Emission Dispersion Parameters

For Input to CCPP Stack Calculation

CO_2 Capture Facility

Kårstø, Norway

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1.0 INTRODUCTION

This document describes the necessary parameters, such as stack height, flue gas flow and velocity, temperature, and composition based on the modified Naturkraft Combined Cycle Power Plant (CCPP) HRSG stack to calculate the emission dispersion from the modified stack, as required by Fichtner document 10112936-FI-B-CON-0012, REV 04, dated 09 June 2008, "Appendix A2 - Explanations Deliverables", Section 3.15.

Additional reference to Fichtner Query no.: 10112936-Q-FIPB-S-0021, dated 24 September 2008, requires the completion of the calculation if the stack parameters are changed or modified. The Query states that preparation of a calculation is not necessary (to be completed by others which is assumed to be the Gassnova Environmental Consultant), that only the technical parameters of the modified stack are to be provided to enable the emissions modeler to complete the necessary calculation.

2.0 STACK MODIFICATION

The present CCPP HRSG stack will be modified to permit the attachment of an exit breeching on the East side of the stack, and re-direct the CT flue gas from exiting the top of the stack and direct it into the ducting to the CO_2 Carbon Capture and Compression (CCC) plant. This is accomplished by perforating the east side of the existing stack with a similar number and size of through-holes, identical to the pattern for the connection of the HRSG breeching into the stack.

On startup the existing stack damper will be open, permitting the CT flue gas to exit the stack at the top, at the current mass flow and temperature, velocity and gas composition. Once the CCC becomes available the CCC flue gas blowers will be started, the HRSG stack damper will be closed, and 100% of the CCPP CT flue gas will be re-directed to the CCC.

The CCC uses two Flue Gas Blowers to create a vacuum in the duct to the CCC to cause the flue gas to be pulled into the CCC plant. The use of variable speed drives on these blowers, and as necessary inlet damper control on each blower, will enable the CCC to control the flue gas flow so that essentially no flue gas will exit the HRSG stack.

Some small amount of stack damper leakage can be expected through the present split-half style Raumag Janich DN 7000 damper. This leakage is expected to be a minimal amount coming into the stack during normal and part load operation, and will not effect the CCC plant operations nor that of the CCPP. Emissions from the HRSG stack during CCC plant operation is expected to be essentially zero.

3.0 CONCLUSION

Based on the CCC plant design there will be no change in the necessary parameters of the HRSG stack emissions such as mass flow and velocity, temperature or gas composition during operation of the CCPP without the CCC, and these stack emissions parameters will be essentially zero when the CCC plant is operating.

Under partial output operation of the CCPP (plant turn-down), with the CCC not in operation, the flue gas mass flow and velocity, temperature, and gas composition will remain unchanged from the present design. With the CCC plant in operation again the emissions from the CCPP will be essentially zero, with minimum stack damper leakage.

Under partial operation of the CCC plant, the CCPP flue gas mass flow out of the HRSG stack will be reduced proportionally, with the velocity, temperature, and gas composition unchanged from the present design.