JUNE 16, 2020

MERRITT GREEN ENERGY

AIR QUALITY TECHNICAL REPORT SUMMARY

An air dispersion modelling assessment was conducted for the Merritt Green Energy (MGE) facility to assess the potential impacts on air quality from the use of chipped wood derived from construction and demolition debris (C&D) as fuel. The assessment considered highly conservative emissions for the boiler stack and three flow scenarios (low, average and permit flow). The model was developed based on the physical characteristics of the MGE boiler stack and site, and air dispersion modelling was conducted using the CALPUFF air dispersion model with four years of local meteorological data. The maximum predicted model results reflect the compound conservatism in the assessment methodology, which includes: conservative emissions, worst-case flow scenario, worst-case meteorology, and a conservative characterization of the baseline air quality.

The assessment considered criteria air contaminants (particulate matter (TSP, PM_{10}, $PM_{2.5}$), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2)) and numerous other air contaminants (12 in total). Where available, baseline air quality data was added to the model predicted results to assess cumulative impacts. These results were then compared to ambient air quality objectives and criteria considered for the assessment.

Below is a summary of the findings:

1) Particulate Matter

   - Maximum model predicted concentrations of particulate matter (TSP, PM_{10} and $PM_{2.5}$) are low to negligible in comparison to the BC Ambient Air Quality Objectives.
   - Maximum model predicted concentrations plus baseline for particulate matter (TSP, PM_{10} and $PM_{2.5}$) exceed the BC Ambient Air Quality Objectives for the following: TSP (24-hour, with the exception of the Low Flow "Outside Merritt" case), PM_{10} (24-hour) and $PM_{2.5}$ (24-hour "In Merritt" only case). These exceedances are due to the high baseline air quality characterized for the assessment. The incremental increase from MGE is low to negligible even at the maximum predicted point(s) of impact (maximum receptor).
   - The results of this assessment are consistent with the results presented in the technical assessment[1] for the original permit which assessed hog fuel.

2) Nitrogen Dioxide and Sulphur Dioxide

   - Maximum model predicted concentrations of nitrogen dioxide analyzed with the ambient ratio method (which includes the nitrogen oxides (NO_x) background) for the 1-hour averaging period were found to be well below the BC Ambient Air Quality Objectives.
   - Maximum model predicted concentrations plus baseline for nitrogen dioxide were also well below the BC Ambient Air Quality Objectives for the annual averaging period.
   - Maximum model predicted concentrations plus baseline for sulphur dioxide were below the BC Ambient Air Quality Objective for the 1-hour averaging period for all receptors except one. This outlier was for the average flow scenario which just goes over the BC Ambient Air Quality Objective of 183 µg/m^3 by 0.5 µg/m^3. The assessment methodology was highly conservative, in particular the estimated emissions considered in the assessment. Actual emissions of sulphur dioxide are expected to be considerably lower which would lead to significantly lower ambient air concentrations.

[1] Levelton, 2011. Technical Assessment – Merritt Green Energy Project Air Permit. Prepared by Levelton Consultants Ltd. for Merritt Green Energy Limited Partnership. November 14, 2011.

- Maximum model predicted concentrations plus baseline for sulphur dioxide were well below the BC Ambient Air Quality Objective for the annual averaging period.

3) Other Air Contaminants

   - Other air contaminants assessed include: Hydrogen Chloride, Hydrogen Fluoride, Chlorophenols, Dioxins and Furans, Chlorobenzene, Polycyclic Aromatic Hydrocarbons, Cadmium, Mercury, Lead, Arsenic, Chromium, Polychlorinated Biphenyls.
   - Maximum predicted model concentrations plus baseline (where baseline was available) for all of these air contaminants were below the air quality criteria considered in this assessment.
   - Considering the conservative approach followed in this assessment it is anticipated that concentrations of these air contaminants would in reality be much lower as compared to the conservative model results predicted in this assessment.

4) The air emissions control system in place at MGE includes the stoker grate furnace and combustion controls, multiclone mechanical dust collector and 4 field Electrostatic Precipitator (ESP). This system functions well during hog fuel operation and has met all supplier performance guarantee levels and permitted emissions limits during operations to date. ESP maintenance is carried out following supplier recommendations, so continued achievement of guaranteed emission levels is expected.

5) C&D fuel specifications require that the fuel will have the same size, moisture and energy content as existing hog fuel, as well as the same content of elements such as sulfur and chlorine. The primary difference between the fuels is the 10% allowance for materials other than clean wood, which are expected to include engineered wood and less than 1% paint and 1% plastic contamination. Given the relative similarity of C&D fuel with hog fuel, the low percentage of materials other than clean wood, and the historical emissions control performance of the furnace, combustion controls and particulate controls, it is expected that existing systems will be adequate to control emissions from C&D combustion.

6) Analysis of start-up, shutdown and short-term / emergency shutdown events has shown than such events occur on average 13 times (start-up / shutdown) and 50 times per year, with short term elevations in particulate matter concentration occurring during each event while the ESP is inactive. Assessment of detailed Continuous Emissions Monitoring System (CEMS) data from these events indicates that the combined effect of higher particulate concentrations with the accompanying reduced flow rates would result in negligible ambient air quality impacts over the period of the event.

7) Following approval of C&D fuel combustion, stack emissions testing to compare emissions from hog and C&D fuel are recommended, with monitoring of all parameters assessed in this analysis. This testing should be accompanied by testing of fly and bottom ash composition. Such testing will confirm the assumptions used in developing the inputs to this assessment and will provide a basis for the development of any modifications to the ongoing stack emissions testing program for the facility.

8) Ash from facility hog fuel combustion is currently beneficially used by Nicola Mining for reclamation activities at the closed Craigmont Mine, under authorizations from the British Columbia Ministry of Energy, Mines and Petroleum Resources and the British Columbia Ministry of Environment and Climate Change Strategy that require metals testing by Nicola Mining. Ash from C&D combustion is expected to be compositionally similar to the existing ash, so continuation of the existing beneficial use arrangement is expected. Testing of ash from C&D combustion is recommended during the combustion trials recommended above.