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BEFORE THE IDAHO PUBLIC UTILITIES COMMISSION

IN THE MATTER OF THE APPLICATION	)	CASE NO. AVU-E-12-08
OF AVISTA CORPORATION FOR THE	)	
AUTHORITY TO INCREASE ITS RATES	)	
AND CHARGES FOR ELECTRIC AND	)	
NATURAL GAS SERVICE TO ELECTRIC	)	DIRECT TESTIMONY
AND NATURAL GAS CUSTOMERS IN THE	)	OF
STATE OF IDAHO	)	CLINT G. KALICH
	)	

FOR AVISTA CORPORATION

(ELECTRIC ONLY)

I. INTRODUCTION

Q. Please state your name, the name of your employer, and your business address.

A. My name is Clint Kalich. I am employed by Avista Corporation at 1411 East Mission Avenue, Spokane, Washington.

Q. In what capacity are you employed?

A. I am the Manager of Resource Planning & Power Supply Analyses in the Energy Resources Department of Avista Utilities.

Q. Please state your educational background and professional experience.

A. I graduated from Central Washington University in 1991 with a Bachelor of Science Degree in Business Economics. Shortly after graduation, I accepted an analyst position with Economic and Engineering Services, Inc. (now EES Consulting, Inc.), a Northwest management-consulting firm located in Bellevue, Washington. While employed by EES, I worked primarily for municipalities, public utility districts, and cooperatives in the area of electric utility management. My specific areas of focus were economic analyses of new resource development, rate case proceedings involving the Bonneville Power Administration, integrated (least-cost) resource planning, and demand-side management program development.

In late 1995, I left Economic and Engineering Services, Inc. to join Tacoma Power in Tacoma, Washington. I provided key analytical and policy support in the areas of resource development, procurement, and optimization, hydroelectric operations and re-licensing, unbundled power supply rate-making, contract negotiations, and system operations. I helped develop, and ultimately managed, Tacoma Power's industrial market access program serving one-quarter of the company's retail load.

In mid-2000 I joined Avista Utilities and accepted my current position assisting the Company in resource analysis, dispatch modeling, resource procurement, integrated resource planning, and rate case proceedings. Much of my career has involved resource dispatch modeling of the nature described in this testimony.

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

A. My testimony will describe the Company's use of the $\text{AURORA}_{\text{XMP}}$ dispatch model, or "Dispatch Model". I will explain the key assumptions driving the Dispatch Model's market forecast of electricity prices. The discussion includes the variables of natural gas, Western Interconnect loads and resources, and hydroelectric conditions. I will describe how the model dispatches its resources and contracts to maximize customer benefit and tracks their values for use in pro forma calculations. Finally, I will present the modeling results provided to Company witness Mr. Johnson for his power supply pro forma adjustment calculations.

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes. I am sponsoring one exhibit marked Confidential Exhibit 5, Schedule 1. It provides summary output from the Dispatch Model and data that are used by Company witness Mr. Johnson as input for his work. All information contained in the schedule was prepared under my direction.

II. THE DISPATCH MODEL

Q. What model is the Company using to dispatch its portfolio of resources and obligations?

A. The Company uses EPIS, Inc.'s $\text{AURORA}_{\text{XMP}}$ market forecasting model ("Dispatch Model") and its associated database for determining power supply costs.[1] The Dispatch Model optimizes Company-owned resource and contract dispatch during each hour of the January 1, 2013 through December 31, 2013 pro forma year.

Q. Please briefly describe the Dispatch Model.

A. The Dispatch Model was developed by EPIS, Inc. of Sandpoint, Idaho. It is a fundamentals-based tool containing demand and resource data for the entire Western Interconnect. It employs multi-area, transmission-constrained dispatch logic to simulate real market conditions. Its true economic dispatch captures the dynamics and economics of electricity markets—both short-term (hourly, daily, monthly) and long-term. On an hourly basis the Dispatch Model develops an available resource stack, sorting resources from lowest to highest cost. It then compares this resource stack with load obligations in the same hour to arrive at the least-cost market-clearing price for the hour. Once resources are dispatched and market prices are determined, the Dispatch Model singles out Avista resources and loads and values them against the marketplace.

[1] The Company is using $AURORA_{XMP}$ version 11.1.1001.

Q. What experience does the Company have using AURORA_{XMP}?

A. The Company purchased a license to use the Dispatch Model in April 2002. AURORA_{XMP} has been used for numerous studies, including each of its integrated resource plans and rate filings after 2001. The tool is also used for various resource evaluations, market forecasting, and requests-for-proposal evaluations.

Q. Who else uses AURORA_{XMP}?

A. AURORA_{XMP} is used across North America and in Europe. In the Northwest specifically, AURORA_{XMP} is used by the Bonneville Power Administration, the Northwest Power and Conservation Council, Puget Sound Energy, Idaho Power, Portland General Electric, Seattle City Light, Grant County PUD, Snohomish County PUD, and Tacoma Power.

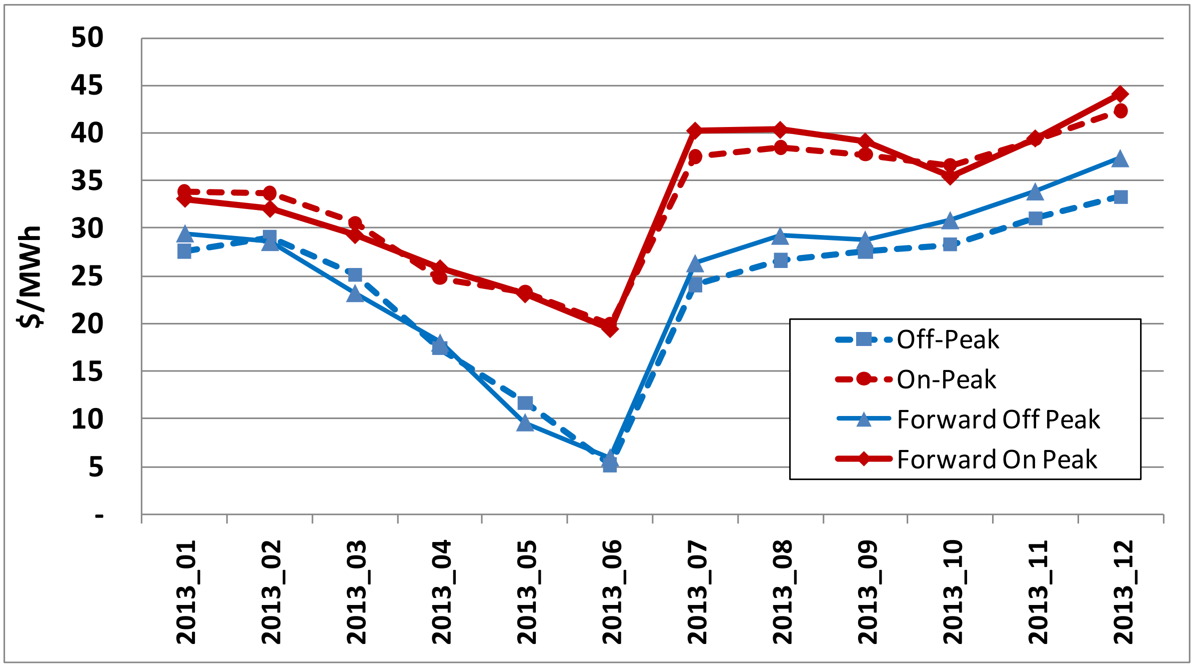
Q. What benefits does the Dispatch Model offer for this type of analysis?

A. The Dispatch Model generates hourly electricity prices across the Western Interconnect, accounting for its specific mix of resources and loads. The Dispatch Model reflects the impact of regions outside the Northwest on Northwest market prices, limited by known transfer (transmission) capabilities. Ultimately, the Dispatch

Model allows the Company to generate price forecasts in-house instead of relying on exogenous forecasts.

The Company owns a number of resources, including hydroelectric plants and natural gas-fired peaking units, which serve customer loads during more valuable on-peak hours. By optimizing resource operation on an hourly basis, the Dispatch Model is able to appropriately value the capabilities of these assets. Forward prices for the proforma 2013 period are 38% higher in the on-peak hours than off-peak hours at the time this case was prepared. The Dispatch Model forecasts on-peak prices for the pro forma period to average 39% higher than off-peak prices. A graphical representation of the differences in on- and off-peak prices over the proforma period is shown below in Chart No. 1.

Chart No. 1 – Monthly AURORA modeled versus forward Mid-C Prices



Forward prices month to month are tracked very closely in the Dispatch Model, given that the AURORA model is using normalized hydro, load, and resource outages. In summary, the Dispatch Model appropriately values the energy from Avista's resources during on-peak periods in a manner similar to that recently experienced in the Northwest region for the 2013 proforma period.

Q. On a broader scale, what calculations are being performed by the Dispatch Model?

A. The Dispatch Model's goal is to minimize overall system operating costs across the Western Interconnect, including Avista's portfolio of loads and resources. The

Dispatch Model generates a wholesale electric market price forecast by evaluating all Western Interconnect resources simultaneously in a least-cost equation to meet regional loads. As the Dispatch Model progresses from hour to hour, it "operates" those least-cost resources necessary to meet load. With respect to the Company's portfolio, the Dispatch Model tracks the hourly output and fuel costs associated with portfolio generation. It also calculates hourly energy quantities and values for the Company's contractual rights and obligations. In every hour the Company's loads and obligations are compared to available resources to determine a net position. This net position is balanced using the simulated wholesale electricity market. The cost of energy purchased from or sold into the market is determined based on the electric market-clearing price for the specified hour and the amount of energy necessary to balance loads and resources.

Q. How does the Dispatch Model determine electricity market prices, and how are the prices used to calculate market purchases and sales?

A. The Dispatch Model calculates electricity prices for the entire Western Interconnect, separated into various geographical areas such as the Northwest and Northern and

Southern California. The load in each area is compared to available resources, including resources available from other areas that are linked by transmission connections, to determine the electricity price in each hour. Ultimately, the market price for an hour is set based on the last resource in the stack to be dispatched. This resource is referred to as the "marginal resource". Given the prominence of natural gas-fired resources on the margin, this fuel is a key variable in the determination of wholesale electricity prices.

Q. How does the Dispatch Model operate regional hydroelectric projects?

A. The model begins by "peak shaving" loads using system hydro resources. When peak shaving, the Dispatch Model determines which hours contain the highest loads and allocates to them as much hydroelectric energy as possible. Remaining loads are then met with other available resources.

Q. Has the Company made any modifications to the EPIS database for this case?

A. Yes. The EPIS database was modified to include various assumptions used in the Company's 2011 Integrated Resource Plan. It uses a similar database as the Company's last rate case filing, with updates to prices, resources, and loads. For example, Avista's resource portfolio is modified to reflect actual project operating characteristics. Natural gas prices are modified to match forward prices over the pro-forma period, regional resources and loads are modified where better information is made available, and northwest hydro data are replaced with Bonneville Power Administration data.

III. HYDRO MODELING ASSUMPTIONS

Q. Please provide additional detail on how the Company has modeled hydroelectric generation for this case.

A. Avista is modeling the Clark Fork, the Mid-Columbia (Mid-C) projects, and the upper four Spokane River projects (Post Falls, Upper Falls, Monroe Street, and Nine Mile) identically as we did in the last rate case. For the two lower (Long Lake and Little Falls) Spokane River projects, the Company is now using its Avista Hydro Optimization model; the same model was adopted for use in the last case for the Clark Fork and Upper Spokane River systems.

Avista uses historical stream flow data from the Bonneville Power Administration ("BPA") for the Clark Fork and the Spokane River projects. For the Mid-C, where the Company does not have adequate data to model them, NWPP generation values are used just as in previous rate cases. As in previous cases, the NWPP data are modified slightly to address the NWPP model's tendency to overstate generation in high-flow periods, to maintain year-to-year consistency in project operations, and to account for encroachment on our Mid-C project shares.

Q. What hydroelectric record is being used in this case?

A. 1929-1998.

Q. How is the generation then used for ratemaking purposes?

A. The monthly generation levels for each project (Mid-C, Spokane River, and Clark Fork) are input into the dispatch model ($AURORA_{XMP}$) where Avista's portfolio value is quantified for ratemaking purposes.

Q. Please describe the Avista Hydro Optimization Package.

A. The Avista Hydro Optimization Package is a mixed-integer linear programming-based system emulating the operation of the Company's projects. It was developed in support of system operations, financial forecasting, and hydro upgrade efforts. Operating on an hourly time-step, they accurately represent individual turbine and reservoir operations. License constraints (e.g., minimum flows, elevation limits) are honored in all periods. The optimization package is comprised of four components.

Q. What is the first component of the Avista Hydro Optimization Package?

A. The first component is the Avista Hydro Water Budget Model. This model looks over the longer record of water flow optimization to ensure storage water is released during the most valuable times of the year. Outputs are weekly beginning and ending project elevations for each storage project. These elevations are exported to the system optimization model Output table.

Q. What is the source for hydroelectric flows in the Avista Hydro Water Budget Model?

A. The source data for the Water Budget Model is BPA daily flow data derived from the U.S. Army Corp of Engineers monthly flow study. This work re-creates historical flows on Avista hydro projects back to 1929 based on today's river system.[2] This data is housed in the

[2] Accounting for additional irrigation depletion, new in-river developments, and present regulation requirements due to environmental requirements.

Avista Hydro Optimization Model Input Database, and is the second element of the Avista Hydro Optimization package.

Q. What is the third element of the Avista Hydro Optimization Package?

A. The third element is the Avista Hydro Optimization Model itself. This hourly model uses a mixed-integer optimization routine to maximize the value of the hydroelectric projects over time. Each project is represented in detail, including individual turbine efficiency curves, physical and license-constrained reservoir elevations, tailrace elevations, and minimum and maximum flow constraints.

The Avista Hydro Optimization Model shapes generation into the most beneficial (i.e., most economic) time periods using the projects' storage reservoirs. It also maximizes the value of the generation by flowing water through the turbines at their most economically efficient points on the power curves.

Q. What is the fourth element of the Avista Hydro Optimization Package?

A. The fourth element is the Avista Hydro Optimization Model Output Database. This database contains the results from the Avista Hydro Optimization Model, including hourly turbine discharge and spill flows, hourly generation levels, and hourly reservoir elevations.

Q. How did the Company ensure that the Avista Hydro Optimization Package accurately reflects the operations and value of Company-owned projects?

A. The Avista Hydro Optimization Package is benchmarked against the Company's 2000-2009 actual results at the projects to ensure its accuracy.

Q. How did the initial results compare, and how was the package adjusted to match with the 10-year record?

A. The Avista Hydro Optimization Package initially over-estimated generation relative to the 2000-2009 periods by approximately 5.5 percent for the Noxon project. It understated generation by 0.6 percent for the Cabinet Gorge project. For the four upper Spokane River projects, generation was overstated by between 5% and 18%. These results were expected, as Avista does not operate its projects in isolation. Instead the Company uses its hydro projects to meet all of its needs, including operating reserves. There are also times where units are out on maintenance or forced outage. To synch the Avista Hydro Optimization Package to history the power curves for each project were therefore adjusted by the differences described above. After the benchmarking process, the model generated levels equal to actual generation during the 2000-2009 period. The adjustments are presented below in Table No. 1.

Table No. 1 – Avista Hydro Optimization Benchmarking Adjustments

Projects	Model Overestimating Percentage (%)	Model Underestimating Percentage (%)	Applied Benchmark Adjustment Percentage (%)
Noxon Rapid	5.5		105.5
Cabinet Gorge		0.6	99.4
Post Falls	16.8		116.8
Upper Falls	12.2		112.2
Monroe Street	4.7		104.7
Nine Mile	18.3		118.3
Long Lake	7.8		107.8
Little Falls	2.5		102.5

Q. Are the hydro models included in the Company's filing?

A. Yes. All four components of the Avista Hydro Optimization Package for each major Company hydro system (Spokane River and Clark Fork River) are included in my work papers, including all input and output data.

Q. Does the Avista Hydro Optimization Package account for recent upgrades at the Noxon Rapids project?

A. Yes. Once the original model was benchmarked against recent generation years that did not benefit from upgrades at Noxon, the newly upgraded units (1, 2, 3, and

4) were input into the model to reflect the higher anticipated generation levels.

Q. How is the Company using the new Avista Hydro Optimization Package in its business operations?

A. The Avista Hydro Optimization Package is an essential tool to assist the Company with optimizing its system operations, both in short- and long-term planning. Its results are also used for Company budgeting and hydro project market valuation studies. It has been used to support various upgrade option studies. Given its speed it is possible to run large hydro-flow records through it, as is necessary for rate filings such as the one before you today. It was used by the Company in its last rate case before the Commission.

Q. How does the $AURORA_{XMP}$ Dispatch Model Operate Company-controlled hydroelectric generation resources?

A. The Dispatch Model treats all hydroelectric generation plants within each river system as a single large plant. To account for the actual flexibility of Company hydroelectric resources, the Company develops individual hydro operations logic for each of its facilities. This separation ensures that the flexibility inherent in these resources is credited to customers in the pro forma exercise.

Q. Please compare the operating statistics from the Dispatch Model to recent historical hydroelectric plant operations.

A. Over the pro forma period the Dispatch Model generates 69% of Clark Fork hydro generation during on-peak hours (based on average water). Since on-peak hours represent only 57% of the year, this demonstrates a substantial shift of hydro resources to the more expensive on-peak hours. This is identical to the five-year average of on-peak hydroelectric generation at the Clark Fork through 2011. Similar relative performance is achieved for the Spokane and Mid-Columbia projects

IV. OTHER KEY MODELING ASSUMPTIONS

Q. Please describe your update to pro forma period natural gas prices.

A. Natural gas prices for this filing are based on a 1-month average from June 28, 2012 to July 27, 2012 of calendar-year 2013 monthly forward prices. Natural gas prices used in the Dispatch Model are presented below in Table No 2.

Table No. 2 - Pro Forma Natural Gas Prices

Basis	Price ($/dth)	Basin	Price ($/dth)
AECO	3.18	Stanfield	3.45
Malin	3.53	Sumas	3.61
Spokane	3.63	Henry Hub	3.61
Rockies	3.45	S. Calif.	3.70

Q. What is the Company's assumption for rate period loads?

A. Pro forma loads used in this case are weather-adjusted loads between July 1, 2011 and June 30, 2012. Table No. 3 below details actual, weather-adjusted load.

Table No. 3 - Pro Forma Loads

Month	Actual	Weather Adjusted	Month	Actual	Weather Adjusted
Jan-12	1,237.9	1,246.2	Jul-11	1,019.1	1,056.9
Feb-12	1,187.9	1,190.8	Aug-11	1,097.4	1,081.5
Mar-12	1,097.3	1,088.2	Sep-11	1,005.9	970.4
Apr-12	1,006.4	1,018.0	Nov-11	1,000.5	1,006.4
May-12	963.6	960.0	Nov-11	1,156.9	1,155.9
Jun-12	957.2	965.1	Dec-11	1,251.0	1,265.5
			Average	**1,081.7**	**1,083.5**

Q. Please discuss your outage assumptions for the Colstrip units.

A. As with our assumptions for other plants, we use a 5-year average through 2011 to estimate long-run performance at the Colstrip plant. The 9.6% forced outage rate is based on this average and is slightly higher than the 8.7% level used in the rate case last year.

V. RESULTS

Q. Please summarize the results from the Dispatch.

A. The Dispatch Model tracks the Company's portfolio during each hour of the pro forma study. Fuel costs and generation for each resource are summarized by month. Total market sales and purchases, and their revenues and costs, are also determined and summarized by month. These values are contained in Confidential Exhibit 5 Schedule 1 and were provided to Mr. Johnson for use in his calculations. Mr. Johnson adds resource and contract revenues and expenses not accounted for in the Dispatch Model (e.g., fixed costs) to determine net power supply expense.

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

A. Yes, it does.

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CONFIDENTIAL

Dispatch Model Summary Output

Pages 1 through 3

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