Government of Newfoundland and Labrador
Department of Environment and Conservation
Pollution Prevention Division

MEMORANDUM

Date: January 26, 2011

TO: Kaylen Hill
Environmental Scientist
Environmental Assessment Division

FROM: Barrie Lawrence
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SUBJECT: Response to air emissions and dispersion modelling comments - Hebron Project

The following comments are provided in response to the comments provided by Hebron on the *Air Emission and Dispersion Modelling Study*.

A) NDOEC wrote:

The use of AERMOD versus CALPUFF. CALPUFF is more suited for modeling of long range transport and has been proven to work very well in the near field and nearshore environments. AERMOD is supposed to be good out to 50 kilometers, but given the size of the domain (100 km x 65 km), AERMOD is stretching the limits of acceptability. It has been found that CALPUFF is the more accurate of the two models.

HEBRON responded:

It is agreed that CALPUFF is the better of the two models for long-range issues but the issue here is not one of long-range impacts, as the concentrations of Project emissions are too low to be of concern at the distances where a transition from AERMOD to CALPUFF would be advisable. Turbines, proposed for use on the Platform, are used for electrical power generation within urban areas across Canada, for example, at Dartmouth and Toronto airports. Setting the domain at the limits used was done because the other projects represent the nearest fixed receptors, and to be in alignment with other component studies. An extensive comparison of CALPUFF, AERMOD and ISC3 models on gas turbine exhausts was undertaken and the results presented at the Guideline for Air Quality Models Conference in 2003 (presentation and animated simulations available upon request). This work confirmed the suggestion that CALPUFF is the better model in the far field, but also showed that AERMOD is a useful, and cost-effective tool in the near to medium range. It is recommended for like situations by the US EPA, and it was agreed in discussion with Environment Canada to be suitable for this application.

NDOEC accepts Hebron's response.

B) NDOEC wrote:

The surface meteorological data is taken from both Hibernia and St. John's by incorporating a "linear interpolation". The use of such a method would result in inaccuracies in model outputs. It implies that not all the hourly data required for input into AERMET is available. Please clarify if all the parameters needed to run AERMET are available from Hibernia (ceiling height and cloud cover in particular)? If not, how are they accounted for in the model description? Given these uncertainties, a recommended

approach is to use output from a meteorological model such as NAM or GEM as the input into the dispersion model.

HEBRON responded:

The interpolation involved the estimation of the in-between observations of the three-hour surface observations at Hibernia. This was done by vector time interpolation of the wind; that is, the wind was decomposed into easting and northing components, each of which were interpolated for the intervening hours, and then recombined for a wind with the correctly oriented direction. Interpolation of weather model data to the site was considered; it was rejected in this case in favour of the actual observations that became available, albeit with some compromise.

NDOEC response:

The linear interpolation scheme used to estimate hours between three-hour surface observations is acceptable. However, the question of whether or not the meteorological parameters needed run AERMET are available from Hibernia was not addressed. It is quite likely that ceiling height and cloud cover data in particular, are not available from Hibernia but were obtained from St. John's airport. If so, then an explanation is required as to the appropriateness of merging Hibernia data with St. John's data and the effects this will have on the model outcomes.

C) NDOEC wrote:

There is a possible error in the document. The model describes receptors which are located at the same location as the emission sources (e.g., Hibernia, Terra Nova and White Rose). Please clarify how this arrangement can provide accurate data or if this is an editing error.

HEBRON responded:

The study did not attempt to assess the contribution of each platform to itself, therefore the receptor coordinates were not designed to accurately locate the air intakes, for example, and the design was not sufficiently advanced to provide locations for the intakes on the Hebron structure. At the separation distances between projects, the difference between the concentrations at the coordinates used and the actual air intakes for the platforms will be not significant.

NDOEC response:

The response does not answer the question. In the report, the location of the Hibernia platform point source (669419 E, 5179807 N (page 14)) is identical to the Hibernia receptor location (pages 17 thru 27). For Terra Nova, the point source and the receptor are 1metre apart. In both instances, this implies the receptor is inside the stack, which clearly is illogical and will hence cause modelling anomalies. Please clarify if this is the case and how the results may be impacted.

D) NDOEC wrote:

The NO_2 / NO / NO_x reduction methods were discussed but it never said which option was used. Please provide the option chosen so that modeling results can be put into perspective.

HEBRON responded:

The modelling for this Project has been done using a worst-case analysis. This can mean an assumption of complete conversion of NO to NO_2, despite the fact that it may overestimate by an order of magnitude; however, in situations where such an approach shows an apparent exceedance, it is necessary to conduct a more realistic appraisal of the conversion rate. Unfortunately, offshore locations have limited ambient ozone data and it is therefore considered appropriate to use a conservative conversion rate that will approximate worst-case conditions, at least within the relative near-field where maximum concentrations are predicted. A conversion rate of 25 percent is adequately protective of the environment, and have used that in this assessment to account for the 10 percent of NO_x emitted as NO_2, plus a conservative additional 15 percent converted in the relative near field.

NDOEC response:

While it is appreciated that there is limited ozone data for the project area to determine a conversion rate from NO to NO_2, assuming that a conversion rate of 15% is adequately protective of the environment is very subjective and likely an underestimation. Using the Plume Volume Molar Ratio Method (PVMRM) as the most advanced algorithm for NO to NO_2 conversion in AERMOD, it can be readily shown, that based on the emission characteristics that were modelled, if, for example, a background ozone level of 20 ppb is assumed under D stability, the conversion rate is approximately 22% (excluding original 10% NO_2 emission rate) about 1 kilometre from the source. Similarly, for example, if a background ozone level of 10 ppb is assumed under D stability, the conversion rate is approximately 32% approximately 2 kilometres from the source. Therefore while a 15% static conversion rate may be somewhat realistic in close proximity to the source, it may be inaccurate beyond 1 kilometre and hence not representative worst-case conditions. The proponent needs to re-evaluate the assumptions made and provide clarity to the potential impacts.

E) NDOEC wrote:

It is mentioned that the BPIP program was used to calculate effects of building downwash for "particulate sources". Does this mean that the downwash was not considered for gaseous emissions? Also, BPIP is very sensitive to how inputs are entered. With the limited information provided, it cannot be determined whether BPIP will run accurately.

HEBRON responded:

The BPIP program was applied for all pollutants, not just particulate matter. A typographical error appears to have changed "particular" to "particulate". The study team is very familiar with the application of BPIP, but in this Project, as is often the case, the engineering design proceeds while the environmental assessment is being prepared. This is one of the best uses of an environmental assessment process, as the design adapts to reduce impacts. Accordingly, the air quality assessment, including BPIP, has been redone to address the design of the physical structure, and other changes that may arise due to load changes or equipment sizing. As standard practice, senior reviewers within the air quality group review all approaches and calculations are considered. The remodelling as of September 28, 2010, is in final data summary, and all model inputs have been through quality checks. Revised model inputs are primarily the turbine emissions, stack sizes and platform geometry. The results indicate compliance with all applicable standards.

NDOEC response:

NDOES accepts Hebron's response regarding "particular" vs "particulate". With regard to the operation of BPIP, NDOEC does not question the proponent's ability to use the model. The question is whether the proponent is aware that how the data is entered into the model will dramatically affect the outcomes from, the model. For example, a simple 1-tiered 20m x 20m building with 1 stack entered as one building will

give a different result that the same building entered as 2 adjacent 10m x 20m buildings. This compounding error within BPIP becomes magnified in situations where there are numerous adjacent structures and tiers. If the BPIP inputs were not entered correctly unrealistic results may occur. Can the proponent provide assurances that the downwash effects are accurately modelled and representative of the configuration of the Hebron platform?

F) NDOEC wrote:

For particulate, only TSP was considered in the model. There is no mention of PM2.5 which is a primary particulate fraction of concern.

HEBRON responded:

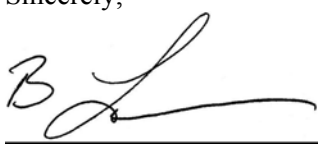
$PM_{2.5}$ is becoming of more immediate concern, but emission factors are rarely available, and, 24 hour levels are regulated at 25 $\mu g/m^3$ by Newfoundland and Labrador, and the Canada Wide Standard is 30 $\mu g/m^3$. The emission factor for Total Suspended Particulate Matter includes the $PM_{2.5}$ fraction. Comparison of the model results with the criteria indicates compliance with both.

NDOEC response:

The model outcomes indicate that 24-hour TSP levels could reach 99.4 $\mu g/m^3$ during peak platform operation. Based on the proponent's response, it is implied that because $PM_{2.5}$ is a fraction of TSP, and TSP is compliant, therefore $PM_{2.5}$ is compliant. This is illogical. If, for example, all the TSP is $PM_{2.5}$, then regardless of which standard is used for comparison, the standard would be exceeded by a factor of 3 - 4. The proponent needs to provide assurance that the $PM_{2.5}$ standards will not be exceeded.

I trust these responses are satisfactory.

Sincerely,



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