

1. INTRODUCTION

1.1. PURPOSE

Sargent & Lundy (S&L) was retained by Minnkota Power Cooperative, Inc. (Minnkota) to support the evaluation of mercury (Hg) emissions reductions in response to the pre-published rule to amend the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coal- and Oil-Fired Electric Utility Steam Generating Units (EGUs), commonly known as Mercury and Air Toxics Standards (MATS) published on April 24, 2023 that would require additional Hg emissions reductions on the Milton R. Young (MRY) Station Units 1 and 2. As part of this evaluation, S&L assisted Minnkota in the coordination of a Hg control test campaign to determine if it is feasible to achieve incremental Hg emission reduction on a lignite-fired unit without a fabric filter that is sufficient to meet a 1.2 lb/TBtu Hg emission rate on a continuous basis.

1.2. FACILITY BACKGROUND

The MRY station is located approximately seven (7) miles southeast of Center, North Dakota or forty (40) miles northwest of Bismarck, North Dakota on ND Highway 25 at 3401 24th Street SW, Center, North Dakota 58530. MRY station provides energy to the Midcontinent Independent System Operator (MISO) system. MRY station consists of two (2) units. Both MRY units are lignite-fired Babcock and Wilcox (B&W) cyclone boilers. Both boilers fire North Dakota lignite coal supplied from BNI Coal, Ltd.'s Center Mine located in close proximity to the plant. The MRY Unit 1 single wall cyclone boiler (Caroline type, radiant natural circulation) was placed into service in 1970 and has a typical output capacity rating of 257 MWg (gross). The MRY Unit 2 opposed wall cyclone boiler (Carolina type, radiant pump assisted natural circulation) was placed into service in 1977 and has a typical output capacity rating of 470 MWg (gross). Both units utilize selective non-catalytic reduction (SNCR) and separated overfire air (SOFA) systems for NO_x control, fuel additive (or halide) injection system and non-halogenated (or non-brominated) powdered activated carbon (PAC) for Hg control, dry electrostatic precipitators (ESP) for PM emissions control, and wet flue gas desulfurization (WFGD) systems for sulfur dioxide (SO₂) control.

1.2.1. Current Hg Control System Specifications

The existing Hg control system is designed to control Hg emissions below 4.0 lb/TBtu using a combination of M-Prove halide injection and non-halogenated PAC. The M-Prove is directly applied on the coal belt prior to reaching coal silos, whereas the non-halogenated PAC is injected into the duct downstream of the air pre heater (APH). Additional information on the design of the existing fuel additive and PAC injection systems for MRY Units 1 and 2 are summarized below:

- MRY Common Non-brominated PAC Storage Silo:
 - PAC Utilized: Cabot DARCO® Hg-H non-halogenated PAC
 - Single storage silo with three (3) outlet cones or discharge connections. Each cone is connected to a feeder train (A, B, and C).
 - Feeder Train A is dedicated to MRY Unit 1
 - Feeder Trains B and C are dedicated to MRY Unit 2
 - Storage Volume: 4,200 cu.ft. (Nominal)
 - Capacity: 105,000 lbs. (based on PAC density of 25 lbs/cu ft.)