March 3, 2015

Mr. Robert Stein, Chairman
State of Connecticut
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: ***Docket 192B-Towantic Energy, LLC Motion to Reopen and Modify the June 23, 1999 Certificate of Environmental Compatibility and Public Need based on changed conditions pursuant to Connecticut General Statutes §4-181a(b) for the construction, maintenance and operation of a 785 Megawatt dual-fuel combined cycle electric generating facility located north of the Prokop Road and Towantic Hill Road intersection in the Town of Oxford, Connecticut.***

Dear Chairman Stein,

Attached please find Bruce A Egan Sc.D., CCM report,

Review of Plume Rise and Meteorological Issue regarding the proposed CPV Towantic Energy Center

I am filing the report on behalf of Marian Larkin, intervener to Docket 192B, as she is unable due to caring for her seriously ill mother. Ms. Larkin has also requested me to represent her with respect to cross-examination or questions the Council may have.

I herewith certify that all Parties and Interveners have been electronically copied, or by US mail. An original and fifteen hard copies will be mailed or hand-delivered to the Council.

Thank you for your kind attention.

Respectfully,

Raymond Pietrorazio

cc: Service list

Review of Plume Rise and Meteorological Issues regarding the proposed CPV Towantic Energy Center.

Bruce A. Egan, Sc.D., CCM

Egan Environmental Inc.

Beverly, MA 01915

February 24, 2015

Prepared for Bedlam Farms

Middlebury, Connecticut

I have reviewed some specific plume rise and atmospheric dispersion modeling aspects of the permit application for the proposed CPV Towantic Energy Center as described in the November 2014 permit application prepared by Tetra Tech.

Proposed stack height of 150 feet.

One concern relates to the below Good Engineering Practice (GEP) Stack Height of 150 feet being proposed because of FAA concerns that , at the proposed location of the CPV Towantic Energy Center, a taller stack would potentially jeopardize the safety of air craft approaching and departing the Waterbury-Oxford Airport .

Good Engineering Practice refers to whether the turbulence generated by airflows over and around buildings or other structures near chimneys or exhaust vents would cause downwash of exhaust gases into the aerodynamic wake regions downwind of such structures. Downwash can prevent an effluent plume from clearing the wake of a structure and limits the amount of plume rise that helps lower the maximum ground level concentrations. The result is higher ground level concentrations and the deposition of particles close to the facility. If an exhaust stack is below a GEP stack height, dispersion modeling required for compliance purposes must include algorithms that quantify and simulate the effects of downwash in calculating downwind concentrations. The maximum off property ground level concentrations under downwash conditions are generally found at or near a source's property boundaries. The modeling process for downwash effects requires an analysis of the effects of building heights and widths and the proximity of the exhaust chimneys to the structures. This is coupled with the use of the Scire- Schulman downwash modeling routines. The permit application states that this modeling was done and acknowledges that the maximum predicted concentrations are, as expected, near the proposed facility's property lines. The results however show compliance with the air quality criteria. The adverse pollution effects will be larger under conditions of low load and during low wind speed nighttime hours when temperature inversions limit the vertical dispersion of pollutants.

It is important to recognize that constructing a shorter than GEP stack in compliance with FAA rules does not eliminate concerns about individual aircrafts being buffeted by the turbulence of buoyant plumes rising from the plant. Under high load conditions, the effluent plume will be very buoyant due to the high temperatures and large exit velocities of the exhaust gases. Very buoyant plumes not only rise to greater heights in the atmosphere but also contain the most vigorously turbulent eddy. The proximity of the CPV Towantic Energy Center to the airport increases the probability that the effluent plumes will affect aircraft in the area and the increased intensity of the buoyant plume turbulence presents a greater danger to smaller lightweight aircraft associated with the traffic at smaller airports. The spread sheet in the Appendix has been created to compare some of the plume rise related effects of the presently proposed CPV Towantic Energy Center with the exhaust gas specifications of the Towantic plant as described in the certificate to construct of 1999. The stack gas exhaust parameters for the proposed CPV center are shown for some of the different load and fuel use cases in the recent permit application. The parameters for the "OLD Towantic" were obtained from the Connecticut DEEP. For comparison purposes, the plume rises for both proposed plants are calculated using the Briggs plume rise equations incorporated into the EPA Industrial Source Complex (ISCST) model. Neutral atmospheric conditions and a nominal wind speed of 3.0 m/s are assumed at the stack top elevation. Larger horizontal wind speeds will result in lower plume rises and greater plume rises would be predicted with lower assumed wind speeds. The total plume height is the sum of the plume rise and the stack height- which is 150 feet for both hypothesized plants. To compare the potential plume rise of the proposed CVP Towantic Energy Center with the plume rises of the originally proposed facility, we can compare the original 100% base load cases for an ambient temperature of 59 degrees F with the CVP Cases #39 and #41 where final plume heights of 1611 feet and 2348 feet are calculated for the burning of Natural Gas and Distillate Oil respectively. These may be compared with the final plume heights of 1442 feet and 1878 feet respectively for the earlier proposed configuration for the same load, fuel use and ambient temperature conditions. One can see that the greater final plume heights for the present proposed plant are several hundred feet higher than for the former proposed plant for the same assumed meteorological conditions –thereby creating more hazardous conditions for aircraft.

The tightening of the National Ambient Air Quality Standards.

Since the permit application of the prior Towantic plant configuration, EPA has tightened some of the NAAQS. In February 2010, EPA promulgated a new one hour average NAAQS for Nitrogen dioxide concentrations of 188 ug/m3. Table L-11 of the permit application shows that the sum of all sources modeled and background concentration total 168.8ug/m3, or 90% of the present standard in the project area. Similarly, the total impact of all $PM_{2.5}$ sources and background in the project area totals 27.5 ug/m3 for the 24 hour NAAQS versus a standard of 35 ug/m3. This latter standard was promulgated in 2006 and represented nearly a factor of two tightening of the prior limit of 65 ug/m3. There is a limit to the number of new projects that can go forward without generating violations of either of these standards. The new standard limits also demonstrate how the regulatory ground rules can change quickly with time and, in effect, modify the scope and nature of development projects. EPA announced in October 2014 that it intends to tighten the present ambient air standard for ozone. In December, EPA noticed a "Workshop and Call for Information on Integrated Science Assessment for Particulate Matter" (See referenced 2014-12-03 Federal Register Notice). Although the mechanisms for implementing further reductions are not known, it is likely that further controls on emissions of nitrogen oxides, other ozone formation precursors and particulate matter will be called for. More generally, EPA continues to study air pollution health effects and consider modifications to compliance assessment methods and the values and associated averaging times for each of the NAAQS. With this in mind, it is appropriate to set priorities for consideration of future projects that will impact air quality in the region.

The most representative meteorological data for the permit air quality analyses.

The reason for the choice of using the Danbury Municipal Airport data for the dispersion modeling rather than the AWOS data collected at the Waterbury-Oxford Airport needs to be explained and justified. I understand the differences in the reporting thresholds for low winds at the two meteorological stations but the proximity of the Waterbury-Oxford station to the proposed power plant site would I think trump the difference in data reporting given the importance of local topography in calculating plume dispersion and trajectories. The facility will be in a complex terrain area and representative meteorological data is a priority to simulate flow patterns in such settings. Is the National Weather Service considering upgrading the AWOS Station to an ASOS station? There would be significant benefits to the airport operations decision makers with an upgraded system. Recognizing the desirability of more representative meteorological data in dispersion models, Air quality regulatory agencies generally allow the use of one year of onsite meteorological data for permitting in place of five years of data collected at a distant airport. There are therefore two options for demonstrating compliance using the more representative meteorological data of the Waterbury –Oxford Airport. One would be to require CPV Towantic to run the AERMOD model with 5 recent years of historic AWOS data. The second option would be to upgrade the AWOS station to ASOS capability and run AERMOD after a single year of new data has been collected.

References

http://www.gpo.gov/fdsys/pkg/FR-2014-12-03/pdf/2014-28278.pdf

MODELING PARAMETER COMPARISONS

	UNITS	CPV Towantic CASE 9	CPV Towantic CASE 41	OLD Towantic 100%load, nat gas	OLD Towantic 100%load, fuel oil
CAPACITY	MW	785	785	512	512
FUEL		NAT GAS	Distillate Oil	NAT GAS	Distillate Oil
PERCENT LOAD		100% BASE	100% BASE	100% Base	100% Base
# Units		2	2		
AMBIENT T(F)	F	59	59	59	59
AMBIENT T(k)	K	288.00	288.00	288.00	288.00
STACK EXHAUST TEMP(F)	F	183.56	294.8	200.948	281.858
STACK EXHAUST TEMP(K)	K	357.2	419	366.86	411.81
DIAM(FT)	FT	22	22	18.5	18.5
DIAM(m)	m	6.71	6.71	5.64	5.64
EXIT VEL(FT/S)	FT/S	56.20	68.84	58.40	67.82
EXIT VEL(m/S)	m/s	17.13	20.98	17.80	20.67
stack gas flow rate	m3/s	604.90	740.85	444.47	516.13
STACK HT(FT)	FT	150	150	150	150
STACK HT(m)	m	45.72	45.72	45.72	45.72
BUOYANCY FLUX, FB	m4/s3	365.55	722.54	298.04	484.06
momentum flux	m4/s2	2659.31	3400.65	1976.98	2374.91
U(stack height)	m/s	3	3	3	3
PLUME RISE(FB>55)	m	445.12	669.91	393.79	526.79
PLUME RISE(FB>55)	ft	1460.42	2197.99	1292.03	1728.41
Distance to FINAL RISE	m	1364.38	1606.77	1299.13	1459.50
PLUME HT(M)	m	490.83	715.63	439.51	572.51
PLUME HT(FT	FT	1610.72	2348.42	1442.29	1878.75
PLUME ELEVATION ABOVE STACK BASE(FT)	FT	1610.72	2348.42	1442.29	1878.75
PLUME ELEVATION ABOVE STACK BASE(m)	m	490.92	715.76	439.59	572.62
ISCST Final PLUME RISE-STABLE conditions	m	129.80	148.75	124.61	137.30
STABILITY PARAMETER	s-2	0.00119	0.00119	0.00119	0.00119
PLUME HEIGHT STABLE	m	175.52	194.47	170.33	183.02
PLUME HEIGHT STABLE	FT	575.99	638.17	558.95	600.59
DIST TO STABLE RISE	m	180.08	180.08	180.08	180.08
DIST TO STABLE RISE	FT	579.48	579.48	579.48	579.48