BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

DOCKET UE-22-____

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 Substation Support department. My title is Senior Manager, Thermal Operations & 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 am a 2019 graduate of Penn State University with a master's degree in Renewable Energy & Sustainability Systems. 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 natural gas-fired steam facilities, a coal facility, and several simple-cycle natural gas turbine facilities.

Q. How long have you been employed by the Company, and what are your duties as Senior Manager, Thermal Operations & Maintenance?

A. I started working for Avista in December 1996 as a mechanical production engineer. In that capacity, I participated in a wide variety of hydro and thermal generating station projects. I joined the Energy Resources Department (Manager Generation Joint Projects) in 2007. These roles were folded into overall Thermal Operations management and shifted to Generation Production Substation Support in 2014. This current role includes management oversight of all Avista's thermal generation assets.

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

A. My testimony will summarize 2021 performance of Avista's thermal generation facilities, including specific testimony describing the outage at Coyote Springs 2 (CS2) that caused the plant to drop below a 70% availability factor for calendar year 2021. For this plant, I will discuss the project scope that required the extended outage timeframe and demonstrate that the outage did not result from imprudent actions.

Q. Are you sponsoring any exhibits?

A. Yes, I am sponsoring two exhibits. Exh. TCD-2 is a copy of the Coyote Springs 2 Single Phase Transformer business case, and Exh. TCD-3 is 2021 Equivalent Availability Factors Report for each of the Company's thermal generation facilities.

II. COYOTE SPRINGS 2 2021 PERFORMANCE

Q. What was the equivalent availability factor (EAF) for CS2 for 2021?

A. The EAF for 2021 for Coyote Springs 2 was 64.5%.

Q. Why is that important in terms of this annual Energy Recovery Mechanism (ERM) review?

A. As discussed by Company witness Ms. Brandon, the 2006 Settlement Agreement in Docket No. UE-060181 regarding the continuation of the ERM included potential limitation of the recovery of fixed costs associated with Kettle Falls, Colstrip, Coyote Springs 2 and Lancaster generating plants when the plants fail to meet a 70% availability factor during the ERM review period. The Equivalent Availability Factors[1] for the Company's thermal plants during 2021 are

[1] Note "equivalent availability factor" is an industry-standard calculation: Total available hours minus outages (forced and planned) divided by Total available hours. This is not meant to represent the North America Electric Reliability Corporation (NERC) required Generating Availability Data System (GADS) calculation which is done within NERC's system for conventional generating units that are 20 MW and larger.

shown in Table No. 1 below.

Table No. 1 - 2021 Thermal Generation Plant Availability Factors

2021 Thermal Generation Plant Availability Factors	
Cosltrip	81.30%
Coyote Springs 2	64.50%
Kettle Falls	88.30%
Lancaster	90.62%

Please see Exh. TCD-3, page 1, for a summary of the 2021 Equivalent Availability Factors for each of the Company's thermal generation facilities. Pages 2 through 10 contain individual pages showing the factors that affected the Equivalent Availability Factors for each of the facilities (with the exception of Lancaster, as described later in my testimony).

Q. Would you please describe the outage(s) at Coyote Springs 2 that caused the plant to drop below a 70% availability factor for calendar year 2021?

A. Yes. The single largest outage of 2021 was the Single-Phase Transformer project that extended from February 26th through June 30th. This outage accounted for 33.7 percent of the total 35.5 percent deficit (i.e., 100 percent less 64.5 percent showing in Table No. 1). Coyote Springs 2 was returned to service on June 30 as originally planned. Therefore, approximately 95% of the total equivalent unavailable hours was due to the transformer change-out project.

Q. Please describe the series of events which led to this Single-Phase Transformer Project.

A. Avista has experienced multiple failures of its generator step-up (GSU) transformers at Coyote Springs 2 over its 17 years of operation. Four GSU's have been placed into service since 2003: two Alstom/Areva units (T1 & T2), which were manufactured in Turkey;

and two Siemens units (T3 & T4), which were manufactured in Brazil. All four units were dual low voltage wound (13.8/18 kV) to 500 kV transformers. Most recently, in 2018, after nine years of service, T3 failed in service. In September of 2018, the in-service three-phase dual-wound generator step-up transformer (Transformer 3, or "T3") tripped via a sudden pressure relay. This was coupled with a sharp increase in acetylene that was indicative of high energy internal arcing (this was later confirmed upon disassembly and forensic analysis).

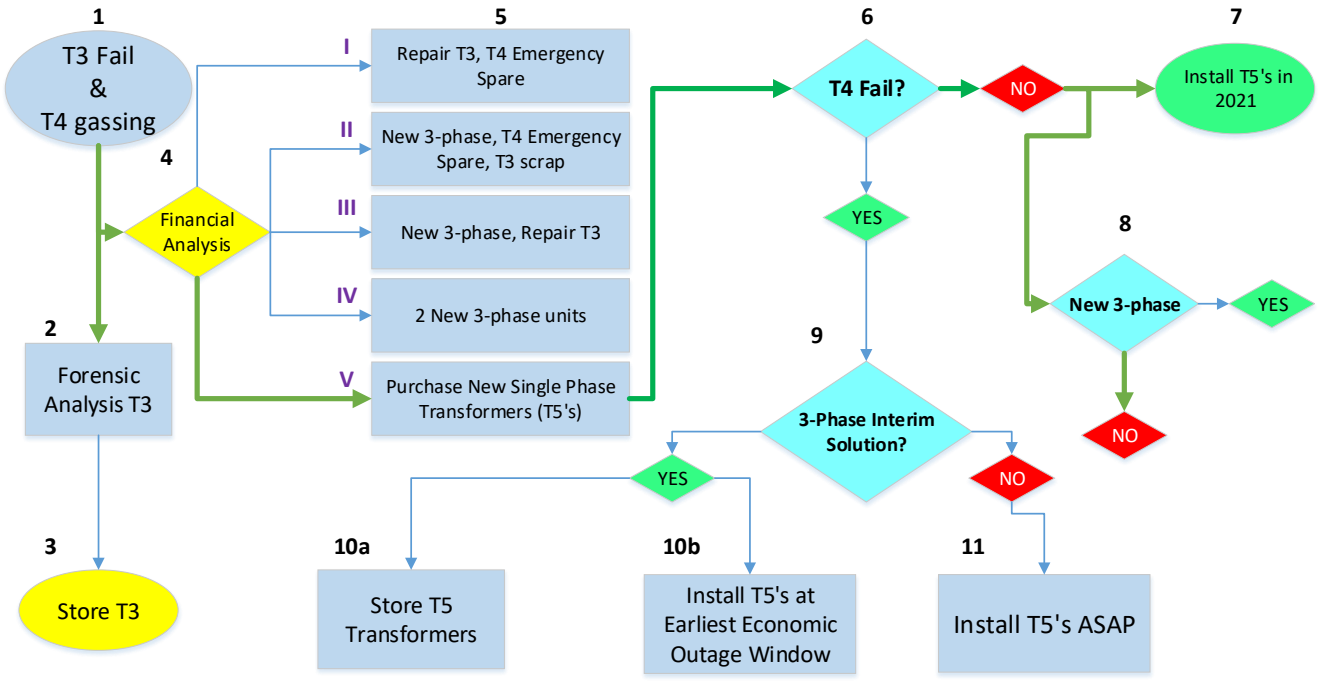
The spare transformer, T4, was placed into service later the same year, but after several weeks of operation it also began exhibiting signs of the same type of internal high energy faulting that led to the failure of T3. To reduce risk of catastrophic failure, the maximum plant generation output was reduced to keep heating in the windings down per recommendations from internal engineering and a consultant, until the transformer could be replaced.

When Avista purchased T3 and T4, we specifically excluded Areva Turkey (original manufacturer of T1 and T2) as a potential supplier so as to get a different design and to have the unit manufactured in a different factory to avoid a factory-related systemic deficiency. This was successful in one aspect as the initial forensic analysis of the T3 failure shows a failure in an entirely different location from the failures that were observed in T1 and T2. Nevertheless, given that we have encountered multiple failures of this three-phase configuration over the operating lifetime, Avista chose to conduct a detailed financial analysis of multiple options that included an alternate single-phase configuration and also considered a risk element for options that would just continue using the three-phase dual wound configuration.

The decision tree provided in Illustration No. 1 below, provides a high-level summary of the decision process regarding the transformer design at Coyote Springs 2. Element 4 represents a financial analysis we performed to determine the best path forward. Options evaluated included

various T3/T4 repair combinations, purchasing of two new dual wound three-phase units, and purchasing new single-phase dual wound units. The financial analysis determined the purchase of single phase dual wound transformers to be the most cost-effective solution for customers. Because of the extraordinarily long lead time associated with acquiring transformers of this size, Avista kept other options open. In the decision tree below, the bolded green lines represent the chosen path. You may note that Element 6 presented a choice that could have taken us down a path of repairing T3 or T4 and placing it back into service even though new transformers of a completely different design had been ordered. The reason for maintaining this optionality is the long lead time required for these types of transformers to be built and shipped, and the potential for extremely long outages that expose the Company to market volatility and higher power supply expense. Fortunately, this is not an alternative the Company had to act on as the units have since been installed successfully.

Illustration No. 1: Coyote Springs 2 Transformer Decision Tree



This project had two sub-projects. The portion of the overall project that transferred to plant in 2020 included the civil and structural modifications that needed to be made to accommodate the installation of the new transformers, oil containment, and firewall systems. This portion of the work was completed in 2020 in order to allow the transformer installation to be completed in the Spring of 2021 before typical summer peak load conditions. Final installation was completed in June of 2021, on time and under the budget assumed in the final project financial analysis. With both portions of the work now complete, the full scope of the effort has been included in Avista's 2022 general rate case (Docket UE-220053).

Q. What factors contributed to the single-phase choice being the most cost-effective replacement option?

A. First, given we had no spare transformer available, we were faced with replacing two transformers instead of one. The individual single-phase transformers are much less expensive that one three-phase unit. One individual single-phase unit can be used as a spare for any of the three in-service single-phase transformers. Second, we increased the capability and safety margin associated with the new transformers. To accomplish this increase in size and safety margin in a single three-phase transformer would have resulted in an even larger and more difficult to transport unit than T4. Finally, although there at least theoretically should not have been a technical reason that a three-phase solution would not be reliable in the long term for this application, we considered the history described above of the three-phase approach at Coyote Springs 2 and compared that with the long-term reliability of Coyote Springs 1 with its single-phase approach. Please see Exh. TCD-2, the Coyote Springs 2 Single Phase Transformer business case, for additional detail.

Q. Did Avista consider alternatives to this project?

A. Avista considered multiple alternatives to this project as indicated in the decision

tree in Illustration No. 1 above. The Company selected what is considered by our expert consultants to be the premier transformer factory in the world, Siemens' facility in Austria, to manufacture four (4) single-phase dual wound transformers. These transformers are of a dramatically different design than the previous transformers at Coyote Springs 2. Each single-phase transformer is much lighter (thus much less costly to transport and handle) than the previous three phase transformers because the duty is divided between three units, yet the combined MVA capacity of these single-phase transformers is significantly higher than T1-T4, which provides for significant additional operating margin and reliability. Had we chosen to replace T4 with a similar upgraded capacity three-phase unit, it likely would not have fit on the existing transformer pad.

Q. How does this project benefit Avista's customers?

A. This project replaces Transformer 3, which failed, and Transformer 4 that fortunately did not fail catastrophically in service but began exhibiting the same gassing evidence of high energy internal faulting as Transformer 3 after only a three-week in-service run. A reliable GSU and spare is required to keep Coyote Springs 2 in service and minimize exposure to market volatility. Coyote Springs 2 alone typically provides about 20 percent of Avista's annual energy needs. The financial analysis considered all options and selected the optimal cost option for customers.

Q. Please explain the duration of the outage in 2021?

A. The outage in 2021 was the second phase of the installation. The work performed in 2020 included the civil and structural modifications that needed to be made to accommodate the installation of the new transformers. This included the installation of new transformer pads and preparation for an entirely different transformer configuration - all while maintaining T4 in service for another year while the new transformers were being manufactured. Avista chose to conduct

the outage over a two-year period to optimize power supply costs. Had the outage been performed in a single year, it would have taken eight consecutive months to complete and would thus have overlapped summer and/or winter traditionally high-priced market condition periods.

Outage work in 2021 involved removing T4, installing new firewall barriers, a complete reconfiguration of the iso-phase bus system, and an upgrade and change of the transformer protection systems. This outage also was timed concurrently with an OEM required major overhaul of the natural gas turbine and natural gas turbine generator - which itself would have been a long duration outage even if no transformer work had needed to be performed.

Q. Were there other outages at Coyote Springs 2 which <u>materially</u> contributed to the reduced Equivalent Availability Factor?

A. No, there were not. The next largest outage, accounting for one percentage point of the equivalent unavailable hours (approximately 95.1 hours) was associated with an improper crossfire tube installation performed by the OEM crews as part of the major turbine overhaul. Please see Exh. TCD-3, page 2, for a listing of the events that affected the overall availability factor for this facility in 2021.

Q. Was the Coyote Springs 2 outage in 2021 the result of imprudent actions?

A. No, for the reasons previously discussed. The forensic analysis of T3 was associated with a specific failed internal component of the transformer. T4 was only in-service a brief period before it began exhibiting similar signs of failure. T4 is currently in-service as a "last resort" spare, but will be scrapped after it is determined that the single-phase transformers have a demonstrated run of successful operations. In addition, Avista was able to take advantage of this Single-Phase Transformer Project outage to accomplish several important maintenance items. A major overhaul of the gas turbine and gas turbine generator, both of which are required by General

Electric (the OEM), were completed during this period. In addition, an intensive inspection of the Heat Recover Steam Generator (HRSG) was also accomplished during this period. The HRSG inspection led to modifications which will result in improved operations and reduced future maintenance costs.

Q. What would the equivalent availability of Coyote Springs 2 have been for 2021 if (1) the OEM required major overhaul and (2) the single-phase transformer project had been excluded?

A. Over 99%. 2021 was an exceptional operating year for CS2 excluding these two planned outages and the small, previously mentioned major overhaul associated crossfire tube installation outage.

III. COLSTRIP 2021 PERFORMANCE

Q. What was the equivalent availability factor (EAF) for Colstrip for 2021?

A. The EAF for 2021 for Colstrip Unit 3 was 74.1% and for Unit 4 was 88.5%. Combined, the plant EAF was 81.3%.

Q. Please provide additional detail on 2021 outages at Colstrip.

A. Unit 3 had a major planned maintenance overhaul on the boiler and turbine that accounted for 1,828.7 of the 2,273 total equivalent hours for that unit. Absent this maintenance period, only minimal operating issues impacted the overall availability. Unit 4 had no large individual events that accounted for the 88.5% EAF. However, tube leaks (6 separate outages) accounted for the largest outage, cumulatively resulting in 612.1 out of the 1,010 total equivalent hours for that unit. The next largest outage was significantly less at 181.4 related to the removal of buildup from the unit required to improve airflow. Additional outages and information can be

found in the exhibits mentioned. Exh. TCD-3, pages 3-4, provide additional details as to these minor issues.

IV. KETTLE FALLS GS & CT 2021 PERFORMANCE

Q. What was the equivalent availability factor (EAF) for Kettle Falls Generating Station (GS) and Combustion Turbine (CT) for 2021?

A. The EAF for 2021 for Kettle Falls GS was 88.3%. The EAF for Kettle Falls CT was 92.8%.

Q. Please provide additional detail on 2021 outages at Kettle Falls GS and CT.

A. Kettle Falls Unit 1 was not available for a total of 1,025 hours. The majority of these hours were related to a scheduled annual maintenance totaling 807 hours. The remaining 218 hours were comprised of 15 unplanned forced outages. There were three separate outages which were longer than 24 hours in duration including a superheater tube leak repair resulting in 77 hours of downtime, a hydraulic leak on the main steam turbine control valve that required 48 hours for repair, and a failure in the electrostatic precipitator resulted in a 47-hour outage. The remaining 15 outages were small in duration and had a combined 45 hours of downtime. Kettle Falls Unit 1 had a great year of generating renewable energy for our customers. Exh. TCD-3, pages 5-6, provide additional details as to these minor issues.

V. RATHDRUM CT 2021 PERFORMANCE

Q. What was the equivalent availability factor (EAF) for Rathdrum CT for 2021?

A. The 2021 EAF for Rathdrum CT was 88.6% for Unit 1 and 95.0% for Unit 2. Combined, the EAF was 91.8%.

Q. Please provide additional detail on 2021 outages at Rathdrum CT.

A. Rathdrum CT Unit 1 was unavailable for a total of 997 hours in 2021. Planned annual maintenance accounted for only 36 hours, so the EAF was impacted primarily by a project required for Energy Imbalance Market (EIM) preparation (535.8 outage hours), and issues with the way the natural gas turbine was operating that caused the unit to be deemed unavailable while troubleshooting with the manufacturer (302.7 outage hours). The work performed for the EIM was primarily related to the installation of meters, which will ensure the unit is able to be dispatched when needed. Customers will benefit from the involvement in the EIM, as the unit will be dispatched when economical or when reliability factors dictate. A small but notable impact to EAF is due to required cleaning of our gas valve due to buildup from a chemical called dithiazine, which is coming from the natural gas suppliers (47.3 outage hours). There were 13 smaller events that accounted for 75.2 outage hours throughout the year. Please see Exh. TCD-3, page 7, for additional details.

Rathdrum CT Unit 2 was unavailable for a total of 442 hours in 2021. Planned annual maintenance accounted for the majority of the time, 376.9 hours. Similar to Rathdrum CT Unit 1, a small but notable impact was due to required cleaning of our gas valve due to buildup from dithiazine, which is coming from the natural gas supplier (41.4 outage hours). Other small items contributing to the 2021 EAF were the starter motor breaker trip (10.2 hours) and five separate, smaller events that accounted for 13.7 hours. Please see Exh. TCD-3, page 8, for additional details.

VI. BOULDER PARK GS 2021 PERFORMANCE

Q. What was the equivalent availability factor (EAF) for Boulder Park GS for 2021?

A. The 2021 EAF for Boulder Park GS was 89.0%

Q. Please describe outages that contributed to the reduced Equivalent Availability Factor.

A. Boulder Park GS had no events or outages that significantly contributed to the EAF as illustrated by its high 89% EAF. There were, however, several very short duration outages in 2021 which is expected due to this type of unit. Please see Exh. TCD-3, page 9, for additional details.

VII. NORTHEAST CT (NECT) 2021 PERFORMANCE

Q. What was the equivalent availability factor (EAF) for NECT for 2021?

A. The reported equivalent availability for NECT in 2021 was approximately 23.5%. However, it has now been determined that the methodology used to calculate this value was improperly applied in the somewhat unusual configuration of NECT. At NECT, two independently operable gas turbines are connected to a single generator. The true availability was approximately 49.7%.

Q. Please describe outages that contributed to the low Equivalent Availability Factor.

A. NECT is a relatively small component of Avista's overall generation resources. It is typically only dispatched during peaking conditions. One of these two turbines was unavailable the entire year, as we have as of yet been unable to meet emission requirements despite extensive troubleshooting. Please see Exh. TCD-3, page 10, for additional details.

Q. Is NECT one of the plants subject to the availability factor requirements set forth in the 2006 Settlement Agreement described earlier?

A. No, it is not.

VIII. LANCASTER POWER PURCHASE AGREEMENT

Q. In addition to the generating resources described above, Avista also has a Power Purchase Agreement for generation at Lancaster. What was the EAF for Lancaster for 2021?

A. The overall EAF for Lancaster was just above 90%. The single-highest outage was related to the annual Spring (May/June) maintenance cycle, which was scheduled for June 4 through June 18. While this maintenance cycle was originally scheduled for only 14 days, additional issues were identified which extended the outage by 10 days to June 28, 2022. Absent this outage, there were no material variations in operations. Maintenance cycles are performed in accordance with the PPA and account for these type of maintenance cycles. As this is a PPA, rather than owned resource, Avista does not have routine access to outage detail.

Q. Does that conclude your pre-filed direct testimony?

A. Yes.