March 31, 2025

Tony Lawlor
Plant General Manager
KLPC

Subject: Regulation 419/05 Annual ESDM Report Up-date

As required by Section 25 of Ont. Reg. 419/05, the ESDM Report must be up-dated annually and an Executive Summary of the report must be available for distribution to the public.

I have considered any changes which may have been implemented at the plant since the preparation of the last ESDM dated October 2023 (no changes), and as such no further modelling work is required at this time.

An Executive Summary is attached to this cover letter. Please have the Executive Summary made available to the public on request (Section 27, Ont. Reg. 419/05).

Yours truly,

Jon Arkell
Environmental Engineer, Thermal and Utilities
Northland Power Inc.

Executive Summary

An Emission Summary and Dispersion Modelling (ESDM) Report was prepared for Kirkland Lake Power Corp. (KLPC) for the Kirkland Lake Generating Station. This ESDM report has been updated for the proposed removal of three wood boilers and the emission rates for the existing sources have been modelled using the latest approved AERMOD model (version 22112). Northland Power Inc. (Northland) operates the Kirkland Lake Generating Station (the Facility) and is a majority owner of KLPC.

This ESDM Report documents the sources at the Facility as required by sub paragraphs 2 to 4 of s. 26 of O. Reg. 419/05. In addition, the Ministry of Environment Conservation and Parks (MECP) Guideline A-10: Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2018 (ESDM Procedure Document) was followed as appropriate.

The North American Industry Classification System (NAICS) primary code that applies to the Facility is 221112 (Fossil Fuel Electric Power Generation) and 221117 (Biomass Electric Power Generation). The 221112 NAICS code is listed under Schedule 4 of O. Reg. 419/05. It can operate up to 24 hours per day, 7 days per week, 52 weeks per year. The Facility is a baseload biomass and natural gas fired combined cycle power plant. It was commissioned in 1991 and is located at 505 Archer Drive in Kirkland Lake, Ontario. The Facility currently operates under Environmental Compliance Approval (ECA) number 4133-C2LRC9, dated July 19, 2021 (Appendix A), and uses gas turbines and biomass burning technology to produce nominally 106 MW of electricity for distribution. The "peaking" gas turbine can produce an additional 30 MW of electricity. The significant contaminants emitted from the operations of the Facility include nitrogen oxides (NOx), suspended particulate matter (SPM), carbon dioxide (CO_2), carbon monoxide (CO), sulphur dioxide (SO_2). The contaminants present at the Facility are subject to Schedule 3 standards as per Section 20 of Ontario Regulation 419/05 – Air Pollution – Local Air Quality (O. Reg. 419/05), therefore, the Facility's assessment of compliance was performed using AERMOD dispersion model and its pre-processors (v.22112).

The Facility plans on discontinuing the use of biomass burning technology (wood boilers). The maximum emission rates for each significant contaminant emitted from the remaining significant sources were calculated in accordance with s.11 of O. Reg. 419/05. The data quality assessment follows the classification system outlined in the ESDM Procedure Document. Some of the contaminants were considered negligible in accordance with s.8 of O. Reg. 419/05.

The modelling scenarios for the relevant averaging periods, assumed operating conditions for the Facility that resulted in the highest concentration of each significant contaminant at a Point of Impingement (POI). The results are presented in the Emission Summary Table in accordance with s.26 of O. Reg. 419/05.

The Facility is located on land zoned for Heavy Industrial (M2). It is surrounded by light industrial zoned land (M1) to the north and east, Heavy Industrial zoned land (M2) to the west, and Rural zoned land (RA) to the south.

The AERMOD advanced air dispersion model was used to assess compliance with the air quality standards listed in Schedule 3 of Ontario Regulation 419/05. AERMOD version 22112 and AERMET version 22112 were used to determine the maximum point of impingement (POI) concentrations of the significant contaminants of concern. The predicted POI concentrations were compared to the respective POI limit(s) set out in Schedule 3 or applicable screening levels.

The Emission Summary Table (Table E-1) shown below demonstrates that the Facility can operate in compliance with the Schedule 3 POI limits or applicable screening levels for all contaminants of concern. The Source Summary Table containing a list of all on-site air emission sources is presented in Appendix B.

Table E-1: Emission Summary Table

Contaminant Name	CAS Number	Total Facility Wide Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (µg/m³)	Averaging Period (hours)	Limiting Effect	Ministry POI Limit (µg/m³)	Guidelines/ Standards	% of POI/ Guideline (%)
Nitrogen Oxides [NOx] [1]	10102-44-0	6.49E+01	AERMOD v.22112	2.35E+02	1	Health	400	Sch. 3	58.7%
		6.49E+01		1.02E+02	24	Health	200	Sch. 3	50.8%
Carbon Monoxide [CO]	630-08-0	1.16E+01		9.60E+01	0.5	Health	6,000	Sch. 3	1.6%
Carbon Dioxide [CO_2]	124-38-9	1.57E+04		4.61E+04	24	Health	255,800	Sch. 3	18.0%
Particulate Matter (< 44 µm diameter) [TPM]	N/A	9.43E-01		2.59E+00	24	Visibility	120	Sch. 3	2.2%
Sulphur Dioxide [SO_2]	7446-09-5	4.64E-01		2.44E+00	1	Health & Vegetation	100	Sch. 3	2.4%
		4.63E-01		6.95E-02	8,760		10	Sch. 3	0.7%

Note: [1] The total emission rate for NOx includes the standby generator emissions during testing. Maximum POI results were compared to the Schedule 3 standards and were in compliance; thus, comparison to the MECP generator guideline of 1880 µg/m³ (0.5 hour averaging time) at the most impacted non-sensitive receptor was not assessed.