June 18, 2010

EXPERT REPORT

Review of Proposed Conditional Approval

Major Comprehensive Plan Application
(Brockton Power Company LLC)
350 Megawatt Power Plant at Oak Hill Way
Brockton, Massachusetts

Prepared for

City of Brockton, Massachusetts

Prepared by

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1.0 INTRODUCTION

This expert review was prepared by Paul A. Eisen, CCM, Principal Scientist of Roux Associates, Inc. (Roux) on behalf of the City of Brockton, Massachusetts. The review is of the May 3, 2010 Proposed Conditional Approval issued by MassDEP of a Major Comprehensive Plan Application (MCPA). The MCPA was submitted by Brockton Power Company LLC (the "Applicant") for the proposed construction and operation of a 350 megawatt (MW) quick-start, combined cycle, natural gas-fired power plant (Brockton Power Plant Project) in the Oak Hill Industrial Park, Oak Hill Way, Brockton, Massachusetts.

Opinions reached in this review are based on the following:

- Review of the MCPA, Proposed Conditional Approval, Project Change Filing of April 9, 2010 (with Massachusetts Energy Facilities Siting Board), and other permit application related documents in the public record.
- Publicly available reports, maps, diagrams, and other documents.
- My professional experience, education, and training in environmental science, meteorology, and air permitting for major projects.

I reserve the right to revise or supplement my opinions should new information, data, maps, documents, photographs, or other materials become available, or if other technical issues arise. I have over 30 years experience in air quality permitting, meteorology and environmental impact assessment. I am also personally familiar with the geography and climate of southeastern Massachusetts, having been born and raised in Fall River, Massachusetts. I have B.S. and M.S. degrees in Meteorology, and am a Certified Consulting Meteorologist (CCM), certified by the American Meteorological Society (Certificate #534). My professional profile is found in Appendix A.

2.0 ASSIGNMENT

I was asked to develop opinions and comments regarding the Proposed Conditional Approval (Application No. 4B08015; Facility No. 323268) for the Brockton Power Plant Project. My review focused on Clean Air Act related topics, such as the completeness and reliability of the air quality impact assessment, adequacy of the permit application review process and Proposed Conditional Approval with respect to key issues (e.g., proposed emission rate limits, New Source Review and Prevention of Significant Deterioration (NSR/PSD) permitting issues, adequacy of Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER) determinations, Risk Management Planning, and Environmental Justice assessment).

3.0 SUMMARY

The details regarding my specific comments and opinions are provided in Section 4. Overall, I believe that the Proposed Conditional Approval is based, in part, upon inadequate or incomplete information and assessment, and thus the project should not be approved. Furthermore, I have specific comments on various provisions of the Proposed Conditional Approval. Key issues that I believe need to be addressed, include:

- likely applicability of major air permit requirements (PSD permit);
- incomplete application of proposed emission rate limits to normal operating conditions (BACT and LAER determinations that are not applied to significant portions of normal facility operations);
- use of meteorological data in the underlying ambient air quality impact assessment that may not be representative of the project site and environs, and may result in significant underestimates of potential impacts and maximum impact locations (including potential impacts in Environmental Justice population areas);
- inadequate assessment of nearby sources, and the need for interactive modeling, when predicting maximum short term impacts;
- inadequate assessment of worst case conditions that might be associated with an accidental release of ammonia; and
- incomplete assessment of project equipment alternatives (consideration of a group of small turbines that may be more energy efficient and reliable than the proposed alternative).

This listing of key issues provided above is not all inclusive, but it does characterize the nature of my comments and underscores the fact that there are many issues that need further consideration and assessment before MassDEP can determine whether it can conditionally approve this project.

4.0 SPECIFIC COMMENTS AND OPINIONS

Comments are provided below, by Section of the Proposed Conditional Approval:

Section IV. Emission Limits

1. Table 1A provides Short Term Emission Limits for the Combustion Turbine. These limits were developed based upon analyses and assessments contained in the underlying air permit application supporting the proposed permit[1]. Section 4.3.3 of that application presents a Best Available Control Technology (BACT) assessment for emissions of volatile organic compounds (VOCs). This VOC BACT assessment concludes (in Section 4.3.3.2) that:

   > *"… The Project is proposing to use an oxidation catalyst to control its VOC emissions for the Project to 1 ppm when firing at 75% load or higher. These emissions levels meet the most stringent permitted VOC emission rates of combined-cycle gas turbines currently in operation for firing natural gas. Therefore, this emission rate is classified BACT for the proposed unit."*

   Table 1A proposes an emission limit of 2.5 ppm when the unit is duct fired. A significant number of duct firing hours (e.g., up to 2,720 hours per year[2]) are projected for this facility. The proposed emission limit fails to meet the specified BACT emission rate limit for VOC emissions. I do not find a separate BACT justification for this separate emission limit for duct firing conditions in the underlying permit application.

2. Table 1B provides Short Term Emission Limits for Each Emergency Generator. The emission limit for $PM_{2.5}$ is proposed at 0.2 pounds per hour. I am concerned that actual Emergency Generator emissions of $PM_{2.5}$ may be far higher than the proposed emission limit. I have not found technical support in the underlying air permit application for the Emergency Generator units being able to meet such a low limit. As shown in Table 1 below, an independent estimate of these potential $PM_{2.5}$ emissions can be made based upon current and accepted EPA (AP-42) emission factors. Here, calculated emissions (1.1 pounds per hour), are as much as 556 % higher than proposed in the Conditional Approval. This could be very significant, because the $PM_{2.5}$ emissions from the Emergency Generators provide significant contributions to maximum predicted $PM_{2.5}$ impacts of the facility for comparison to 24 hour $PM_{2.5}$ significant impact levels.

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[1] Brockton Power Company LLC, Consolidated Air Plan Approval Application, submitted to Department of Environmental Protection on April 25, 2008, updated March 25, 2010 and April 30, 2010.

[2] Commonwealth of Massachusetts; Energy Facilities Siting Board; EFSB 07-7/D.P.U. 07-58/D.P.U. 07-59, Response to Record Request "RR-COB-2", June 26, 2008, page 3 of 6.

Table 1. **Estimate of Potential Hourly $PM_{2.5}$ Emissions[1,2] From Combustion of Diesel Fuel in Emergency Generators**			
Assumptions:			
1.	Estimate uses emissions factors in EPA AP-42 Table 3.4-2 for Large Uncontrolled Stationary Diesel Engines (>600 hp).		
2.	Assumes that all condensable particulate is PM-2.5 or smaller (convervatively).		
3.	$PM_{2.5}$ emissions include both filterable and condensable particulate .		
	AP-42 Emission Factor for Filterable Particulate <3 μm =	0.0479	lb/MMBtu
	AP-42 Emission Factor for Condensable Particulate =	0.0077	lb/MMBtu
4.	Estimated Diesel Engine Capacity (@ 100% power) =	20	MMBtu/hr
	Estimated PM-2.5 Emission Rate (100% Power) =	**1.112**	**lb/hr**
	Estimated PM-2.5 Emission Rate (60% Power) =	**0.6672**	**lb/hr**
	Proposed Maximum Emission Rate =	**0.2**	**lb/hr**
	Max. % Difference, Conditional Approval vs. AP-42 =	**556%**	
	[1] Estimate is based on EPA AP-42 Factors, and is for each of three Emergency Generators.		
	[2] According to the EPA (Retrofit Program), the use of Ultra Low Sulfur Diesel reduced particulate emissions from 5 to 9 percent. The estimates presented here do not account for these relatively small potential reductions.		

3. Table 1A, 1B, 1C, 1D, 2, and 3 Notes (page 13 of 46) require clarification in several instances:

   a. Footnote 3 requires clarification regarding what is defined as "normal operating range." Also, if it is possible that the power generating equipment will occasionally operate at a load higher than 100 percent[3] (for short periods of time), it would seem that the term "100 percent load" as expressed in this Note should be replaced by the term "Maximum Operating Load."

   b. Footnote 4 states that maximum emission rates are based upon 60 percent load, but there is no justification for this. My calculations, as provided in Table 1, indicate that maximum potential $PM_{2.5}$ emissions occur at 100 percent load. Therefore, Table 1B is inaccurate.

   c. Footnotes 6, 7, 8, and 12 provide descriptive information on how annual emissions limits were derived for the Facility (as summarized in Table 3). The assumed number of annual startups and shutdowns are not specified. This is important since CO emissions are limited to 98.5 tons, and the PSD permitting threshold is only slightly above that value (100 tons). CO emissions during startups are proposed to be limited to 784 lbs/hr, much higher than the 12.5 pounds per hour emission limit proposed when the oxidation catalyst is fully effective. It may be necessary to establish a limit on the number of startups and shutdowns

[3] Presumably 350 MW.

per year in order to confirm that there will not be a potential for the PSD permitting threshold for CO to be exceeded.

d. Full documentation explaining the calculation of these specific long term emission rate limits should be provided for review. Also, data that demonstrates the equipment will have the ability to meet these limits should be provided for review (e.g., equipment manufacturer guarantees).

Section V. Prevention of Significant Deterioration (PSD)

1. The Proposed Conditional Approval notes that "US EPA Region I has the responsibility to determine PSD applicability for this project." Has EPA Region I ever made a formal written determination regarding PSD Applicability for this project? If not, such a determination should be requested and received. If a determination has previously been made by EPA, the determination needs to be updated due to recent and directly relevant regulatory developments.

   Specifically, on May 13, 2010 the US EPA issued its final greenhouse gas (GHG) permitting rule, referred to as the "Tailoring Rule." The Tailoring Rule (revisions to 40 CFR Parts 51, 52, 70, and 71) incorporates GHG emissions into the existing Title V and PSD permitting programs. The PSD permitting threshold for new major sources of GHG emissions is set at 100,000 tons per year. The proposed Brockton facility is well over that threshold, with annual potential emissions of CO_2 at 1,094,900 tons (more than 10 times the newly established threshold for PSD permitting). The key issue in this instance is how US EPA interprets the status of the Brockton Power Plant project with respect to the newly established timelines for implementing the rule. Notably, after July 1, 2011, sources will not be able to commence construction of a new source, not otherwise applicable to PSD permitting requirements, without issuance of a PSD permit for GHG emissions. If EPA determines that the Brockton Power Plant project triggers PSD applicability for any other criteria pollutant, the facility will need to prepare a PSD permit application considering that criteria pollutant, as well as GHG emissions. This permitting requirement would be effective as of January 1, 2011. One of the key requirements of this new rule with respect to the proposed Brockton Power Plant, is what would be considered BACT for GHGs. I discuss this issue further in my comments on the current BACT analysis for CO_2 (found below in "Section VII. BACT Analysis" of this review).

Section VI. Emission Offsets and Nonattainment Review

1. The project is subject to Lowest Achievable Emission Rate (LAER) requirements for NOx emissions. There is a demonstration (Section 4.2, Consolidated Air Plan Approval Application) of how the proposed LAER emission rate limit for NOx (2 ppmvd @ 15% O_2) was developed for emissions between 60 and 100 percent load. However, I have not found a separate LAER demonstration for the Startup and Shutdown emission rate limit for NOx, which is set at levels that are 50 % higher than the LAER Limit. Startup and Shutdown conditions are part of a normal operating scenario for this facility. The applicant estimated approximately 150 startups and 150 shutdowns per year.

However, there is no limit on the number of startup/shutdown events, and the mid merit nature of the facility (ISO-NE dispatch when all other base load facilities have been dispatched) could result in significantly more Startup and Shutdown events than estimated. The Applicant should develop a LAER analysis regarding proposed maximum allowable NOx emissions during Startup and Shutdown events.

2. As noted by the MassDEP (Conditional Approval p. 17):

   "…310 CMR 7.00: Appendix A requires that the Applicant demonstrate, and the Department concur, that the benefits of the proposed project significantly outweighs the environmental and social costs imposed as a result of the project's location, construction or modification (310 CMR 7.00: Appendix A (8)(b)). This demonstration requires analysis of alternative sites, sizes, production processes, and environmental control techniques."

   The alternative project size analysis (Section 4.2.4.2, Consolidated Air Plan Approval Application) notes that the potential use of multiple, smaller turbines was not pursued because such a configuration would have higher capital cost on a dollars per installed MW basis and would have a marginally higher heat rate (thus having higher air emissions on a lbs/MW-hr basis).

   This discussion is the extent of analysis of the potential for use of multiple, smaller turbines in the Consolidated Air Plan Approval Application. This is of great concern, because the statements are unsupported by technical data, and do not address site specific operating requirements that would seem to suggest that a further and more detailed analysis is warranted.

   More specifically, the construction of one large combustion turbine which will undergo numerous startup and shutdown events may not be as energy efficient or reliable as a grouping of smaller turbines (say 3 or 4) which could operate in combined cycle mode at lower energy output than could the combustion turbine proposed for this project. For example, the proposed combustion turbine equipment will operate in the less efficient simple cycle mode until it reaches 197 MW output. Duct firing is also less energy efficient, and could potentially be minimized or eliminated if smaller turbines were utilized to generate the 350 MW of desired maximum output. Finally, from a reliability standpoint, the use of a small grouping of turbines provides the potential for generating power at 75 or 80 percent of maximum output if one of the combustion turbines happens to need maintenance or is out of service. A maintenance or out of service condition for the single combustion turbine proposed for this site leaves no backup combustion turbine power in such events, a potentially significant disadvantage to such an equipment design and size arrangement.

3. Tables 5A, 5B, and 5C discuss the results of the predicted ambient air quality impacts for the proposed project. However, surface meteorological data used to estimate these potential maximum air quality impacts are from Boston's Logan Airport. I have investigated Logan Airport's measured weather conditions over a recent five year period. In doing this, I compared the observations of wind speed and wind direction to equivalent data from an alternative site (Taunton, Massachusetts) that I suspect is more representative

of surface conditions in the Brockton area. This analysis is discussed in more detail below. In my opinion, based on the comparative analysis provided below, the sufficiency and completeness of the National Ambient Air Quality Standard attainment demonstration needs to be re-assessed. I believe that it is quite possible that predicted air quality impacts have been significantly underestimated.

The Boston Logan Airport weather station site is in the immediate vicinity of the coast, and can be expected to be subject to frequent land and sea breeze effects that are typical of such coastal locations. The presence of coastal effects can substantially diminish the representativeness of wind speed and wind direction conditions if they are to be applied to conditions at an inland site such as Brockton. Wind speed and direction values are extremely important in air quality impact assessment because they determine the magnitude and location of maximum impacts. Most importantly, coastal sea breeze regimes increase average wind speeds, and can falsely indicate that ventilation and dilution of stagnant air quality conditions will occur when, in fact, this is not likely to be the case. A far more representative site for climatologically representative surface weather conditions in Brockton may be the Taunton, Massachusetts office of the National Weather Service. This official data collection site is positioned less than half the distance from Brockton, compared to the Logan Airport site (9 miles vs. 21.5 miles), and is in a comparable inland setting.

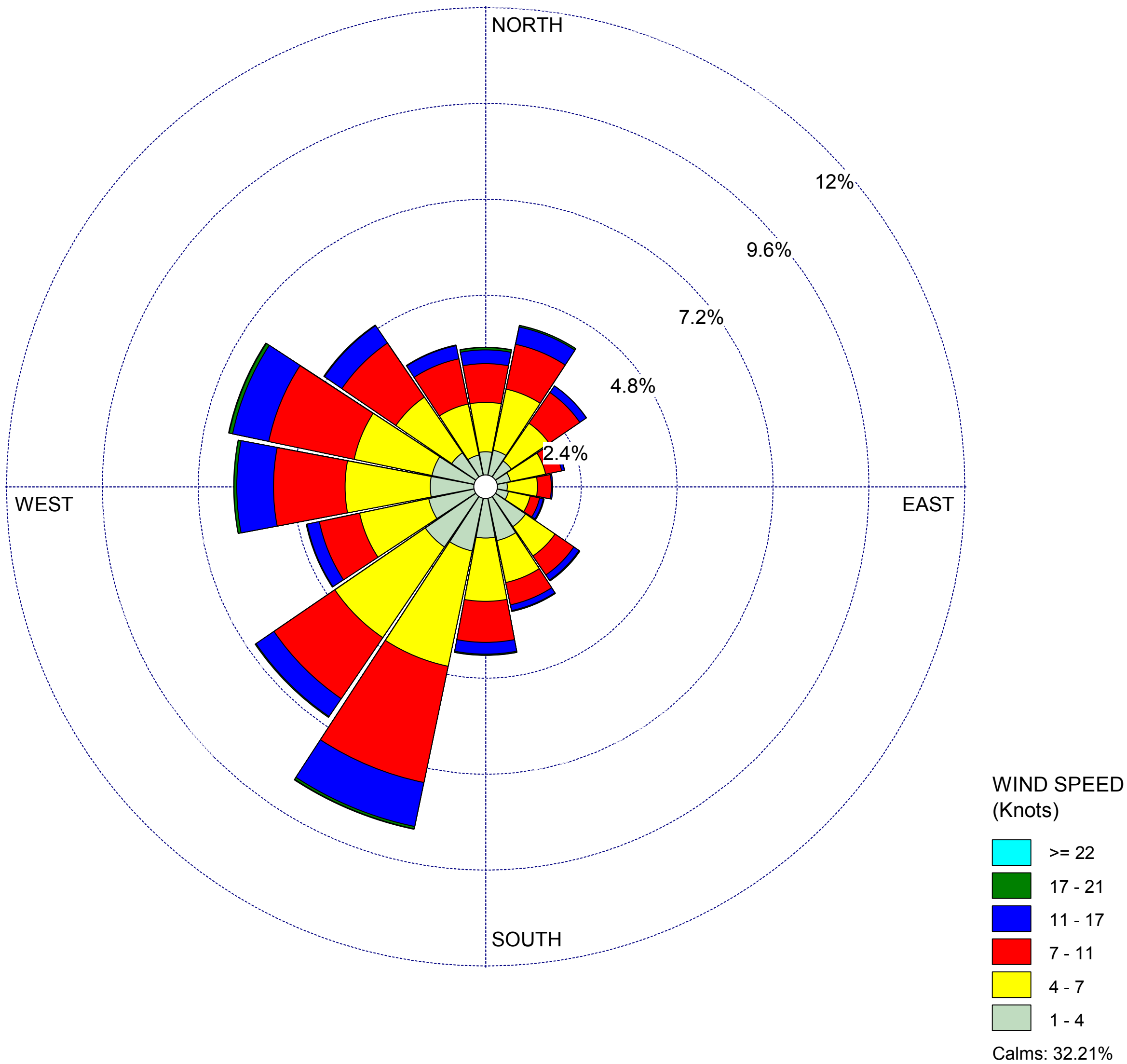
I reviewed five years of the most recently available weather data (2005 – 2009) from Logan Airport and the National Weather Service Office at Taunton, Massachusetts. Figures 1 and 2 present Wind Rose Analyses for each of the five year data sets for comparative analysis. Wind roses depict the frequency of occurrence of wind direction and speed classes for each of the commonly referenced wind direction sectors (N, NNE, NE, etc.). Five years of data was composited for each site because this is a robust enough data set to be considered a climatologically significant data set. In reviewing these Figures, it is clear that Logan Airport wind speed and wind direction data are highly influenced by the station's close proximity to the Atlantic Ocean. These coastal effects include a substantially higher average wind speed at Logan Airport, 10.8 mph (9.37 knots), compared to 5.5 mph (4.77 knots) at the Taunton site. The Logan Airport site also has a higher prevalence of easterly winds, and substantial differences in prevalence and speed of various westerly wind directions. This is indicative of the existence of a frequent and potentially highly localized sea breeze regime. Like Taunton, the Brockton site lies in an area of southeastern Massachusetts that is substantially inland and probably not as subject to the local coastal effects that are observed at Logan Airport. I believe that this comparative analysis of five years of recent data demonstrates the significant differences between data collected from these two sites. It also indicates that the magnitude of predicted impacts for the Brockton site may have been significantly underestimated, and that the probable location of those maximum impacts may have been incorrectly determined.

WIND ROSE PLOT:

Figure 1. Taunton, MA
2005-2009 Wind Rose

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2005 2006 2007 2008 2008 2009** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **Roux Associates, Inc.**	
		MODELER: **Paul Eisen**	
	CALM WINDS: **32.21%**	TOTAL COUNT: **42859 hrs.**	
	AVG. WIND SPEED: **4.77 Knots**	DATE: **6/12/2010**	PROJECT NO.:

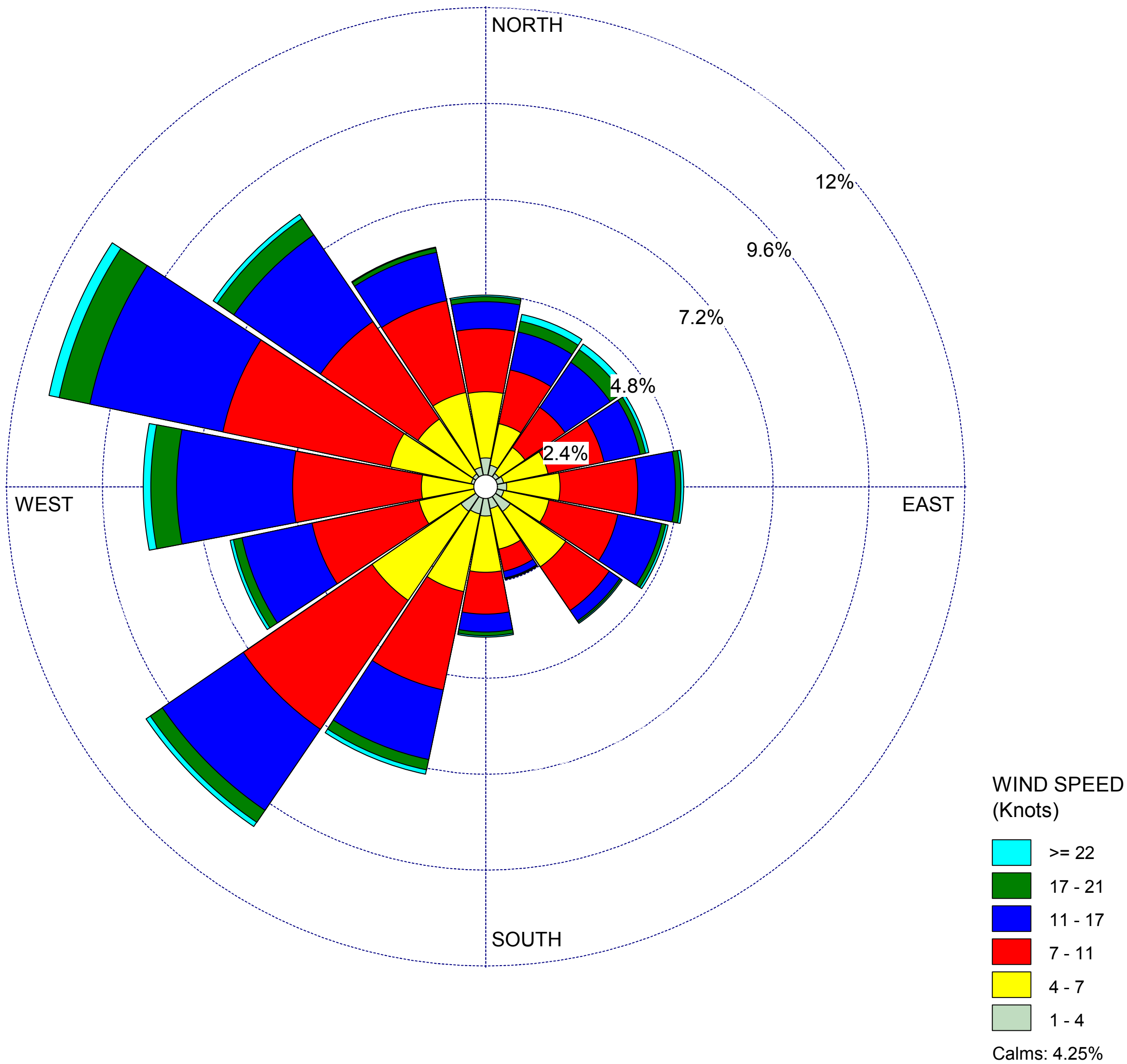
WRPLOT View - Lakes Environmental Software

WIND ROSE PLOT:

Figure 2. Boston, MA - Logan Airport 2005-2009 Wind Rose

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2005 2006 2007 2008 2009 **Jan 1 - Dec 31** **00:00 - 23:00**	**Roux Associates, Inc.**	
		MODELER: **Paul Eisen**	
	CALM WINDS: **4.25%**	TOTAL COUNT: **43232 hrs.**	
	AVG. WIND SPEED: **9.37 Knots**	DATE: **6/12/2010**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

One related subject that clearly needs further investigation is the potential for a large number of hours of stagnant air quality conditions, and how those potential conditions might affect maximum predicted impacts. Taunton data (Figure 1) show that calm winds occur during 32.2 % of total hourly observations (42,859 hours of data over 5 years). Logan Airport data indicate that calm conditions occur only about 4.25 % of the time (43,232 hours of data over the same 5 years). The presence of calm winds for approximately one-third of total hourly observations over a five year period is unusual and potentially highly significant. Such observations, made so close to the Brockton Project site, indicate that there is a need to investigate whether these observations are the result of some unique station features (station siting issues). If not, and their representativeness of the area is confirmed, it is also appropriate to assess the likelihood of a similar regime occurring at nearby Brockton. The potential effect of a calm wind regime on worst case short-term air quality impacts is very large, and special assessment is warranted.

4. The ambient air quality impact assessment presented by the Applicant provides an assessment of the potential significance of impacts for $PM_{2.5}$, but does not follow EPA's latest recommendations for a complete analysis (EPA Memorandum of March 23, 2010, see Appendix B). The model used for near term $PM_{2.5}$ modeling, AERMOD, does not account for the secondary formation of $PM_{2.5}$ which could be caused by the project's significant potential emissions of oxides of nitrogen (NOx) and ammonia (NH_3). The recent EPA guidance states:

   "While representative background monitoring data for $PM_{2.5}$ should adequately account for secondary contribution from background sources in most cases, if the facility emits significant quantities of $PM_{2.5}$ precursors, some assessment of their potential contribution to cumulative impacts as secondary $PM_{2.5}$ may be necessary."

   The fact that the analysis does not assess the potential for secondary formation of $PM_{2.5}$ needs to be discussed. The important factors that will determine the potential for a significant contribution to observed $PM_{2.5}$ from secondary $PM_{2.5}$ formation have not been determined. The policy of the Massachusetts DEP regarding the assessment of this potential for secondary formation considering the new EPA Guidance is not known, or how that policy is to be applied to this proposed site.

5. The ambient air quality impact assessment prepared by the Applicant in support of the air permit and summarized in Tables 5A, 5B, and 5C does not include a complete analysis of potential maximum 24-hour $PM_{2.5}$ impacts from all appropriate nearby sources. In fact, it is unclear whether the need for interactive modeling was correctly determined. The air permit application (page 4-14)[4] noted that:

   *"An evaluation by MassDEP of potential interactive sources has revealed that there are no major sources, **based on actual emissions**, of PM_{10}, $PM_{2.5}$, CO, NOx, or SO_2 within 10 km from the proposed BCE stack. Therefore, an interactive source analysis is not warranted…* (emphasis added)."

[4] Brockton Power LLC, op. cit., page 4-14

However, the need for an interactive analysis for a site to assess potential short-term air quality impacts should be based on an assessment of potential emissions, not actual emissions. A complete and accurate emissions inventory of all nearby sources of $PM_{2.5}$ and their potential short term $PM_{2.5}$ emissions should be assembled and assessed. For example, the wastewater treatment facility that is immediately adjacent to the proposed power plant site, operates several diesel fired emergency generators, several boilers, and a residuals landfill (a potentially large source of fugitive $PM_{2.5}$ emissions) in addition to the sludge incinerator. Yet, only the sludge incinerator was included in the assessment of potential cumulative 24- hour $PM_{2.5}$ impacts. Furthermore, a potentially large source of fugitive particulate emissions (Trojan Recycling, Inc.) is located approximately 0.8 miles from the site (to its North) at 71 Forest Street. This facility is required by the Brockton Board and Health to conduct biannual monitoring of particulates due to its potential $PM_{2.5}$ emissions. Estimates of this source's emissions, as well as biannual monitoring data results, need to be reviewed and considered in determining the need for and extent of interactive source assessment.

6. I am also concerned that the Supplemental Air Quality Dispersion Modeling prepared by the Applicant in support of the air permit and summarized in a Siting Board filing[5] indicates a potential for significant short-term $PM_{2.5}$ impacts. The analysis provides an assessment of potential impacts from the combined operation of project cooling towers, black start generators and combustion turbine. The analysis reveals the potential for PM_{10} impacts of 3.34 $\mu g/m^3$. How much of this potential PM_{10} impact is potential $PM_{2.5}$ impact? Does this potential impact analysis include a separate assessment of simultaneous operation of two of the three "black start" generators, since this is a potential worst case condition?

7. Statements regarding the probable location and value of potential maximum annual $PM_{2.5}$ impacts with respect to Environmental Justice (EJ) communities (e.g., page 21 of 46, Proposed Conditional Approval) need to be re-assessed in light of the comments discussed above (e.g., use of Logan Airport meteorological data).

Section VIII. BACT Analysis

1. The BACT summary for CO_2 emissions states (Proposed Conditional Approval, p. 23) that:

   "BACT for CO_2 emissions will be achieved by using a highly efficient water cooled F-Class turbine in a combined cycle mode firing natural gas exclusively"

   The unit will frequently be operated in simple cycle mode, start-up and shutdown mode, and duct fired mode. These modes of operation will not be as energy efficient as the combined cycle mode. There is no quantitative analysis of how such operations could be minimized. The cost effectiveness of such potential minimization options (e.g., no duct firing, reasonable limits on hours of operation to be allowed in simple cycle mode) needs to be examined.

[5] Commonwealth of Massachusetts, Energy Facility Siting Board, op. cit., pages 4-6

Furthermore, the alternative of using a grouping of smaller turbines to meet BACT (see Section VI, Comment 2) has not been quantitatively assessed as a means to improve overall energy efficiency and system reliability. This needs further explanation and analysis.

Finally, the total reliance on one non-renewable fossil fuel source (natural gas) for the main power generating equipment on site (combustion turbine, heat recovery steam generator, auxiliary boiler) seems unwise from a reliability and operability standpoint, and may also not meet BACT for CO_2. MassDEP should require analysis of the potential for the use of some form of renewable energy at the site (e.g., as a back-up fuel or power source).

2. As noted earlier (Section IV, comment 1) the BACT summary for VOC emissions states that VOC emissions will be controlled with an oxidation catalyst. The oxidation catalyst minimizes VOC emissions to 1 ppmvd @ 15% O_2. However, the effectiveness of the catalyst is diminished when the unit is in duct fired mode, and the proposed VOC limit for that condition is more than twice as high at 2.5 ppmvd @15% O_2. Besides not being an energy efficient mode of operation, duct firing increases VOC emissions substantially. The formal BACT determination accompanying the permit application[6] notes that:

   > *"The Project is proposing to use an oxidation catalyst to control its VOC emissions for the Project to 1 ppm when firing at 75% load or higher. These emissions levels meet the most stringent permitted VOC emission rates of combined-cycle gas turbines currently in operation for firing natural gas. Therefore, this emission rate is classified as BACT for the proposed unit."*

   The duct firing mode is not discussed in this BACT determination and has not been justified at the stated level of 2.5 ppmvd @15% O_2. The unit has the potential of operating in the duct firing mode more than a few thousand hours per year. A BACT analysis for this mode of operation needs to be provided, and the potential prohibition of duct firing needs to be considered based on standard BACT criteria.

Section XI. Sound

1. The City of Brockton has its own Noise Code and Noise Standards[7]. These standards need to be discussed and their applicability to the project needs to be determined. Some of the proposed Allowable Sound impacts at the Property Line (Tables 7A and 7B) will not meet these local standards.

2. There is a potential for the two (2) emergency generator sets to be operated simultaneously, if there were a need to provide a "black start" (start up without power from the regional power grid). Note 2, accompanying noise limits in Table 7A and 7B, states that the noise limits include operation of one (1) emergency engine generator set under load for readiness test purposes. Tables 7A and 7B need to be revised to reflect the potential for simultaneous operation of two (2) emergency generators.

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[6] Brockton Power, LLC., op cit. Section 4.3.3.2, Page 4-27
[7] City of Brockton Code, Art. III § 27-24.2

3. The noise mitigation measures include 116-foot tall barrier walls for the HRSG. The top of the HRSG will be open and exposed to the outdoors, allowing noise to emanate unabated from above the HRSG. Did the noise modeling supporting the permit application adequately account for the potential of atmospheric temperature inversions and their deflection of this noise back down to the surface and toward nearby residential locations? Under conditions of a temperature inversion (temperature increasing with increasing height), the sound waves will be refracted downwards, and therefore may be heard over larger distances. Temperature inversions are common in this area, most often happening during clear nights after the sun goes down, and when the ground cools off quickly, while the air above the ground remains warm.

Section XII. Special Conditions

1. There is no special condition that prohibits simultaneous operation of the auxiliary boiler and gas turbine. This is an unnecessary mode of operation. According to the Applicant[8]:

   > *"…the 60 MMBtu per hour auxiliary boiler is used to warm the HRSG, hence it is clearly not required once the 2,004 MMBtu per hour gas turbine is started. Accordingly, the Company would expect that any DEP Air Plan approval for the Project would include an enforceable permit condition that would preclude simultaneous operation of the auxiliary boiler and the gas turbine."*

2. There is no special condition that prohibits the emergency engine generator sets from providing peaking power to the electric grid. This is an unnecessary mode of operation that would increase short term $PM_{2.5}$ air quality impacts locally, and perhaps result in significant air quality impact. According to the Applicant[9]:

   > *"…The company also anticipates that the DEP Air Plan approval will include an enforceable permit condition that would preclude use of the generator sets to provide peaking power to the grid."*

3. Special Condition 20. In addition to the Applicant complying will all applicable requirements of 310 CMR 7.71 (Reporting of Greenhouse Gas Emissions), the Condition fails to note that the Applicant must comply with all applicable requirements of the U.S. EPA Greenhouse Gas Reporting Rule[10], and recently promulgated Greenhouse Gas "Tailoring Rule."

Section XIII. Monitoring and Recording Requirements

1. Item 1 fails to consider the requirements of the EPA Greenhouse Gas Reporting Rule for monitoring for exhaust gas flow and CO_2.

2. Item 9 fails to include CO_2 as one of the "direct-compliance" monitors based upon determination of the applicable provisions of U.S. EPA Greenhouse Gas Reporting Rule, and recently promulgated Greenhouse Gas "Tailoring Rule."

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[8] Commonwealth of Massachusetts, Energy Facility Siting Board, op. cit., pages 1-2.
[9] Commonwealth of Massachusetts, Energy Facility Siting Board, op. cit., pages 2-3.
[10] 40 CFR Part 98

3. Item 18 fails to require that each hour that the NH_3 CEM is not available be counted as downtime and not "maintenance" when tabulating CEMs percent available per proviso XIII.7.

Section XIV. Record Keeping Requirements

1. Item 6 fails to require that the applicant record **corrective actions** associated with problems, upsets, or failures of the emission control systems, DAH, CEMS, COMS, or ammonia handling systems.

2. Item 7 fails to include 40 CFR Part 98 in the list of applicable regulations with record keeping requirements.

3. Item 8 fails to include Tables 1A, 1B, and 2 in the list of Tables that the Applicant shall maintain records demonstrating compliance.

Section XV. Reporting Requirements

1. Item 6 fails to require pounds per hour, and pounds per day be included as reporting requirements for NH_3 emissions reporting, in addition to ppmvd corrected to 15% O_2.

Section XVI. Testing Requirements

1. Item 9 fails to include 40 CFR 98 to the listing of applicable testing requirements.

Section XVIII. Construction Requirements

1. Consideration should be given to requiring the Applicant to prepare a Community Air Monitoring Plan for monitoring and abating air and noise impacts during the period of project construction. For instance, it is unclear as to the presence or extent of contaminants of concern on the existing site, and the potential for offsite migration as a result of project excavation and construction activities. Prior characterizations of existing environmental conditions of the site (soil and groundwater test results, Phase I assessments, spill history) should be consulted in making this determination.

2. Construction at the site will disturb more than one acre. Construction activities (which include soil disturbing activities such as clearing, grading, excavating, stockpiling, etc.) that disturb one or more acres are regulated under the U.S. EPA's NPDES stormwater program. Operators of regulated construction sites are required to develop stormwater pollution prevention plans; to implement sediment, erosion, and pollution prevention control measures; and to obtain coverage under a state or EPA NPDES permit.

Section XIX. Section 61 Findings

1. With respect to Table 8 – Summary of Impacts and Mitigation Measures, the following comments are made:

- Air Quality – The statement that Maximum ground-level concentrations of criteria pollutants will be well below U.S. EPA and Massachusetts Significant Impact Levels (SILs) needs to be re-evaluated in light of comments provided earlier in this review. For instance, the use of Boston's Logan Airport as the site of meteorological data for use in atmospheric dispersion modeling is particularly problematic and may have resulted in an incomplete and inaccurate assessment of the project's potential air quality impacts.

- Hazardous Materials and Waste Management – Table 8 states:

  > *"aqueous ammonia will be stored in a fully diked tank, with appropriate safety controls and emergency response plans. The tank will be located within ventilated building minimizing impacts in the event of a tank failure."*

  The assessment regarding the potential consequence of an accidental release of ammonia is severely flawed.

  The permit application[11] assessment claims that an assessment has been made of *"the worst-case catastrophic accident conceivable."* However, this is far from the case. The worst case accident conceived by the Applicant involves spilling the entire volume of the tank (15,000 gallons), but then takes credit for the mitigation that might be offered by plastic ball-like baffles that would float over the spilled liquid and reduce the ammonia vaporization rate by 90 percent. It then also takes credit for the fact that the tank is enclosed by a building. The modeling presented assumes that the release, which has already been reduced by 90 percent, has its potential impact further reduced by the presence of a containment building, and ultimate release through a vent near the building roof top. Based upon these assumptions, and the modeling techniques employed, the Applicant claims that:

  > *"the worst-case catastrophic spill of the entire tank is less than 2 ppm. This is very much below the ammonia Emergency Response Planning Guideline ERPG-2 level of 150 ppm and the odor threshold of approximately 5-50 ppm."*

  Painting such a rosy picture as a "worst case" analysis is a sad example of how dangers posed by a potentially toxic chemical release can be severely underestimated, potentially resulting in inadequate protection of public health and safety. It is relatively easy to pose a worst case release scenario that may be far more dangerous than analyzed by the Applicant. What if there were to be a natural gas explosion at the facility that damaged the building and its enclosed ammonia tank? Such an explosion could easily provide the force necessary to blow the plastic ball-like baffles away from the diked area, leaving the site with a totally uncontrolled and near ground level release of 15,000 gallons of aqueous ammonia.

  Another plausible accidental release scenario involves the trailer trucks that would deliver ammonia to the site several times a month. Section 2.2.9 of the Facility Description

[11] Brockton Power, LLC., op. cit., pages 6-18 through 6-19

contained in the permit application[12] describes the potential for full trailer deliveries of aqueous ammonia as follows:

> *"The aqueous ammonia storage tank will have a capacity of approximately 15,000 gallons. This represents approximately one month's supply at expected usage rates. This tank size will allow the Project to accept full trailer deliveries (typically 6,000 gallons) thus minimizing the number of deliveries required to a minimum."*

What is the worst case potential consequence of an accidental release of ammonia from these trailer deliveries? The trailer will not be enclosed in a building. Will the trailer be in secondary containment as it off-loads its cargo of aqueous ammonia? What could happen if there were to be a break in the outdoor transfer lines or connections that are providing for the tank filling operation?

These are just a few examples that demonstrate that *"the worst-case catastrophic accident conceivable"* has not been assessed, as has been claimed by the Applicant. I would strongly urge that the Applicant be asked to review and revise this assessment, and that emergency response planning be adjusted accordingly.

[12] Brockton Power, LLC., op. cit. Page 2-14

5.0 CONCLUSION

Based on my review, for the reasons above, the Proposed Conditional Approval is based, in part, upon inadequate or incomplete information and assessment, and thus the project should not be approved.

APPENDIX A

Professional Profile

Paul A. Eisen, CCM
Principal Scientist

Technical Specialties:
Testifying Expert on Air Quality, Environmental Compliance, Meteorology. Atmospheric Dispersion modeling and risk assessment analyses. Meteorological analyses. Environmental management services. PSD/NSR permitting, Control Technology and applicability reviews. Environmental Impact Statement preparation and review.

Experience Summary:
Thirty years of experience: Principal Scientist/Meteorologist at Roux Associates; Chief Operating Officer at Terranext, LLC, Senior Environmental Scientist at New York Power Authority, Regional Director at WAPORA, Inc., Air Quality Scientist at LIPA, Environmental Scientist at NOAA's Environmental Research Laboratories, Meteorologist at National Weather Service

Credentials:
M.S. Meteorology, Pennsylvania State University, 1972
B.S. Meteorology, University of Massachusetts, 1970
Certified Consulting Meteorologist, American Meteorological Society (Certificate #534)

Professional Affiliations:
Air & Waste Management Association;
American Meteorological Society;
NY Academy of Sciences (NYAS), Chairman, Atmospheric Sciences Section

Testifying Expert

- Provided expert witness investigation and testimony under NY State Article X licensing hearings regarding a 300 MW simple cycle combustion turbine facility proposed for Kings Park, NY. This testimony resulted from review of the Draft NYSDEC Air Permit, permit and performance data for similar facilities (Stack Tests, CEMs Data Summaries, permit conditions, etc.), and atmospheric dispersion modeling of the proposed facility. Testimony was provided on critical issues related to facility siting, equipment selection, anticipated performance (i.e., air quality modeling and BACT/LAER analyses). The proposed simple cycle configuration was compared and contrasted with a combined cycle alternative. Calculations were presented that demonstrated that the simple cycle alternative would have a significant air quality impact when compared to a combined cycle alternative.

- Expert witness and technical evaluations in association with efforts to resolve New Source Review disputes between pulp and paper mills and the U.S. EPA. This assistance has been provided for the Glatfelter pulp and paper mill in Spring Grove, PA, and the Smurfit Stone pulp and paper mill in West Point, VA. Activities have included investigations regarding emissions, applicable regulations, air quality impacts, potentially available air quality control technologies, etc. Appearances at U.S. Dept. of Justice and U.S. EPA settlement conferences and technical sessions to discuss the series of events that led to the issuance of Notices of Violations, and feasible technical solutions. Reviews have focused on potential pollution control system performance for NOx and SO2 control on each mill's power boilers (coal, oil and woodwaste fired with NCG combustion). The NOx control evaluations have included fuel switching, Low NOx burners, SNCR, and SCR. They have been comprehensive evaluations that include balance of plant impacts specific to each mill. Most recently, after the recent approval and adoption of a Consent Order (West Point Mill), an investigation is being conducted into the latest options for installation of SO2 scrubbing on a large coal fired boiler that is one of the mill's primary sources of steam and power. Stack design modeling is being conducted as well as conceptual cost estimation and balance of plant assessment for the various scrubber technologies. These evaluations consider future regulations (Boiler MACT and new NOx budget limits) that will affect the equipment.

- Provided expert witness reports and testimony regarding the fire and chemical explosion that had occurred in April 1995, at Napp Technologies, Inc. on Main St. in Lodi, NJ. The fire killed four plant workers and burned for 35 hours. Area residents raised a number of health-related questions, and expert witness services were required to evaluate the atmospheric dispersion, chemical properties, and human exposure from chemicals released as a result of the fire and explosion. Atmospheric dispersion modeling was conducted and modeling studies by others were reviewed and critiqued. Provided expert witness depositions and testimony in proceedings to review the events and subsequent efforts to draw conclusions regarding public exposure and significance of risk to health of nearby residents.

- Provided expert witness investigation and testimony in Federal Court regarding a proposed new Brooklyn Federal Courthouse. Reviewed the DEIS, FEIS and Record of Decision for a new U.S. Eastern District Courthouse that was to be constructed in downtown Brooklyn. This review included atmospheric dispersion modeling and impact assessment of the traffic emissions associated with roadways serving the project site area. All project documentation was reviewed for NEPA compliance and technical accuracy. Issues of particular concern were air quality impact, alternative sites and designs, and project need. Partly as a result of this review and testimony, major revisions were made to project design and mitigation features recommended were incorporated into the Final EIS prior to its certification.

Risk Assessment Investigations

- Project Manager and principal scientist in the development worldwide risk assessment guidance and analysis procedures for air emissions from Pfizer Corporation manufacturing and research facilities. This included development and testing of a tiered screening approach for the various source types (chemical/pharmaceutical production, combustion, wastewater fugitive, etc.) located at Pfizer's major facilities. Also assisted Pfizer in the strategic planning of facility upgrades with respect to air quality impacts and permitting issues.

- Project manager and principal scientist for U.S. EPA's nationwide human exposure and risk assessment studies of emissions of 37 hazardous/toxic air pollutants. The work was conducted on behalf of U.S. EPA's Office of Air Quality Planning and Standards and consisted of refinement of emission inventories, atmospheric dispersion modeling, human exposure analyses, risk assessment, and consultations with stakeholders and U.S. EPA on the results and regulatory recommendations. One area of investigation was hazardous waste disposal facilities (landfill's, surface impoundment's, etc.). A methodology was developed to assist in the assessment of emissions and impacts of such facilities.

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- Toxic emissions dispersion modeling and risk assessment studies for new E.I. Du Pont facilities in Cape Fear, SC. The focus of this investigation was on potential vapor phase releases from reactor vessels and relief valves. Analyses assisted in development of final design parameters for the new facility.
- Risk assessment reviews for accident scenario analysis at chemical plants operated by Ciba Geigy and ICI to determine maximum potential human exposure at on- and off-site locations for comparison to health impact criteria. These analyses were used to assist in refinement of optimum design parameters (stack height, relief valve requirements) for new sources.

Permitting of Major Projects:

- Project Manager for environmental permitting and management services at a large New Jersey steel mill (Gerdau Ameristeel, Sayreville, NJ). Obtained permit approval for construction of a replacement Billet Reheat Furnace. The new furnace will markedly increase energy efficiency while reducing air quality impacts by optimizing "hot rolling" operations. Management of investigations into available measures to control mercury emissions from the mill's melt shop (primarily, Electric Arc Furnace). These investigations include pollution prevention, process modifications and add-on controls. Results have been used to support an administrative appeal of recently adopted rules requiring mercury emissions control at all iron and steel melting facilities in New Jersey. Prepared and delivered presentations to senior management (air compliance, enforcement and science and technology) at NJDEP. Discussed alternative methods of compliance with existing and future mercury control requirements and emissions standards. Supervising development of the facility's Title V operating permit, stormwater pollution prevention plan (and Best Management Practices), spill prevention and countermeasure plans, etc. Managing preparation of PSD permit application for a significant increase in steel production at the facility. This permitting process includes State-of-the-Art review for the facility's melt shop and its associated pollution control systems, air quality impact and risk assessment review using U.S. EPA and New Jersey DEP approved models and health risk assessment analysis.
- Responsible for the successful licensing of the 248 MW Cambalache Combustion Turbine Project for the Puerto Rico Electric Power Authority (PREPA). The facility was the first power plant to be successfully licensed on the island in the past 25 years. It consists of 3 combustion turbines which are installed to run as peaking units to support the island's power grid during power shortages. A year long pre-construction monitoring program was conducted on-site for ambient air quality and meteorological conditions. PSD permitting, Best Available Control Technology review and expert witness support was provided during the licensing process. After facility construction and initial operation, technical support was provided regarding performance of air pollution control systems (e.g., SCR for NOx control). More recently, PSD applicability review (netting analyses), air quality impact assessments have been performed in support of planning the potential conversion of the power plant to a base loaded unit (producing an additional 120 MW of power). Similar PSD netting analyses have been performed in conjunction with planning for four other power plant site upgrades in Puerto Rico.
- Project manager for air permit application preparation (Title V Operating Permit, PSD permit, RACT Plan, MACT Plan) at Glatfelter pulp and paper mill in Spring Grove, PA. Supervision of efforts to estimate emissions from numerous air emission sources at the mill (lime calciner, recovery boilers, power boilers, paper machines, coaters, pulp mill vents, wastewater treatment plant operations, etc.). Conducted extensive air quality dispersion modeling of facility SO2 emissions to evaluate impacts in simple and complex terrain and assure attainment of National Ambient Air Quality Standards. Conducted stack design studies to determine feasible equipment arrangements upon modification of the facility.
- Project manager and overall QA/QC for air permitting and on-site environmental support services at Hoeganaes Corporation in Riverton, NJ. Initially, an NJDEP inspection of this powdered metal manufacturing facility identified several air pollution sources that appeared to need further control. The facility has over forty sources of air emissions. Initially, the major focus was on the facility's melt shop and Electric Arc Furnace (subject to New Source Performance Standards - 40 CFR Part 60, Subpart AAA). The facility was asked to install controls for fugitive emissions. The investigation of control options concluded that a new canopy hood system needed to be installed with a dedicated baghouse. Preparation of permit applications and supporting documentation included air quality emissions estimates, impact assessment and risk assessment. The emissions estimations demonstrated that the melt shop modifications did not trigger PSD permitting requirements. Subsequent to these successful permitting efforts, work has expanded to the provision of full environmental management and compliance services for the facility.

Environmental Impact Assessment

- Provided overall QA/QC Management for an EIS prepared on behalf of the NY State University Construction Fund for a new sports stadium and enhanced athletic facilities at the State University of New York at Stony Brook. The EIS was performed under strict adherence to New York's SEQRA regulations. Key issues included traffic, parking, air quality and noise.
- Assisted in the preparation of Federal (NEPA) EISs for a number of large municipal wastewater treatment projects funded by U.S. EPA Region II. One of these projects evaluated alternative strategies for clean-up of Hudson River PCB contaminated sediments (resulting from General Electric's discharges over many years (via dredging and upland disposal). Mr. Eisen assisted in evaluating emissions and impacts of upland disposal of those contaminated sediments utilizing atmospheric dispersion modeling techniques.
- Completed technical reviews of mobile source air quality and noise analysis sections of SEQRA environmental impact statements for the Town of Wallkill, New York. Several projects were reviewed including: the Plaza at Crystal Run Shopping Center, the Galleria Shopping Mall, the Orange

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County Plaza Shopping Center Expansion and the Midway Park Commons Office Park development. Typically, these SEQRA air quality and noise reviews included an analysis of the proposed air quality and noise impacts, mitigation measures and related traffic issues such as maximum travel speeds and signal timing.

- Served as lead environmental scientist in a Facility Environmental Planning Study for the Tennessee Valley Authority's Muscle Shoals, Alabama facilities. Provided review of research facilities (laboratories, wetlands research center) to help in the determining the best strategy for modernizing and enhancing the environmental research capabilities of the facility during an overall re-organization and re-focusing of the facility's services.
- Retained by the Borough of Little Ferry, NJ to work with the County's engineering consulting firm to review odor controls proposed for the Bergen County Utilities Authority (BCUA) wastewater treatment plant. The review included proposed sludge dewatering facilities designed pursuant to the State of New Jersey mandate to eliminate ocean dumping. Sludge produced at the BCUA plant was to be dewatered on-site. Wastewater from the dewatering was to be cycled back to the WWTP for treatment. Sludge cake was to be chemically fixed and utilized as landfill cover or incinerated. This investigation helped assure that: 1) the full range of odorous compounds that were known to have the potential of being emitted from the facility were addressed; 2) that the design and selection of the air pollution control systems was evaluated from a state-of-the-art perspective; and 3) that the application covered standard design concerns as specified in EPA's "Design Manual: Odor and Corrosion Control in Sanitary Sewerage Systems and Treatment Plants".
- Provided oversight of projects to assess noise baseline conditions, noise impacts and noise mitigation strategies. A number of these projects have been completed including a baseline noise monitoring analysis conducted for a commercial development site in Queens, NY which was already heavily impacted by traffic and airport noise. Work with project developers and NYCDEP in assessing noise mitigation strategies and options. Oversaw community noise monitoring effort for a New Jersey steel mill to address community noise complaints. Prepared RFP for real time noise and video surveillance system to be installed at the steel mill. That system is now used to assist in the retrospective assessment of community noise complaints. Participated in community advisory panel meetings which were held with nearby residents to openly and cooperatively assess noise and air complaints that were provided to steel mill.
- Principal air quality scientist for major highway expansion project (Delaware Rt. 13). Prepared mobile source impact analysis for a 50 mile highway upgrade in the State of Delaware. This project required a analysis of traffic data projections and roadway configurations, detailed air quality impact analysis for each of three project alternatives, and projections of effects of increased traffic on region wide attainment of the NAAQS for ozone.
- Responsible for preparation of key sections of a NY State Environmental Impact Statement (EIS) for the re-location of Ciba's U.S. Corporate Headquarters to Tarrytown, NY, as well the research and development laboratory for its Additive's division. Evaluated air toxic emissions, as well as reviewed chemical purchasing and storage procedures, low level radiological material handling and disposal, and hazardous waste storage, transport and disposal practices. Existing research laboratories were examined, staff were interviewed and air quality modeling was performed to characterize potential impacts at the new facility according to procedures utilized the NY State (Air Guide-1). Regulations applicable to the existing laboratories were also reviewed to determine whether operations were in compliance. Participated in the public hearings before the lead agency (Town Board) and its supporting bodies (Planning Board and Board of Zoning Appeals). The facility was approved for construction.

Power Plant Support

- Air quality consultant to the management team responsible for the EPC contract for the Lakewood, NJ co-generation plant. The plant was nearing start-up and was under a tight schedule to complete performance testing to satisfy all contract obligations. However, it had run into some difficulty with regard to interpretation of permit conditions. Assistance was provided in working out a plan for expeditious revision of permit conditions, such that the permitting process would not interfere with successful start-up and turnover of the power facilities.
- Project Manager For Dynegy in Poughkeepsie, NY (formerly Central Hudson Gas and Electric Company) in preparation of air quality procedures manual for the utility's Roseton and Danskammer units. The manual reviewed permit and regulatory requirements for the two large coal fired units and described how operators of the facilities could achieve compliance on a regular basis. Provided technical and regulatory review of Title V operating permits under NY State Part 201 regulations when they were issued. Provided comments with respect to interpretation of requirements and permit obligations.
- Conducted evaluations of equipment modifications (coal conversion, peaking unit installation, etc.) for the Atlantic Electric Generating Company and PSE&G power stations in New Jersey. Assessed permitting requirements with respect to the Clean Air Act and helped design strategies to avoid triggering New Source Review and PSD permitting.
- Managed a study of environmental permitting constraints that would be created if Boston Edison's Mystic Units were to be converted to firing Orimulsion as an alternative to established oil firing practices. The major concern was the high sulfur content of orimulsion, and the resulting need to employ expensive SO2 scrubbing technologies in order to achieve permit approvals.
- Responsible for emergency preparedness support at New York Power Authority nuclear power plants (Indian Point and James Fitzpatrick stations). Support was provided in evaluating meteorological data collection systems, and conducting dose assessment modeling using atmospheric dispersion models. Participated in emergency preparedness drills and performed weather analysis and forecasting and off-site consequence analyses.

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Publications/Presentations:

Eisen, P. A., "Climate Change, Regulatory Developments", Presented at January, 2010 meeting of the Gloucester and Salem County, NJ Plant Executives

Eisen, P. A., "Air Pollution, Clean Air Act, Past, Present and Future Perspectives", Presented to Touro Law School - Environmental Law Class, March 2008

Eisen, P. A., "Air Pollution Control in New York", Presented at the New York Environmental Law & Management : Year 2000 Update, Government Institutes Division, ABS Group, Inc. October 16, 2000. Huntington, NY

Eisen, P. A., Egdall, R. S., Hennessy, P. J. and Wesolowski, T. B. Proceedings: Air & Waste Management Association 92nd Annual Meeting and Exhibition. "Development and Validation of Permit Limits for an EAF Meltshop. (1999)

Spisak, J. F. and Eisen, P. A. Technical Association of Pulp & Paper Industry (TAPPI) Proceedings, 1999 International Environmental Conference, "Best Management Practice and Environmental Management Systems: Are You Really Prepared? Volume 2: 691-692. (1999)

Eisen, P. A., Wang, J. and Callahan, R. E. Proceedings: Air & Waste Management Association 91st Annual Meeting and Exhibition. "A Streamlined Approach for NAAQS Compliance Demonstration Modeling (1998)

Eisen, P. A., Callahan, R.E., and Wang, J. TAPPI Proceedings, 1998 International Environmental Conference, "An Updated Approach for Major Source Air Permit Modeling" Book 2: 711-720. (1998)

Eisen, P. A., and Callahan, R.E., TAPPI Proceedings, 1997 International Environmental Conference, "Retrospective Permitting For RACT and MACT Compliance At a Northeast Pulp and Paper Mill" Book 1: 277-296. (1997)

Eisen, P. A., and Callahan, R. E. Proceedings: Air & Waste Management Association 89th Annual Meeting and Exhibition. "RACT and MACT Compliance at a Northeast Pulp and Paper Mill." (1996)

Eisen, P. A., and Callahan, R. E., TAPPI Proceedings, 1996 International Environmental Conference. "RACT and MACT Compliance at a Northeast Pulp and Paper Mill." Book 2: 853-859. (1996)

APPENDIX B

EPA Memorandum of March 23, 2010

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAR 23 2010

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS

FROM: Stephen D. Page, Director
Office of Air Quality Planning and Standards

TO: See Addressees

This memorandum addresses the need for recommendations regarding appropriate dispersion modeling procedures which can be used to demonstrate compliance with $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS). The need for these recommendations arises from several recent regulatory actions and proposals which increase the likelihood that applicants for permits under the new source review (NSR) and prevention of significant deterioration (PSD) programs may be required to demonstrate compliance with $PM_{2.5}$ NAAQS rather than relying upon the PM_{10} surrogate policy established in 1997. These recommendations are intended to facilitate appropriate and consistent implementation of current guidance regarding $PM_{2.5}$ dispersion modeling contained in the *Guideline on Air Quality Models*, Appendix W to 50 CFR Part 51, while acknowledging that such guidance is somewhat limited in detail due to technical issues associated with $PM_{2.5}$ modeling.

This memorandum provides recommendations on two aspects of the modeling procedures for demonstrating compliance with the $PM_{2.5}$ NAAQS. First, this memorandum discusses some of the technical issues that must be addressed by any applicant or permitting authority that is seeking to rely on the PM_{10} surrogate policy. Second, this memorandum provides additional information on modeling procedures to demonstrate compliance with $PM_{2.5}$ NAAQS without relying upon the PM_{10} surrogate policy.

BACKGROUND

On July 18, 1997, EPA revised the NAAQS for particulate matter to add new annual and 24-hour standards for fine particles using $PM_{2.5}$ as the indicator. EPA revised the 24-hour NAAQS for $PM_{2.5}$ on September 21, 2006, reducing the standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. EPA also retained the previous 1997 annual standard for $PM_{2.5}$ and the 24-hour standard for PM_{10}, while revoking the previous annual standard for PM_{10}. For attainment of the new 24-hour $PM_{2.5}$ NAAQS based on ambient monitoring, the average of the 98th percentile 24-hour values over three years of monitoring must not exceed 35 $\mu g/m^3$. The annual $PM_{2.5}$ NAAQS is set at 15 $\mu g/m^3$ based on the average of the annual mean $PM_{2.5}$ concentrations over three years.

Citing significant technical difficulties with respect to $PM_{2.5}$ monitoring, emissions estimation, and modeling, EPA established a policy, known as the PM_{10} surrogate policy, on October 23, 1997. This policy allowed permit applicants to use compliance with the applicable PM_{10} requirements as a surrogate approach for meeting $PM_{2.5}$ NSR requirements until the technical difficulties were resolved. On May 16, 2008, EPA promulgated final rules governing the implementation of the NSR program for $PM_{2.5}$, which included a "grandfathering provision" allowing applicants for federal PSD permits covered by 40 CFR § 52.21, with complete permit applications submitted as of July 15, 2008, to continue relying on the PM_{10} surrogate policy. In response to a petition challenging the continued use of the PM_{10} surrogate policy for issuing PSD permits, on June 1, 2009, EPA issued a 3-month administrative stay of the grandfathering provision for $PM_{2.5}$ affecting federal PSD permits to give EPA time to propose repealing the challenged grandfathering provision. On September 16, 2009, the original 3-month stay was extended to June 22, 2010, to allow additional time for EPA to formally propose repeal of the grandfathering provision from the $PM_{2.5}$ NSR implementation rule for federal PSD permits issues under 40 CFR § 52.21. On February 11, 2010, EPA published its proposal to repeal the grandfathering provision in the *Federal Register* at 75 FR 6827. These actions cite the fact that the technical difficulties which necessitated the PM_{10} surrogate policy have been largely, although not entirely, resolved.

As part of the proposed rulemaking to repeal the grandfathering provision contained in the federal PSD program, EPA has also proposed to end the use of the PM_{10} surrogate policy for state PSD programs that EPA has approved as part of the state implementation plan (SIP) under 40 CFR § 51.166. Under the PSD programs for $PM_{2.5}$ currently in effect for SIP-approved states, states would be allowed to continue using the PM_{10} surrogate policy until May 2011, or until EPA approves the revised SIP for $PM_{2.5}$, whichever occurs first. While we continue to allow states to use the PM_{10} surrogate policy during their transition to the new $PM_{2.5}$ requirements, we have also made it clear that the policy needs to be implemented by taking into account court decisions that address the surrogacy concept. Accordingly, an applicant seeking a PSD permit under a SIP-approved PSD program may still rely upon the PM_{10} surrogate policy as long as (1) the appropriateness of the PM_{10}-based assessment for determining $PM_{2.5}$ compliance has been adequately demonstrated based on the specifics of the project; and (2) the applicant can show that a $PM_{2.5}$ analysis is not technically feasible. Absent such demonstrations, applicants would be required to submit a $PM_{2.5}$-based assessment to demonstrate compliance with the $PM_{2.5}$ standards, in addition to meeting the other requirements under the NSR/PSD programs.

PM_{10} SURROGACY DEMONSTRATIONS

Given the need for applicants that continue to rely on the PM_{10} surrogate policy to demonstrate the appropriateness of the policy based on the specifics of the project, we feel that it is appropriate and timely to address some of the technical issues associated with a surrogacy demonstration. EPA's August 12, 2009, Administrative Order in response to petitions regarding the Title V permit for Louisville Gas and Electric Company (LG&E), Trimble Generating Station, provides a brief summary of the case law history that bears on the PM_{10} surrogacy issue which suggests that an appropriateness demonstration "would need to address the differences between PM_{10} and $PM_{2.5}$."[1] The LG&E order cites two examples in this regard: 1) "emission controls used to capture coarse particles may be less effective in controlling $PM_{2.5}$"; and 2) "particles that make up $PM_{2.5}$ may be transported over long distances while coarse particles normally only travel short distances." These examples serve to highlight the two main aspects of PSD permitting for which the appropriateness of the surrogate policy should be demonstrated: 1) the Best Available Control Technology (BACT) emission control technology assessment; and 2) the ambient air quality impact assessment to demonstrate compliance with the applicable NAAQS.

While acknowledging "an evolving understanding of the technical and legal issues associated with the use of the PM_{10} Surrogate Policy," the LG&E order offers two steps as possible approaches for making an appropriateness demonstration, without suggesting that the "two steps are necessary or sufficient to demonstrate that PM_{10} is a reasonable surrogate for $PM_{2.5}$" and clearly stating that "these two steps are not intended to be the exclusive list of possible demonstrations" regarding surrogacy. The two steps offered in the LG&E order are primarily relevant to the appropriateness demonstration regarding emission controls under BACT, while the discussion here will be focused on the appropriateness demonstration in relation to ambient air impacts.

Given the range of application-specific factors that may need to be addressed for an appropriateness demonstration in relation to ambient air impacts, it is not practical to provide detailed guidance regarding how to conduct such demonstrations. However, the following list identifies some of the "differences between PM_{10} and $PM_{2.5}$" in relation to ambient air impacts that should be addressed in the development of a surrogacy demonstration:

1. While EPA revoked in 2006 the annual PM_{10} standard that was in effect when the surrogate policy, the surrogacy demonstration would still need to address the appropriateness of the PM_{10} surrogate policy in relation to the annual $PM_{2.5}$ standard, and would likely require a modeling analysis of annual PM_{10} impacts.
2. The current 24-hour NAAQS of 35 $\mu g/m^3$ is well below the previous level of 65 $\mu g/m^3$ that was in effect when the PM_{10} surrogate policy was established. The background monitored levels of $PM_{2.5}$ are, therefore, likely to account for a more significant fraction of the cumulative impacts from a modeling analysis relative to the current 24-hour $PM_{2.5}$ NAAQS than for PM_{10}.
3. Secondary formation of $PM_{2.5}$ from emissions of NO_x, SO_x and other compounds from sources across a large domain will often contribute significantly to the total ambient levels of $PM_{2.5}$, and may be the dominant source of ambient $PM_{2.5}$ in some cases. In contrast, secondarily formed particles are less likely to be significant portion of PM_{10}, which may result in significant differences in the spatial and temporal patterns of ambient impacts between $PM_{2.5}$ and PM_{10}.

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[1] A discussion of the case law that bears on the PM_{10} surrogacy issue also appears in the February 11, 2010, proposed rule at 75 FR 6831-6832.

4. The probabilistic form of the $PM_{2.5}$ NAAQS, based on the multiyear average of the 98th percentile for the daily standard, differs from the expected exceedance form of the PM_{10} NAAQS, which allows the standard to be exceeded once per year on average using the high-sixth-high (H6H) value over 5 years. These differences affect the temporal and spatial characteristics of the ambient air impacts of PM_{10} and $PM_{2.5}$. Differences in the form of the NAAQS also complicate the process of combining modeled impacts with monitored background levels to estimate cumulative impacts under the NSR/PSD permitting programs, as well as the determination of whether modeled impacts from the facility will cause a significant contribution to any modeled violations of the NAAQS that may occur.

These factors complicate the viability of demonstrating the appropriateness of the PM_{10} surrogate policy to comply with the requirement for a $PM_{2.5}$ ambient air quality impact assessment. In light of these complications, applicants may elect to use $PM_{2.5}$ dispersion modeling to explicitly meet the requirement of an ambient air quality impact assessment under the PSD permitting program, provided that the technical difficulties with respect to $PM_{2.5}$ monitoring, emissions estimation, and modeling have been sufficiently resolved in relation to the specific application.

For surrogacy demonstrations, it is assumed that as an initial step the applicant will have conducted an appropriate dispersion modeling analysis which demonstrates compliance with the PM_{10} NAAQS, including an analysis of annual PM_{10} impacts to address item 1. A simple example illustrating when a PM_{10} modeling analysis might serve as a surrogate for $PM_{2.5}$ modeling would be if a clearly conservative assumption is made that all PM_{10} emissions are $PM_{2.5}$, and the modeled PM_{10} impacts are taken as a direct surrogate for $PM_{2.5}$ impacts and compared to the $PM_{2.5}$ NAAQS. If an adequate accounting for contributions from background $PM_{2.5}$ concentrations to the cumulative impact assessment can be made, and a reasonable demonstration that the modeled PM_{10} emission inventory adequately accounted for potential nearby sources of $PM_{2.5}$, then the appropriateness of surrogacy could be reasonably found in this example. An analysis of source-specific $PM_{2.5}$/ PM_{10} emission factor ratios may also support the assumption of a more realistic, yet still conservative approach for taking a ratio of modeled PM_{10} ambient impacts to provide conservative estimates of $PM_{2.5}$ impacts.

While additional modeling analyses, short of explicit $PM_{2.5}$ modeling, may also be used to the support the surrogacy demonstration in some cases, it is important to make a clear distinction between modeling analyses for purposes of surrogacy demonstrations and modeling analyses that are intended to explicitly demonstrate compliance with the $PM_{2.5}$ standards. The distinction between these two types of modeling analyses may not always be clear, but one important distinction is whether or not a $PM_{2.5}$ emission inventory has been developed as the basis for the modeling. The distinction between these types of modeling is important because modeling procedures that may be considered appropriate for one type of analysis may not be appropriate for the other. The following section elaborates further on this point.

$PM_{2.5}$ MODELING ANALYSES

The differences between PM_{10} and $PM_{2.5}$ described above in relation to surrogacy demonstrations, especially items 2 through 4, also have implications on how best to conduct an explicit $PM_{2.5}$ NAAQS compliance demonstration through dispersion modeling. Due to the potentially significant contribution from secondary formation of $PM_{2.5}$, and the more prominent role of monitored background concentrations of $PM_{2.5}$ in the cumulative analysis, certain aspects of standard modeling practices used for PM_{10} and other criteria pollutants may not be appropriate for $PM_{2.5}$. Our recommendations for addressing these issues in terms of explicit $PM_{2.5}$ modeling analyses are described in more detail below.

Given the issues listed above, and especially the important contribution from secondary formation of $PM_{2.5}$, which is not explicitly accounted for by the dispersion model, PSD modeling of $PM_{2.5}$ should currently be viewed as screening-level analyses, analogous to the screening nature of the guidance in Section 5.2.4 of Appendix W regarding dispersion modeling for NO_2 impacts given the importance of chemistry in the conversion of NO emissions to ambient NO_2. The screening recommendations presented below for demonstrating compliance with the $PM_{2.5}$ NAAQS through dispersion modeling have been developed with the factors listed above in mind. As with any modeling analysis conducted under Appendix W, alternative models and methods may be considered on a case-by-case basis, subject to approval by the Regional Office in accordance with the recommendations in Section 3.2 on "Use of Alternative Models."

The following sections describe the recommended modeling methods for the two main stages in a typical PSD ambient air quality analysis: 1) preliminary significant impact analysis; and 2) cumulative impact assessment. The rationale for the recommendations is also provided.

Preliminary Significant Impact Analysis

The initial step in air quality impact assessments under NSR/PSD is typically a significant impact level analysis to determine whether the proposed emissions increase from the proposed new or modified source (i.e., project emissions) would have a "significant" ambient impact. Thus, the first step of the ambient impact analysis is to determine whether those emissions would result in ambient air concentrations that exceed a de minimis level, referred to as the Significant Impact Level (SIL). If modeled impacts from the facility do not exceed the SIL, then the permitting authority may be able to conclude, based on this preliminary analysis, that the project would not cause or contribute to a violation of the NAAQS. Under these circumstances, EPA would not consider it necessary for the facility to conduct a more comprehensive cumulative impact assessment that would involve modeling the facility's total emissions along with emissions from other nearby background sources, and combining impacts from the modeled emission inventory with representative ambient monitored background concentrations to estimate the cumulative impact levels for comparison to the NAAQS. The SIL is also used to establish the significant impact area of the facility for purposes of determining the geographic range of the background source emission inventory that would be appropriate should a cumulative impact assessment be necessary.

EPA's 2007 proposed rule to establish PSD increments, SILs, and a Significant Monitoring Concentration (SMC) for $PM_{2.5}$ included three options for the $PM_{2.5}$ SILs for both the 24-hour and annual NAAQS. Until the $PM_{2.5}$ SILs are finalized, the proposed SILs may not be presumed to be appropriate de minimis impact levels. However, EPA does not preclude states from adopting interim de minimis impact levels for $PM_{2.5}$ to determine whether a cumulative impact analysis will be necessary, provided that states prepare an appropriate record to support the value used. Such de minimis levels do not necessarily have to match any of the SILs that have been proposed for $PM_{2.5}$, but the levels proposed by EPA and the record supporting EPA's proposed rule could be considered in the state's determination.

The modeling methods used in this initial significant impact assessment phase of the $PM_{2.5}$ analysis, based on either a state's interim de minimis levels or EPA-finalized SILs, are similar to the methods used for other pollutants, including the use of maximum allowable emissions. However, due to the probabilistic form of the NAAQS, we recommend that the highest average of the modeled annual averages across 5 years for National Weather Service (NWS) meteorological data or the highest modeled annual average for one year of site-specific meteorological data be compared to the annual screening level (SIL). Similarly, the highest average of the maximum 24-hour averages across 5 years for NWS meteorological data or the highest modeled 24-hour average for one year of site-specific meteorological data should be compared to the 24-hour screening level (SIL).

Using the average of the highest values across the years modeled preserves one aspect of the form of the NAAQS, while using the average of the first highest 24-hour averages rather than the 98^{th} percentile (8^{th} highest) values from the distribution is consistent with the screening-level nature of the analysis. In addition, since the $PM_{2.5}$ NAAQS is based on air quality levels averaged over time, it is appropriate to use an average modeled impact for comparison to the SIL since that will more accurately characterize the modeled contribution from the facility in relation to the NAAQS than use of the highest modeled impacts from individual years. At the present time, the dispersion modeling recommendations presented here are based on modeling only the primary or direct $PM_{2.5}$ emissions from the facility.

Cumulative Impact Assessment

Unless modeled ambient air concentrations of $PM_{2.5}$ from the project emissions are shown to fall below the state's de minimis level or EPA's promulgated SIL (when finalized), then a cumulative impact assessment would be necessary to account for the combined impact of facility emissions, emissions from other nearby sources, and representative background levels of $PM_{2.5}$ within the modeling domain. The cumulative impacts are then compared to the NAAQS to determine whether the facility emissions will cause or contribute to a violation of the NAAQS. Several aspects of the cumulative impact assessment for $PM_{2.5}$ will be comparable to assessments conducted for other criteria pollutants, while other aspects will differ due to the issues identified above.

Modeling Inventory

The current guidance on modeling emission inventories contained in Section 8.1 of Appendix W will generally be applicable for the $PM_{2.5}$ modeling inventory, recognizing that these recommendations only address modeling of primary $PM_{2.5}$ emissions. The guidance in Appendix W addresses the appropriate emission level to be modeled, which in most cases is the maximum allowable emission rate under the proposed permit. Nearby sources that are expected to cause a significant concentration gradient in the vicinity of the facility should generally be included in the modeled inventory. Since modeling of $PM_{2.5}$ emissions has not been a routine requirement to date, the availability of an adequate $PM_{2.5}$ emission inventory for background sources may not exist in all cases. Recommendations for developing $PM_{2.5}$ emission inventories for use in PSD applications will be addressed separately, but existing PM_{10} inventories may provide a useful starting point for this effort.

Monitored Background

The determination of representative background monitored concentrations of $PM_{2.5}$ to include in the $PM_{2.5}$ cumulative impact assessment will entail different considerations from those for other criteria pollutants. An important aspect of the monitored background concentration for $PM_{2.5}$ is that the monitored data should account for the contribution of secondary $PM_{2.5}$ formation representative of the modeling domain. As with other criteria pollutants, consideration should also be given to the potential for some double-counting of the impacts from modeled emissions that may be reflected in the background monitoring, but this should generally be of less importance for $PM_{2.5}$ than the representativeness of the monitor for secondary contributions. Also, due to the important role of secondary $PM_{2.5}$, background monitored concentrations of $PM_{2.5}$ are likely to be more homogeneous across the modeling domain in most cases, compared to other pollutants. We plan to address separately more detailed guidance on the determination of representative background concentrations for $PM_{2.5}$.

Comparison to NAAQS

Combining the modeled and monitored concentrations of $PM_{2.5}$ for comparison to the $PM_{2.5}$ NAAQS also entails considerations that differ from those for other criteria pollutants, due to the issues identified above. Given the importance of secondary contributions for $PM_{2.5}$ and the typically high background levels relative to the NAAQS for $PM_{2.5}$, greater emphasis is placed on the monitored background contribution relative to the modeled inventory. Also, given the probabilistic form of the $PM_{2.5}$ NAAQS, careful consideration must be given to how the monitored and modeled concentrations are combined to estimate the cumulative impact levels.

The representative monitored $PM_{2.5}$ design value, rather than the overall maximum monitored background concentration, should be used as a component of the cumulative analysis. The $PM_{2.5}$ design value for the annual averaging period is based on the 3-year average of the annual average $PM_{2.5}$ concentrations; for the 24-hour averaging period, the design value is based on the 3-year average of the 98^{th} percentile 24-hour average $PM_{2.5}$ concentrations for the daily standard. Details regarding the determination of the 98^{th} percentile monitored 24-hour value based on the number of days sampled during the year are provided in the ambient monitoring regulations, Appendix N to 40 CFR Part 50.

The modeled annual concentrations of (primary) $PM_{2.5}$ to be added to the monitored annual design value should be computed using the same procedure used for the initial significant impact analysis based on the highest average of the modeled annual averages across 5 years for NWS meteorological data or the highest modeled annual average for one year of site-specific meteorological data. The resulting cumulative annual concentration would then be compared to the annual $PM_{2.5}$ NAAQS of 15 $\mu g/m^3$.

For the 24-hour NAAQS analysis, the modeled concentrations to be added to the monitored 24-hour design value should be computed using the same procedure used for the preliminary analysis based on the highest average of the maximum modeled 24-hour averages across 5 years for NWS meteorological data or the maximum modeled 24-hour average for one year of site-specific meteorological data. As noted above, use of the average modeled concentration across the appropriate time period more accurately characterizes the modeled contribution from the facility in relation to the NAAQS than use of the highest modeled impact from individual years, while using the average of the <u>first</u> highest 24-hour averages rather than the 98^{th} percentile (8^{th} highest) values is consistent with the screening nature of $PM_{2.5}$ dispersion modeling. Furthermore, combining the 98^{th} percentile monitored with the 98^{th} percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98^{th} percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS.

The recommendations provided above constitute a First Tier modeling analysis for $PM_{2.5}$ compliance demonstrations. For applications where impacts from primary $PM_{2.5}$ emissions are not temporally correlated with background $PM_{2.5}$ levels, combining the modeled and monitored contributions as described above may be overly conservative. In these cases, a Second Tier modeling analysis may be considered that would involve combining the monitored and modeled $PM_{2.5}$ concentrations on a seasonal or quarterly basis, and re-sorting the total impacts across the year to determine the cumulative design value. We plan to provide separately additional details regarding this Second Tier, including a discussion of circumstances where this approach may be appropriate.

Determining Significant Contributions to Modeled Violations

If the cumulative impact assessment following these screening recommendations results in modeled violations of the $PM_{2.5}$ NAAQS, then the applicant will need to determine whether the facility emissions are causing a significant contribution to those modeled violations. A "significant contribution" determination is based on a comparison of the modeled impacts from the project emissions associated with the modeled violation to the appropriate SIL. The significant contribution determination should be made following the same procedures used during the initial significant impact analysis, based on a comparison of the average of the modeled concentrations at the receptor location showing the violation, across 5 years for NWS meteorological data and the highest modeled concentration for one year of site-specific meteorological data. For a violation of the annual NAAQS, the average of the annual values at the affected receptor(s) is compared to the SIL, while the average of the highest 24-hour average concentrations at the affected receptor(s) should be used for the 24-hour NAAQS. Use of the average modeled concentration is appropriate in this context since it is consistent with the actual contribution of the facility to the cumulative impacts at the receptor(s) showing violations and accounts for the fact that modeled violations of the 24-hour NAAQS represent average impacts across the modeling period.

Synopsis

Significant Impact Analysis: Compare the average of the highest modeled individual year's annual averages and the average of the first highest individual year's 24-hour average concentrations from project emissions to their respective screening levels, which may be based on the state's de minimis levels or EPA-finalized SILs. If modeled impacts exceed the screening levels, a cumulative impact assessment would need to be performed.

Cumulative Impact Assessment: Develop an emission inventory of background sources to be included in the modeling analysis using traditional guidance. That would include using the significant impact area established in the initial significant impact analysis, plus a 50-km annular ring to determine the geographic extent of the background emission inventory. From data obtained within this combined area, compare the average of the highest modeled individual year's annual averages and the average of the first highest individual year's 24-hour averages, plus representative background monitored concentrations, to their respective NAAQS. Monitored background concentrations are based on the 3-year average of the annual $PM_{2.5}$ concentrations, and the 3-year average of the 98th percentile 24-hour averages. To determine whether the proposed project's emissions cause a significant contribution to any modeled violations of the NAAQS, the proposed project's impacts at the affected receptor(s) are determined based on the average of the highest modeled individual years' annual averages and average of the first highest individual years' 24-hour averages from the proposed project's emissions, and are compared to the state's de minimis levels or EPA-finalized SILs.

Additional Caveats

A few additional caveats should be considered while implementing these recommendations:

1. The current preferred dispersion model for near-field $PM_{2.5}$ modeling, AERMOD, does not account for secondary formation of $PM_{2.5}$. Therefore, any secondary contribution of the facility's or other modeled source's emissions is not explicitly accounted for. While representative background monitoring data for $PM_{2.5}$ should adequately account for secondary contribution from background sources in most cases, if the facility emits significant quantities of $PM_{2.5}$ precursors, some assessment of their potential contribution to cumulative impacts as secondary $PM_{2.5}$ may be necessary. In determining whether such contributions may be important, keep in mind that peak impacts due to facility primary and secondary $PM_{2.5}$ are not likely to be well-correlated in space or time, and these relationships may vary for different precursors. We plan to issue separately additional guidance regarding this issue.

2. While dry and/or wet deposition may be important processes when estimating ambient concentrations of particulate matter (PM) in general, these factors are expected to be minor for $PM_{2.5}$ due to the small particle size. In addition, there may be additional uncertainty associated with deposition modeling for $PM_{2.5}$ due to the variable makeup of the constituent elements for $PM_{2.5}$ and the fact that deposition properties may vary depending on the constituent elements of $PM_{2.5}$. Therefore, use of deposition algorithms to account for depletion in estimating ambient $PM_{2.5}$ concentrations should be done with caution and only when clear documentation and justification of the deposition parameters is provided.

3. While EPA has proposed PSD increments for $PM_{2.5}$, the increments have not been finalized yet. Until the increments are finalized, no increment analysis is required for $PM_{2.5}$. However, it should be noted that some of the recommendations presented here in relation to NAAQS modeling analyses may need to be modified for $PM_{2.5}$ increment analyses due to the differences between the forms of the NAAQS and increments. We plan to provide further clarification of these differences separately, once the increments are finalized.

This memorandum presents EPA's views on these issues concerning modeling procedures for demonstrating compliance with the $PM_{2.5}$ NAAQS. The statements in this memorandum do not bind State and local governments and the public as a matter of law. If you have any questions concerning this memorandum, please contact Tyler Fox, Leader, Air Quality Modeling Group at (919) 541-5562.

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