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BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

DOCKET NO. UE-19____

DIRECT TESTIMONY OF

THOMAS C. DEMPSEY

REPRESENTING AVISTA CORPORATION

I. INTRODUCTION

Q. Please state your name, business address, and present position with Avista Corporation.

A. My name is Thomas C. Dempsey. My business address is 1411 East Mission Avenue, Spokane, Washington, and I am employed by the Company in the Generation Production and Substation Support Department. My title is Manager, Thermal Operations and Maintenance.

Q. What is your educational background and prior work experience?

A. I am a 1993 graduate of the University of Texas at Austin with a Degree in Mechanical Engineering. I started my career as a performance engineer at Houston Lighting & Power in Houston, Texas. While working there I participated in equipment performance testing activities on a number of gas-fired steam facilities, a coal facility, and several simple-cycle gas turbine facilities. I started working for Avista in December 1996 as a mechanical production engineer in the Generation Production Substation Support Department. In that capacity I participated in a wide variety of hydro and thermal generating station projects. In 2007 I joined the Power Supply Department where I managed Avista's share of the Coyote Springs 2 and Colstrip Generating Station facilities. In 2014 I rejoined GPSS where my primary responsibilities include operations and maintenance management for all of Avista's thermal generating facilities. For the last 23 years at Avista I have had a number of engineering and supervisory roles related to our thermal generation fleet.

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

A. My testimony will describe the Mercury & Air Toxics Standards ("MATS") emission exceedance that led to outages that occurred at the Colstrip Generating Station, specifically Units #3 and #4. I will demonstrate that the outages that occurred were not the result of imprudent actions on the part of Avista, the other plant owners, nor the plant operator (Talen). In support of that assertion, I will summarize Talen's actions as described in the September 17, 2018 letter to Montana Department of Environmental Quality (MDEQ). Finally, I will provide an overview of recent transformer concerns at our Coyote Springs 2 Generating Facility and how the Company has and continues to address issues related to certain transformers.

Q. Are you sponsoring any exhibits to be introduced in this proceeding?

A. Yes. I am sponsoring Exhibits No. TCD-2 and TCD-3. Exh. TCD-2 is a copy of the August 31, 2018 letter from MDEQ to Talen, "Request for information with Mercury & Air Toxics Standard". Exh. TCD-3 is Talen's September 17, 2018, response letter to MDEQ related to the compliance with Mercury Air Toxics Standard for Colstrip.

<u>II. COLSTRIP UNITS 3 & 4</u>

Q. What is Avista's role in the planning, management and operation of the Colstrip plant?

A. Avista is a 15% owner of the Colstrip Units #3 and #4, a twin-unit, coal fired, generating facility, and is not directly involved in the day to day operations of the plant. Avista, along with the other owners of the facility, and according to ownership percentage, provide oversight of the facility. The operator, Talen Montana, plans and carries out the daily operation of the facility.

Q. Please describe the environmental compliance issue at Colstrip that caused the outage in 2018.

A. Mercury and Air Toxics Standard (MATS) became effective on April 16, 2017, for all Colstrip units. MATS requires that Particulate Matter (PM) emissions be used as a surrogate for toxic emissions of non-Mercury metals. Mercury emissions are measured separately to meet a Mercury-specific limitation.

Talen currently performs compliance assurance stack testing for Colstrip on a quarterly basis to meet the MATS site-wide limitation for PM emissions (0.03 lbs./MMBtu). Test results for Colstrip Units #3 and #4, performed on June 21, 2018, and June 26, 2018, respectively, indicated Colstrip was operating in excess of MATS limits as included in Air Permit #0513-14 issued by the MDEQ. MDEQ was notified of the PM emission exceedance on June 28, 2018, and as a result, Unit #3 was immediately removed from service. Similarly, Unit #4 was removed from service on June 29, 2018.

Talen submitted a Final testing report confirming the non-compliance with MATS to the MDEQ on August 20, 2018. Talen proposed that <u>limited operation</u> of Unit #3 and Unit #4 for the evaluation of a corrective action and/or data gathering related to potential corrective action was a prudent approach to addressing the issue.

On August 31, 2018, the MDEQ issued a "Request for information with Mercury & Air Toxics Standard", which has been provided as Exh. TCD-2. In that letter, the MDEQ stated:

> Talen Montana, LLC (Talen) conducted PM emissions testing at CSES on June 21, 2018 and June 26, 2018 for Units 3 and 4, respectively. Test results indicated, and the Source Test Report submitted by CSES confirmed, that CSES was operating in excess of the applicable emission limit contained in Title 40 Code of Federal Regulations Part 63 (40 CFR 63) Subpart UUUUU, also referred to as the Mercury and Air Toxics Standard (MATS).

MDEQ specifically requested information through six questions, as shown in Exh. TCD-2.

Q. Please summarize Talen's immediate actions taken to resolve the MATS compliance issue.

A. On September 17, 2018, Talen responded to the MDEQ request for information by addressing the six questions related to the compliance with MATS. This response is provided as Exh. TCD-3. That letter provides a detailed description of the activities taken associated with the boilers and Venturi scrubbers after the emission exceedance occurred. In summary, an extensive inspection was conducted of the coal mills, boilers, ductwork, air preheater, scrubbers and the stack. Cleaning, adjustments and repairs were conducted, as needed which required Unit #3 to be offline from June 28-July 8 and Unit #4 to be offline from June 29-July 17. There were four main areas that were investigated to determine and address the cause of emission exceedance:

- Compliance test method
- Fuel quality
- Boiler combustion
- Scrubber performance

In addition to Talen staff, nationally recognized expertise was brought on-site to help conduct the investigation and implement corrective actions. The PM compliance test method and procedures were verified by audit and independent side-by-side testing. A proximate and ultimate analysis was performed on the coal, and the results were within contract specifications. Coal mills were tested and adjusted to help reduce slagging/fouling. Overall boiler combustion was evaluated to ensure that SO3 mist and condensable PM were not being formed and emitted. Lastly, the focus turned to overall scrubber performance which focused on three main areas – (1) liquid spray, (2) flue gas flow, and (3) scrubber chemistry.

1. Liquid spray flow – the wet Venturi scrubbers remove both PM and SO2 with proper spray flow to the multiple sections of the scrubber. All the sprays were inspected, evaluated and adjusted to achieve a more effective balance for emissions removal.
2. Flue gas flow – overall flue gas flow and distribution of the flue gas is important to effective scrubber operation. The mist eliminator section of the scrubber controls carry-

over droplets from the wet scrubbing process. These droplets can contain solids which can contribute to PM emissions. Testing of the mist eliminator section of the scrubber indicated that the some eliminators were not optimally balanced, which resulted in higher areas of flow and the potential for carry-over. Talen immediately notified MDEQ of its plan to install new scrubber flow distribution plates to balance the flow across the mist eliminator section.

3. Scrubber chemistry – A review of scrubber chemistry, consisted of a review of the solids in the scrubber water, comparing current levels versus against historic levels. The solids were 2-5% above the historic operating ranges. New operating ranges were immediately adopted to address this problem.

Q. Were the measures taken in whole by Talen (with assistance of third-party advisors) effective in returning Units #3 and #4 to compliance with MATS?

A. Yes, the measures were effective. On September 4, 2018, Unit #4 demonstrated compliance with MATS Standard with a PM emission rate of 0.021 lb./mmbtu. On September 11, 2018, Unit #3 demonstrated compliance with MATS Standard with a PM emission rate of 0.024 lb./mmbtu.

Q. What specific actions were most effective in bringing the Colstrip plant back to within MATS compliance?

A. Talen inspected, cleaned, adjusted and repaired many potentially contributing systems during their efforts to get Units #3 and #4 back online quickly. The areas identified above under scrubber performance, specifically the installation flow distribution plates, resulted in the largest improvement in emission removal and ultimately achieved MATS compliance.

Talen considered it important to identify all potential PM contributors and then review unit operating data and diagnostic test data in order help determine which areas may or may not have contributed to the issue. To help aid in this determination, Talen has contracted with a third party vendor to review potential causes of the outage. Should the review be finalized during the pendency of this ERM Review, the Company will supplement with the final report.

Q. Is MDEQ expected to take any enforcement action in regards to the MATS compliance issue?

A. Yes. Due to the failure to meet the MATS standard, Colstrip Units #3 and #4 are now subject to potential MDEQ enforcement action. The extent of this action, including any potential fines, is currently in the discussion phases.

Q. Please describe the actions the plant owners are taking to prevent a future outage of a similar nature.

A. Talen is currently working with MDEQ on an agreement for future MATS compliance assurance. In addition, plant owners are evaluating the specific actions taken by Talen for potential improvements and implementation. In addition, information will be provided as part of the third-party review referenced above.

Q. What are the requirements as it relates to the availability of Colstrip Units #3 and #4 as it relates to treatment in the Energy Recovery Mechanism?

A. Paragraph 6(E) of the Settlement Agreement approved by Order 03 in Docket UE-060181 dated June 16, 2006, requires the Company to demonstrate that: (1) the fixed costs set in rates were incurred for the time the plant had an outage that reduced the availability factor below 70%; and (2) the outage was not the result of imprudent actions on the part of the Company.

Q. What was the availability factor for Colstrip Unit #3 and #4, combined, for 2018?

A. The equivalent availability factor for 2018 for the Colstrip plant (Units #3 and #4) was 82%.

Q. In your opinion, was the Colstrip outage a result of imprudent actions on the part of Avista, the Plant Operator, or other Plant Owners?

A. The outage was not the result of imprudent actions on the part of Avista, Talen, or the other plant owners. In my view, Talen acted appropriately both in terms of conducting the required compliance testing which provided the preliminary findings of non-compliance with MATS, properly notifying MDEQ of the issue and securing an agreement to provide for the limited operation of the units until the issue could be resolved. Talen immediately began troubleshooting to determine the cause of the exceedance, made adjustments and needed equipment improvements which ultimately brought Units #3 and #4 back into MATS compliance.

In addition, Talen was very transparent in communicating their status and actions on a daily conference call with all internal stakeholders. Company representatives from Avista and other owners were also periodically on-site during the event to aid in the evaluation and confirm the progress toward compliance.

Q. What was the financial impact included in this filing related to the issues with Colstrip in 2018?

A. As Company witness Mr. Johnson discusses, the impact of the issues at Colstrip for July 2018 – August 2018 was approximately $3.5 million in increased power supply expenses.

III. COYOTE SPRINGS II

Q. Please describe Avista's Coyote Springs 2 ("CS2") natural gas generating facility.

A. CS2 is a natural-gas fired combined cycle combustion turbine located in Boardman, Oregon. Portland General Electric, who owns Coyote Springs 1, operates both units. The plant, completed in 2003, has a maximum capacity of 317.5 megawatts in the winter, 285 megawatts in the summer, and has a nameplate rating of 287.3 megawatts. In 2016 the plant was upgraded with new control technology that increased its capacity by 18 megawatts.

Q. During normal operations, how many transformers are in service at CS2?

A. There is one Generator Step-Up (GSU) Transformer in use at any time at Coyote Springs 2. This Transformer is fed by one natural gas turbine generator which produces 18,000 volts of electricity and one steam turbine generator which produces 13,800 volts of electricity. The electricity produced from both units flow through the GSU Transformer where the voltage is increased to 500,000 volts, and then connects to the Bonneville Power Administration transmission system. Transformer #3 was placed in service in May, 2007, and was still in operation as of September 21, 2018. Transformer #4 was located at the plant for use as a spare, so it was not in use.

The CS2 GSU transformers are each filled with 23,696 gallons of mineral oil that is used for the insulation and cooling of electrical components inside the transformer. The GSU transformers have a conservator tank that is slightly elevated and separate from the transformer that acts as a reservoir for transformer oil and allows for adequate space for expansion of transformer oil when heated under increased load or ambient temperature.

Q. As it relates to CS2 GSU Transformer #3, what transpired on September 21, 2018?

A. At 2:21 PM on September 21, 2018, the CS2 GSU transformer (T#3) was tripped by a Buchholz relay action and was automatically removed from service, causing all electrical generation from CS2 to immediately stop. A Buchholz relay trips when a high internal arc is accompanied by the generation of gas in the mineral oil, combined with a surge of oil from the transformer tank to the conservator. The tripping signal stops the flow of electricity from the transformer to prevent further damage to the transformer, to other equipment, or to nearby personnel.

Within the next four hours, the online oil analyzer on Transformer #3 confirmed the presence of acetylene and an increase of other gasses indicative of a high energy internal arc. A manual oil sample was taken and sent to the laboratory for analysis; the laboratory conclusion was the same as what the online gas analyzer indicated – namely, that the increase in the amount of gases in the oil resulted in a high energy internal arc.

Q. What actions were initially taken to determine the condition of Transformer #3?

A. Avista Engineering, electrical crews, and protection and control technicians immediately mobilized to conduct further analysis and planning of next steps. These steps included, but are not limited to:

- A review of the online gas-in-oil analyzer readings that suggested a high energy internal arc.

- An inspection of the Buchholz relay was conducted to ensure it functioned properly and was not simply a false relay action.

- An Avista electrical crew performed initial electrical testing and verified the amount of gas in the transformer oil.

Q. Did the Company recently undertake preventative measures or inspections of GSU Transformer #3?

A. Yes. The most recent tests and inspections were conducted in May of 2018, where Avista electrical crews performed various tests to check the condition of the transformer. These included testing of the insulation within the transformer and an examination of high energy arc locations. All tests concluded with normal results, meaning there were no abnormalities. In addition, Avista uses an online gas analyzer on many of its critical transformers, including CS2, to be able to monitor for gas-in-oil caused by a high energy internal arc. Manual oil samples are taken and sent to a laboratory for gas-in-oil analysis on a 3 – 4 month interval.

Q. Could the Company simply have left Transformer #3 in service, and continue to have the ability to generate at full capacity?

A. No. The decision to replace Transformer #3 was thoroughly analyzed by Avista engineering. The following risks were analyzed as part of the decision to replace:

- Doble (electrical testing) confirmed accelerated deterioration of the Transformer #3 internal workings;
- Persistent overheating of the GSU Transformer #3 top that caused Siemens (the original equipment manufacturer) to recommend replacing with a different top;
- Without repairs, re-energizing would risk catastrophic failure or if Transformer #3 was placed back in service and failed during peak months (peak electrical need is during the coldest part of the winter or hottest part of the summer) replacement would be more costly;
- The Buchholz Relay, Serveron on-line gas analyzer, and Kelman, a separate oil analysis tool, were three independent devices or tools that led to the same conclusion that indicated a high energy internal arc and increased gas-in-oil.

Had the Company not taken Transformer #3 out of service, there was a significant risk of catastrophic failure of not only Transformer #3 but also the potential to damage other nearby equipment and people. Safety of the employees working in proximity of the GSU transformer was a paramount concern.

Q. Has the Company employed experts or representatives of the transformer manufacturer in order to assist in determining what happened with Transformer #3?

A. Yes. Transformer Cooling and Apparatus LLC, North American Substation Support, Doble Engineering, and Siemens (the Original Equipment Manufacturer), were among the experts retained to help identify the condition of Transformer #3.

Q. Without Transformer #3, what is the impact to the overall generation production potential at CS2?

A. Without a GSU in service, CS2 has no ability for electrical generation and transmission. Transformer #3 was the GSU in service. When it failed, the decision was made to keep it out of service because of its condition.

Q. Does the Company maintain a backup transformer at CS2?

A. Yes. Since there is a very long lead time to build a similar transformer, the Company has maintained a backup transformer that is located at the facility for any event which may take the current transformer (in this case Transformer #3) out of service. Transformer #4, an exact duplicate of Transformer #3, was purchased from Siemens Brazil and transported to CS2 in 2009. Once on-site, all associated apparatuses, oil coolers, fans, bushings and conservator were installed and Transformer #4 was filled with mineral oil and kept in a safe, long term storage condition.

Q. When did the Company put Transformer #4, the backup transformer, into service?

A. Following the analysis of all the testing and indications that pointed to the decision to remove T#3 from service, work began the end of September 2018 to remove Transformer #3 and position Transformer #4 for commissioning. Transformer #4 was placed in service on October

28, 2018. While Transformer #4 was in the process of being inspected for use, an internal inspection found that supports of some of the electrical equipment were broken. Prior to refilling Transformer #4 with oil, these broken supports were removed and the similar supports were taken out of Transformer #3 and placed in Transformer #4. There were no other concerns found during the remainder of the internal inspection and electrical testing of Transformer #4.

Q. Did the Company encounter any other issues with Transformer #4 once it was placed into service?

A. Initially, no. Following commissioning and returning to unrestricted service, Transformer #4 showed no issues. The Serveron online gas-in-oil analyzer and manual oil samples indicated Transformer #4 was functioning as designed, and oil and winding temperature gauges mounted on the transformer were within the normal, expected range.

Q. Will you please provide more detail as to the nature of the issues later found with Transformer #4?

A. Yes. All transformers will generate gas-in-oil; Transformer #4 is no different. There were multiple gasses present and the amount of gas in the oil was slowly increasing, as shown by the on-line oil analyzer. This is not traditionally unexpected. However, on November 20, 2018, the oil analyzer gave the first indication that there may be an issue with Transformer #4. A sharp increase in combustible gasses in the oil suggested an elevated metal temperature internal to the transformer. A manual oil sample was taken and sent for off-site analysis, and similar results were observed.

Immediate steps were taken in an attempt to reduce the increasing gas and to lower the risk of further damage. CS2 was de-rated, in order to limit the amount of electricity being produced and flowing through the transformer, to 200 MW, in an attempt to stop the increasing gas in the oil by reducing the amount of heat generated in Transformer #4. This action, however, of de-rate did not resolve the gas-in-oil issue. Transformer #4 was removed from service for electrical and internal inspection on December 8, 2018. The electrical testing performed and the visual internal inspection performed by experts from North American Substation Support, did not point to any high energy arc locations within Transformer #4.

Q. Given the issues with Transformer #4, is it still in operation?

A. Yes. Transformer #4 was placed back in service after the testing and inspection. All of the test results and reports have been shared with Siemens and Transformer Cooling and Apparatus LLC for their recommendation for continued operation. The recommendations were to place Transformer #4 back on line at a de-rate level, beginning at 200 MW, and monitor the gas-in-oil and transformer temperatures while operating. Since the start-up in December, the amount of increase of the gas-in-oil has allowed the de-rate to increase from 200 MW to 280 MW. Avista Engineering will continue to analyze for further de-rate adjustments as the amount of the gas-in-oil allows.

Q. Are you continuing to monitor and test Transformer #4 so as to keep it in service while next steps are being determined for Transformer #3?

A. Yes. Our main analysis tools continue to monitor the gas that is being produced in the mineral oil of the transformer, and to monitor the winding and oil temperatures of the transformer. The gas-in-oil analyzer located on Transformer #4 samples the oil every 2 to 4 hours. Additionally there are manual oil samples taken twice per week and sent a laboratory for a third party analysis. This helps us forecast when action should be taken to ensure our transformer oil contains sufficient insulating and cooling qualities.

Q. As it relates to Transformer #3, what is the current status of either fixing or replacing that transformer?

A. Transformer #3 remains located on site at CS2. Siemens Brazil was on site in January 2019 to perform their own internal inspection to look for high energy arc locations. We are awaiting their final report and recommendations for the next steps to either repair or replace Transformer #3. We expect this report and further budgetary amounts, including time necessary for repair or replace, during March, 2019. The Company is also researching whether a different design of transformer, specifically the use of three individual electrical phase transformers instead having all three electrical phases contained within one transformer (as Transformer #3 and #4 are designed), would be a viable option for the future.

Q. Given the issues with Transformer #4, what are the next steps, if any, to alleviate the problem with that transformer?

A. Avista's internal engineering, along with transformer consultants continue to monitor the gas-in-oil to ensure the insulating and cooling qualities of the oil remain sufficient. Should the gas increase to a point where it is no longer safe to operate, we plan on taking CS2 and the transformer off-line and run the transformer oil through a filtering process. This will reduce the gas-in-oil back to a point where the insulating and cooling characteristics are acceptable. We plan on filtering the oil no later than May 2019, during our normally scheduled annual maintenance at CS2.

Once Transformer #3 has been repaired or replaced, the timing for swapping it with Transformer #4 will be developed. At that time, Transformer #4 will be removed from service and we will conduct further analysis of the gassing issue.

Q. What was the financial impact included in this filing related to the issues with CS2 in 2018?

A. As Company witness Mr. Johnson discusses, the impact of the issues at CS2 in 2018 was approximately $4.6 million in increased power supply expense.

Q. As the Manager of Thermal Operations and Maintenance, do you believe that the actions of the Company in any way contributed to the issues with the two transformers at CS2?

A. No, I do not. As you can well imagine, the electrical system is extremely complex. We use large machines and devices in order to generate and deliver the energy our customers require. Unfortunately, machines do break down, and that includes transformers. In my view, there was no additional level of maintenance or capital additions that could have prevented the issues with either Transformer #3 or #4. The Company utilized industry standards for monitoring and analyzing gas in the transformer oil, and operated CS2 within the transformer (s) rated capabilities. The Company also performed electrical testing in the Spring of 2018 on Transformer #3 to verify its condition remained sufficient to remain on line and handle the full generation of CS2.

Q. Does this conclude your testimony?

A. Yes, it does.