



January 21, 2014

Mr. James Belsky, Permit Chief
MassDEP Northeast Region
205B Lowell Street
Wilmington, MA 01887

**Re: Major Comprehensive Plan Application No. NE-12-022
Transmittal Number X254064 - Salem Harbor Redevelopment (SHR) Project
Draft PSD Permit and Proposed Air Quality Plan Approval**

Dear Mr. Belsky:

This letter supplements the submissions dated December 11, 2013, and January 10, 2014, with respect to the draft PSD permit and proposed Air Quality Plan Approval for the Footprint Power Salem Harbor Development LP (“Footprint” or “Applicant”) Salem Harbor Redevelopment Project (“Project”). This letter corrects two minor items and supersedes the January 16, 2013 letter. These corrections are under item 2, in the equation and in the revised CO concentration in auxiliary boiler exhaust. Specifically, this letter provides:

- (1) Revised air quality dispersion modeling results for PM_{10} and $PM_{2.5}$, reflecting the reduction in the PM_{10} and $PM_{2.5}$ emission rates for the GE turbine provided in our letters dated November 1, 2013 and January 10, 2014.
- (2) Updated CO and H_2SO_4 emission rates in parts per million (ppm) for the auxiliary boiler reflecting the updated emissions with incorporation of the oxidation catalyst.
- (3) Correction of several minor typographical errors in prior submissions.

1. Revised Dispersion Modeling Results for PM_{10} and $PM_{2.5}$

Dispersion modeling results for PM_{10} and $PM_{2.5}$ have been recalculated using the updated emission rates for normal operation as well as for startup and shutdown. The modeling procedures used are identical to those documented in our prior submissions. The model inputs and results are found in the updated Application Tables 4-1, 6-2, 6-3, 6-9 and 6-12, provided in Attachment 1. The maximum predicted 24-hr PM_{10} and 24-hr $PM_{2.5}$ impacts with respect to the Significant Impact Levels (SILs) are unchanged. This is because the ancillary sources (emergency diesel generator and emergency fire pump), rather than the combustion turbines, have the greatest predicted contribution to the maximum 24-hr PM impacts.

The maximum annual $PM_{2.5}$ impact with respect to SILs has decreased from 0.12 to 0.11 micrograms/cubic meter (ug/m^3) as a result of the updated lower emission rates for the combustion turbines.

The concentration statistics used for the 24-hr and annual PM_{2.5} increment consumption are different than the SIL statistics for PM_{2.5}. While the SIL statistics for PM_{2.5} are based on 5-year averages of the maximum concentrations at each receptor, the 24-hr PM_{2.5} increment consumption is based on the highest second-highest value at any receptor in any one year, and the annual PM_{2.5} increment consumption is based on the maximum concentration at any receptor in any one year. Using the PM_{2.5} increment consumption statistics with the updated lower emission rates, the 24-hr PM_{2.5} increment consumption decreases from 3.2 to 3.0 ug/m³, while the annual PM_{2.5} increment consumption remains unchanged at 0.12 ug/m³.

Enclosed is a disk containing all revised computer modeling files.

2. Calculation of Auxiliary Boiler CO and H₂SO₄ Emission in parts per million (ppm)

The auxiliary boiler CO and H₂SO₄ emissions in parts per million (ppm) corrected to 3% O₂ (dry basis) are calculated using Equation 19-1 from 40 CFR 60, Method 19. Equation 19-1 is solved for ppm at 3% O₂ dry, as follows:

$$\text{ppm} = (\text{E in lb/MMBtu}) / [(K)(8710 \text{ dscf/MMBtu})(20.9\% / (20.9\% - 3.0\% \text{ O}_2))]$$

Where K is the conversion from lb/dscf to ppm, which is 7.27 E-08 for CO and 2.54 E-07 for H₂SO₄. The updated calculated values are as follows:

CO: 4.7 ppmvd @ 3% O₂

H₂SO₄: 0.35 ppmvd @ 3% O₂

3. Correction of Minor Typographical Errors

Table 6-2 in Attachment 1 contains two typographical errors that have been corrected and are shown in bold. Attachment 2 shows corrections made to the lb/MW_{hr} values for CO in Table 2-1 of our December 11, 2013 Attachment 1, which had been inadvertently transposed.

If you have additional questions on this letter, please contact either me at (617) 803-7809 or George Lipka at (617) 443-7545.

Sincerely,



Keith H. Kennedy
Senior Consultant – Energy Programs

Attachments

ATTACHMENT 1
UPDATED MODELING TABLES
JANUARY 21, 2014

Table 4-1 National and Massachusetts Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS/MAAQS ($\mu\text{g}/\text{m}^3$)		Significant Impact Level ($\mu\text{g}/\text{m}^3$)	Maximum Predicted SHR Project impact
		Primary	Secondary		
NO ₂	Annual ¹	100	Same	1	0.4
	1-hour ²	188	None	7.5	41.8
SO ₂	Annual ^{1,3}	80	None	1	0.03
	24-hour ^{3,4}	365	None	5	0.7
	3-hour ⁴	None	1,300	25	1.1
	1-hour ^{5,6}	196	None	7.8	1.0
PM _{2.5}	Annual ⁷	12	Same	0.3	0.12 0.11
	24-hour ⁸	35	Same	1.2	3.2
PM ₁₀	24-hour ⁹	150	Same	5	4.3
CO	8-hour ⁴	10,000	None	500	112.4
	1-hour ⁴	40,000	None	2,000	313.6
O ₃	8-hr ¹⁰	147	Same	NA	NA
Pb	3-month ¹	0.15	Same	NA	<0.00016

¹ Not to be exceeded.
² Compliance based on 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area.
³ The 24-hour and annual average primary standards for SO₂ will be revoked.
⁴ Not to be exceeded more than once per year.
⁵ Compliance based on 3-hour average of 99th percentile of the daily maximum 1-hour average at each monitor within an area.
⁶ The 1-hour SO₂ standard was effective as of August 23, 2010.
⁷ Compliance based on 3-year average of weighted annual mean PM_{2.5} concentrations at community-oriented monitors.
⁸ Compliance based on 3-year average of 98th percentile of 24-hour concentrations at each population-oriented monitor within an area.
⁹ Not to be exceeded more than once per year on average over 3 years.
¹⁰ Compliance based on 3-year average of fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area.

Table 6-2 Stack Characteristics

Parameter	Turbine Stacks	Auxiliary Boiler Stack	Emergency Generator Stack	Fire Pump Engine Stack	Auxiliary Cooling Tower
Base Elevation, msl (feet/meters)	16 / 4.9	16 / 4.9	16 / 4.9	16 / 4.9	16 / 4.9
Stack Height (feet/meters)	230 / 70.1	230 / 70.1	86 / 26.2	22 / 6.71	23.3 / 7.1
Inside Stack Diameter (feet/meters)	28.3 / 8.6 (Corresponds to the effective area of both adjacent flues)	3 / 0.9	1 / 0.3	0.667 / 0.3	12 / 3.6
Number of Stacks	1 (with 2 adjacent flues modeled as a single stack)	1	1	1	3
Predominant Land Use Type	Rural	Rural	Rural	Rural	Rural
Stack Location (in NAD83): UTM-E (m) UTM-N(m)	345,732.6 4,709,832.6	345,738.1 4,709,835.2	345,836.1 4,709,846.0	345,760.2 4,709,848.0	345,837.0 4,709,808.2

Table 6-3 Turbine Load Scenarios and Emission Rates

Turbine Manufacturer	GE	GE	GE	GE
Operating Load	100%	75%	46%	Startup
Ambient Temperature (deg F)	90	20	20	50
Evap Cooler and Duct Firing Status	ON	OFF	OFF	OFF
Combined Turbine and Duct Firing Rate (MMBtu/hr) (both turbines)	4898	3580	2720	2530
Comment	Max Firing Case – GE	Intermediate Firing Case - GE	Low Firing Case - GE	Startup Worst Case Hour
Stack Exhaust Velocity (m/s)	18.87	15.82	11.95	12.89
Stack Exhaust Temperature (°K)	369.3	357.26	352.59	344.59
CO (g/s) (both turbines)	2.78	2.03	1.95	73.03
NO _x (g/s) (both turbines)	4.57	3.34	2.54	23.42
SO ₂ (g/s) (both turbines)	0.93	0.677	0.514	0.479
PM _{2.5} (g/s) (both turbines)	3.94 3.28	2.92 2.22	2.80 2.22	2.60 2.22
PM ₁₀ (g/s) (both turbines)	3.94 3.28	2.92 2.22	2.80 2.22	2.60 2.22

Table 6-9 Project Maximum Predicted Impact Concentrations Compared to Significant Impact Levels (micrograms/cubic meter)

Pollutant	Averaging Period	Maximum Predicted Salem Harbor Redevelopment Project Impact	SIL
PM ₁₀	24-Hour	4.3	5
PM _{2.5}	24-Hour	3.2	1.2
	Annual	0.42 0.11	0.3
NO ₂	1-Hour	41.8	7.5
	Annual	0.4	1
SO ₂	1-Hour	1.0	7.8
	3-Hour	1.1	25
	24-Hour	0.7	5
	Annual	0.03	1
CO	1-Hour	313.6	2000
	8-Hour	112.4	500

Table 6-12 Salem Harbor Station Redevelopment Project PSD Increment Compliance Assessment (micrograms/cubic meter)

Pollutant	Averaging Period	Project Increment Consumption ¹	Maximum Allowable PSD Increment
PM _{2.5} (µg/m ³)	24-Hour	3.2 3.0	9
PM _{2.5} (µg/m ³)	Annual	0.42 0.12	4

ATTACHMENT 2
UPDATED SHORT TERM EMISSION RATE TABLE
COMBUSTION TURBINE COMBINED CYCLE UNITS
JANUARY 21, 2014

Table 2-1. Short-Term Emission Rates for Combustion Turbine Combined Cycle Units

Pollutant	ppmvd at 15% O₂	lb/MMBtu	lb/hr (per Unit)	lb/MWhr
NO _x , unfired	2.0	0.0074	17.0	0.051
NO _x , duct-fired	2.0	0.0074	18.1	0.055
CO, unfired	2.0	0.0045	Not to exceed 8.0	0.025 0.027
CO, duct fired	2.0	0.0045		0.027 0.025
VOC, unfired	1.0	0.0013	3.0	0.009
VOC, duct-fired	1.7	0.0022	5.4	0.016
SO ₂ , unfired	0.3	0.0015	3.5	0.010
SO ₂ , duct-fired	0.3	0.0015	3.7	0.011
PM/PM ₁₀ /PM _{2.5} , unfired	N/A	0.0071	8.8	0.029
PM/PM ₁₀ /PM _{2.5} , duct-fired	N/A	0.0062	13.0	0.041
NH ₃ , unfired	2.0	0.0027	6.2	0.019
NH ₃ , duct-fired	2.0	0.0027	6.6	0.020
H ₂ SO ₄ , unfired	0.1	0.0010	2.2	0.007
H ₂ SO ₄ duct-fired	0.1	0.0010	2.3	0.008