is in progress to adopt regulatory requirements that would require the Brunner Island facility, if located in Connecticut, to reduce emissions to a level lower than is currently required in Pennsylvania.[15] DEEP has determined that such emissions limits are reasonably available for coal-fired electric generating units. An overview of Connecticut's efforts to reduce NOx emissions from Connecticut's sources is provided in Attachment 2 to this Petition demonstrating that Connecticut has put in place many programs impacting a variety of stationary source categories in an effort to reduce ozone precursor emissions. Brunner Island may reduce NOx emissions significantly at a comparatively low cost per ton value and produce a significant reduction in the quantity of NOx emitted. For Connecticut to achieve comparable emissions reductions (in tons) from its existing stationary sources, DEEP would need to put in place additional NOx limitations beyond those referred to above, which could only be achieved at a much higher cost per ton value and would likely need to impact many facilities to achieve a comparable reduction in the quantity of NOx emitted.

For comparison, the 2011 Periodic Emission Inventory for Connecticut indicates total annual point source NOx emissions in the state of 5,957 tons. If Brunner Island operated only on natural gas, and achieved the 60% reduction cited above, its 2011 annual emissions (from Table II-1) would be reduced by 10,132 tons, more than the total CT point source emissions in 2011.

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[15] See Connecticut proposed adoption of RCSA sections 22a-174-22e and 22a-174-22f. As we are writing this petition, DEEP is about to publish the notice of intent to adopt these regulations and invite public comment. DEEP is pursuing a schedule to complete adoption in 2016. Information on the proposal is available in Connecticut's eRegulations System: https://eregulations.ct.gov/eRegsPortal/

The 60% reduction applied to Brunner Island's 2014 actual emissions (Table II-1) would yield a reduction of 6,632 tons, also more than the total Connecticut point sources in 2011.

### C. Connecticut Has Demonstrated that Brunner Island Station Significantly Contributes to Nonattainment and Interference with Maintenance of the 2008 Ozone NAAQS.

In summary, Connecticut has demonstrated that Brunner Island Station's NOx emissions are linked to ozone contributions above one percent of the 2008 ozone NAAQS at nonattainment and maintenance receptor sites in Connecticut, including sites projected to be nonattainment and maintenance sites in 2017 after implementation of the CSAPR Update. Connecticut has also shown that Brunner Island Station has cost-effective and readily available NOx control options to reduce its ozone contribution. Therefore, the Plant is a significant contributor to Connecticut's ozone nonattainment and maintenance problems.

## IV. Pennsylvania Has Failed to Adopt a SIP that Addresses Brunner Island's Significant Contribution to Nonattainment in Connecticut

Brunner Island is located in York County, Pennsylvania, and thus its emissions—including its emissions of NOx—are regulated by PADEP. As discussed below, PADEP has failed to submit a good neighbor SIP for the 2008 ozone NAAQS. PADEP's adopted SIP for the 2008 ozone NAAQS allows Brunner Island's NOx emissions to continue unabated, and thus to continue to significantly contribute to nonattainment, and interfere with maintenance, of the 2008 ozone NAAQS in Connecticut.

PADEP is required to adopt enforceable limitations on sources to address the "good neighbor" provision that prohibits sources in the state, including Brunner Island, "from emitting any air pollutant in amounts which will . . . contribute significantly to nonattainment in, or interference with maintenance by, any other state with respect to any" primary or secondary NAAQS. In addition, seventeen counties in Pennsylvania were designated nonattainment under the 2008 ozone NAAQS.[16] Pennsylvania is also part of the Ozone Transport Region (OTR). As a result, PADEP is also required to adopt reasonably available control technology ("RACT")

[16] *See* Envtl. Prot. Agency, *Current Nonattainment Counties for All Criteria Pollutants, available at* http://www3.epa.gov/airquality/greenbk/ancl.html.

standards for NOx and VOC from major stationary sources to limit the sources' emissions to a RACT level of control. *See* 42 U.S.C. §§ 7502(c)(1), 7511a(b)(2) and (f), and7511c(b)(2).

PADEP has failed to promulgate limitations on its sources to address the good neighbor provision of CAA section 110(a). On June 30, 2015, EPA issued a finding of failure to submit a complete good neighbor SIP (80 FR 39961) with respect to the 2008 NAAQS. EPA has not subsequently received and approved a complete good neighbor SIP revision to correct the deficiency. *See* EPA, Proposed Cross-State Air Pollution Update Rule - Status of the 110(a)(2)(D)(i)(I) SIPs TSD. With respect to its duty to promulgate a SIP that imposed RACT standards for NOx from Brunner Island, PADEP has recently promulgated RACT regulatory requirements that do not require any reduction of NOx emissions from the Plant. More specifically, the PADEP RACT rule, effective April 23, 2016, sets an extremely lenient standard for NOx emissions from coal-fired emission units like Brunner Island, with NOx emission limits that require facilities to operate the controls already in place and nothing more.[17] Facilities equipped with selective catalytic reduction ("SCR") are required to achieve an emissions limit of 0.12 pounds of NOx per million British thermal units of heat input (lb NOx/MMBtu) when operating above 600 degrees, and units equipped with selective non-catalytic reduction ("SNCR") are required to operate those controls when temperatures exceed 1,600 degrees. *Id.* However, a facility in Pennsylvania such as Brunner Island that has neither SCR nor SNCR controls and has tangentially-fired boilers is only required to meet a limit of 0.35 lb NOx/MMBtu, nearly triple the rate of controlled facilities. *Id.* at § 129.97(1)(vi)(B). Brunner Island is the only plant in Pennsylvania that falls within this category. Brunner Island is the sixth largest coal plant in the state, and the three coal-fired electric generating units ("EGUs") at Brunner Island together emitted about 11,000 tons of NOx in 2014. By comparison, Connecticut's largest NOx EGU facility emitted less than 600 tons in 2014, and the total NOx emissions from all point sources combined in Connecticut was 8,800 tons. (*See* EPA's Air Markets Program Database, http://ampd.epa.gov/ampd/) Despite recognizing the serious environmental and health effects of ozone (*See* Proposed Rule, 44 Pennsylvania Bulletin 2392, "Repeated exposure to ozone pollution may cause a variety of adverse health effects for healthy people and those with existing conditions...."), Pennsylvania's regulations effectively do nothing

[17] *See* Additional RACT Requirements for Major Sources of NOx and VOCs, at http://www.pabulletin.com/secure/data/vol46/46-17/694.html

to further limit NOx pollution from Brunner Island. EPA must ensure through the SIP approval process that PADEP adopt appropriate RACT standards and good neighbor provisions to reduce emissions and eliminate significant contributions.

## V. EPA's Proposed Update to the Cross State Air Pollution Rule Does Not Remedy Brunner Island's Significant Contribution to Connecticut's Nonattainment and Maintenance Issues

EPA recently proposed to update the Cross-State Air Pollution Rule ("CSAPR Update"), which was initially developed to address the 1997 ozone NAAQS and 2006 fine particulate matter NAAQS, to address the 2008 NAAQS. *See* 80 Fed. Reg. 75,706. However, for a number of reasons the CSAPR Update does not remedy Brunner Island's impacts in Connecticut. First, the CSAPR Update is still only a proposed rule and therefore cannot be relied upon to limit NOx emissions from Brunner Island to below EPA's "significance criteria" of less than 1% of the NAAQS, or 0.75 ppb for the 2008 ozone NAAQS, even if the proposal was designed to so do. The final form that the rule will take and the timeline for implementation are still uncertain.

Second, the CSAPR Update does not reduce Brunner Island's significant contribution to ozone levels in Connecticut. The CSAPR Update focuses on "immediately available and cost-effective emissions reductions that are achievable by the 2017 ozone season." *Id.* at 75,714. Because of the short timeline, EPA claimed that installation of new SCRs or SNCRs is not feasible to achieve reductions by the 2017 ozone season. *Id.* at 75,731. The CSAPR Update instead allocates state ozone season NOx budgets based on a uniform cost that reflects turning on idled SCRs and SNCRs and upgrading combustion controls. *See* Envtl. Prot. Agency, Office of Air and Radiation, Regulatory Impact Analysis for the Proposed Cross-State Air Pollution Rule (CSAPR) Update for the 2008 Ozone National Ambient Air Quality Standards (NAAQS). Nothing in the CSAPR Update requires Brunner Island to reduce its emissions, and its resulting impacts to Connecticut, to below the significance threshold required by the Clean Air Act. Consequently, the CSAPR Update does not resolve Connecticut's nonattainment or maintenance issue. EPA itself acknowledges that the CSAPR Update does not fully address all upwind states' good neighbor obligations, but is rather a "first, partial step" for most states. 80 Fed. Reg. at 75,714-15. In fact, EPA's own projections show four Connecticut monitors in nonattainment in 2017 under the proposed emissions budget. *See* Envtl. Prot. Agency, Office of Air and Radiation,

Ozone Transport Policy Analysis Proposed Rule TSD, at 27, Table C-5 (Nov. 2015). Stated another way, even after the CSAPR Update goes into effect, Connecticut will still have maintenance and nonattainment issues with respect to the 2008 ozone NAAQS. And Brunner Island will not be obligated to address its significant contribution to attainment or maintenance issues in Connecticut.

Furthermore, the CSAPR Update allows for the trading of allowances, each worth one ton of NOx emitted during the ozone season, both within and between states. 80 Fed. Reg. at 75,741-42. Through the use of these allowances, a state may exceed its NOx emissions budget by 21 percent without penalty. *Id.* at 75,745. Likewise, even if the initial allocation for a source would reduce that source's emissions to below a EPA's significance threshold, the CSAPR Update authorizes the source to use a trading mechanism to continue to emit at pre-CSAPR Update levels such that the source would continue to contribute significantly to nonattainment and maintenance issues if such contributions occurred pre-CSAPR Update. In this regard, EPA also predicts that states may already hold a huge number (over 210,000) of banked allowances from the original CSAPR at the start of the 2017 ozone season. 80 Fed. Reg. at 75,746. This large bank of low cost NOx allowances ($120/ton to $280/ton in 2015, source: SNL Energy) will result in actual EGU NOx emissions well above the proposed budget levels in 2017 and subsequent early years of the updated CSAPR program. Thus, the CSAPR Update will have very few, if any, impacts on Brunner Island emissions, and it will not require the necessary reduction in Brunner Island's emissions to a level below the significant contribution threshold.

To put a finer point on the lack of improvement in Brunner Island's impact on Connecticut as a result of the CSAPR Update, the CSAPR Update will not reduce Brunner Island's emissions on the days when Brunner Island is most likely to impact Connecticut's ozone levels. CSAPR is a seasonal trading program. A seasonal trading program masks increased NOx emissions on specific days, such as high electric demand days or days with the highest ozone levels. Often, the days with the highest ozone levels coincide with the highest electrical demand days experienced in New England. Ozone is most likely to form on the hottest days of summer, and these days are also often the highest electric demand days recorded in the year by Independent System Operators (ISOs), as a result of residential and commercial air conditioning. To meet peak electric demand on hot, summer days, ISOs dispatch older, less efficient and higher emitting EGUs. Contributions to Connecticut's ozone levels on these high

electric demand days from Brunner Island are particularly harmful since such contributions would increase ozone levels to an even higher level and could potentially increase Connecticut's design values for that season. The CSPAR Update will not reduce high electric demand day emissions from Brunner Island.

## VI. The EPA Must: 1) Issue a Finding that Brunner Island Emissions are Significantly Contributing to Nonattainment of, and Interference with Maintenance of, the 2008 Ozone NAAQS in the State of Connecticut; and 2) Direct the Plant's Operators to Either Reduce Emissions or Cease Operations As Expeditiously As Practicable But In No Later Than Three Years

The State of Connecticut petitions EPA under section 126 of the Act to find that ozone emissions from Brunner Island significantly contribute to nonattainment and interfere with maintenance of the ozone NAAQS and to recognize that at least one cost-effective and expeditious strategy exist as a remedy. Further, DEEP requests that EPA order the Plant to reduce NOx emissions sufficiently such that the Plant no longer contributes to nonattainment of and interferes with maintenance of the 2008 ozone NAAQS in Connecticut.

### A. EPA Should Grant Connecticut's Section 126 Petition and Order Brunner Island to Reduce Its Emissions to Levels Such That the Plant No Longer Significantly Contributes to Nonattainment, or Interferes With Maintenance of, the 2008 Ozone NAAQS in Connecticut.

As discussed above, section 126 provides the state of Connecticut the right to "petition the Administrator for a finding that any major source . . . emits or would emit any air pollutant" that "contribute[s] significantly to nonattainment in, or interfere with maintenance by, any other State with respect to [a] national primary or secondary ambient air quality standard." *See* 42 U.S.C. § 7426(b), § 7410(a)(2)(D)(i)(I) (noting that downwind states or political subdivisions may petition EPA).[18]

In this case, Connecticut has submitted monitoring data showing nonattainment of the 2008 ozone NAAQS in Connecticut, and CAMx modeling data showing that Brunner Island's emissions are contributing more than 1% to nonattainment of, and interfering with maintenance of, the 2008 ozone NAAQS in Connecticut at several monitors, requiring EPA's finding of a

[18] As noted above, because Brunner Island emits greatly in excess of 100 tons per year of NOx, an ozone precursor, it qualifies as a "major source" under Section 126 of the Clean Air Act. *See* 42 U.S.C. § 7602(j).

section 126 violation. *See Michigan v. EPA*, 213 F.3d 663, 684 (D.C. Cir. 2000); *EPA v. EME Homer City Generation, L.P.*, 134 S.Ct. at 1596. Again, ozone impacts as high as 0.93 ppb are modeled to occur within Connecticut from Brunner Island's emissions, even without consideration of background levels of ozone. *See* Brunner Island Modeling Report at 11. These exceedances of the ozone NAAQS have severe adverse public health effects on the people in Connecticut and others in the region, including those who live, work, travel, or recreate in the impacted areas.

Thus, the CAMx OSAT modeling results for Brunner Island more than meet the standard of a section 126 Petition and trigger EPA's duty to grant the petition. Indeed, the D.C. Circuit has explained that a source's or state's significant contribution to downwind nonattainment must only be identified by some "measurable contribution." *Michigan v. EPA*, 213 F.3d at 684. Here, DEEP has shown that Brunner Island's emissions have impacts of over one percent of the 2008 ozone NAAQS, which demonstrates significant contribution to nonattainment and interference with maintenance of the NAAQS. *See id*; *EPA v. EME Homer City Generation, L.P.*, 134 S.Ct. at 1596.

Furthermore, a number of cost effective remedies are available by which Brunner Island's NOx emissions may be reduced including one, operation on natural gas, for which the necessary permit approvals have been issued.

In short, this Petition and the evidence submitted herewith regarding Brunner Island's ozone-forming NOx emissions demonstrate that the facility is contributing to nonattainment of, and interfering with maintenance of, the NAAQS in Connecticut and a cost-effective control and expeditious strategy exists. As such, EPA must grant the Petition. *See* Portland Rule, 76 Fed. Reg. at 69,063.

### B. Section 126 of the Act Requires EPA to Act Within 60 Days of this Petition, and Requires the Plant to Reduce Its Emissions as Expeditiously as Practicable, But in No Later than Three Years.

Section 126 establishes clear deadlines for action by the Administrator in response to a petition under that section. 42 U.S.C. § 7426; *GenOn Rema, LLC v. EPA*, 722 F.3d 513, 521-22 (3rd Cir. 2013). The Administrator must make the requested finding or deny the petition within 60 days after receipt of the petition, and after a public hearing. 42 U.S.C. § 7426(b).

Once EPA makes a finding under section 126(b), section 126(c) requires that the violating source shall not operate three months after the finding regardless of whether the source has been operating under a duly issued state operating permit. 42 U.S.C. § 7426(c). The Administrator may allow the source to operate beyond such time only if the source complies with emission limitations and compliance schedules (containing increments of progress) as the Administrator may direct to bring about compliance. *Id.* Such compliance must be brought about "as expeditiously as practicable," and in no case later than three years after the date of the Administrator's finding. *Id.* In this case, there are any number of ways that the owners of Brunner Island can reduce its emissions and impacts to below the significance threshold in a timeframe far shorter than three years. The owners can retire one or more units. The owners can burn natural gas in the ozone season. The owners can add additional post-combustion air pollution control technologies. The owners can implement a combination of these options. All of these options may be implemented in less than three years and are technically and economically feasible.

Accordingly, EPA must act on this petition within 60 days and must provide for a public hearing as per the deadlines set forth in section 126 of the Act. Moreover, EPA must require emissions reductions sufficient to eliminate the facility's interference with the state of Connecticut's ability to attain the NAAQS as expeditiously as practicable, but at most within three years.

## VII. Conclusion

The State of Connecticut has demonstrated that Brunner Island Station is causing and significantly contributing to exceedances of the 2008 ozone NAAQS in Connecticut, as evaluated according to best practices and all available EPA guidance. As such, EPA should grant the DEEP's petition and issue a finding that Brunner Island is significantly contributing to nonattainment and interfering with maintenance of the 8-hour ozone NAAQS in the state. Consequent to that finding, EPA should direct the owners of the Plant —as expeditiously as practicable but in no case within longer than three years— to reduce its ozone emissions sufficiently to prevent interference with Connecticut's ability to attain the NAAQS.

ATTACHMENT 1

Sonoma Technology, Inc.
*Environmental Science and Innovative Solutions*

# Technical Memorandum

August 6, 2015 STI-915046-6329

To: Zachary Fabish, Josh Berman, and Josh Stebbins, Sierra Club

From: Kenneth J. Craig and Stephen B. Reid

**Re: Ozone Impacts from Brunner Island Power Plant in 2011**

## Executive Summary

Sonoma Technology, Inc. (STI) performed source apportionment modeling to analyze impacts of emissions from the Brunner Island power plant in York County, Pennsylvania, in 2011 on air quality in Pennsylvania and neighboring states. The results of this analysis showed that emissions from Brunner Island contribute significantly to ozone formation in Pennsylvania during the modeled ozone season. Modeled 8-hr ozone impacts were as large as about 10 ppb in Pennsylvania. In addition, impacts considered significant (>1% of the current ozone National Ambient Air Quality Standards [NAAQS]) were modeled on as many as 50 days at a single Pennsylvania monitor during the single ozone season. Significant ozone impacts were modeled at one or more Pennsylvania monitors on 66% (100 out of 152) of modeled days during the entire ozone season, and almost every day (86%) during June, July, and August. Peak modeled 8-hr ozone impacts from Brunner Island, depicted in Figure 1, show large impacts in southeastern Pennsylvania near Brunner Island (star). Significant ozone impacts occur in several states from North Carolina to the Canadian border.

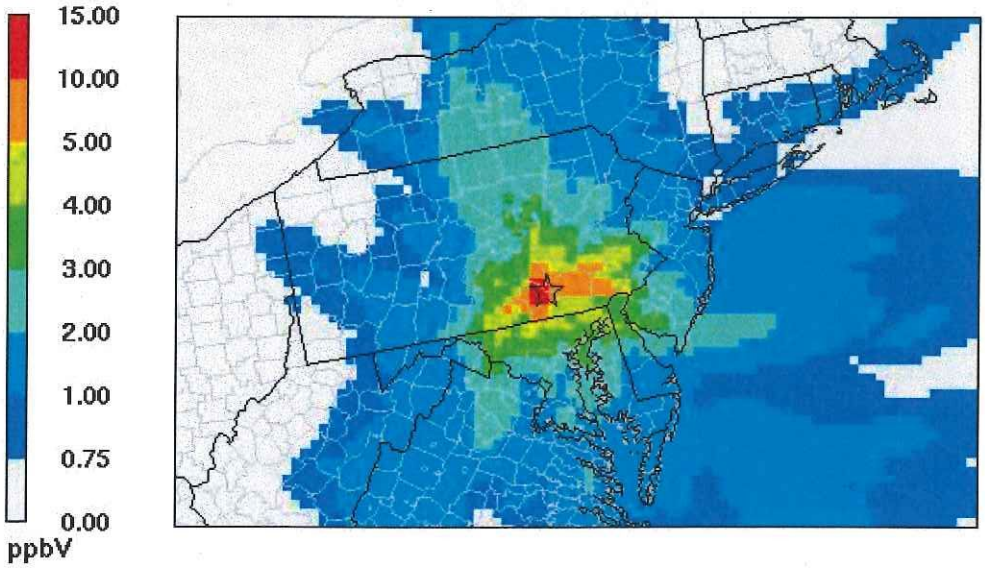


**Figure 1.** Peak modeled 8-hr ozone impacts from Brunner Island power plant.

## Introduction

STI performed source apportionment modeling using the Comprehensive Air Quality Model with Extensions (CAMx) with Ozone Source Apportionment Technology (OSAT) to support the Sierra Club and state air agencies to evaluate ozone impacts from coal-fired power plants and other emission sources on downwind receptors in non-attainment areas. The source apportionment modeling was conducted for the 2011 ozone season (May to September) for a domain covering the continental United States at 12-km spatial resolution (**Figure 2**), and results were compiled into a series of databases that can be used for future data mining and analysis. Additional details on the models, data, and methods used can be found in **Appendix A**.

**Figure 2.** Modeling domain for the source apportionment model simulations. Source: U.S. Environmental Protection Agency (2015).

STI used the results from this source apportionment modeling to analyze impacts of emissions from the Brunner Island power plant (Brunner Island) in York County on air quality monitor locations in Pennsylvania and neighboring states. In summary, the modeling results showed that emissions from Brunner Island contribute significantly to ozone formation downwind in Pennsylvania during the 2011 ozone season. Modeled daily 8-hr average ozone impacts were as large as 10.58 ppb at Pennsylvania monitors, and were significant (>0.75 ppb) on as many as 50 days at a single Pennsylvania monitor. Significant ozone impacts were modeled at one or more Pennsylvania monitors on 66% of modeled days (100 out of 152) during the ozone season, where 86% (79 of 92) of those days occurred during the June–August summer season. On several days during the ozone season, significant ozone contributions from Brunner Island coincided with days when monitored ozone concentrations exceeded the current ozone National Ambient Air Quality Standards (NAAQS) (75 ppb).

## Brunner Island Ozone Contributions in Pennsylvania

Brunner Island is a coal-fired electrical generating facility along the Susquehanna River in York County. The plant has three major boiler units, built in the 1960s, with approximately 1,500+ Megawatts of capacity.[1] In 2011, the total $NO_x$ emissions from Brunner Island were about 16,800 tons, making Brunner Island the fourth highest $NO_x$ emitter of all tagged power plants in the source apportionment modeling.

Figure 3 shows a map of Brunner Island's location (orange star), and nearby ozone monitoring stations (blue dots). The Sipe Avenue ozone monitoring station in the Harrisburg area is about 12 miles north of Brunner Island, while the Little Buffalo State Park (Little Buffalo SP) ozone monitor is further to the northwest, about 35 miles from Brunner Island. To the east in the Lancaster area, the Abraham Lincoln Junior High and Newport Road ozone monitoring stations are 22 and 31 miles from the Brunner Island, respectively. The Hill Street ozone monitor in York County is the nearest monitor to Brunner Island, about 9 miles south of the facility.

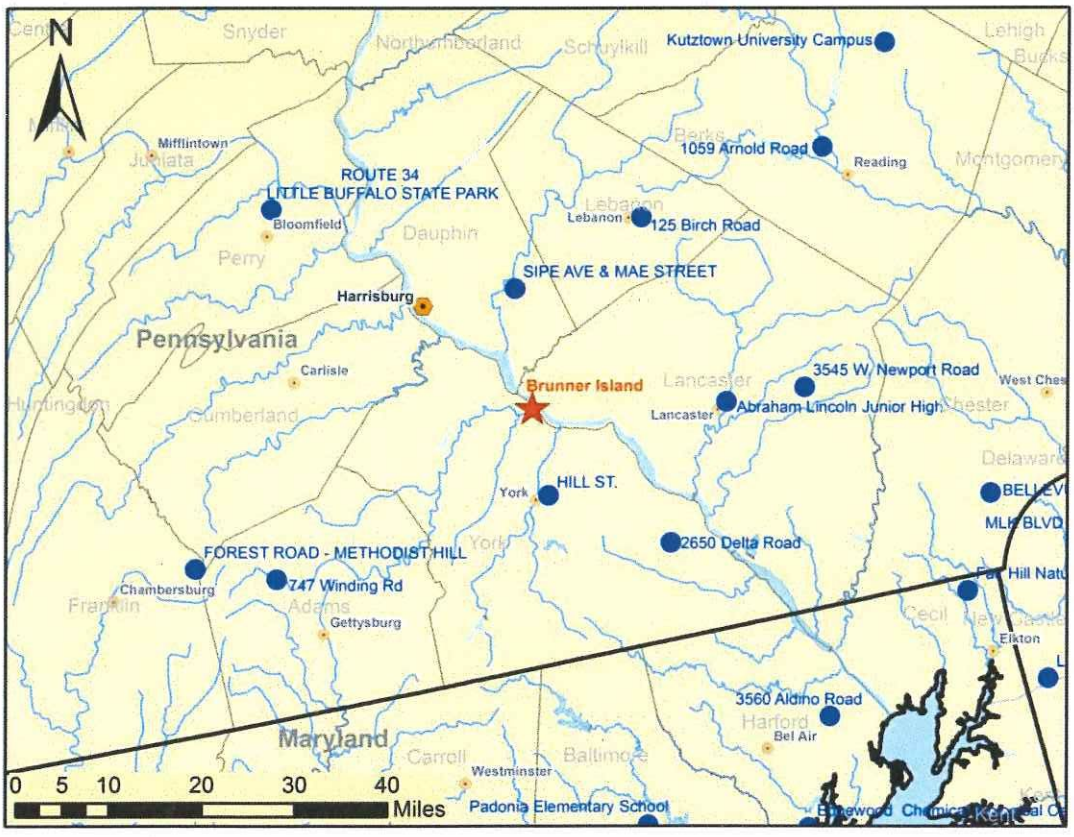


**Figure 3.** The Brunner Island power plant in York County and nearby air quality monitoring sites.

[1] http://www.sourcewatch.org/index.php/Brunner_Island_Power_Station

For this analysis, modeled 8-hr ozone impacts greater than 1% of the NAAQS are considered significant. For the current ozone NAAQS, this significance threshold is 0.75 ppb. This type of significance threshold is consistent with how the U.S. Environmental Protection Agency (EPA) has previously defined significant interstate contributions for ozone and $PM_{2.5}$.[2]

Starting with results at monitors relatively close to Brunner Island, for example, Figure 4 shows a time-series plot of the daily modeled 8-hr average ozone impacts from Brunner Island at two air quality monitoring sites near Harrisburg, Pennsylvania. The Sipe Avenue monitor (blue line) is closer to Brunner Island than Little Buffalo SP (red line); as a result, the modeled impacts were larger at Sipe Avenue on most days. Modeled impacts were significant (>0.75 ppb) on 34 days (22% of days modeled) at Sipe Avenue and on 12 days (8% of days modeled) at Little Buffalo SP, and exceeded 2 ppb on 14 days at Sipe Avenue and 2 days at Little Buffalo SP. The peak modeled ozone impacts were 6.70 ppb and 3.15 ppb at Sipe Avenue and Little Buffalo SP, respectively. The Harrisburg monitors are most impacted by Brunner Island emissions when winds are blowing from the south or southeast directions.

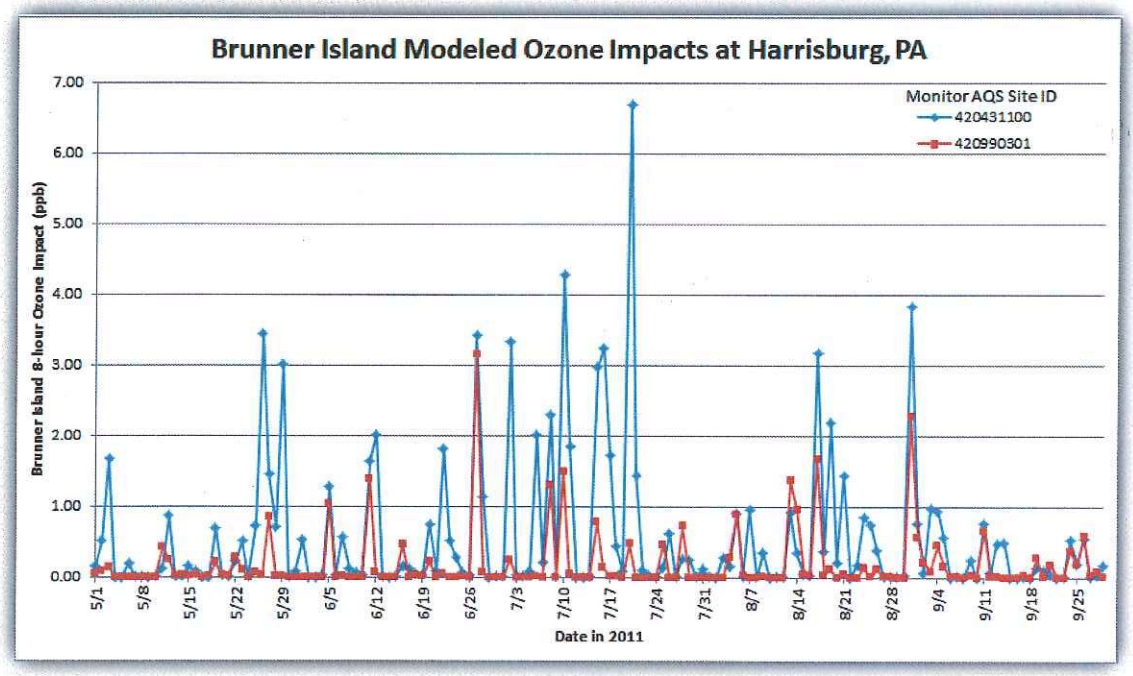


Figure 4. Time series of modeled daily 8-hr ozone impacts from Brunner Island at air quality monitors near Harrisburg.

[2] See 75 Federal Register (August 2, 2010) and 76 Federal Register (August 8, 2011), 40 CFR Parts 51, 52, 72, 78, and 97.

Figure 5 shows a time-series plot of the daily modeled 8-hr average ozone impacts from Brunner Island at two air quality monitoring sites near Lancaster, Pennsylvania. The monitoring site at Abraham Lincoln Junior High (blue line) is about 9 miles closer to Brunner Island than the Newport Road monitor (red line). As a result, the modeled impacts were generally larger at Abraham Lincoln Junior High than at Newport Road, although the reverse was true on a few days. Modeled impacts were significant on 36 days (24% of days modeled) at Abraham Lincoln Junior High, and 31 days (20% of days modeled) at Newport Road. Impacts exceeded 2 ppb on 19 days at Abraham Lincoln Junior High and 13 days at the Newport Road monitor. The peak modeled ozone impacts were 5.56 ppb and 5.17 ppb at Abraham Lincoln Junior High and Newport Road, respectively. The Lancaster monitors are most impacted by Brunner Island emissions when winds are blowing from the west.

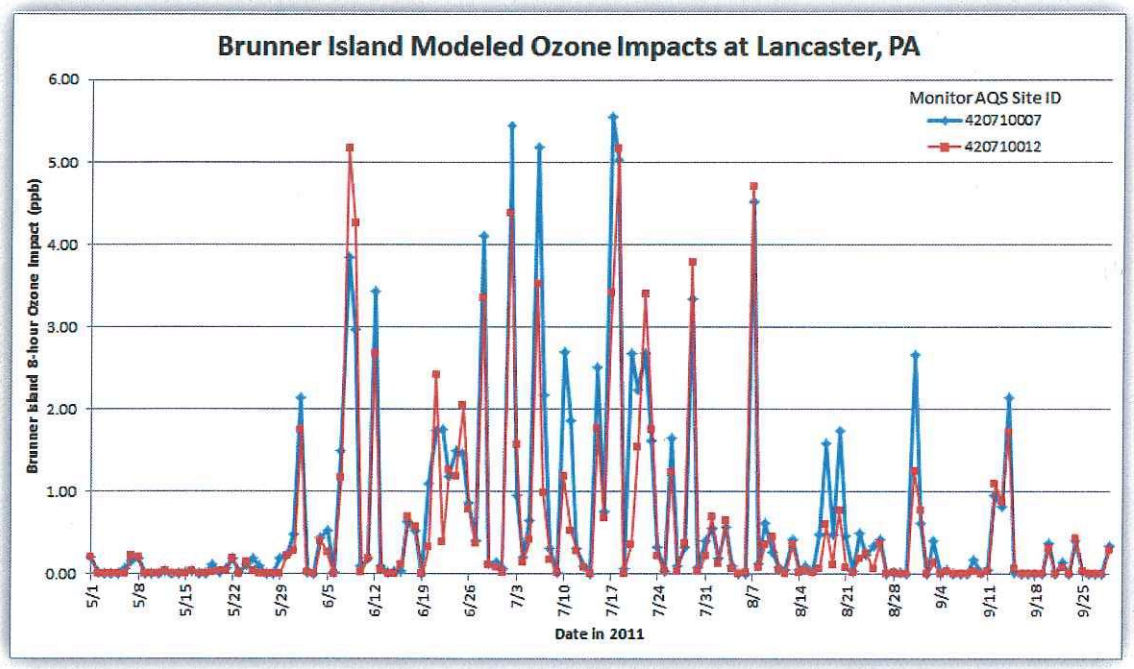


Figure 5. Time series of modeled 8-hour average ozone impacts from Brunner Island at air quality monitors in Lancaster.

Brunner Island ozone impacts from the CAMx OSAT modeling were analyzed at 53 air quality monitoring sites throughout Pennsylvania, including the four sites discussed above. Table 1 shows the highest significant (>0.75 ppb) modeled ozone contributions for the 2011 ozone season, as well as the number of days with significant modeled ozone impacts. The largest overall modeled ozone impact was 10.58 ppb at Hill Street in York, which is the closest monitor to Brunner Island. Significant impacts occurred on 33% (50 out of 152) of modeled days at that site. A significant contribution was modeled at least once during the ozone season at 75% (40 of 53) of Pennsylvania monitoring sites.

The largest impacts generally occurred at monitors closest to Brunner Island, particularly those in southeast Pennsylvania. However, monitors throughout Pennsylvania, including those in Pittsburgh and in counties bordering Ohio, were also significantly impacted on at least one day during the 2011 ozone season. The OSAT modeling predicted significant impacts from Brunner Island on multiple days as far away as Indiana, Pennsylvania (135 miles). Significant ozone impacts from Brunner Island were modeled at one or more Pennsylvania monitors on 66% of modeled days (100 out of 152) during the 2011 ozone season, and 86% (79 of 92) of days during June through August summer season.

The electronic attachment provided with this memorandum includes a full listing of days and monitors in Pennsylvania when modeled The 8-hr ozone impacts were greater than 1% of the ozone NAAQS.

**Table 1.** Peak modeled 8-hr average ozone impacts and number of days with significant (>0.75 ppb) modeled 8-hr average ozone impacts at Pennsylvania monitors due to Brunner Island emissions during the 2011 ozone season, ranked by peak modeled impact. Only monitors with a significant modeled impact are shown.

| AQS Site ID | Monitor County | Core Based Statistical Area | Maximum Modeled Contribution (ppb) | Number of Significant Impact Days |
|---|---|---|---|---|
| 421330008 | York | York-Hanover, PA | 10.58 | 50 |
| 420431100 | Dauphin | Harrisburg-Carlisle, PA | 6.70 | 31 |
| 420710007 | Lancaster | Lancaster, PA | 5.56 | 36 |
| 420710012 | Lancaster | Lancaster, PA | 5.17 | 31 |
| 420019991 | Adams | Gettysburg, PA | 5.01 | 14 |
| 420750100 | Lebanon | Lebanon, PA | 4.78 | 33 |
| 421330011 | York | York-Hanover, PA | 4.65 | 48 |
| 420110011 | Berks | Reading, PA | 3.93 | 22 |
| 420290100 | Chester | Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 3.85 | 26 |
| 420550001 | Franklin | Chambersburg, PA | 3.85 | 7 |
| 420450002 | Delaware | Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 3.74 | 14 |

| AQS Site ID | Monitor County | Core Based Statistical Area | Maximum Modeled Contribution (ppb) | Number of Significant Impact Days |
|---|---|---|---|---|
| 420910013 | Montgomery | Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 3.36 | 16 |
| 420990301 | Perry | Harrisburg-Carlisle, PA | 3.15 | 12 |
| 420810100 | Lycoming | Williamsport, PA | 2.82 | 9 |
| 420950025 | Northampton | Allentown-Bethlehem-Easton, PA-NJ | 2.46 | 12 |
| 420110006 | Berks | Reading, PA | 2.36 | 21 |
| 421010004 | Philadelphia | Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 2.25 | 8 |
| 421010048 | Philadelphia | Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 2.25 | 8 |
| 420770004 | Lehigh | Allentown-Bethlehem-Easton, PA-NJ | 1.99 | 13 |
| 421174000 | Tioga | N/A | 1.88 | 7 |
| 420958000 | Northampton | Allentown-Bethlehem-Easton, PA-NJ | 1.76 | 10 |
| 421011002 | Philadelphia | Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 1.75 | 10 |
| 421010024 | Philadelphia | Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 1.75 | 10 |
| 420690101 | Lackawanna | Scranton--Wilkes-Barre, PA | 1.62 | 8 |
| 420692006 | Lackawanna | Scranton--Wilkes-Barre, PA | 1.60 | 8 |
| 420279991 | Centre | State College, PA | 1.45 | 3 |
| 420170012 | Bucks | Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 1.41 | 9 |
| 420270100 | Centre | State College, PA | 1.40 | 3 |
| 420630004 | Indiana | Indiana, PA | 1.08 | 4 |
| 420210011 | Cambria | Johnstown, PA | 1.02 | 3 |
| 421290008 | Westmoreland | Pittsburgh, PA | 0.94 | 1 |
| 421290006 | Westmoreland | Pittsburgh, PA | 0.90 | 1 |
| 420730015 | Lawrence | New Castle, PA | 0.89 | 1 |
| 420850100 | Mercer | Youngstown-Warren-Boardman, OH-PA | 0.87 | 1 |
| 420031005 | Allegheny | Pittsburgh, PA | 0.85 | 1 |
| 420031008 | Allegheny | Harrison Township | 0.85 | 1 |
| 420070014 | Beaver | Pittsburgh, PA | 0.81 | 1 |
| 420030008 | Allegheny | Pittsburgh, PA | 0.77 | 1 |
| 420030010 | Allegheny | Pittsburgh, PA | 0.77 | 1 |

To illustrate how emissions from Brunner Island contribute to ozone concentrations throughout the region, **Figure 6** shows a spatial plot of maximum modeled 8-hr ozone impacts from Brunner Island on July 20, 2011.[3] This day had the highest modeled ozone impact at monitors in Pennsylvania (10.58 ppb at York). Significant ozone impacts (>0.75 ppb) on this day extend from Scranton, Pennsylvania, to Washington, D.C. A wind shift that occurred on July 20 caused ozone contributions to extend in two different directions from Brunner Island on that day.

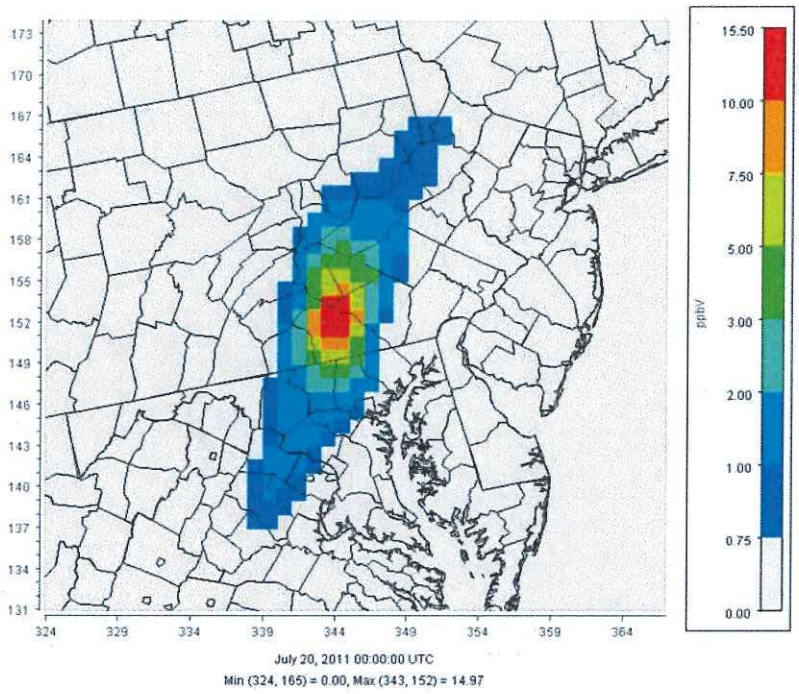


**Figure 6.** Spatial plot of maximum modeled 8-hr average ozone contribution from Brunner Island on July 20, 2011.

[3] This figure shows the *maximum* modeled 8-hr ozone contributions from Brunner Island, which were computed without regard to the time period when the maximum modeled 8-hr average ozone concentrations occurred. Therefore, the data represented in this figure may differ slightly from the corresponding data found in the Access databases provided to the Sierra Club.

We also analyzed days during the 2011 ozone season when significant (>0.75 ppb) modeled ozone impacts from Brunner Island coincided with days when the monitored maximum 8-hr average ozone concentration exceeded the current ozone NAAQS (>75 ppb). **Figures 7 and 8** show these occurrences with incremental monitored concentrations above the current 8-hr ozone NAAQS at ozone monitors in Harrisburg and Lancaster, respectively. For example, at the Sipe Avenue monitor in Harrisburg on July 20 (Figure 7), the observed maximum 8-hr ozone concentration of 81 ppb exceeded the current ozone NAAQS by 6 ppb. The modeled 8-hr ozone impact from Brunner Island on this day was 6.70 ppb.

At the Sipe Avenue monitor in Harrisburg (Figure 7), significant modeled impacts from Brunner Island coincided with monitored NAAQS exceedances three times during the 2011 ozone season. On those days, monitored ozone concentrations ranged from 5 to 10 ppb over the NAAQS, and modeled ozone contributions from Brunner Island ranged from 1.44 to 6.70 ppb. In Lancaster (Figure 8), modeled impacts from Brunner Island were significant at the Abraham Lincoln Junior High monitor (blue bars) on five days, and the Newport Avenue monitor (red bars) on six days, when the NAAQS was exceeded at these monitors. On those days, monitored ozone concentrations exceeded the NAAQS by 1 to 15 ppb, and modeled ozone contributions from Brunner Island ranged from 1.00 to 5.45 ppb. The electronic attachment provided with this memorandum includes a full listing of days and monitors in Pennsylvania for which modeled 8-hr ozone impacts coincided with days when monitored ozone concentrations exceeded the current ozone NAAQS.

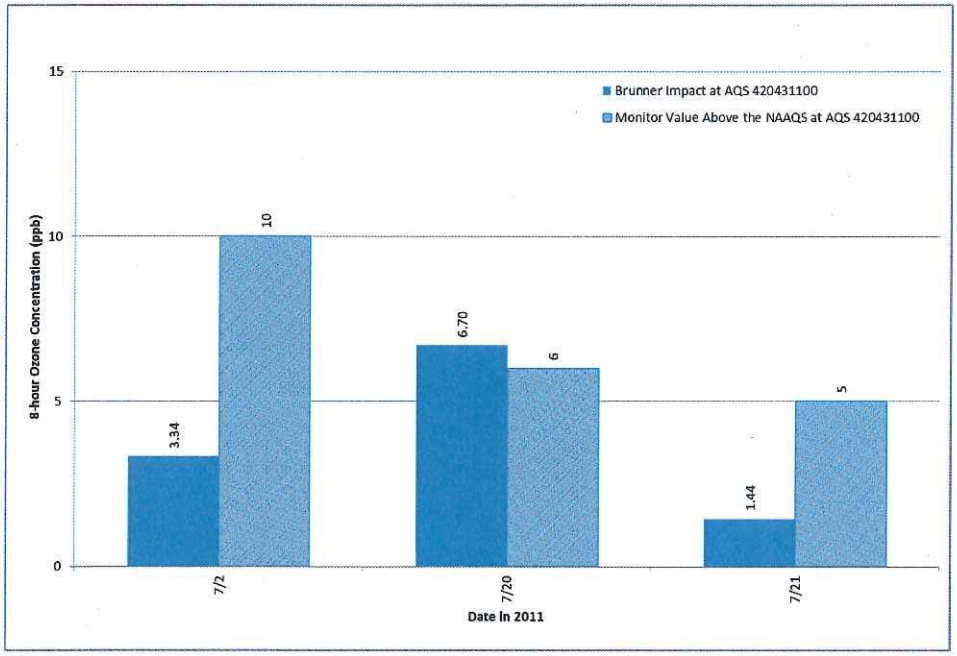


**Figure 7.** Modeled 8-hr ozone impacts from Brunner Island exceeding 1% of the ozone NAAQS, and incremental monitored ozone concentrations above the ozone NAAQS on days when the NAAQS was exceeded at the Sipe Avenue ozone monitor near Harrisburg.

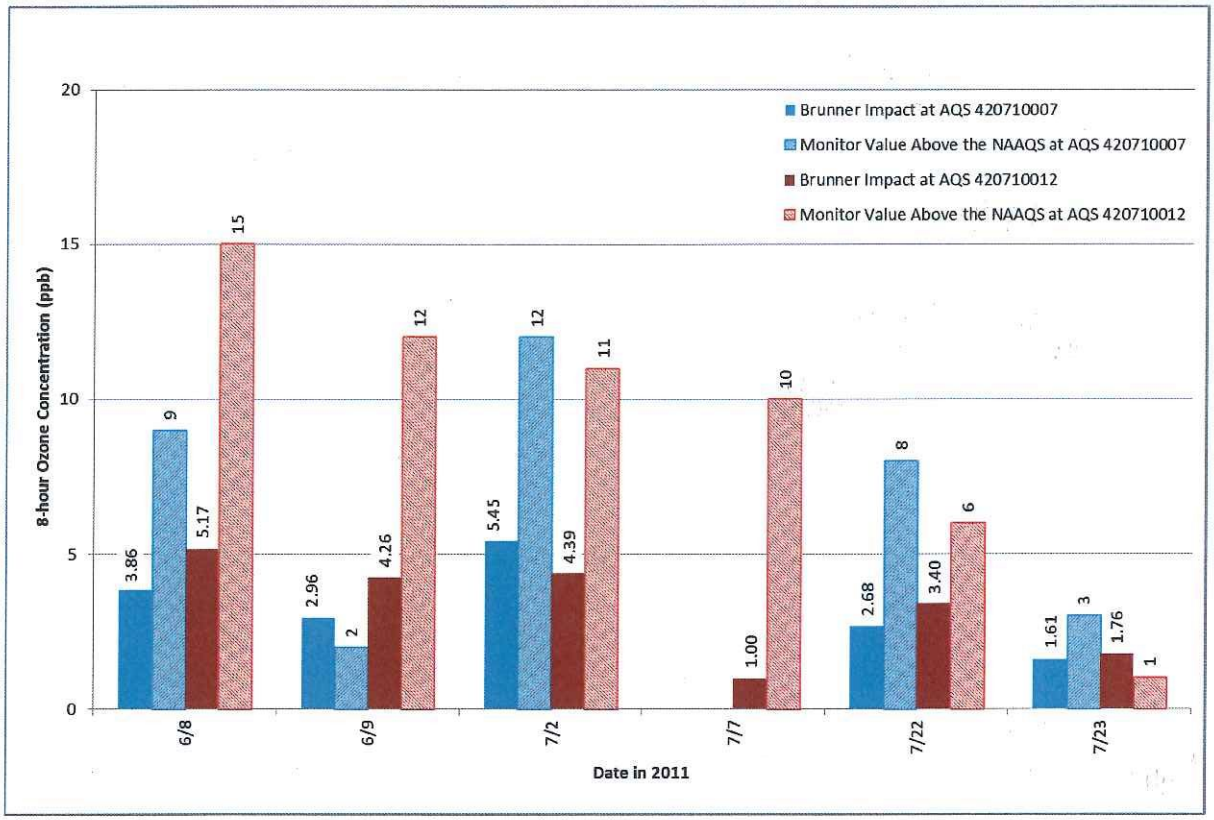


**Figure 8.** Modeled 8-hr ozone impacts from Brunner Island exceeding 1% of the ozone NAAQS, and incremental monitored ozone concentrations above the ozone NAAQS on days when the NAAQS was exceeded at air quality monitors near Lancaster.

## Brunner Island Ozone Contributions on Neighboring States

In addition to analyzing the modeled ozone contributions due to Brunner Island emissions at receptors within Pennsylvania, we also analyzed contributions at air quality monitors in five neighboring downwind states: New York, New Jersey, Delaware, Maryland, and Connecticut.

Table 2 summarizes the number of times during the 2011 ozone season in which Brunner Island was a significant contributor to the total 8-hr ozone concentration at air quality monitors in each state. The table also includes the peak modeled contributions at monitors in each state, as well as the average and 75$^{th}$ percentile of *significant* modeled ozone contributions from Brunner Island at monitors in each state.

The electronic attachment provided with this memorandum includes a full listing of days when modeled ozone contributions from Brunner Island exceeded 1% of the ozone NAAQS (0.75 ppb) at monitors in all six states (PA, CT, DE, MD, NJ, and NY), along with the matching *monitored* maximum 8-hr ozone concentration on those days. Coincident occurrences of significant modeled ozone contributions from Brunner Island and high (>75 ppb) monitored maximum 8-hr average ozone concentrations at a monitor are highlighted and color-coded to indicate the attainment status of the monitor with respect to the 1997 and 2008 ozone NAAQS. The table is grouped by state (Pennsylvania first), and then sorted by the highest to lowest significant 8-hr ozone contribution from Brunner Island.

**Table 2.** Summary of significant (>0.75 ppb) modeled 8-hr ozone contributions from Brunner Island at monitoring stations in Pennsylvania and neighboring states. A "monitor-day" refers to one occurrence of a significant ozone contribution at one monitor. Peak modeled contributions at ozone monitors in each state, as well as the average and 75$^{th}$ percentile of significant contributions in each state, are also included.

| State | Monitors with Significant Ozone Contributions | Maximum Number of Days any One Monitor had a Significant Ozone Contribution | Monitor-Days with Significant Ozone Contributions | Peak Ozone Contribution (ppb) | Average of Significant Ozone Contributions (ppb) | 75th Percentile of Significant Ozone Contributions (ppb) |
|---|---|---|---|---|---|---|
| Pennsylvania | 40 | 50 | 495 | 10.58 | 1.63 | 2.23 |
| Connecticut | 6 | 2 | 8 | 0.93 | 0.85 | 0.89 |
| Delaware | 7 | 28 | 118 | 4.83 | 1.69 | 2.10 |
| Maryland | 20 | 35 | 336 | 4.06 | 1.56 | 1.97 |
| New Jersey | 17 | 15 | 133 | 3.12 | 1.29 | 1.47 |
| New York | 16 | 6 | 45 | 2.31 | 1.00 | 1.02 |

# Appendix A. Modeling Methods

## Photochemical Grid Model and Source Apportionment

To quantify the ozone impacts due to precursor emissions from individual power plants and other source groups, STI performed CAMx OSAT source apportionment model simulations for the 2011 ozone season (May to September). The modeling domain and configurations used were based on those developed by EPA in recent ozone transport assessments using CAMx OSAT (U.S. Environmental Protection Agency, 2014a), and included the use of the carbon-bond 6 revision 2 gas phase chemistry mechanism.

The Comprehensive Air Quality Model with Extensions (CAMx version 6.1) (ENVIRON International Corporation, 2014) is a publically available, peer-reviewed, state-of-the-science three-dimensional grid-based (Eulerian) photochemical air quality model designed to simulate the emission, transport, diffusion, chemical transformation, and removal of gaseous and particle pollutants in the atmosphere over spatial scales ranging from continental to urban. CAMx was designed to approach air quality as a whole by including capabilities for modeling multiple air quality issues, including tropospheric ozone, fine particles, visibility degradation, acid deposition, air toxics, and mercury. The ability of photochemical grid models such as CAMx to treat a large number of sources and their chemical interactions makes them well suited for assessing the impacts of natural and anthropogenic emissions sources on air quality. CAMx is widely used to support regulatory air quality assessments and air quality management policy decisions in the United States In recent years, the EPA has used CAMx to support the NAAQS designation process (U.S. Environmental Protection Agency, 2014a) and evaluate interstate pollutant transport (U.S. Environmental Protection Agency, 2005).

CAMx also includes Ozone Source Apportionment Technology (OSAT), which can be used to estimate the contributions of individual sources, groups of sources, or source regions to ozone concentrations at a given receptor location (Yarwood et al., 1996). Source apportionment modeling is useful for understanding model performance, designing emission control strategies, and performing culpability assessments to identify emission sources that contribute significantly to pollution (ENVIRON International Corporation, 2010). The key precursor species for ozone production are volatile organic compounds (VOC) and oxides of nitrogen ($NO_x$). OSAT uses reactive tracers to track the fate of these precursor emissions and the ozone formation resulting from them within a CAMx simulation. The ozone and precursors are tracked and apportioned by OSAT without perturbing the host model chemistry; therefore the OSAT results are fully consistent with the host model results for total concentrations. OSAT can efficiently estimate source contributions from multiple emission sources within a single model simulation. Importantly, while source apportionment modeling can be used to estimate source contributions to ozone concentrations for a given set of emission inputs, sensitivity modeling approaches such as brute-force modeling[4] or the direct decoupled method (DDM)[5] are

[4] The brute-force modeling method involves running the model both with and without emission controls applied to the source(s) of interest. The difference in pollutant concentrations between the two simulations yields the impact of the emission control scenario.
[5] DDM provides sensitivity coefficients that relate emissions changes to model outcomes. These sensitivity coefficients can be used to evaluate how pollutant concentrations would respond to a range of changes in emissions from a source or group of sources.

needed to quantify the effect of a given emission control scenario (e.g., 90% $NO_x$ reduction at power plants) on ozone concentrations.

In this work, the Anthropogenic Precursor Culpability Assessment (APCA) extension of OSAT was used. APCA is based on OSAT, but calculates source contributions a little differently to recognize the fact that biogenic (or non-anthropogenic) emissions are not controllable. For example, when ozone is formed by reactions between biogenic VOC and anthropogenic $NO_x$, APCA apportions the ozone contribution entirely to the anthropogenic source. APCA only apportions ozone contributions to biogenic sources when both the VOC and $NO_x$ precursors are from biogenic sources. APCA is useful for determining which source controls might have the greatest effect at reducing ozone concentrations.

## 2011 EPA Modeling Platform

The CAMx OSAT simulations were based on EPA's 2011 modeling platform. A modeling platform consists of a structured system of connected data and models that provide a consistent and transparent basis for assessing the air quality impact of anticipated changes in emissions. EPA develops and evaluates a new modeling platform each time the National Emissions Inventory (NEI) is updated (every three years). EPA has used the 2011 modeling platform to support development of revised ozone NAAQS (U.S. Environmental Protection Agency, 2014a) and to quantify future-year interstate contributions to ozone concentrations to help states address their obligations under the "Good Neighbor" provision of the Clean Air Act for the 2008 ozone NAAQS (U.S. Environmental Protection Agency, 2015).

The CAMx OSAT simulations relied on EPA's 2011v6.1 modeling platform, which was based on the 2011 NEI, Version 1 (2011NEIv1). The NEI is compiled by EPA on a triennial basis, primarily from data submitted by state, local, and tribal air agencies, and the 2011 NEI includes emissions from five source sectors: point sources, nonpoint (or area) sources, onroad mobile sources, nonroad mobile sources, and fire events.

For air quality modeling purposes, the 2011 NEI data was augmented by EPA to include biogenic emissions and data from Canadian and Mexican emissions inventories. In addition, the annualized point source data for electrical generating units (EGUs) in the 2011 NEI were replaced with hourly 2011 continuous emissions monitoring (CEMS) data for $SO_2$ and $NO_x$. Annual emissions for pollutants were converted to an hourly basis using CEMS input data (U.S. Environmental Protection Agency, 2011).

## Source Apportionment Tagging

After obtaining the 2011 modeling platform from EPA, STI worked with the Sierra Club and state air agencies in Connecticut, Delaware, and Maryland to identify sources and source groups to be tagged for ozone attribution analysis. Tagged sources fell into one of the following general categories:

- Individual coal-fired power plants (in some cases, specific coal-fired EGUs within a single facility were tagged separately);
- Groups of coal-fired power plants within a state or sub-state region (e.g., downstate New York);
- Groups of other (non-EGU) point sources within a state or sub-state region; and
- Non-point source sectors (e.g., biogenic sources and onroad mobile sources) within a state, sub-state, or multi-state region (e.g., states in the Southeast States Air Resources Managers [SESARM] consortium).

A total of 52 EGUs were individually tagged, while several dozen additional EGUs were tagged within 61 state and sub-state regions. Point sources that were tagged individually were not included in any of the state- or sub-state-level tag groups. In addition, each non-point source sector was tagged within 15 state, sub-state, or multi-state regions. Because of the large number of tags modeled, the processing was divided in to three separate CAMx OSAT simulations. Brunner Island is represented by source tag I7 in Simulation 1. More detailed information on sources tagged in the CAMx OSAT simulations is provided in **Appendix B**.

## Meteorology

Meteorological inputs for the CAMx-OSAT simulations were developed by EPA for the 2011 modeling platform using version 3.4 of the Weather Research and Forecasting (WRF) numerical weather prediction model (Skamarock et al., 2008). The meteorological outputs from WRF include hourly varying winds, temperature, moisture, vertical diffusion rates, clouds, and rainfall rates. Additional details about this WRF simulation and its performance evaluation can be found in U.S. Environmental Protection Agency (2014b).

## Initial and Boundary Conditions

Initial and lateral boundary conditions were developed from three-dimensional global atmospheric chemistry simulations with GEOS-Chem standard version 8-03-02 with 8-02-01 chemistry (http://geos-chem.org) provided with the EPA 2011 platform. The GEOS-Chem predictions were translated into CAMx-ready initial and boundary conditions using code and procedures developed by Henderson et al. (2014), and modifications provided to STI by the Lake Michigan Air Directors Consortium (LADCO) to accommodate carbon-bond 6 chemistry species. OSAT tracks ozone transported through the boundaries, as well as ozone formation resulting from precursor emissions transported through the boundaries.

## Post-Processing

The raw result from a CAMx OSAT simulation is hourly ozone contributions from each source tag at each grid cell in the modeling domain for the 2011 ozone season. These hourly contributions were extracted and post-processed for several hundred receptor sites, listed in the electronic attachment

provided with this memorandum. The receptors correspond to quality monitoring sites across the eastern half of the United States, and include sites of specific interest to northeastern states, as well as monitors with current ozone design values exceeding 65 ppb. At each receptor and for each day, the 8-hr average ozone contribution was calculated for all source tags using the averaging period corresponding to the period of highest modeled 8-hr average concentration at the receptor location. Although this analysis approach may not capture the largest ozone contributions modeled during the day, it does reflect contributions during time periods when ozone concentrations are highest. This analysis approach also ensures that ozone contributions from all source tags[6] sum to total modeled 8-hr ozone concentration each day. The post-processed OSAT results were compiled into Microsoft Access databases to facilitate future data mining and analysis.

## Model Performance Evaluation

EPA evaluated its 2011 modeling platform using statistical assessments of model predictions versus observations paired in time and space. Overall, the model performance statistics for ozone were within or close to the ranges found in other peer-reviewed applications (Simon et al., 2012) and were found to be suitable for use in a regulatory context (U.S. Environmental Protection Agency, 2014a).

As an example of how the 2011 modeling platform was performing in southeast Pennsylvania, **Figure 9** shows a time-series comparison between modeled and monitored peak 8-hr ozone concentrations at the Sipe Avenue monitor in Harrisburg. The modeled ozone concentrations will not typically show perfect agreement with observed concentrations. For the Sipe Avenue monitor, the model performs well and captures observed ozone trends throughout the 2011 ozone season quite well, but tends to under-predict ozone concentrations when monitored concentrations are highest.

[6] Including a leftover residual contribution from all untagged sources calculated by CAMx.

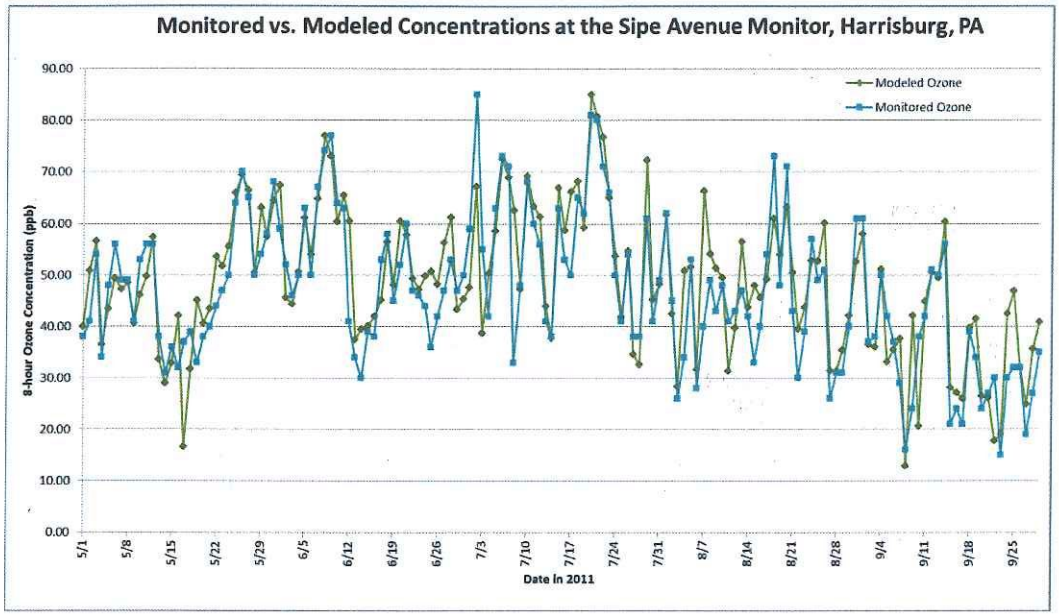


**Figure 9.** Monitored vs. modeled 8-hr ozone concentrations at the Sipe Avenue monitor near Harrisburg.

# Appendix B. OSAT Source Tags

This information is also included in the Access database of OSAT results provided to the Sierra Club. Point source state groups (e.g., PA1, MDALL, and CTOTH) do not include point sources that were already tagged individually or point sources included in other state groupings from the same state.

## Simulation 1

| Tag Name | State | Tag Description |
|---|---|---|
| IC | N/A | Initial Conditions |
| BC | N/A | Boundary Conditions |
| biog | N/A | Biogenics |
| I2 | CT | Bridgeport Station |
| I5 | PA | Conemaugh |
| I6 | PA | Homer City Station |
| I7 | PA | PPL Brunner Island |
| I10 | PA | Bruce Mansfield |
| I11 | PA | Keystone |
| I12 | PA | PPL Montour |
| II7 | VA | Chesterfield |
| II9 | WV | Pleasants Power Station |
| I23 | IL | E D Edwards |
| I28 | WV | Harrison Power Station |
| I30 | WV | Fort Martin Power Station |
| I32 | WV | John E Amos |
| I33 | MI | St Clair |
| I34 | MI | Trenton Channel |
| I35 | IN | Clifty Creek |
| I36 | IL | Wood River |
| I37 | IL | Waukegan |
| I38 | OH | Kyger Creek |
| I39 | IL | Will County |
| I40 | OH | Cardinal |
| I41 | MI | J H Campbell |
| I43 | OH | General James M Gavin |
| I44 | OH | W H Sammis |
| I45 | IL | Powerton |
| I46 | MI | River Rouge |

| Tag Name | State | Tag Description |
|---|---|---|
| I49 | PA | Cheswick Power Plant |
| IL1 | IL | Illinois point group 1 |
| IL2 | IL | Illinois point group 2 |
| IN1 | IN | Indiana point group 1 |
| IN2 | IN | Indiana point group 2 |
| MD | MD | Maryland point group |
| MI | MI | Michigan point group |
| NJ1 | NJ | Illinois point group 1 |
| NJ2 | NJ | Illinois point group 2 |
| NY | NY | New York point group |
| OH1 | OH | Ohio point group 1 |
| OH2 | OH | Ohio point group 2 |
| PA1 | PA | Pennsylvania point group 1 |
| PA2 | PA | Pennsylvania point group 2 |
| VA1 | VA | Virginia point group 1 |
| VA2 | VA | Virginia point group 2 |
| WV | WV | West Virginia point group |
| NYEGU | NY | New York EGUs not individually tagged |
| NYUOTH | NY | Non-EGU point sources in upstate New York |
| NYDCMB | NY | New York "downstate" combustion sources |
| NYDOTH | NY | New York "downstate" point sources |
| PAEGU | PA | Pennsylvania EGUs not individually tagged |
| PAOTH | PA | Other Pennsylvania sources |
| NJCMB | NJ | New Jersey CMB sources |
| NJOTH | NJ | Other New Jersey point sources |
| CTCMB | CT | Connecticut combustion sources |
| CTOTH | CT | Other Connecticut point sources |
| MDALL | MD | Other Maryland point sources |
| VAALL | VA | Other Virginia point sources |
| OHALL | OH | Other Ohio point sources |
| INALL | IN | Other Indiana point sources |
| OTHER | N/A | CAMx "residual" contribution |
| total | N/A | Total ozone concentration |

## Simulation 2

| Tag Name | Tag Description |
|---|---|
| IC | Initial conditions |
| BC | Boundary conditions |
| biog_oth | Biogenic emissions from states not included in tagging |
| biog_CT | Connecticut biogenics |
| biog_DC | Washington D. C. biogenics |
| biog_IL | Illinois biogenics |
| biog_IN | Indiana biogenics |
| biog_MD | Maryland biogenics |
| biog_MI | Michigan biogenics |
| biog_NJ | New Jersey biogenics |
| biog_NYD | New York "downstate" biogenics |
| biog_NYU | New York "update" biogenics |
| biog_OH | Ohio biogenics |
| biog_PA | Pennsylvania biogenics |
| biog_SESARM | Biogenics from SESARM states |
| biog_VA | Virginia biogenics |
| biog_WV | West Virginia biogenics |
| biog_DE | Delaware biogenics |
| nonr_oth | Non-road emissions from states not included in tagging |
| nonr_CT | Connecticut non-road |
| nonr_DC | Washington D. C. non-road |
| nonr_IL | Illinois non-road |
| nonr_IN | Indiana non-road |
| nonr_MD | Maryland non-road |
| nonr_MI | Michigan non-road |
| nonr_NJ | New Jersey non-road |
| nonr_NYD | New York "downstate" non-road |
| nonr_NYU | New York "update" non-road |
| nonr_OH | Ohio non-road |
| nonr_PA | Pennsylvania non-road |
| nonr_SESARM | non-road from SESARM states |
| nonr_VA | Virginia non-road |
| nonr_WV | West Virginia non-road |
| nonr_DE | Delaware non-road |

| Tag Name | Tag Description |
|---|---|
| onr_oth | Onroad emissions from states not included in tagging |
| onr_CT | Connecticut onroad |
| onr_DC | Washington D. C. onroad |
| onr_IL | Illinois onroad |
| onr_IN | Indiana onroad |
| onr_MD | Maryland onroad |
| onr_MI | Michigan onroad |
| onr_NJ | New Jersey onroad |
| onr_NYD | New York "downstate" onroad |
| onr_NYU | New York "update" onroad |
| onr_OH | Ohio onroad |
| onr_PA | Pennsylvania onroad |
| onr_SESARM | onroad from SESARM states |
| onr_VA | Virginia onroad |
| onr_WV | West Virginia onroad |
| onr_DE | Delaware onroad |
| othr_oth | Other emissions (not addressed by the onroad, non-road, and biogenic tags) from states not included in tagging |
| othr_CT | Other emissions from Connecticut |
| othr_DC | Other emissions from Washington, DC |
| othr_IL | Other emissions from Illinois |
| othr_IN | Other emissions from Indiana |
| othr_MD | Other emissions from Maryland |
| othr_MI | Other emissions from Michigan |
| othr_NJ | Other emissions from New Jersey |
| othr_NYD | Other emissions from downstate New York |
| othr_NYU | Other emissions from upstate New York |
| othr_OH | Other emissions from Ohio |
| othr_PA | Other emissions from Pennsylvania |
| othr_SESARM | Other emissions from SESARM states |
| othr_VA | Other emissions from Virginia |
| othr_WV | Other emissions from West Virginia |
| othr_DE | Other emissions from Delaware |
| total_icbc | Total initial and boundary conditions |
| total_biog | Total biogenic emissions |
| total_nonr | Total nonroad emissions |

| Tag Name | Tag Description |
|---|---|
| total_onr | Total onroad emissions |
| total_othr | Total other emissions |
| total | Total ozone concentration |

## Simulation 3

| Tag Name | State | Plant Name |
|---|---|---|
| IC | N/A | Initial conditions |
| BC | N/A | Boundary conditions |
| biog | N/A | Biogenics |
| OTHER | N/A | CAMx "residual" contribution |
| total | N/A | Total ozone concentration |
| I1 | DE | Indian River Generating Station |
| I3 | AR | White Bluff |
| I4 | AR | Independence |
| I6 | TX | Big Brown |
| I8 | GA | Hammond |
| I9 | KS | Tecumseh Energy Center |
| I13 | TX | W A Parish |
| II4 | TX | Coleto Creek |
| II5 | TX | Monticello |
| II6 | TX | Fayette Power Project (a.k.a. Sam Seymour) |
| II8 | TX | Martin Lake |
| I20 | TX | Pirkey |
| I21 | TN | Kingston |
| I22 | KY | Kenneth C Coleman |
| I24 | TN | Gallatin |
| I25 | KY | Elmer Smith |
| I26 | KY | E W Brown |
| I27 | KY | Shawnee |
| I29 | MO | Thomas Hill |
| I31 | MO | Sioux |
| I42 | NC | G G Allen |
| I47 | GA | Scherer |
| I48 | NC | Marshall |
| I50 | OK | Muskogee |

| Tag Name | State | Plant Name |
|---|---|---|
| I51 | OK | GRDA |
| AL1 | AL | Alabama point group 1 |
| AL2 | AL | Alabama point group 2 |
| AR | AR | Arkansas point group |
| FL1 | FL | Florida point group 1 |
| FL2 | FL | Florida point group 2 |
| GA | GA | Georgia point group |
| IA1 | IA | Iowa point group 1 |
| IA2 | IA | Iowa point group 2 |
| KS | KS | Kansas point group |
| KY1 | KY | Kentucky point group 1 |
| KY2 | KY | Kentucky point group 2 |
| LA | LA | Louisiana point group |
| MA | MA | Massachusetts point group |
| MN1 | MN | Minnesota point group 1 |
| MN2 | MN | Minnesota point group 2 |
| MO | MO | Missouri point group |
| MS1 | MS | Mississippi point group 1 |
| MS2 | MS | Mississippi point group 2 |
| NC | NC | North Carolina group |
| NE1 | NE | Nebraska group |
| NH | NH | New Hampshire point group |
| OK1 | OK | Oklahoma point group 1 |
| OK2 | OK | Oklahoma point group 2 |
| SC1 | SC | South Carolina point group 1 |
| SC2 | SC | South Carolina point group 2 |
| TN1 | TN | Tennessee point group 1 |
| TN2 | TN | Tennessee point group 2 |
| TX1 | TX | Texas point group 1 |
| TX2 | TX | Texas point group 2 |
| WI1 | WI | Wisconsin point group 1 |
| WI2 | WI | Wisconsin point group 2 |

## References

ENVIRON International Corporation (2010) User's guide: Comprehensive Air Quality Model with extensions (CAMx) Version 5.30. December. Available at http://www.camx.com/files/CAMxUsersGuide_v5.30.pdf.

ENVIRON International Corporation (2014) User's guide: Comprehensive Air Quality Model with extensions (CAMx) version 6.1. April. Available at http://www.camx.com/files/camxusersguide_v6-10.pdf.

Henderson B.H., Akhtar F., Pye H.O.T., Napelenok S.L., and Hutzell W.T. (2014) A database and tool for boundary conditions for regional air quality modeling: description and evaluations. *Geosci. Model Dev.*, 7, 339-360.

Simon H., Baker K.R., and Phillips S. (2012) Compilation and interpretation of photochemical model performance statistics published between 2006 and 2012. *Atmos. Environ.*, 61, 124-139, doi: 10.1016/j.atmosenv.2012.07.012. Available at http://www.sciencedirect.com/science/article/pii/S135223101200684X.

Skamarock W.C., Klemp J.B., Dudhia J., Gill D.O., Barker D.M., Duda M.G., Huang X.-Y., Wang W., and Powers J.G. (2008) A description of the Advanced Research WRF Version 3. NCAR Technical Note NCAR/TH-475+STR, June.

U.S. Environmental Protection Agency (2005) Technical support document for the final clean air interstate rule: air quality modeling. Technical support document prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March.

U.S. Environmental Protection Agency (2011) Preparation of emissions inventories for the version 6.1, 2011 emissions modeling platform. Technical support document prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, November. Available at http://www.epa.gov/ttn/chief/emch/2011v6/2011v6.1_2018_2025_base_EmisMod_TSD_nov2014_v6.pdf.

U.S. Environmental Protection Agency (2014a) Regulatory impact analysis of the proposed revisions to the national ambient air quality standards for ground-level ozone. Prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-452/P-14-006, November. Available at http://www.epa.gov/ttnecas1/regdata/RIAs/20141125ria.pdf.

U.S. Environmental Protection Agency (2014b) Meteorological model performance for annual 2011 WRF v3.4 simulation. Technical support document prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, November. Available at http://www.epa.gov/ttn/scram/reports/MET_TSD_2011_final_11-26-14.pdf.

U.S. Environmental Protection Agency (2015) Air quality modeling technical support document for the 2008 ozone NAAQS transport assessment. Technical support document prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, January. Available at http://www.epa.gov/airtransport/O3TransportAQModelingTSD.pdf.

Yarwood G.Y., Stoeckenius T.E., Wilson G., Morris R.E., and Yocke M.A. (1996) Development of a methodology to assess geographic and temporal ozone control strategies for the South Coast Air Basin. Report prepared by ENVIRON International Corporation, Novato, CA, December.

ATTACHMENT 2

**Connecticut has Undertaken All Required Efforts to Limit Emission of Ozone Precursors within its Borders**

DEEP has undertaken significant efforts to reduce ozone precursor emissions from Connecticut's stationary and mobile sources. These efforts arise mainly from attainment planning efforts required under CAA section 110, such as control measures developed under the 1-hour and 1997 ozone NAAQS and RACT measures. Connecticut is currently working to adopt a number of additional measures to satisfy the commitments made in the RACT SIP for the 2008 ozone NAAQS.[1] All of these efforts are summarized in this section.

## A. Stationary/Area Source NOx Reduction Strategies

DEEP regulates NOx emissions from major stationary sources mainly through two regulations, RCSA section 22a-174-22, control of NOx from fuel-burning equipment, and RCSA section 22a-174-38 concerning municipal waste combustors. As set out in DEEP's 2014 RACT SIP, RCSA section 22a-174-22 is scheduled for deletion and replacement by two new sections, 22a-174-22e concerning the control of NOx emissions from fuel-burning equipment at major sources of NOx, and 22a-174-22f, concerning high daily NOx emitting units at non-major sources of NOx. DEEP will be publishing the notice of intent and invitation to comment concerning the adoption of these two regulations by April 2016 and intends to complete the adoption process by December 31, 2016.[2] DEEP anticipates NOx reductions will result upon full implementation of these two regulations.

DEEP has published a notice of intent to amend RCSA section 22a-174-38. As a RACT commitment under the 2008 ozone NAAQS, one element of the amendment is a more stringent NOx emission limitation for mass burn waterwall municipal waste combustors. DEEP anticipates substantial NOx emissions reductions will result from adoption of the proposed

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1 Available at http://www.ct.gov/deep/cwp/view.asp?a=2684&q=546804&deepNav_GID=1619

2 Draft RCSA section 22a-174-22e includes a NOx emission limit for coal-fired electric generating units of 0.12 lb/MMBtu measured as a daily block average. This is a substantially lower emission limit required over a much shorter averaging time (30 days versus 24 hours) than either the NOx emission limit that now applies to the Brunner Island units or that will be required under Pennsylvania Department of Environmental Protection's draft final NOx RACT rule.

amendment. Materials concerning the amendment are available through the Connecticut eRegulations system.[3]

## B. Stationary /Area Source VOC Reduction Strategies

*1. Measures Based on Control Techniques Guidelines ("CTGs")*

EPA has published a series of CTGs with recommendations for states about what EPA considers a RACT level of control for a particular source category or operation. DEEP has adopted regulatory requirements to implement all CTGs for which there are sources in Connecticut. **Table 1 (end of document)** lists the current CTG documents and identifies the corresponding regulations that Connecticut has adopted to achieve emissions reductions equivalent to the CTGs. **Table 1** also includes the effective dates of the state regulations and the date of SIP approval. **Table 1** also identifies those CTGs for which no operating source in Connecticut meets the description of the subject source category.

*2. Measures Developed by the Ozone Transport Commission ("OTC")*

DEEP has adopted a number of additional VOC control measures for source categories that the OTC recommended for additional limitation in order to address the persistent ozone nonattainment problems experienced by OTC states. Many of these measures have been developed based on rules developed by the California Air Resources Board (CARB) or by a California air quality district. The measures and associated implementing regulations are identified in **Table 2**, with the exception of measures that apply to CTG sources, which are identified in Table 1.

**Table 2. VOC control measures recommended by the OTC to pursue as regional ozone attainment measures and the status of Connecticut's efforts toward measure implementation.**

| VOC Control Measures | Connecticut regulation (if applicable) | Status of Control Measure Implementation in Connecticut |
|---|---|---|
| 2013, 2012 and 2010 Consumer Product Updates | Amendment of RCSA section 22a-174-40 | Amendment of existing Connecticut regulation now under development. |
| AIM Coatings Update | Amendment of RCSA section 22a-174-41 | Amendment of existing Connecticut regulation now under development. |
| Large Above Ground VOC Storage Tanks | Amendment of RCSA section 22a-174-20 | Requirements adopted on March 7, 2014 and submitted as a SIP revision. |
| Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations (and alternate | RCSA section 22a-174-3b(d) | Adopted March 15, 2002 and amended April 4, 2006. Emission reductions approved for one-hour ozone attainment |

[3] https://eregulations.ct.gov/eRegsPortal/Search/RMRView/PR2015-192.

| | | |
|---|---|---|
| technical revisions) | | on August 31, 2006. |
| Reduction of VOC evaporation and spillage from portable fuel containers | RCSA section 22a-174-43 | Adopted 10 May 2004, approved by EPA on 31 August 2006, amended 29 January 2007 and repealed 10 September 2012, given the adoption of a substantially similar federal portable fuel container program (40 CFR 59, Subpart F). |
| Adhesives and sealants | RCSA section 22a-174-44 | Requirements adopted on October 3, 2008 and submitted as a SIP revision 9 June 2014. 79 FR 32873 |

## C. RACT for Major non-CTG Sources of NOx and VOC

In DEEP's 2014 RACT SIP, DEEP included a RACT analysis for each major stationary source of VOC and for each major stationary source of NOx. "Major stationary source" is defined in CAA Section 302, as modified by Sections 182(b), (c), (d) or (e) of the CAA, as applicable to the classification of the nonattainment areas in which a stationary source is located. Additionally, Connecticut is in the Ozone Transport Region ("OTR") and subject to CAA Section 184. Therefore, because Connecticut is in the OTR and was initially classified as marginal nonattainment statewide for the 2008 ozone NAAQS, the term "major source" for the purposes of the 2014 RACT review is limited to facilities that have the potential to emit (PTE) 100 tons per year or more of NOx or 50 tons per year or more of VOC.

As noted in the 2014 RACT SIP, individual sources in Connecticut may also be subject to more stringent technology control levels such as lowest achievable emissions rate ("LAER") or best available control technology ("BACT") as a result of Connecticut's new source review permitting program, or, if the source of a major source of hazardous air pollutants, maximum achievable control technology ("MACT"). LAER, applicable to new and modified major sources located in nonattainment areas, is the lowest achievable emission rate of the nonattainment pollutant that can be achieved by the source without respect to cost. BACT, or best available control technology, is applicable to new and modified sources located in attainment areas. BACT may be less stringent than LAER because consideration is given to energy, environmental and economic impacts, as well as other costs when evaluating the BACT emission rate. MACT is the control achieved by the best performing twelve percent of sources in a source group. For sources emitting volatile organic hazardous air pollutants subject to MACT, EPA has historically allowed states to rely on MACT standards for the purpose of showing that a source has met VOC RACT. BACT and LAER determinations are made prior to

construction as part of the new source review ("NSR") permitting process. Under the federal National Emissions Standards for Hazardous Air Pollutants, the requirement to implement MACT-based controls applies directly to owners of major sources of hazardous air pollutants.

Each of these control requirements, LAER, BACT and MACT, at the time of review, would necessarily be more stringent than RACT. In addition, many of the major sources of NOx or major sources of VOC are subject to a NSR permit and have therefore been required to implement BACT or LAER levels of control, as appropriate to the source at the time of determination. Furthermore, Connecticut requires top-down BACT in its minor NSR program, thereby requiring even minor sources to be held to a control level that is at least equivalent to RACT. Thus, as a result of the NSR permitting program Connecticut's stationary sources are subject to at least a RACT level of control for NOx and VOC, and in many cases are subject to more stringent control requirements.[4]

**D. Limitations of In-State Strategies**

Despite Connecticut's success in reducing ozone exceedance days experienced in the summer months in Connecticut over the last 30 years,[5] it important to recognize the limits of obtaining additional emissions reductions from sources in the state as a means to reduce ambient ozone levels. A comparison of contributions from all sources in the Connecticut inventory is instructive. **Table 3** shows the total VOC and NOx emissions from the thirteen major categories of emissions (Tier 1 Source Categories). These categories include all anthropogenic sources included in the 2011 National Emissions Inventory (NEI). Note that biogenic sources in Connecticut are estimated to emit an additional 48,070 tons of VOC annually. Thus, about 129,670 tons of VOC were emitted statewide in 2011.

Connecticut's major stationary sources of NOx emitted about 5902 tons of NOx in 2011, according to Connecticut's 2011 emissions statement reporting. These stationary sources

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[4] The exceptions are some emission units subject to the amendment of RCSA section 22a-174-38 or the repeal of RCSA section 22a-174-22 and adoption of sections 22a-174-22e and -22f. Such units will be controlled to a RACT level after the proposed regulatory requirements are implemented.

[5] DEEP acknowledges that Connecticut's efforts alone are not wholly responsible for the reduction in ozone exceedance days. Federal measures and controls in upwind states are also responsible for the improvement.

account for approximately 7.5% of the NOx emissions inventory. Connecticut's major stationary sources of VOC emitted approximately 880 tons according to the 2011 emissions statement reporting. This amounts to approximately 1% of the statewide total annual VOC emissions (not including biogenic emissions). Thus, opportunities for Connecticut to reduce ambient ozone levels through control of its major stationary sources are severely limited. The impact of mobile and area source emissions, and pollution transported from other states, on ozone values in Connecticut, cannot be overstated. **Figure 4** compares Connecticut's NOx emissions to those of other states in the eastern United States. Significant reductions from sources in upwind states are crucial to Connecticut's ability to attain and maintain the ozone NAAQS, as evidenced by EPA's most recent transport modeling, which indicates that 94% of peak ozone impacts at Connecticut's worst case monitor are caused by emissions outside of Connecticut's jurisdiction.[6]

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[6] Appendix B of EPA. Air Quality Modeling Technical Support Document for the 2008 Ozone NAAQS Cross-State Air Pollution Rule Proposal. November 2015. http://www.epa.gov/sites/production/files/2015-11/documents/air_quality_modeling_tsd_proposed_rule.pdf

**Table 3. Connecticut State Emissions Summary by Tier 1 Source Category (NEI 2011)**

| Tier | Category | VOC Annual Emissions (Tons) | NOx Annual Emissions (Tons) |
|---|---|---|---|
| 1 | FUEL COMB. ELEC. UTIL. | 82 | 1,277 |
| 2 | FUEL COMB. INDUSTRIAL | 168 | 3,397 |
| 3 | FUEL COMB. OTHER | 9,607 | 10,616 |
| 4 | CHEMICAL & ALLIED PRODUCT MFG | 48 | 0 |
| 5 | METALS PROCESSING | 0 | 0 |
| 6 | PETROLEUM & RELATED INDUSTRIES | 1 | 0 |
| 7 | OTHER INDUSTRIAL PROCESSES | 251 | 0 |
| 8 | SOLVENT UTILIZATION | 26,721 | 0 |
| 9 | STORAGE & TRANSPORT | 4,433 | 5 |
| 10 | WASTE DISPOSAL & RECYCLING | 317 | 3,182 |
| 11 | HIGHWAY VEHICLES | 22,676 | 38,933 |
| 12 | OFF-HIGHWAY | 17,165 | 21,310 |
| 14 | MISCELLANEOUS | 131 | 25 |
| Total | | 81,601 | 78,744 |

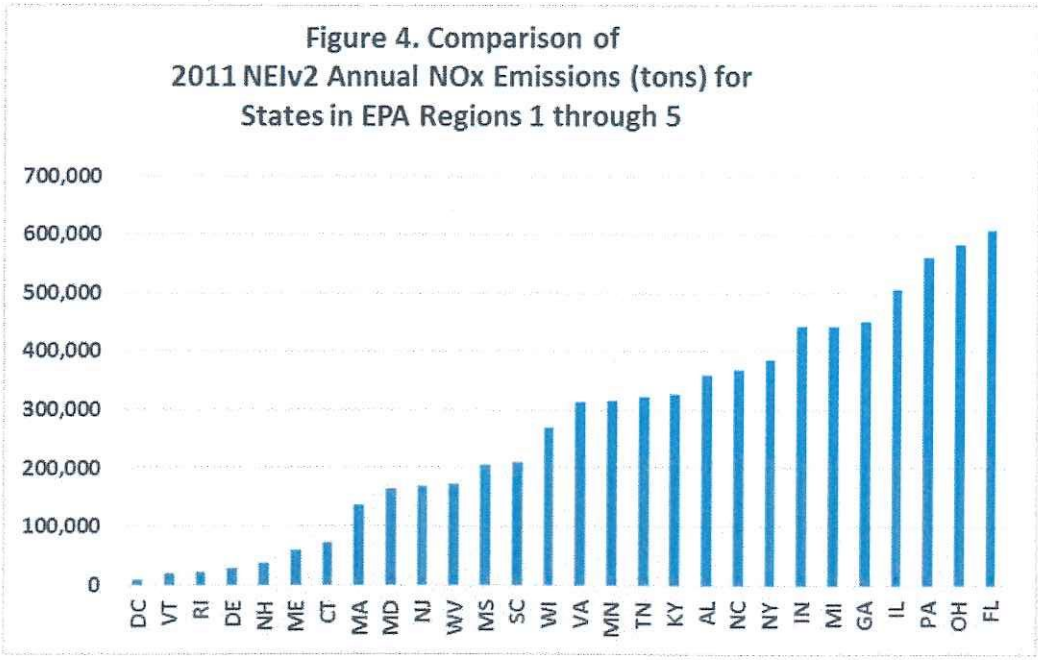

**Table 1. List of Issued CTGs and Connecticut Regulatory Requirements Corresponding to Each Listed CTG.**

| *CTG Category* | *CTG Document* | *Applicable Connecticut Regulation.* | *SIP Approval of Connecticut Regulation or Negative Declaration* *Adopted by State/ Approved by EPA/ FR Cite/ 52.370* | *Comments* |
|---|---|---|---|---|
| Aerospace | Aerospace (CTG & MACT) (see 59 FR 29216, June 6, 1994); CTG (Final), EPA-453/R-97-004, December 1997. | *22a-174-32 Reasonably Available Control Technology (RACT) for volatile organic compounds. 22a-174-20(s)Miscellaneous Metal and Plastic Parts Coating* | 11/18/93 3/10/99 64 FR 12024 ..... (c)(76) 8/27/99 10/19/00 65 FR 62624 ..... (c)(84) 4/29/10 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Automobile Coating | Control Techniques Guidelines for Automobile and Light-Duty Truck Assembly Coatings (PDF 44 pp, 2.64MB) EPA 453/R-08-006-*2008/09* And Protocol for Determining the Daily Volatile Organic Compound Emission Rate of Automobile and Light-Duty Truck Primer-Surfacer and Topcoat Operations (PDF 129 pp, 450KB) EPA 453/R-08-002-2008/09 | *Not Applicable* | *Negative declaration for coating of automobile and light-duty trucks* | *Connecticut reaffirms that no sources meeting the description of this CTG category are operating within the State.* |
| Cutback Asphalt | Control of Volatile Organic Compounds from Use of Cutback Asphalt, EPA-450/2-77-037, December 1977 | *22a-174-20(k) Restrictions on cutback asphalt* | 10/10/80 1/17/82 47 FR 762 ..... (c) 20 12/13/84 7/18/85 50 FR 29229 ..... (c) 34 10/31/89 10/18/91 56 FR 52205 ..... (c) 58 8/22/12; 77 FR 50595; ...(c)100 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Dry Cleaning (Large Petroleum) | Control of Volatile Organic Compound Emissions from Large Petroleum Dry Cleaners, EPA-450/3-82-009, September 1982 | *Not Applicable* | 40 CFR § 52.375 (a) **Certification of no** large petroleum dry cleaner **sources.** | *Connecticut reaffirms that no sources meeting the description of this CTG category are operating within the State.* |
| Fabric Coating | Control of Volatile Organic Emissions from Existing Stationary Sources, Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks, EPA-450/2-77-008, May 1977. | *22a-174-20(o) Fabric and vinyl coating;* | 8/31/79 12/23/80 45 FR 84769 ..... (c) 11 10/31/89 10/18/91 56 FR 52205 ..... (c) 58 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Fiberglass Boat | Control Techniques Guidelines for Fiberglass Boat Manufacturing Materials (PDF 41 pp, 336KB) EPA 453/R-08-004-*2008/09* | *Not Applicable* | *Negative Declaration for fiberglass boat manufacturers* | *Connecticut reaffirms that no sources meeting the description of this CTG category are operating within the State.* |
| Flexible Package Printing | Control Techniques Guidelines for Flexible Package Printing (PDF 33 pp, 216KB) EPA-453/R-06-003-*2006/09* | *22a-174-20(ff)* | 4/29/10 6/9/14 79 FR 32873 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |

| *CTG Category* | *CTG Document* | *Applicable Connecticut Regulation.* | *SIP Approval of Connecticut Regulation or Negative Declaration* *Adopted by State/ Approved by EPA/ FR Cite/ 52.370* | *Comments* |
|---|---|---|---|---|
| | | | | |
| Bulk Gasoline Plants | Control of Volatile Organic Emissions from Bulk Gasoline Plants, EPA-450/2-77- 035, December 1977 | *22a-174-20(b) Loading of gasoline and other volatile organic compounds.* | 4/4/72 5/31/72 37 FR 23085 ..... (b).<br>8/31/79 12/23/80 45 FR 84769 ..... (c) 11<br>10/10/80 2/17/82 47 FR 6827 ..... (c) 25<br>4/1/98 10/19/00 65 FR 62624 ..... (c)(84)<br>9/24/83 3/21/84 49 FR 10542 ..... (c) 32<br>12/13/84 7/18/85 50 FR 29229 ..... (c) 34<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58<br>4/1/98 10/19/00 65 FR 62624 ..... (c)(84)<br>3/07/2014 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Graphic Arts | Control of Volatile Organic Emissions from Existing Stationary Sources, Volume VIII: Graphic Arts - Rotogravure and Flexography, EPA-450/2-78-033, December 1978. | *22a-174-20(v) Graphic arts rotogravures and flexography.* | 10/10/80 2/17/82 47 FR 6827 ..... (c) 25<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58<br>11/18/93 3/10/99 64 FR 12024 ..... (c)(75)<br>8/1/95 10/19/00 65 FR 62624 ..... (c)(84) | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Industrial Adhesives | Control Techniques Guidelines for Miscellaneous Industrial Adhesives (PDF 47 pp, 350KB) EPA 453/R-08-005-*2008/09* | *22a-174-44* | 11/18/08<br>6/9/14 79 FR 32873 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Large Appliances | Control Techniques Guidelines for Large Appliance Coatings (PDF 44 pp, 374KB) EPA 453/R-07-004-*2007/09* | *22a-174-20(hh)* | 4/29/10<br>6/9/14 79 FR 32873 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Magnet Wire | Control of Volatile Organic Emissions from Existing Stationary Sources, Volume IV: Surface Coating for Insulation of Magnet Wire, EPA-450/2-77-033, December 1977 | *22a-174-20(r) Wire coating.* | 8/31/79 12/23/80 45 FR 84769 ..... (c) 11<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Metal Coil, Container and Closure | Control of Volatile Organic Emissions from Existing Stationary Sources, Volume II: Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks, EPA-450/2-77-008, May 1977. | *22a-174-20(m) Can coating;*<br>*22a-174-20(n) Coil coating.* | 8/31/79 12/23/80 45 FR 84769 ..... (c) 11<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Metal Furniture | Control Techniques Guidelines for Metal | *22a-174-20(p) Metal furniture coating.* | 8/31/79 12/23/80 45 FR 84769 ..... (c) 11 | *Regulatory requirements are consistent* |

| *CTG Category* | *CTG Document* | *Applicable Connecticut Regulation.* | *SIP Approval of Connecticut Regulation or Negative Declaration* *Adopted by State/ Approved by EPA/ FR Cite/ 52.370* | *Comments* |
|---|---|---|---|---|
| | Furniture Coatings (PDF 100 pp, 293KB) EPA 453/R-07-005-*2007/09* | | 10/31/89 10/18/91 56 FR 52205 ..... (c) 58<br>4/29/10 6/9/14 79 FR 32873 | *with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Metal & Plastic Parts Coating | Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings (PDF 143 pp, 897KB) EPA 453/R-08-003-*2008/09* | *22a-174-20(s) Miscellaneous metal and plastic parts coating*<br>*22a-174-20(k) Pleasure craft coating* | 10/10/80 2/17/82 47 FR 6827 ..... (c) 25<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58<br>11/18/93 3/10/99 64 FR 12024 ..... (c)(75)<br>8/1/95 10/19/00 65 FR 62624 ..... (c)(84)<br>11/21/12 6/9/14 79 FR 32873 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Natural Gas / Gasoline | Control of Volatile Organic Compound Equipment Leaks from Natural Gas/Gasoline Processing Plants, EPA-450/2-83-007, December 1983. | *Not Applicable* | 40 CFR § 52.375(b) **Certification of no** Natural Gas/Gasoline Processing Plant **sources.** | *Connecticut reaffirms that no sources meeting the description of this CTG category are operating within the State.* |
| Paper, Film & Foil | Control Techniques Guidelines for Paper, Film, and Foil Coatings (PDF 102 pp, 488KB) EPA 453/R-07-003-*2007/09* | *22a-174-20(q) Paper coating;* | 8/31/79 12/23/80 45 FR 84769 ..... (c) 11<br>10/31/89 10/18/91 56 FR 52205 (c) 58<br>4/29/10 6/9/14 79 FR 32873 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Pharmaceutical Products | Control of Volatile Organic Emissions from Manufacture of Synthesized Pharmaceutical Products, 450/2-78-029, December 1978. | *22a-174-20(t) Manufacture of synthesized pharmaceutical products.* | 10/10/80 2/17/82 47 FR 6827 ..... (c) 25<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Polyester Resin | Control of Volatile Organic Compound Emissions from Manufacture of High-Density Polyethylene, Polypropylene, and Polystyrene Resins, EPA-450/3-83-008, November 1983<br>AND<br>Control of Volatile Organic Compound Fugitive Emissions from Synthetic Organic Chemical Polymer and Resin Manufacturing Equipment, EPA-450/3-83-006, March 1984 | *22a-174-20(y) Manufacture of polystyrene resins.* | 2/2/87 5/19/88 53 FR 17934 ..... (c) 38<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58<br>AND<br>40 CFR § 52.375 (d) **Certification of no** manufacturers of high-density polyethylene and polypropylene resins. | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Printing Industries - offset lithographic and letterpress | Control Techniques Guidelines for Offset Lithographic Printing and Letterpress Printing (PDF 52 pp, 349KB) EPA-453/R-06-002- | *22a-174-20(gg)* | 4/29/10 6/9/14 79 FR 32873 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |

| *CTG Category* | *CTG Document* | *Applicable Connecticut Regulation.* | *SIP Approval of Connecticut Regulation or Negative Declaration* *Adopted by State/ Approved by EPA/ FR Cite/ 52.370* | *Comments* |
|---|---|---|---|---|
| | *2006/09* | | | |
| Refineries | Control of Refinery Vacuum Producing Systems, Wastewater Separators, and Process Unit Turnarounds, EPA-450/2-77-025, October 1977.<br><br>AND<br><br>Control of Volatile Organic Compound Leaks from Petroleum Refinery Equipment, EPA-450/2-78-036, June 1978. | *22a-174-20(c) "Volatile organic compound" water separation.* | *Negative Declaration for refineries.* | *Connecticut reaffirms that no sources meeting the description of this CTG category are operating within the State.* |
| Rubber Tires | Control of Volatile Organic Emissions from Manufacture of Pneumatic Rubber Tires, EPA-450/2-78-030, December 1978. | *22a-174-20(u) Manufacture of pneumatic rubber tires.* | 10/10/80 2/17/82 47 FR 6827 ..... (c) 25<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Service Stations | Design Criteria for Stage I Vapor Control Systems - Gasoline Service Stations, November 1975. | *22a-174-30a Dispensing of Gasoline/Stage I Vapor Recovery.* | 1/12/93 12/17/93 58 FR 65930 ..... (c) 62<br>1/12/93 1/18/94 59 FR 2649 ..... (c) 62<br>05/10/04 8/31/06 71 FR 51761 ..... (c) 95<br>*08/07/2015* | *Stage II vapor recovery program is discontinued given the widespread use of onboard vapor recovery. SIP revision submitted 09/14/2015.* *http://www.ct.gov/deep/cwp/view.asp?a=2684&q=331234&deepNav_GID=1619* |
| Ships | Shipbuilding/repair ACT (EPA 453/R-94-032, April 1994) and CTG, see 61 FR 44050, August 27, 1996 | *22a-174-32 Reasonably Available Control Technology (RACT) for volatile organic compounds.* | 11/18/93 3/10/99 64 FR 12024 ..... (c)(76)<br>8/27/99 10/19/00 65 FR 62624 ..... (c)(84) | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Solvent Cleaning | Control Techniques Guidelines for Industrial Cleaning Solvents (PDF 290 pp, 7.6MB) EPA-453/R-06-001-*2006/09* | *22a-174-20(l) Metal cleaning*<br><br>*22a-174-20(ii)*<br><br>*22a-174-20(jj)* | 8/31/79 12/23/80 45 FR 84769 ..... (c) 11<br>10/10/80 6/7/82 47 FR 24452 ..... (c) 23<br>12/10/82 2/1/84 49 FR 3989 ..... (c) 29<br>9/24/83 2/1/84 49 FR 3989 ..... (c) 29<br>9/24/83 3/21/84 49 FR 10542 ..... (c) 32<br>8/31/79 3/21/84 49 FR 10542 ..... (c) 32<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58 | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |

| ***CTG Category*** | ***CTG Document*** | ***Applicable Connecticut Regulation.*** | ***SIP Approval of Connecticut Regulation or Negative Declaration*** *Adopted by State/ Approved by EPA/ FR Cite/ 52.370* | ***Comments*** |
|---|---|---|---|---|
| | | | 8/23/96 10/19/00 65 FR 62624 ..... (c)(84)<br>8/22/12 77 FR 50595 ....(c)(100)<br>4/29/10 6/9/14 79 FR 32873 | |
| Synthetic Organic Chemical | Control of Volatile Organic Compound Emissions from Air Oxidation Processes in Synthetic Organic Chemical Manufacturing Industry, EPA-450/3-84-015, December 1984.<br><br>AND<br><br>SOCMI Distillation and Reactor Processes CTG (EPA 450/4-91-031, August 1993). | *22a-174-20(x) Control of Volatile Organic Compound Leaks from Synthetic Organic Chemical & Polymer Manufacturing Equipment.* | 2/2/87 5/19/88 53 FR 17934 ..... (c) 38<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58<br><br>*AND*<br><br>40 CFR § 52.375 (c) **Certification of no** Air Oxidation Processes/SOCMI.**sources**<br><br>40 CFR § 52.375 (e) **Certification of no sources of** Synthetic Organic Chemical Manufacturing Industry (SOCMI) distillation.<br><br>40 CFR § 52.375 (f) Certification of no sources of Synthetic organic chemical manufacturing industry (SOCMI) reactor vessels | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Tanks | Control of Volatile Organic Emissions from Storage of Petroleum Liquids in Fixed Roof Tanks, EPA-450/2-77-036, December 1977<br><br>AND<br><br>Control of Volatile Organic Emissions from Petroleum Liquid Storage in External Floating Roof Tanks, EPA-450/2-78-047, December 1978. | *22a-174-20(a) Storage of "volatile organic compounds" and restrictions for the Reid Vapor Pressure of gasoline.*<br><br>*22a-174-20(c) "Volatile organic compound" water separation.* | 8/31/79 12/23/80 45 FR 84769 ...(c) 11<br>9/24/83 3/21/84 49 FR 10542 .... (c) 32<br>12/13/84 7/18/85 50 FR 29229 .. (c) 34<br>12/30/88 6/2/89 54 FR 23650 .... (c) 50<br>10/31/89 10/18/91 56 FR 52205 (c) 58<br>*03/07/2014* | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |
| Tank Trucks | Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals, EPA-450/2-77- | *22a-174-20(b) Loading of gasoline and other volatile organic compounds.* | 8/31/79 12/23/80 45 FR 84769 ..... (c) 11<br>9/24/83 3/21/84 49 FR 10542 ..... (c) 32 | *Regulatory requirements are consistent with the CTG and represent RACT under* |

| *CTG Category* | *CTG Document* | *Applicable Connecticut Regulation.* | *SIP Approval of Connecticut Regulation or Negative Declaration* *Adopted by State/ Approved by EPA/ FR Cite/ 52.370* | *Comments* |
|---|---|---|---|---|
| | 026, December 1977.<br><br>AND<br><br>Control of Volatile Organic Compound Leaks from Gasoline Tank Trucks and Vapor Collection Systems, EPA-450/2-78-051, December 1978. | | 12/13/84 7/18/85 50 FR 29229 ..... (c) 34<br>10/31/89 10/18/91 56 FR 52205 ..... (c) 58<br>4/1/98 10/19/00 65 FR 62624 ..... (c)(84)<br>07/08/2015 | *the 2008 8-Hour Ozone NAAQS.* |
| Wood Coating | Control Techniques Guidelines for Flat Wood Paneling Coatings (PDF 27 pp, 212KB) EPA-453/R-06-004-*2006/09* | *Not Applicable* | *Negative declaration of sources of surface coating of flat wood paneling.* | *Connecticut reaffirms that no sources meeting the description of this CTG category are operating within the State.* |
| Wood Furniture | Wood Furniture (CTG-MACT) - draft MACT out 5-94; Final CTG, EPA-453/R-96-007, April 1996; see also 61 FR 25223, and, 61 FR 50823, September 27, 1996. | *22a-174-32 Reasonably Available Control Technology (RACT) for volatile organic compounds.* | 11/18/93 3/10/99 64 FR 12024 ..... (c)(76)<br>8/27/99 10/19/00 65 FR 62624 ..... (c)(84) | *Regulatory requirements are consistent with the CTG and represent RACT under the 2008 8-Hour Ozone NAAQS.* |