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Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
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# Draft for Public Comment

# Prevention of Significant Deterioration Permit

# Fact Sheet Addendum

## Canal Unit 3
## 9 Freezer Road
## Sandwich, MA

## Transmittal No. X269143
## Application No. SE-16-015

## August 23, 2017

The Massachusetts Department of Environmental Protection ("MassDEP") is hereby issuing this Prevention of Significant Deterioration ("PSD") Permit Fact Sheet Addendum, concurrently with a revised Draft PSD Permit for Canal Unit 3 ("Project")[1] MassDEP based its permit decisions on the information and analysis provided by NRG Canal 3 Development, LLC (hereinafter referred to as the "Applicant" or "Canal 3") and MassDEP's own technical review. This Fact Sheet documents the information and analysis MassDEP used to support its PSD Permit decisions. It includes a description of the proposed Project, the applicable PSD regulations, and an analysis demonstrating how the Applicant complied with all applicable PSD requirements.

## I. General Information

| | |
|---|---|
| Name of Source: | Canal Generating Station |
| Location: | Sandwich, Massachusetts |
| Applicant's Name and Address: | NRG Canal 3 Development, LLC<br>9 Freezer Road<br>Sandwich, MA 02563 |
| Application Prepared By: | Tetra Tech, Inc.<br>160 Federal St., 3rd Floor<br>Boston, MA 02110 |

Prevention of Significant Deterioration Application

| | |
|---|---|
| Transmittal Number: | X269143 |
| Application Number: | SE-16-015 |
| MassDEP Contact: | Thomas Cushing, Permit Chief<br>Bureau of Air and Waste<br>MassDEP Southeast Regional Office<br>20 Riverside Drive<br>Lakeville, MA 02347<br>508-946-2824<br>Thomas.Cushing@state.ma.us |

MassDEP administers the federal PSD Program pursuant to the "Agreement for Delegation of the Federal Prevention of Significant Deterioration Program by the United States Environmental Protection Agency to the Massachusetts Department of Environmental Protection" ("PSD Delegation Agreement") between MassDEP and the United States Environmental Protection Agency ("USEPA"), Region 1, dated April 11, 2011. The PSD Delegation Agreement directs

[1] Hereinafter the new installation, the subject of this Plan Approval, will be termed the 'Project,' and the existing and new installations together will be termed the 'Facility.'

that all Permits issued by the MassDEP under the Agreement follow the applicable procedures in 40 CFR 52.21 and 40 CFR 124 regarding permit issuance, modification and appeals.

On February 18, 2016, the Applicant submitted an initial Application to MassDEP requesting a PSD Permit for construction of one new, simple-cycle electric generating combustion turbine with a nominal electrical output of 350 megawatts ("MW"). The Project will be located on approximately 12 acres within the existing 29-acre Canal Generating Station site on Freezer Road, Sandwich, Massachusetts. The Applicant submitted a revised application on October 27, 2016. On January 5, 2017 MassDEP issued a PSD Fact Sheet and a Draft PSD Permit for a 30-day public comment period as required by the PSD Delegation Agreement and 40 CFR 124 - Procedures for Decision Making. Issuance of the Draft PSD Permit, along with a proposed major Comprehensive Plan Approval ("CPA"), began a public comment period that ended on Thursday February 9, 2017. MassDEP held a public hearing on the proposed actions on Wednesday, February 8, 2017 at 7:00 PM at Sandwich Town Hall, 130 Main Street in Sandwich, Massachusetts

The proposed project is also subject to review and approval by the Massachusetts Department of Public Utilities, Energy Facilities Siting Board ("EFSB"). On July 5, 2017, the EFSB issued a Final Decision for the Project, which directed NRG to increase the stack height from 220 feet to 250 feet.

On July 15, 2017, Canal 3 submitted a PSD Application Addendum which included revised stack height, exit diameter, and exhaust gas temperatures, and a revised Air Quality Impact Analysis and Air Toxics Analysis to accurately establish the ambient air quality impacts associated with the aforementioned design changes.

The PSD Regulations at 40 CFR 52.21 require a public process for changes to a Facility that would have an effect on the available PSD increment. This includes a change in stack design and exhaust gas parameters due to their effects on ambient air quality impacts. Because of the Project change, the Draft PSD permit is undergoing a second public process, which will be limited to public comment period on the stack design changes and resulting change in ambient air quality impacts.

The Project is also subject to the MassDEP Plan Approval and Emission Limitations requirements at 310 CMR 7.02 and Emission Offsets and Nonattainment Review at 310 CMR 7.00: Appendix A ("Appendix A"). MassDEP issued a Final Air Quality Plan Approval under these regulations on August 4, 2017.

This Fact Sheet only addresses the PSD Application changes as a result of the stack design changes and revised dispersion modeling. This document serves to amend and replace sections III and VIII in the original fact sheet. Sections II, IV, V, VI, VII, IX, and X in the original fact sheet are not affected by the new project parameters.

Oral and written testimony received at the public hearing and written comments received during the public comment periods will be considered in revisions to the Draft PSD Permit content when the Final Permit is issued. A summary of the Department's evaluation of the public comments received during both public comment periods will be provided in the Department's Response to Comments document, to be issued with the Final Permit.

## II. PROPOSED PROJECT CHANGES

The Applicant has increased the stack height from 220 to 250 feet, lowered the design attemperated flue gas temperature from 900°F to 850°F, and increased the design stack exit temperature from 750°F to 835°F. The stack exit diameter is increased from 25 feet to 25 feet 4 inches. The taller 250-foot stack will now be insulated so the stack temperature loss has decreased from the prior design for the 220-foot stack. The decrease in the design attemperated flue gas temperature will allow more effective operation of the SCR system and more flexibility in SCR catalyst selection.

## III. BACT ANALYSIS

As required by the Federal PSD Program at 40 CFR 52.21(j)(3), a major modification shall apply best available control technology for each regulated NSR pollutant for which it would result in a significant net emissions increase at the source. Prior to issuance of the August 4, 2017 CPA Approval and the January 5, 2017 draft PSD Permit / Permit Fact Sheet, MassDEP conducted a BACT analysis for all emissions at Canal 3. These analyses are documented in the CPA Approval and the January 5, 2017 PSD Fact Sheet. The revisions proposed today do not alter any of these BACT analyses. Accordingly, MassDEP concludes that the revisions do not affect the existing BACT findings or require additional BACT analysis.

## IV. MONITORING AND TESTING

The revisions proposed today do not alter any of the monitoring and testing requirements. Please refer to the CPA Approval dated August 4, 2017 and the January 5, 2017 draft PSD Permit / Fact Sheet for a discussion of the monitoring and testing requirements.

## V. AIR QUALITY IMPACT ANALYSIS

The Applicant is required to demonstrate, using air quality dispersion modeling, that the increase in emissions as a result of the Project, in conjunction with background air quality and other emissions, will not cause or contribute to a violation of a National Ambient Air Quality Standards ("NAAQS") or applicable PSD increment for a regulated NSR pollutant subject to PSD review. For this project, Particulate Matter ("PM"), Particulate Matter with a diameter equal to or less than 10 microns ("$PM_{10}$"), Particulate Matter with a diameter equal to or less than 2.5 microns ("$PM_{2.5}$"), oxides of Nitrogen ("NOx"), sulfuric acid mist ("$H_2SO_4$"), and Greenhouse Gases ("GHG") are the regulated NSR pollutants subject to PSD review. The NAAQS include both primary and secondary standards of different averaging periods. The primary standards protect public health and the secondary standards protect public welfare, such as damage to property or vegetation.

A PSD increment is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant and averaging period. The baseline concentration must be determined for each pollutant and, in general, is the ambient concentration existing at the time that the first complete PSD permit application affecting the area is submitted. Significant deterioration is said to occur when the amount of new pollution would exceed the applicable PSD increment. It is important to note, however, that air quality cannot deteriorate beyond the concentration allowed by the applicable NAAQS, even if not all of the PSD increment is consumed.[2]

The Applicant conducted refined dispersion modeling analyses to predict the impacts of the Project's emissions of PSD pollutants on ambient concentrations, and determine whether the Project will comply with NAAQS and PSD Increments. These analyses were conducted in accordance with USEPA's "Guideline on Air Quality Models" (November 2005) as described in the Air Quality Modeling Protocol submitted to MassDEP on October 13, 2015. For the revised emissions modeling, the Applicant used the most up-to-date version of the USEPA-recommended AERMOD model (AERMOD version 16216r, AERMAP version 11103, and AERMET version 16216) to perform the dispersion modeling. The Applicant conducted dispersion modeling in a manner that evaluated emissions from a range of operating conditions in an effort to identify the worst-case operating conditions, that is, those that result in the highest ambient air quality impact for each pollutant and averaging period.

To conduct dispersion modeling, the Applicant was required to input meteorological data relevant to the Project area. An applicant can either establish an on-site meteorological station to

[2] https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information

gather one year of data or propose to use five years meteorological data from a source where the applicant believes data are representative to its proposed site. The Applicant used five years (2008 through 2012) of site-specific data from the nearby Telegraph Hill monitor (approximately 2.9 miles to the south-southeast of the Project) along with concurrent surface observations from Barnstable Municipal Airport and upper air data from Chatham Municipal Airport. AERMET (version 16216) and AERSURFACE (version 13016) were used to prepare the meteorological files.

The Applicant characterized land use within a 3-kilometer radius of the Facility as rural. Therefore, the Applicant used rural dispersion coefficients in the dispersion modeling.

The modeling analyses included emissions from all proposed combustion equipment, which includes the new combustion turbine, the emergency generator engine, and the emergency fire pump engine, plus the existing sources at the Canal Generating Station, all operating simultaneously. The Applicant determined emission rates at three combustion turbine operating loads (30-40%, 75%, and 100% loads) each at five ambient operating temperatures (0°F, 20°F, 50°F, 59°F and 90°F) at steady-state conditions while firing natural gas and ultra-low sulfur distillate ("ULSD"). For each turbine load, the highest pollutant-specific emission rate coupled with the lowest exhaust temperature and exhaust flow rate was utilized. The Applicant also evaluated emissions from a combustion turbine start-up/shut down condition.

As discussed in Section I (General Information), the reason that the air quality dispersion modeling analysis has been redone is because of the requirement for a taller combustion turbine stack height imposed by the Massachusetts EFSB. The revised modeling also incorporates prior changes in the emission rates for particulate matter with a diameter equal to or less than 10 microns ("$PM_{10}$") and particulate matter with a diameter equal to or less than 2.5 microns ("$PM_{2.5}$") emission rates, as well as the annual limit on ULSD operation.[3] While the January 5, 2017 Draft PSD Permit incorporated the final BACT limits for the $PM_{10}/PM_{2.5}$ emission rates and annual limit on ULSD operation as permit limits, the Air Quality Modeling Analysis results on which the Draft PSD Permit were based conservatively used higher combustion turbine $PM_{10}/PM_{2.5}$ emission rates and higher ULSD annual operating hours. The modeling results below now reflect the Draft PSD permit limits for these parameters.

3 $PM_{10}$ and $PM_{2.5}$ includes both filterable and condensable particulate. Condensable, as used throughout this document means gaseous emissions from the emission units, which condenses to form particulate matter at ambient temperatures.

A. Significant Impact Analysis

To identify new pollution sources with the potential to alter significantly ambient air quality, USEPA adopted "significant impact levels." If the predicted impact of the new or modified emission source is less than the Significant Impact Level ("SIL") for a particular pollutant and averaging period, and the margin between background ambient air quality and the NAAQS is greater than the SIL, then no further evaluation is needed for that pollutant and averaging period. However, if the predicted impact of the new or modified source is equal to or greater than the SIL for a particular pollutant and averaging period, then further impact evaluation is required. This additional evaluation must include measured background levels of pollutants, and emissions from both the proposed new or modified source and any existing emission sources that may interact with emissions from the proposed new emissions source (referred to as cumulative modeling).

The PSD regulations addressing SILs for $PM_{2.5}$ were partially vacated and remanded in the January 22, 2013 decision of the United States Court of Appeals for the District of Columbia Circuit (No. 10-413, *Sierra Club v. EPA*). The Court decision does not preclude the use of the SILs for $PM_{2.5}$ entirely, but requires that monitoring data be evaluated to ensure that predicted impacts that are less than the SIL do not result in total concentrations (existing ambient plus project-related contributions) that exceed the NAAQS. Therefore, if there is a sufficient margin (greater than the SIL value) between the representative monitored background concentration in the area and the $PM_{2.5}$ NAAQS, then USEPA believes it would be sufficient to conclude that a proposed source with an impact less than the SIL value will not cause or contribute to a violation of the NAAQS and to forego a more comprehensive modeling analysis for that pollutant for that averaging period.

Table 1 presents the difference between the NAAQS and the representative monitored background concentration, compared to the SILs. The Applicant demonstrated that all averaging periods for each pollutant have a margin between the monitored value and the NAAQS that is greater than the respective SIL; therefore, the Applicant concluded that the use of the SILs as *de minimis* levels for all pollutants is appropriate.

| Table 1 | | | | | |
|---|---|---|---|---|---|
| **Margin between the Monitored Air Quality Concentration and the NAAQS compared to the SILs** | | | | | |
| **Pollutant** | **Averaging Period** | **Background Concentration ($\mu g/m^3$)** | **NAAQS ($\mu g/m^3$)** | **Delta Concentration (NAAQS – Background) ($\mu g/m^3$)** | **Significant Impact Level ($\mu g/m^3$)** |
| $SO_2$ | 1-Hour | 22 | 196 | 174 | 7.8 |
| | 3-Hour | 58 | 1,300 | 1,242 | 25 |
| | 24-Hour | 12 | 365 | 353 | 5 |
| | Annual | 5 | 80 | 75 | 1 |
| $NO_2$ | 1-Hour | 40 | 188 | 148 | 7.5 |
| | Annual | 15 | 100 | 85 | 1 |
| $PM_{10}$ | 24-Hour | 23 | 150 | 127 | 5 |
| | Annual | 9 | 50 | 41 | 1 |
| $PM_{2.5}$ | 24-Hour | 11 | 35 | 24 | 1.2 |
| | Annual | 5 | 12 | 7 | 0.3 |

**Table 1 Key**:

NAAQS = National Ambient Air Quality Standards
SILs = Significant Impact Levels
$\mu g/m^3$ = micrograms per cubic meter
$SO_2$ = sulfur dioxide
$NO_2$ = nitrogen dioxide
$PM_{10}$ = particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter

Table 2 presents the maximum predicted ambient air quality impact concentrations for the new sources at the Project. The analysis predicted that maximum ambient air quality impact concentrations from new sources at the Project are less than SILs for all pollutants and averaging periods, except for the 1-hour $NO_2$ and the 24-hour $PM_{2.5}$ NAAQS.

| Table 2 | | | | |
|---|---|---|---|---|
| **Results of Significant Impact Level Analysis** | | | | |
| **Pollutant** | **Averaging Period** | **Max. Predicted Project Impact (µg/m$^3$)** | **SIL (µg/m$^3$)** | **Greater than SIL?** |
| $SO_2$ | 1-Hour(1) | 0.34 | 7.8 | No |
| | 3-Hour | 0.32 | 25 | No |
| | 24-Hour | 0.18 | 5 | No |
| | Annual | 0.0026 | 1 | No |
| $PM_{10}$ | 24-Hour | 4.18 | 5 | No |
| | Annual | 0.02 | 1 | No |
| $PM_{2.5}$ | 24-Hour(2) | 2.77 | 1.2 | **Yes** |
| | Annual(3) | 0.02 | 0.3 | No |
| $NO_2$(4) | 1-Hour(1) | 28.26 | 7.5 | **Yes** |
| | Annual | 0.33 | 1 | No |

**Table 2 Notes**:

1. High daily maximum 1-hour concentrations averaged over 5 years.
2. High maximum 24-hour concentrations averaged over 5 years.
3. Maximum annual concentrations averaged over 5 years.
4. $NO_2$ estimated by assuming 75% conversion of nitrogen oxides ("$NO_x$") to $NO_2$ for annual concentrations and 80% conversions of $NO_x$ to $NO_2$ for 1-hour concentrations.

**Table 2 Key**:

| | |
|---|---|
| Max. | = maximum |
| SILs | = Significant Impact Levels |
| µg/m$^3$ | = micrograms per cubic meter |
| $SO_2$ | = sulfur dioxide |
| $NO_2$ | = nitrogen dioxide |
| $PM_{10}$ | = particulate matter less than or equal to 10 microns in diameter |
| $PM_{2.5}$ | = particulate matter less than or equal to 2.5 microns in diameter |
| % | = percent |

## B. Background Air Quality

The PSD regulations require that a PSD permit application establish existing air quality levels. The determination of existing air quality levels can be satisfied by air measurements from an existing representative monitor, by an on-site monitoring program, or by demonstrating that modeled impacts are *de minimis*, as defined by Significant Monitoring Concentrations ("SMC").

Due to its proximity to the Project, data from the Shawme Crowell Monitoring Station can be used to fulfill the PSD pre-construction monitoring requirement for $PM_{10}$, $PM_{2.5}$, and $NO_2$.

The Applicant presented monitored ambient quality concentrations collected at the Shawme Crowell Monitoring Station in Shawme Crowell State Park, Sandwich, approximately 1 mile southwest of the Project site. The station measures concentrations of $SO_2$, $NO_2$, $PM_{10}$, and $PM_{2.5}$. The Shawme-Crowell monitor is a source-specific location designed to capture impacts from the existing Station, which was cumulatively modeled with the Project. A summary of the background air quality concentrations based on the latest three years (2012-2014) of existing monitoring data is presented in Table 3.

**Table 3**

**Monitored Ambient Quality Concentrations and Selected Background Levels**

| Pollutant | Averaging Period | Year 2012 | Year 2013 | Year 2014 | Background Air Quality ($\mu g/m^3$) | NAAQS ($\mu g/m^3$) |
|---|---|---|---|---|---|---|
| $SO_2$ (ppb) | 1-Hour | 11 | 9 | 5 | 22 | 196 |
| | 3-Hour | 22 | 14 | 5 | 58 | 1,300 |
| | 24-Hour | 5 | 4 | 5 | 12 | 365 |
| | Annual | 1 | 2 | 2 | 5 | 80 |
| $NO_2$ (ppb) | 1-Hour | 22 | 20 | 22 | 40 | 188 |
| | Annual | 8 | 8 | 7 | 15 | 100 |
| $PM_{10}$ ($\mu g/m^3$) | 24-Hour | 23 | 18 | 20 | 23 | 150 |
| | Annual | 9 | 9 | 9 | 9 | 50 |
| $PM_{2.5}$ ($\mu g/m^3$) | 24-Hour | 12 | 10 | 10 | 11 | 35 |
| | Annual | 5 | 5 | 4 | 5 | 12 |

**Table 3 Key:**

NAAQS = National Ambient Air Quality Standards
$\mu g/m^3$ = microgram per cubic meter
$SO_2$ = sulfur dioxide
$NO_2$ = nitrogen dioxide
$PM_{10}$ = particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter
ppb = parts per billion
ppm = parts per million

In accordance with the PSD regulations and USEPA guidance, MassDEP determined that the data from the monitoring site are representative of background conditions at the Project site for $PM_{2.5}$ and other PSD pollutants and that preconstruction monitoring is not required.

C. Cumulative Dispersion Modeling

The Applicant used dispersion modeling to assess the air quality impacts from the entire Facility, including the existing emission sources and all proposed new sources. The Applicant added these impacts to background air quality. Table 4 shows the cumulative impact of both the new and existing sources at the Canal Generating Station when added to background air quality. Based on the results of the cumulative Facility impact analysis, the Project's worst-case emissions from the proposed new sources in combination with emissions from the existing Facility sources do not result in predicted concentrations that exceed the applicable NAAQS.

For the pollutants and averaging periods that have maximum predicted impacts greater than SILs (see Table 2), cumulative modeling is required. The Applicant found that there were no additional sources required for cumulative NAAQS modeling analysis. Table 4 shows the cumulative design value modeled concentrations of the new Project and existing Canal Generating Station combined with appropriate ambient background concentrations, and comparisons with the corresponding NAAQS. Based on these results, the predicted total ambient criteria pollutant concentrations are less than the NAAQS for all pollutants.

**Table 4**

**Results of Cumulative Impact Analysis**

| Criteria Pollutant | Averaging Period | Predicted Facility Impact (µg/m$^3$) | Background (µg/m$^3$) | Predicted Facility Impact plus background (µg/m$^3$) | NAAQS (µg/m$^3$) | Less than NAAQS? |
|---|---|---|---|---|---|---|
| $SO_2$ | 1-Hour | 128.29 | 22 | 150.29 | 196 | Yes |
| | 3-Hour | 133.77 | 58 | 191.77 | 1,300 | Yes |
| | 24-Hour | 45.90 | 12 | 57.90 | 365 | Yes |
| | Annual | 4.20 | 5 | 9.20 | 80 | Yes |
| $PM_{10}$ | 24-Hour | 6.40 | 23 | 29.40 | 150 | Yes |
| | Annual | 1.00 | 9 | 10.00 | 50 | Yes |
| $PM_{2.5}$ | 24-Hour | 3.87 | 11 | 14.87 | 35 | Yes |
| | Annual | 0.79 | 5 | 5.79 | 12 | Yes |
| $NO_2$[(1)] | 1-Hour | 91.23 | 40 | 131.33 | 188 | Yes |
| | Annual | 10.04 | 15 | 25.04 | 100 | Yes |

**Table 4 Note:**

1. $NO_2$ estimated by assuming 75% conversion of $NO_x$ to $NO_2$ for annual concentrations and 80% conversions of $NO_x$ to $NO_2$ for 1-hour concentrations.

**Table 4 Key:**

| | |
|---|---|
| NAAQS | = National Ambient Air Quality Standards |
| $\mu g/m^3$ | = micrograms per cubic meter |
| $SO_2$ | = sulfur dioxide |
| $NO_2$ | = nitrogen dioxide |
| $PM_{10}$ | = particulate matter less than or equal to 10 microns in diameter |
| $PM_{2.5}$ | = particulate matter less than or equal to 2.5 microns in diameter |

## D. Start-Up/Shutdown Impact Analysis

The Applicant evaluated the turbine start-up/shut-down (SU/SD) emissions by including this in the modeling analysis performed in support of the permit application. The specific SU/SD scenarios that were modeled are as follows:

- Natural gas start-up to steady-state base load (100%)
- Natural gas start-up to steady-state minimum load (30-40%)
- ULSD oil start-up to steady-state base load (100%)
- ULSD oil start-up to steady-state minimum load (30-40%)

For each of the four SU/SD scenarios, the Significant Impact Level (SIL) modeling analysis included emissions from the Canal 3 emergency generator and fire pump engines. For the SU/SD NAAQS modeling, emissions from the Canal 3 emergency generator and fire pump engines, emissions from all other existing sources at the Station, plus background air quality concentrations were included in the analysis.

The results of the SU/SD SIL modeling revealed impacts below SILs for all four SU/SD scenarios for CO, $PM_{10}$ and $SO_2$ for all averaging periods (1-, 3-, 8-, and 24-hour). Impacts for 1-hour $NO_2$ and 24-hour $PM_{2.5}$ were over the SILs for many of the scenarios with the worst – case result for all three pollutants being from the ULSD oil start-up to steady-state minimum load scenario. Accordingly, these two pollutants were further assessed by modeling all other emission units at the Station and adding background to the modeled-predicted concentration for comparison to the NAAQS.

The SU/SD modeling results are presented in Table 5. Because the maximum facility-wide impacts were controlled by the existing emission units (primarily for $NO_2$), results from the Project alone are also presented in Table 5 to see how they compare to the NAAQS. SU/SD modeling results show compliance with the NAAQS by wide margins.

**Table 5**

**Results of SU/SD Impact Analysis**

**$NO_2$: ULSD Oil Start-Up to Steady-State Base Load Scenario (Worst-Case Impacts)**
**$PM_{25}$: ULSD Oil Start-Up to Steady-State Minimum Load Scenario (Worst-Case Impacts)**

| Criteria Pollutant | Averaging Period | Predicted Facility Impact ($\mu g/m^3$) | Background ($\mu g/m^3$) | Predicted Facility Impact plus background ($\mu g/m^3$) | NAAQS ($\mu g/m^3$) | Less than NAAQS? |
|---|---|---|---|---|---|---|
| **Facility-Wide (Project SU/SD + Existing Sources) Impacts** | | | | | | |
| $NO_2$[(1)] | 1-Hour | 91.23 | 40 | 131.23 | 188 | Yes |
| $PM_{2.5}$ | 24-Hour | 3.87 | 11 | 14.87 | 35 | Yes |
| **Project SU/SD Emissions Alone Impacts** | | | | | | |
| $NO_2$[(1)] | 1-Hour | 21.02 | 40 | 61.02 | 188 | Yes |
| $PM_{2.5}$ | 24-Hour | 1.05 | 11 | 12.05 | 35 | Yes |

**Table 5 Note:**

1. $NO_2$ estimated by assuming 80% conversion of $NO_x$ to $NO_2$ for 1-hour concentrations

**Table 5 Key:**

NAAQS = National Ambient Air Quality Standards
$\mu g/m^3$ = microgram per cubic meter
SU/SD = Start-Up/Shutdown
$NO_2$ = Nitrogen dioxide
$PM_{2.5}$ = Particulate Matter less than or equal to 2.5 microns in diameter

## E. PSD Increment Analysis

The PSD increment analysis requires additional modeling if the maximum modeled concentration of a pollutant due to emission increase from the proposed Project exceeds the applicable SIL (see Table 2). Therefore, the Applicant was required to model PSD increment consumption for 24-hour $PM_{2.5}$. The USEPA has not promulgated a PSD increment for 1-hour $NO_2$. There are no $PM_{2.5}$ increment-consuming sources in the baseline area.

The only major stationary source of PSD pollutants in the significant impact area of the Project or anywhere nearby is the existing NRG Canal Station Boiler Units 1 and 2 in the town of Sandwich in Barnstable County, MA. These emission units pre-date PSD increment trigger dates for all pollutants and their emissions are part of baseline concentrations.

The Project's SIL modeling revealed a significant impact area with a radius of significance of 1.7 km for $PM_{2.5}$. This distance of 1.7 km from Unit No. 3 is completely within the county of Barnstable. As a result, the Canal 3 Project triggers minor source baseline in Barnstable County for $PM_{2.5}$. The trigger date was January 5, 2017 and is based on the date the PSD application was considered complete by MassDEP.

Because the Canal No 3 Project is the source triggering baseline for $PM_{2.5}$, there would be no other increment consuming sources in NRG's surrounding area. Emissions from all existing sources at the time the PSD application was deemed complete are contributing to baseline ambient air quality concentration levels on that date. Hence, proposed NRG Canal Unit 3 is the only source currently consuming increment in NRG's surrounding area (i.e., in Barnstable County).

Table 6 shows the results of the PSD increment analysis for $PM_{2.5}$, which includes impacts from the new turbine, emergency generator and emergency fire pump engine. The results indicate that the operation of the proposed Project is protective of the PSD increments.

**Table 6**

**Modeled Results Compared to the PSD Increments**

| Pollutant | Averaging Period | Modeled Concentration ($\mu g/m^3$) | PSD Increment ($\mu g/m^3$) | Less than PSD Increment? |
|---|---|---|---|---|
| $PM_{2.5}$ | 24-Hour | 3.71 | 9 | Yes |

**Table 6 Key**:

$\mu g/m^3$ = micrograms per cubic meter
PSD = Prevention of Significant Deterioration
$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter

F. Secondary $PM_{2.5}$ Impacts

The previously mentioned USEPA *Guidance for $PM_{2.5}$ Permit Modeling* provides guidance on demonstrating compliance with the NAAQS and PSD increments for $PM_{2.5}$ specifically with regard to secondary formation of $PM_{2.5}$ resulting from emissions of $PM_{2.5}$ precursor pollutants. In the Guidance, USEPA has defined four Assessment Case categories based on the magnitude of a project's potential emissions of direct $PM_{2.5}$ and precursors for potential secondary $PM_{2.5}$ formation, $NO_x$ and $SO_2$ (in tons per year). The Assessment Case categories identify assessment approaches that are available and appropriate for each case. The Project falls into Case 3 because direct $PM_{2.5}$ emissions are greater than 10 tons per year ("tpy") and $NO_x$ and/or $SO_2$ emissions are greater than 40 tpy. Accordingly, the Applicant conducted a Case 3 qualitative assessment of potential secondary formation of $PM_{2.5}$, which is appropriate because the underlying refined air quality modeling provides a well-developed analysis of both the current background concentrations and the Project's primary $PM_{2.5}$ emissions. The Applicant's qualitative assessment followed the example in Appendix D of the Guidance, which involves calculating an equivalent secondary $PM_{2.5}$ to primary $PM_{2.5}$ ratio. The ratio is 1.01 based on projected $PM_{2.5}$, $NO_x$ and $SO_2$ emissions. Based on the results of this assessment, shown in Table 6, the secondary $PM_{2.5}$ impact associated with the Project's precursor emissions will not cause or contribute to a violation of the 24-hour or annual $PM_{2.5}$ NAAQS.

**Table 7**

**Total $PM_{2.5}$ (Primary + Secondary) Impacts Comparison to the NAAQS and PSD increments**

| Averaging Period | New Source Primary $PM_{2.5}$ Conc. ($\mu g/m^3$) | Primary plus Secondary $PM_{2.5}$ Conc. ($\mu g/m^3$) | Monitored Background ($\mu g/m^3$) | Existing Source Contribution ($\mu g/m^3$) | Total $PM_{2.5}$ Impact ($\mu g/m^3$) | Standard ($\mu g/m^3$) | Less than Standard? |
|---|---|---|---|---|---|---|---|
| **NAAQS** | | | | | | | |
| 24-Hour | 1.05 | 1.06 | 11 | 3.87 | 15.93 | 35 | Yes |
| Annual | 0.02 | 0.02 | 5 | 0.79 | 5.81 | 12 | Yes |
| **PSD Increments** | | | | | | | |
| 24-Hour | 3.71 | 3.75 | N/A | N/A | 3.75 | 9 | Yes |
| Annual | 0.02 | 0.02 | N/A | N/A | 0.02 | 4 | Yes |

**Table 7 Key**:
$\mu g/m^3$ = micrograms per cubic meter
PSD = Prevention of Significant Deterioration

NAAQS = National Ambient Air Quality Standards
$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter

## G. AIR TOXICS ANALYSIS

The Applicant conducted an air quality impact assessment of the non-criteria pollutants (air toxics) emitted from the proposed Project and the existing Canal Generating Station. Provision IV.C. of MassDEP's 2011 PSD Delegation Agreement with the USEPA allows MassDEP to implement rules or policies that are more stringent than the federal PSD program, provided it is clearly documented that said requirements are not derived from federal PSD requirements. The air toxics analysis is not required by federal PSD Regulations at 40 CFR 52.21, but is a MassDEP requirement for PSD applications set forth in MassDEP policy "Air Toxics Implementation Update," dated August, 1989.

To obtain the predicted concentration of each pollutant across all operating loads, the Applicant utilized AERMOD and scaled the concentrations by the appropriate pollutant emission rates. The worst-case impacts were compared to applicable thresholds, according to the MassDEP's guidelines for 24-hour Threshold Effects Exposure Limit ("TEL") and annual Allowable Ambient Limit ("AAL"). The results concluded that air quality impacts from the non-criteria emissions are less than the threshold levels of the corresponding AALs and TELs. See Tables 5-16 and 5-17 of the PSD application Supplement No. 1 for the complete modeled results.

## H. IMPAIRMENT TO VISIBILITY, SOILS AND VEGETATION AND IMPACT ON GROWTH

### Visibility

Federal Land Managers ("FLMs") recommend that an Applicant for a PSD permit conduct a screening analysis to determine if the proposed Project has the potential to adversely impact a Class I area, described in the *Federal Land Managers' Air Quality Related Values Work Group Phase 1 Report – Revised*.[4]

This guidance document references an emission/distance ("Q/D") ratio of 10, below which a proposed source is not likely to have an adverse impact on a Class I Area and therefore, a full Class I Area impact analysis is not warranted. The "Q" in the Q/D is the sum of $NO_x$, $SO_2$,

[4] National Park Service, 2010. Phase I Report of the Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Revised 2010. National Park Service, Air Resources Division; U.S. Forest Service, Air Quality Program; U.S. Fish and Wildlife Service, Air Quality Branch.

$H_2SO_4$, and PM emissions expressed in tpy, based on maximum short-term (24-hour) emissions levels. The Applicant determined that the total sum of these short-term emissions, based on firing ULSD, is 720.38 tpy. The "D" in the Q/D is the distance from the Facility to the closest Class I area in kilometers. The closest Class I area is the Lye Brook Wilderness Area in southern Vermont, approximately 250 kilometers northwest of the Facility. The resulting Q/D ratio is 2.9, which is less than the recommended screening ratio of 10.

Based on the results of this analysis, Mr. Ralph Perron, Air Quality Specialist of United States Forest Service Eastern Regional Office, the responsible FLM, concurred that a Class I Air Quality Related Values (AQRV) analysis is not required for the Project. This was documented in an email message by Mr. Perron dated October 26, 2015. There is no increased potential to have an adverse impact on a Class I area stemming from the revised project parameters. Therefore, the decision continues to rely on that communication.

**Soils and Vegetation**

The PSD regulation requires analysis of air quality impacts on sensitive vegetation types, with significant commercial or recreational value, or sensitive types of soil. The Applicant evaluated impacts on sensitive vegetation by comparison of predicted Project impacts with screening levels presented in *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils and Animals*.[5]. As an indication to whether emissions from the Project will significantly impact the surrounding vegetation (i.e., cause acute or chronic exposure to each evaluated pollutant), the modeled emission concentrations were compared against both a range of injury thresholds found in the guidance, as well as those established by the NAAQS secondary standards. Since the NAAQS secondary standards were set to protect public welfare, including protection against damage to crops and vegetation, comparing modeled emissions to these standards provides some indication of whether potential impacts are likely to be significant. Table 7 lists the results of the potential soil and plant concentrations (based on maximum annual concentrations) and compares them to the corresponding screening concentration criteria. The results show that the concentrations are less than the screening criteria.

[5] USEPA 1980. A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals. EPA-450/2-81-078. USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711.

| Table 8 | | | | | | |
|---|---|---|---|---|---|---|
| **Soils Impact Screening Assessment** | | | | | | |
| **Pollutant** | **Max. Deposited Conc. (ppmw)** | **Soil Screening Criteria (ppmw)** | **Percent of Soil Screening Criteria** | **Plant Tissue Concentration (ppmw)** | **Plant Screening Criteria (ppmw)** | **Percent of Plant Screening Criteria** |
| Arsenic | $1.36x10^{-5}$ | 3 | 0.0005% | $1.90x10^{-6}$ | 0.25 | 0.0008% |
| Cadmium | $1.51x10^{-6}$ | 2.5 | 0.0001% | $1.61x10^{-5}$ | 3 | 0.0005% |
| Chromium | $6.08x10^{-3}$ | 8.4 | 0.0723% | $1.85x10^{-4}$ | 1 | 0.0122% |
| Lead | $9.20x10^{-4}$ | 1,000 | 0.0001% | $4.14x10^{-4}$ | 126 | 0.0003% |
| Mercury | $3.01x10^{-6}$ | 455 | 0.0000% | $1.51x10^{-6}$ | N/A | N/A |
| Nickel | $2.78x10^{-3}$ | 500 | 0.0006% | $1.25x10^{-4}$ | 60 | 0.0002% |
| Selenium | $7.54x10^{-5}$ | 13 | 0.0006% | $7.54x10^{-5}$ | 100 | 0.0001% |

**Table 8 Key**:
Max. = maximum
Con. = concentration
ppmw = parts per million by weight
N/A = not applicable
% = percent

## Impact on Growth

During the 21-month construction period for the Project, the number of workers will include up to 150 workers. For 13 months, less than 100 workers will be on-site. For approximately eight months (March 2018 to October 2018), more than 100 workers are expected to be on-site. The peak period of construction activity will occur from June 2018 to July 2018, with approximately 150 workers traveling to and from the Project site. The Station expansion will not require a significant addition of new full-time employees.

The Applicant stated that a significant construction force is available and is supported by the fact that within New England significant construction activities have already occurred. Therefore, it is expected that because this area can support the Project's construction from within the region, new housing, commercial and industrial construction will not be necessary to support the Project during the construction period.

If any new personnel move to the area to support the Project, a significant housing market is already established and available. Therefore, no new housing is expected. Further, due to the small number of new individuals expected to move into the area to support the Project and the

significant level of existing commercial activity in the area, new commercial construction is not foreseen to be necessary to support the Project's expanded work force. In addition, no significant level of industrial related support will be necessary for the Project; thus, industrial growth in the area is not expected.

Thus, no new significant emissions from secondary growth during either the construction phase or operations are anticipated.

## VI. ENVIRONMENTAL JUSTICE

The MassDEP has confirmed the Environmental Justice determination presented in the January 5, 2017 Fact Sheet is unaffected by the proposed changes. The analysis is re-iterated here for the reader's convenience.

Environmental justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies.

On February 11, 1994, Executive Order 12898 was issued to direct Federal agencies to incorporate achieving environmental justice into their mission. MassDEP has the obligation under the provisions of the April 11, 2011 PSD Delegation Agreement to implement and enforce the federal PSD regulations at 40 CFR 52.21.

The terms of the PSD Delegation Agreement require MassDEP to demonstrate that the PSD permit does not violate EPA's Environmental Justice (EJ) policy and guidelines. The Delegation agreement explicitly says:

> MassDEP will follow EPA policy, guidance, and determinations as applicable for implementing the federal PSD program, whether issued before or after the execution of this Delegation Agreement, including…Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, Exec. Order 12,898, 59 Fed. Reg. 7,629 (Feb. 16, 1994). ("Executive Order" or "EJ 12898").

EJ 12898 states in relevant part that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low- income populations. Exec. Order 12898, § 1-101, 59 Fed. Reg. 7, 629 (Feb. 16, 1994).

Federal agencies are required to implement this order consistent with, and to the extent permitted by, existing law. To comply with this requirement, EPA adopted its Environmental Justice Policy that describes environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. Meaningful involvement means:

- People have an opportunity to participate in decisions about activities that may affect their environment and/or health
- The public's contribution can influence the regulatory agency's decision
- Community concerns will be considered in the decision making process
- Decision makers will seek out and facilitate the involvement of those potentially affected.

MassDEP understands that the Executive Order and EJ Policy requirements pertain to MassDEP as EPA's delegated permitting authority with respect to the PSD review process for the Project.

The USEPA has developed EJSCREEN, an environmental justice mapping and screening tool, which provides demographic and environmental information for a selected area. The potential EJ communities are identified as areas that should be more fully evaluated.

EJSCREEN results identify the Otis Air National Guard Base, located to the southwest of the Project, as a minority and low-income area. EPA guidance states that screening results should be supplemented with additional information and local knowledge to get a better understanding of the issues in a selected location.

As noted in the PSD application, a review of housing on the Base indicates there is only one home in the northeast section of the Base that is within 5 miles of the Project, with the remaining housing located in the extreme southern portions of the Base, which is beyond 5 miles from the Project. Additionally, the Barnstable County Correctional Facility is located within the southwest portion of the Base, and is also beyond 5 miles from the Project.

The demographics of the area are classified by census tract. The presence of this correctional facility in this tract (Barnstable County, Census Tract 141) is driving the classification of the Base as minority (52%) and low-income (55%).

Based on a review of census data and the housing in Census Tract 141 of Barnstable County, there are no affected Environmental Justice Communities within 5 miles of the proposed Facility.

The purpose of an EJ analysis is to determine whether the construction or operation of a proposed facility would have an adverse and disproportionate burden on an EJ community. The maximum predicted ambient air quality impacts of the proposed Project are all located within 0.25 miles of the proposed Project stack location. These maximum impact locations are much closer to the Project site than the Barnstable County Correctional Facility, which is in the southwest portion of the Otis Air National Guard Base and more than 5 miles from the Project site. For pollutants for which the Project has impacts above the SILs, the Significant Impact Area in all cases is within 3 miles of the proposed Project site. Therefore, the Project will not have a disproportionately high impact on minority and low-income populations, which are located well outside the area of maximum predicted impacts.

Based on its review of the PSD application, MassDEP analysis of environmental justice issues determined that MassDEP has complied with the Executive Order and EJ Policy because there are no affected environmental justice communities within five miles of the Project. The Project's emissions will not have a disproportionally high and adverse human health or environmental effects on minority and low income populations. Furthermore, MassDEP has found no indication that the Project will not extend fair treatment and meaningful involvement to all people regardless of race, color, national origin, or income with respect to the preconstruction environmental review process for the project.

Even though the Project is not subject to the requirements of EOEEA's Environmental Justice Policy, Canal 3 has developed a comprehensive communications plan that includes a number of approaches designed to keep local residents, abutters, businesses and Town of Sandwich officials updated on significant construction milestones and schedules related to the expansion of the Facility. These approaches include:

- **Electronic mail** - As part of public outreach during the permitting process, the Company developed e-mail lists to reach specific targeted audiences, including direct abutters, nearby neighbors within 1 mile, local businesses and key external stakeholders. These lists will be used to deliver targeted traffic and construction messages to affected audiences during the construction phase of the Project.
- **Mailings** – as part of initial communications announcing and describing the Proposed Facility, the Company developed and utilized mailing lists to communicate information on public hearings related to the Project. Those lists will be utilized to provide traffic,

parking, delivery and construction related updates and notifications during the next phase of Project development.

- **Website** – The Company has established a website at www.canalnewgeneration.com that will be updated as appropriate. From the website, visitors will see the latest information, and can download a printable fact sheet. The website has a provision for visitors to sign up for periodic emails, as well as renderings of how the station will look before and after completion of the Project. The website is being promoted through local media via announcements, emails and phone calls to working journalists and media outlets as well as advertising in selected local publications.
- **Routine updates with Town of Sandwich officials** – The Company has established routine communication networks with local officials including traffic, fire, police and others regarding the Project particularly concerning traffic management, construction, delivery, noise and all other potential issues of concern to the Town and residents during the construction phase.

## VII. NATIONAL HISTORIC PRESERVATION ACT, ENDANGERED SPECIES ACT, TRIBAL AND OTHER CONSULTATIONS

The following sections describe how the Applicant met the National Historic Preservation Act, Endangered Species Act, and Tribal consultation requirements identified in the PSD Delegation Agreement and describe other consultations.

### *A. National Historic Preservation Act Consultation*

On August 16, 2017, the Applicant sent a notification letter regarding the submittal of the revisions to the PSD air permit application to the Massachusetts Historical Commission, as identified by the PSD Delegation Agreement and required by the National Historic Preservation Act consultation requirements. The Applicant also sent notification letters to the Tribal Historic Preservation Officers of the Wampanoag Tribe of Gay Head (Aquinnah) and the Mashpee Wampanoag Tribe.

### *B. Endangered Species Act Consultation*

On August 16, 2017, the Applicant sent a notification letter regarding the submittal of the PSD air permit application to the U.S. Fish and Wildlife Service ("FWS"), as identified by the PSD Delegation Agreement. Additionally, the Applicant sent a notification letter to the National Marine Fisheries Service.

### *C. Tribal Consultation*

On August 16, 2017, the Applicant sent letters of notification regarding the submittal of the PSD air permit application to the Mashpee Wampanoag Tribe and the Wampanoag Tribe of Gay Head (Aquinnah).

### *D. Class I Area Modeling*

The Applicant completed a Request for Applicability for Class I Area Modeling Analysis Document with regard to Class I areas in Vermont and New Hampshire and submitted it to the Eastern Regional Office of the US Forest Service. An Air Quality Specialist of United States Forest Service Eastern Regional Office responded that the Forest Service would not be requesting Air Quality Related Values analyses of the Proposal.

### *E. Magnuson-Stevens Fishery Conservation and Management Act*

As indicated on the PSD Fact Sheet dated January 5, 2017, EPA Region 1 staff reviewed the proposed project and concluded that the Magnuson-Stevens Act requirements do not apply. MassDEP has determined that the impact associated with the stack modifications have a de-minimis impact on essential fish habitats, therefore the Magnuson - Stevens Fishery Conservation and Management Act does not apply.

## VIII. COMMENT PERIOD, HEARINGS AND PROCEDURES FOR FINAL DECISIONS

All persons, including the Applicant, who believe any condition of the Draft PSD Permit as it relates to the changes in the Air Quality Impact Analysis is inappropriate is required to raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, 5:00 PM on September 25, 2017 to Thomas Cushing of MassDEP at the address listed in Section IX of this Fact Sheet.

Persons can arrange to view copies of the Draft PSD Permit, this PSD Fact Sheet, and the Applicant's applications at MassDEP's Southeast Regional Office located at 20 Riverside Drive, Lakeville, MA between 9:00 AM to 4:00 PM by calling the Southeast Region Records Coordinator at 508-946-2772. Copies of these materials are also available on MassDEP's website at: http://www.mass.gov/eea/agencies/massdep/news/comment/.

Copies of the Draft PSD Permit, this PSD Fact Sheet, and the Applicant's applications are available for review at the Sandwich Town Clerk's Office located at 130 Main Street, Sandwich, MA and at the Sandwich public library.

Note: the notification below will appear in the PSD Permit. MassDEP is providing the notification in this PSD Fact Sheet so that interested persons will understand the applicable appeal process for any PSD Permit that may issue following the Public Hearing and Comment Period.

Along with the PSD Permit, MassDEP is notifying each person of their right to appeal the issuance of any Final PSD Permit, in accordance with 40 CFR 124.15 and 124.19 as follows:

1. Within 30 days after the issuance of a final PSD Permit decision under 40 CFR 124.15, any person who filed comments on the Draft Permit or participated in any public hearing may petition USEPA's Environmental Appeals Board ("EAB") to review any condition of the Permit decision.

2. The effective date of the Permit is 30 days after service of notice to the Applicant and commenters of MassDEP's final decision to issue, modify, or revoke and reissue the Permit, unless review to the EAB is requested on the Permit under 40 CFR 124.19 within the 30 day period.

3. If any person appeals the Permit to the EAB, the effective date of the Permit is suspended until the appeal is resolved.

## IX. MassDEP CONTACTS

Any person may obtain additional information concerning the Draft PSD Permit between the hours of 9:00 AM and 4:00 PM, Monday through Friday, excluding holidays from:

Thomas Cushing, Permit Chief
Bureau of Air and Waste
Massachusetts Department of Environmental Protection
Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347
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