MONTANA-DAKOTA UTILITIES CO.
A Division of MDU Resources Group, Inc.

Before the South Dakota Public Utilities Commission

Docket No. EL15-___

Direct Testimony
of
Alan L. Welte

Q. Please state your name and business address.

A. My name is Alan L. Welte and my business address is 400 North Fourth Street, Bismarck, North Dakota 58501.

Q. By whom are you employed and in what capacity?

A. I am the Director of Generation in the power production department of Montana-Dakota Utilities Co. (Montana-Dakota), a Division of MDU Resources Group, Inc.

Q. Please describe your duties and responsibilities with Montana-Dakota.

A. I have overall responsibility for the day-to-day operation of Montana-Dakota's electric generation facilities, represent Montana-Dakota's interests in jointly owned generation facilities operated by other companies, and I am also responsible for new generation development.

Q. Please outline your educational and professional background.

A. I hold a Bachelor's Degree in Mechanical Engineering from North Dakota State University. My work experience at Montana-Dakota includes eight years of experience as a plant engineer, twelve years of experience

as a plant manager, and eleven years of generation development and operational responsibilities in my current position which includes coal-fired, gas-fired, and renewable generation.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to describe the analysis performed to determine the optimal emissions control strategy for the Lewis & Clark Station (Lewis & Clark), the additional pollution control equipment and modifications necessary for compliance, and the estimated cost required to demonstrate compliance with the U.S. Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards (MATS) Rule.

Secondly, I will discuss the Air Quality Control System project (AQCS) being installed on the Big Stone Plant (Big Stone) to comply with the South Dakota State Implementation Plan (SIP) that was developed to comply with the EPA Regional Haze Rule (40 CFR Part 51 Subpart P), as well as the equipment at Big Stone necessary for compliance with the MATS Rule.

Finally, I will provide an overview of the incremental reagent costs required at several of Montana-Dakota's generating stations as a result of the MATS Rule.

Q. What analysis was performed to determine the pollution control equipment additions and modifications that are required for compliance with the MATS Rule at Lewis & Clark?

A. Several diagnostic stack emissions tests were performed to determine the Lewis & Clark's baseline emissions. The stack test results and continuous emissions monitoring data were analyzed to determine which emissions were not meeting the applicable MATS emission limits based on the existing suite of pollution control equipment. The engineering firm of Sargent & Lundy was retained by Montana-Dakota to evaluate emission control technology strategies that would provide a cost effective means to demonstrate compliance with the MATS Rule.

Q. What was the result of comparing actual emissions to the MATS emission limits?

A. The results indicated that Lewis & Clark is already meeting the MATS limits for mercury and for acid gases, as demonstrated by hydrogen chloride (HCl). The results from diagnostic testing in 2011 and 2012 indicated that the Lewis & Clark measured emissions for filterable particulate matter, total non-mercury and individual non-mercury hazardous air pollutant metals all exceeded the respective MATS limits. Specifically the results showed manganese would be expected to consistently prevent the unit from being compliant with either the individual or total non-Hgmercury HAP metals emission limits, and FPM would be expected to prevent the unit from being compliant with the FPM emission limit based on the existing suite of air pollution control technologies.

Q. Would you please describe Montana-Dakota's plan for complying with the MATS Rule non-mercury hazardous pollutant metals requirements?

A. As part of the 2013 IRP, resource expansion modeling and analyses were performed to explore multiple options in meeting the MATS Rule by April 2015. The results of the initial modeling supported the installation and operation of a fabric filter baghouse system along with modifications to the existing mist eliminator at Lewis & Clark as compared to the retirement of the plant at the end of the 2014 and a number of natural gas conversion alternatives.

Subsequent to Montana-Dakota's initial modeling results, the cost estimate for the fabric filter baghouse and mist eliminator modifications option increased from $27 million to approximately $40 million due to the need for additional equipment to prevent deposits from forming in the stack and to reflect the current regional climate for construction costs. This caused Montana-Dakota to reevaluate its initial Lewis & Clark MATS project plan as it was no longer an economical means of meeting the MATS requirements. Initially, co-firing coal with natural gas was considered to be a viable option due to pipeline capacity becoming available which was not available at the time of the 2013 resource expansion modeling. However, diagnostic test results under various natural gas/coal supply mixes indicated the natural gas co-fire option would not support MATS compliance. In September of 2014, Montana-

Dakota initiated a study with URS Corporation (URS), a consulting engineering firm experienced in modifying wet scrubbers similar to the scrubber utilized at the Lewis & Clark. Upon evaluation, URS concluded that a large fraction of the particulate matter in the scrubber slurry is re-entrained in the flue gas leaving the stack. URS determined that modifications to the existing scrubber and stack vessels will reduce the re-entrainment of scrubber slurry and the associated filterable particulate matter (FPM) sufficiently to meet the MATS non-mercury hazardous air pollutant metals compliance requirements. URS proposed a solution with guaranteed FPM reductions and that could be installed and placed into service in late 2015.

Q. What additional equipment and modifications are required for Lewis & Clark to comply with the MATS Rule?

A. To comply with the MATS Rule, Montana-Dakota will need to add the following equipment and modifications;

- Turning vanes to change the distribution of the flue gas within the stack.
- A sieve tray and mist eliminator system to increase the efficiency of removing FPM.
- A forced oxidation system to control the chemical reactions within the system and to prevent deposits from forming.

Q. Would you please describe the current status of the Lewis & Clark MATS project?

A. Montana-Dakota executed a contract with URS for them to engineer, procure and construct the project. A one year extension was granted by the Montana Department of Environmental Quality to allow for the time needed to design, procure, construct and commission the project. URS is completing the detailed design, and procuring the equipment and construction services for the project. The construction contractor is scheduled to mobilize to Lewis & Clark in July, 2015 to begin work. The majority of the construction activities will take place during a ten week outage scheduled from September 5 to November 15, 2015. Initial operation, tuning and testing is scheduled for late November and early December, and commercial operation on about December 15, 2015. The projected cost for the project is $16 million.

Q. What additional equipment is required for Big Stone to comply with the Regional Haze and MATS Rules?

A. To comply with the Regional Haze Rule, the following equipment was added as part of the AQCS project:

- Selective catalytic reduction technology (SCR) with separated over-fired air for control of NO_x.
- Circulating dry scrubber for control of SO_2.
- A baghouse for control of particulate matter.
- Replacement Induced Draft fans.

- Modifications to the boiler tube surfaces to obtain the required SCR inlet flue gas temperature and to the boiler structure to meet the new pressure requirements for the boiler setting.
- Pebble lime and ammonia reagent handling systems.
- Waste ash handling system.

An activated carbon injection system was installed to comply with the mercury limit of the MATS Rule. The South Dakota DENR issued a one year compliance deadline extension for meeting the MATS requirements to April 16, 2016.

Q. What is the current status of the Big Stone AQCS project?

A. Actual construction on the project is now over 99 percent completed. Big Stone was shut down during the evening of February 27, 2015, for the start of the outage to "tie-in" all of the AQCS equipment. The outage was scheduled to be completed and the unit back on line by June 9, 2015, but because of problems found with the plant's High Pressure (HP) steam turbine during routine inspection, the outage has been extended. The current projected time for the unit to return to service is August 2015, an approximate 10 week extension from the original schedule. This HP steam turbine work is unrelated to the AQCS Project. Because of the outage extension, the project budget will be negatively impacted, but the project is still projected to finish on or under the $384 million budget estimate. Montana-Dakota's share of the total $384 million capital cost estimate for the AQCS and MATS projects is $90 million.

Upon commercial operation of the AQCS equipment at Big Stone, now expected in late 2015, the plant will require additional expenses related to its ongoing operation and maintenance. The largest of these ongoing additional costs will be the emission control reagents.

Plant staff is expected to increase by the equivalent of approximately eight full time employees needed to receive the chemical reagents, prepare the chemicals for use, operate and maintain the equipment and haul the ash.

Q. Would you please describe the incremental reagents necessary at Big Stone and other Company generating facilities in order to comply with environmental regulations?

A. Yes. Reagents are substances used to process emissions, with the type of reagents used varying depending on the emissions control equipment being installed at a specific generating facility. Reagents include powdered activated carbon, pebble and hydrated lime, calcium bromide, anhydrous ammonia and urea. Powdered activated carbon and calcium bromide are used in the reduction of mercury emissions. Pebble lime and hydrated lime are used for the reduction in sulfur dioxide (SO_x) emissions, and anhydrous ammonia and urea are used for the reduction of nitrogen dioxide (NO_2).

Pebble lime, activated carbon, and anhydrous ammonia will be utilized for the new emissions control equipment being installed at Big Stone.

New equipment installed at the Coyote Station will consume powdered activated carbon for the reduction of mercury emissions. Powdered activated carbon and calcium bromide are used as the reagents for mercury control under MATS at Lewis and Clark. The majority of these reagent expenses are new costs to Montana-Dakota and the incurrence of these costs will phase in overtime and are subject to fluctuations due to competing market demands as well as fuel and transportation costs consumed during delivery of the product. As the reagent expenses are directly related to generation and are volatile in nature the costs should be considered as part of the Fuel and Purchased Power Adjustment as presented in Mr. Jacobson's testimony.

Q. Please describe the additional staffing needed in the Power Production and Environmental areas due to the environmental modification and generation facility expansion projects.

A. Montana-Dakota has added two full time employees and expects to add two more later in 2015 to the Power Production and Environmental area. These additions are needed for project development, execution, and tracking as well as for on-going permitting, reporting, maintenance planning, environmental and other compliance activities.

Q. Does this conclude your direct testimony?

A. Yes, it does.