BEFORE THE WASHINGTON

UTILITIES & TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

Complainant,

v.

AVISTA CORPORATION, d/b/a AVISTA UTILITIES

Respondent.

DOCKETS UE-240006 and UG-240007 (*Consolidated*)

RESPONSE TESTIMONY OF DR. ROBERT L. EARLE ON BEHALF OF THE WASHINGTON STATE OFFICE OF THE ATTORNEY GENERAL PUBLIC COUNSEL UNIT

EXHIBIT RLE-1CT

July 3, 2024

Shaded Information is Designated Confidential per Protective Order in Dockets UE-240006 & UG-240007 and WAC 480-07-160

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EXHIBITS LIST

I. INTRODUCTION / SUMMARY

Q. Please state your name and business address.

A. My name is Robert Earle. My business address is 1388 Haight St. #49, San Francisco, CA, 94117.

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

A. I am employed by Alea IE, LLC as the owner.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Public Counsel Unit of the Washington Attorney General's Office (Public Counsel).

Q. Please describe your professional qualifications.

A. I have over two decades of experience in the electric power and natural gas industries. This includes working on infrastructure planning, environmental mitigation, and analysis of gas and electric power markets. I taught graduate level classes in statistical machine learning at the University of Zürich for five years and supervised two masters' theses. I have Ph.D. and M.S. degrees from Stanford University in operations research, and an A.B. in mathematics from the College of William and Mary. My curriculum vitae is attached as Exhibit RLE-2.

Q. What exhibits are you sponsoring in this proceeding?

A. I am sponsoring the following exhibits in this proceeding:

- Exhibit RLE-2 Curriculum Vitae of Robert L. Earle
- Exhibit RLE-3 Avista's Response to Staff Data Request No. 34
- Exhibit RLE-4 Econometric Analysis of Asymmetric Information
- Exhibit RLE-5 Avista's Response to Staff Data Request No. 177
- Exhibit RLE-6C Avista's Response to Public Counsel Data Request No. 307 with Attachment A

- Exhibit RLE-7C Avista's Response to Public Counsel Data Request No. 308 with Attachment A
- Exhibit RLE-8 Avista's Response to Public Counsel Data Request No. 134
- Exhibit RLE-9 Avista's Response to Public Counsel Data Request No. 272
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- Exhibit RLE-11 Avista's Response to Public Counsel Data Request No. 274
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- Exhibit RLE-13 Avista's Response to Public Counsel Data Request No. 276
- Exhibit RLE-14 Avista's Response to Public Counsel Data Request No. 277
- Exhibit RLE-15 Avista's Response to Staff Data Request No. 35
- Exhibit RLE-16 Bootstrap inference for general non-i.i.d. models

Q. Please give an overview of your testimony.

A. My testimony addresses three issues. First, Avista proposes to add a forecast error adjustment of $65.8 million to the Net Power Supply Expense (NPE). The Washington Utilities and Transportation Commission (Commission) should reject Avista's proposal because it does not entail actual costs that Avista has incurred or will incur on behalf of its customers, and the premise of the impossibility of forecasting NPE is false as shown by the record established in the Energy Recovery Mechanism (ERM) proceedings.

Second, Avista proposes to eliminate the deadbands and sharing bands in the ERM in favor of a single 95 percent pass through of cost variance from authorized levels to customers. The Commission should reject this transfer of risk from the Company to customers because Avista has the ability and obligation to

control its NPE. Retaining the existing incentives in the ERM for Avista to control costs is vital for customers.

Third, Avista proposes a new methodology to value Energy Imbalance Market (EIM) benefits with a resulting forecast of $5.5 million annually (system) in EIM benefits. However, Avista's EIM forecast methodology is fundamentally flawed and as a result systematically underestimates the value of EIM participation. The Commission should reject Avista's EIM benefit forecast methodology and its forecast of $5.5 million in benefits. Further, the Commission should order Avista to develop a valid EIM benefits forecast methodology and order the adoption of an annual EIM benefits forecast of $20.7 million (system).

II. FORECAST ERROR ADJUSTMENT

Q. Please describe Avista's proposed forecast error adjustment of $65.8 million to its power cost estimate for 2025 and 2026.

A. Avista proposes to add $65.8 million to its power cost estimate after running through its usual steps of gathering data and running the Aurora model. Avista claims that this is necessary because there has been a "magnification over time of forecast error in our portfolio."[1]

Q. What does Avista mean by portfolio "forecast error"?

A. Avista appears to mean the value of its generation resources in the market. Avista performs a forward looking evaluation of its generation resources for various years, and then performs a backward looking evaluation of its generation

[1] Direct Test. of Scott J. Kinney, Exh. SJK-1T at 66:12–13.

resources. The difference between the two Avista calls its forecast error.[2] Avista averages the modeled portfolio forecast error (PFE) over years 2018 to 2022 to obtain the $65.8 million it wants to add to the already calculated NPE.[3]

Q. Is this value relevant for setting the NPE?

A. Not at all. While the value of Avista's generation in the marketplace has an impact on NPE, the ERM mechanism takes into account forecast errors of various types such as load forecast error, errors in the forecast of hydro conditions (or how hydro conditions vary from the average in the model), market prices for electricity and natural gas, and any portfolio forecast error (PFE).

Indeed, PFE is not a separate cost that Avista incurs on behalf of ratepayers and therefore should not be charged to ratepayers. The absurdity of Avista's claim is illustrated by considering 2022's NPE. For 2022 rates, Avista forecast and was authorized to recover $72.3 million. In operation, Avista incurred $121.1 million in NPE, a $48.8M under-collection. But Avista calculated the portfolio error for 2022 at $202.7 million which is included in the average it uses to calculate the $65.78 million it wants to tack onto the already calculated NPE for 2025 and 2026. Under Avista's proposed scheme, Avista's portfolio error would have been tacked onto the authorized NPE, almost quadrupling it to $275.0 million, and leading to a ridiculous over-recovery of $154 million in a single year. Such absurd results should be rejected and demonstrate, conclusively,

[2] *Id.* at 67:8–17.
[3] *Id.* at 68:1–6.

that the PFE is not an actual cost and should not be recovered as if it were actually incurred.

Moreover, the massive change in forecasting NPE that Avista proposes through the addition of PFE flatly contradicts Avista's previous contention that "Modeling changes have only been adopted after significant vetting and Commission approval, and should not be changed based on how current conditions benefit one party or another, particularly in the absence of alternative model recommendations."[4]

Q. How has Avista performed in forecasting NPE?

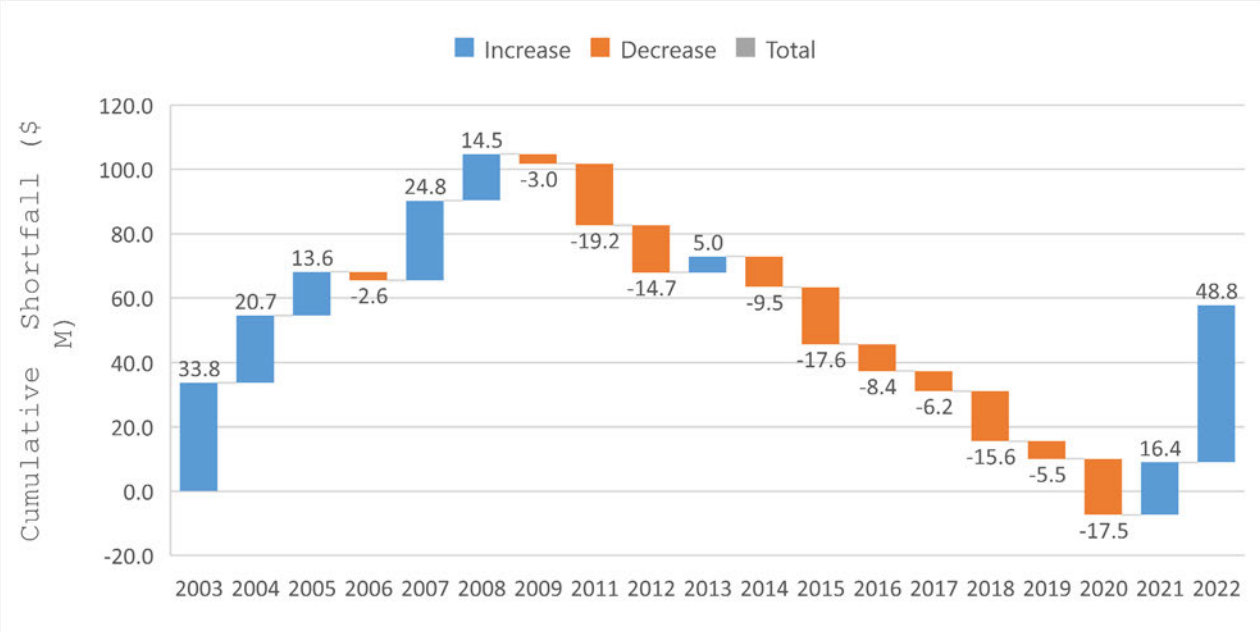
A. While Avista currently denies that the historical record of NPE is informative,[5] in 2017 Avista argued that the ERM needed to be evaluated in terms of its overall history starting in 2003.[6] Examining the 19 years of the operation of the ERM from 2003 to 2022 (the ERM was suspended in 2010), Avista has only had a 3.3 percent aggregate error rate.[7] The authorized level of NPE totaled $1,751 million, while the total difference between the actual and authorized NPE was $57.4 million.[8]

Figure 1 shows a waterfall diagram of the cumulative effect of the differences between actual and authorized expense over time. The blue bars show the years where the actual was greater than the authorized and the amount for that year is labeled above the bar, while the red bars show the years where the actual

[4] *Wash. Utils. & Transp. Comm'n v. Avista Corp.,* Dockets UE-170485, et al., Final Order 07/02/02, ¶ 147 (Apr. 26, 2018).
[5] Direct Test. of Scott J. Kinney, Exh. SJK-1T at 67:1–5.
[6] *Wash. Utils. & Transp. Comm'n v. Avista Corp.,* Dockets UE-170485, et al., Final Order 07/02/02, ¶ 141 (Apr. 26, 2018).
[7] As yet, the 2023 ERM figures have not yet been approved, and so are properly omitted from this analysis.
[8] Robert L. Earle, Exh. RLE-3 (Avista Response to Staff Data Request No. 34).

was less than the authorized with the amount labeled below that bar. The cumulative amount is given by the vertical y-axis. This cumulative amount corresponds to the level of the top of the blue bars, and the bottom of the red bars (not the numbers labeling the bars).

Figure 1
Waterfall Diagram of Actual Minus Authorized



As the Figure shows, the cumulative error rose from zero at the start to $33.8 million in 2003. The cumulative error then reached a peak of $104.7 in 2008, falling to -$7.4 million in 2020. For eight of the 19 years, the actual was greater than the authorized, while for 11 of the 19 years the actual was less than the authorized.

Avista makes the claim that it has become increasingly difficult for it to forecast costs and it is increasingly subject to a very large forecast error in the positive direction (actual minus authorized). However, the Figure disproves

Avista's claims such as "our forecasts continue to get worse" and "power supply costs cannot be forecasted accurately, and for reasons outside of utility control."[9]

Eleven of the 19 years had a negative forecast error, while only eight had a positive error. Only three of the past 13 ERM years have had a positive forecast error. The Figure shows that there were mostly positive forecast errors from 2000 to 2009, but that pattern was replaced with negative forecast errors until 2021.

Furthermore, while the discrepancy in 2022 between actual and authorized was high, the difference was 67.5 percent, almost 10 percent less than the 77.3 percent in 2003. So, the 2022 forecast was more accurate than the first ERM forecast in 2003.

Q. Is Avista's proposed $65.8 million portfolio forecast error adjustment to NPE justified?

A. No. The PFE does not consist of costs that Avista can demonstrate it incurred in the past and not recovered, nor are these costs Avista will actually incur in the future. Therefore, Avista's proposed $65.8 million forecast error adjustment is unjustifiable and imprudent. .

III. ENERGY RECOVER MECHANISM DEADBANDS AND SHARING BANDS

Q. What does Avista propose concerning the ERM deadbands and sharing bands?

A. Avista proposes elimination of the deadbands and having "a single 95% pass-through of cost variance from authorized levels to customers."[10]

[9] Kinney, Exh. SJK-1T at 54:7–8.
[10] Direct Test. of Clint G. Kalich, Exh. CGK-1T at 2:17–19.

Q. How does Avista justify its proposal?

A. Avista provides five reasons for eliminating the deadbands and having a single 95 percent pass-through of cost variance.[11] These are:

1. Forecast error.
2. Regional resource adequacy.
3. Lack of market liquidity.
4. Carbon emission policy.
5. Changing market dynamics.

Q. Do you have any general comments on the reasons Avista gives to justify its proposal?

A. Yes. All of Avista's reasons are based on its self-declared inability to forecast or prepare for changes in the market. Regarding forecast error, Avista complains "power supply costs cannot be forecasted."[12] Concerning regional resource adequacy, Avista is troubled by "market uncertainty." With respect to lack of market liquidity, Avista is worried about its ability "to procure future energy." Related to its "carbon emission policy," Avista is further disturbed by "market uncertainty." Finally, in the catch-all category of "changing market dynamics," Avista is alarmed about its ability to handle unplanned events such as changes in the weather.[13] In essence, Avista is saying that it lacks the competence to adapt to normal occurrences in the market such as weather and fuel price volatility along

[11] Kinney, Exh. SJK-1T at 50:7–35.
[12] *Id*. at 54:7-8.
[13] *Id.* at 50:20, 50:24, 50:27, & 50:30.

with new developments in the market. As a result, Avista wants to push 95 percent of the risk of its own decisions onto its Washington customers.

However, part and parcel of a utility's job is to deal with changes in the market and forecast anticipated costs well. Avista is simply saying it has failed while abandoning its customers to suffer the consequences. Avista complained about its inability to manage "stream flows, natural gas prices, power prices, forced outages, and retail loads" 13 years ago as a reason to eliminate the deadbands.[14] So, despite the dramatic language, the problems that Avista discusses are not new and in the 11 ERM years since then (2012 to 2022), the actual NPE has been less than the authorized for eight of those years. None of the reasons Avista provides for changing the ERM deadbands and sharing bands hold up under scrutiny.

As a general matter, drastically reducing incentives with respect to power costs burdens the Commission and intervenors, requiring a much higher level of review of Avista's actions. Such review is inevitably disadvantaged by the informational asymmetry that works in favor of the Company. Discovering the actual costs incurred and whether they are prudently incurred is a central problem of utility regulation. An information asymmetry characterizes this problem: the utility knows much more about its operations and costs than the regulator or other stakeholders. As a classic paper on this topic describes:

> The major goal of public utility regulation is price-setting. One of the most common causes of disputes in determining these prices is over the regulated firm's true minimum-cost of production. The regulated firm has private information, not known by the regulator,

[14] *Id.* at 55:10–15.

> concerning its true production technology. In most instances, the utility also has very little incentive to reveal this private information to the regulator. Moreover, because it is a privately-owned company that must answer to its shareholders, the utility should use this private information to maximize its profits subject to the constraints imposed on it by the regulatory process.[15]

As the Commission said in the PacifiCorp 2024 General Rate Case:

> Without the guardrails of deadbands and sharing bands, the utility no longer has an economic stake in a major resource decision. As a result, the utility is more likely to ignore fossil fuel price volatility because it knows, regardless of price fluctuations, that it will be made whole by ratepayers. This approach creates a circumstance that one witness termed a "moral hazard" where one party is willing to engage in risky behavior or not act in good faith because it knows the other party, in this case the ratepayer, will bear the economic consequences.[16]

Q. Please provide your specific response to each of Avista's five reasons to pass 95 percent of the risk of NPE to its customers.

A. First, with respect to forecast error, the discussion above about Avista's proposed PFE shows that its claims about problems forecasting are unfounded. The history of the difference between authorized and actual NPE shows Avista's claims such as "our forecasts continue to get worse" and "power supply costs cannot be forecasted accurately, and for reasons outside of utility control" [17] are unsubstantiated.

Avista also complains that "authorized power supply expenses are determined using forward market prices as much as 35 months prior to the actual

[15] Earle, Exh. RLE-4 (An Econometric Analysis of the Asymmetric Information, Regulatory-Utility Interaction).
[16] *Wash. Utils. & Transp. Comm'n v. PacifiCorp d/b/a Pacific Power & Light Co.*, Dockets UE-230172 & UE-210852 (*Consolidated*), Order 08/06, ¶ 390 (Mar. 19, 2024).
[17] Kinney, Exh. SJK-1T at 54:7–8.

operating day with a multi-year rate filing…and therefore managing the forecast error is outside of the Company's control."[18] This is a distortion of the facts. The Company has proposed a 60-day update prior to Rate Year One (RY1) but did not propose a 60-day update prior to Rate Year Two (RY2).[19] As a result, RY1 costs have updated forward market prices that go out at most 14 months for the last month of RY1 (not 35 months). Moreover, the fact that RY2 costs use forward market prices that go out as much as 26 months (still not 35 months) is the fault of the Company's proposal. The Company is self-sabotaging in not proposing either.

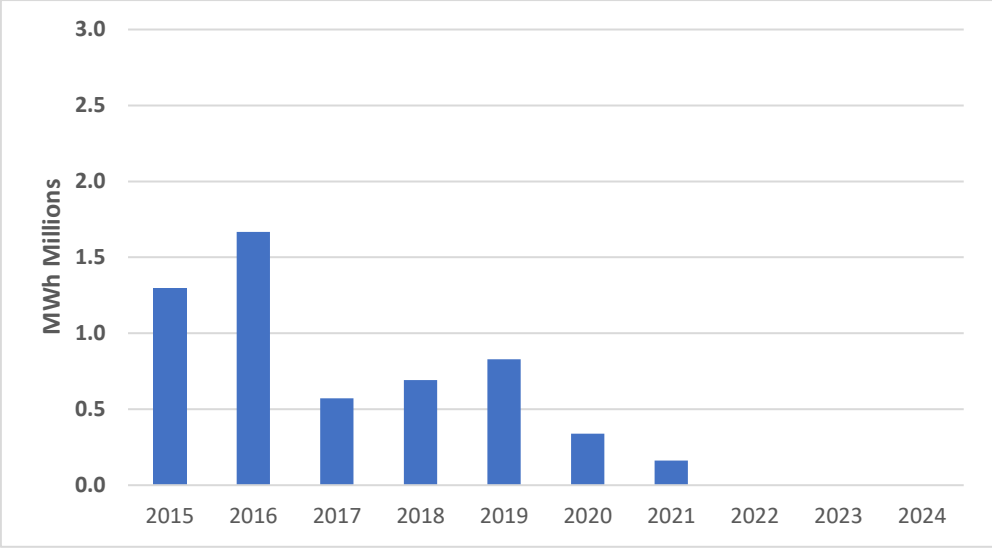
Second, the Company complains that regional resource adequacy is shifting "with the retirement of thermal resources and the integration of more variable resources."[20] While this may be true, this is why Avista has an Integrated Resource Plan (IRP) process to address such issues. Avista seems to be saying that it is not adequately addressing this issue in its IRP. If this is the case, then the Commission should investigate why Avista's IRP process has been inadequate, rather than shift risk to Avista's customers per Avista's proposal. Moreover, this is why Avista is participating in the Western Reliability Adequacy Program (WRAP), spending over a quarter of a million dollars each in 2025 and 2026. If regional resource adequacy is still a risk despite Avista's IRP process and participation in WRAP, perhaps ratepayer funds spent on WRAP should be disallowed. Finally, it is clear that Avista's concern about regional resource adequacy is misplaced with respect to its own position in the market. In its 2023

[18] Kinney, Exh. SJK-1T at 50:11–15.
[19] Earle, Exh. RLE-5 (Avista Response to Staff Data Request 177).
[20] Kinney, Exh. SJK-1T at 50:17–21.

IRP, Avista states that "Avista's first capacity and energy resource deficiency begins in January 2034."[21] This gives Avista 10 years to work on its own resource deficiency before it becomes a problem.[22]

Third, Avista complains about the lack of market liquidity,[23] and says that it did not make any forward electricity purchases for the years 2022 to 2024.[24] Figure 2 shows Avista's forward electricity purchases from 2015 to 2023. Forward electricity purchases were at low levels in 2020 and 2021 compared to previous years and then disappear from 2022 onwards.

Figure 2
Electric Power Forward Purchases 2015-2023



[21] Avista, *Electric Integrated Resource Plan* at 4-1 (2023) https://www.myavista.com/-/media/myavista/content-documents/about-us/our-company/irp-documents/2023/2023-electric-irp-final-w-cover.pdf.
[22] Kalich, Exh. CGK-1T at 26:19–21. In its testimony, Avista recognizes that its portfolio is in a "surplus position."
[23] Kinney, Exh. SJK-1T at 62:9–63:2.
[24] Earle, Exh. RLE-6C (Avista Response to Public Counsel Data Request No. 307 with Confidential Attachment).

This is concerning and surprising given the ability of other utilities to buy electric power forward. Avista's complaint about market liquidity is unreasonable.

Fourth, Avista complains that the State of Washington's carbon emissions policy results in market uncertainty, creating forward price premiums.[25] While Public Counsel agrees that Avista should address the uncertainty in the carbon emissions policy, uncertainty is not a reason for Avista to do nothing, relegating almost all of the risk to ratepayers. Avista claims it does not have control over allowance costs, but that is not true. Avista can modify its operations in response to observed costs and purchase and sell allowances in the market to mitigate risk.[26] Moreover, it should be emphasized that compliance periods for allowances are four years followed by 10 months to transfer compliance instruments for the compliance period.[27] This allows Avista to perform substantial risk mitigation over a period of almost five years. The volatility seen in Washington allowance prices is likely to decrease as the market matures as evidenced by the relative lack of volatility in California allowance prices. If the Washington market links to California and/or Québec, allowance prices in Washington will likely decrease in volatility as well because they will be in a larger market.

Fifth, Avista includes a catch-all category of changing market dynamics, repeating complaints about emissions policy, market liquidity, and resource

[25] Kinney, Exh SJK-1T at 50:27–28 & 56:6–22.
[26] In this regard, a risk sharing mechanism for allowance costs might be appropriate for Avista so that it is incentivized to address the risks from allowances.
[27] RCW 70A.65.310(1). WAC 173-446-600(4).

adequacy. The only new item that seems to fall under this rubric is their complaint about unplanned changes in the weather. It should be emphasized that unplanned changes in the weather are not a new phenomenon. While climate change may make changes more severe, it does not mean planning cannot occur or contingencies be put into place to handle them. Strangely, Avista brags in its 2023 Annual Report that it received an award to handle weather contingencies.[28] While the award is for work to improve operational efficiency, Avista still relied on historical weather data and weather forecasts in this work.

Q. Along with the fact that the reasons Avista gives for its proposed changes to ERM do not hold up under scrutiny, are there other reasons to reject Avista's proposal?

A. Yes, there are. First, it is apparent from the discussion on forecast error above that the ERM is working as it was designed to. There are some years in which shortfalls result in the sharing of costs, and other years in which savings result in the sharing of benefits. That there are years such as 2022 with large shortfalls is concerning and may be an indication of insufficient hedging as indicated by no forward electricity purchases in that year. Before considering altering the ERM deadbands and sharing bands, the Commission should order Avista to provide a comprehensive report on its hedging policies and practices.

[28] Avista, *Staying Power Avista Annual Report,* at 4 (2023) https://investor.avistacorp.com/static-files/e4a82f1f-4d5a-40d5-9c36-c23c8d603da0 (Last accessed June 25, 2024). *See also*, Chartwell. *Avista's New Weather & Incident Forecasting Tool Offers a Better Customer Experience*. https://chartwellinc.com/conferences/avistas-weather-forecasting-tool-improves-operational-efficiencies/. (Last accessed June 25, 2024).

Second, there are many ways in addition to hedging that Avista has control over its actual NPE. Avista can optimize maintenance outage schedules and maintenance of equipment to maximize capacity factors, as well as minimize forced outages, and improve heat rates at plants that burn fuel.

Third, participation in the EIM, the Extended Day-Ahead Market (EDAM), or Markets+ is not an excuse for Avista to give up on controlling costs.[29] The Company estimates that only 5.2 percent of its generation was dispatched through EIM for 2023 through April 2024.[30] Moreover, Avista is, of course, not a participant in EDAM or Markets+ so any assertions about how much of its generation would be dispatched through those markets is speculative. So, any effects of participation in EDAM or Markets+ are some time off. Even if participation in EDAM or Markets+ might have some future effect on Avista's ability to manage NPE, it should be ignored for the purposes of changing the ERM at this time. Even so, for EIM, EDAM, or Markets+, Avista has, or will have, substantial control over how it chooses to bid into these markets taking into account the cost of fuel (which it should be managing), operations and maintenance (O&M) costs (which it should also be managing), and understanding and optimization of opportunity costs (especially for hydropower with a sell now or sell later dynamic).

Fourth, it is curious that if Avista is correct that participation in EIM, EDAM, and Markets+ takes optimization of NPC out of the Company's control,

[29] Kinney, Exh. SJK-1T at 65:10–20.
[30] Earle, Exh. RLE-7C (Avista Response to Public Counsel Data Request No. 308 with Confidential Attachment).

that the Company has not, to my knowledge, announced savings through the reduction or elimination of trading personnel and other staff. After all, if the optimization will be out of Avista's control, at least some of the staff who have been working on resource optimization should be redundant. This begs the question: Does Avista intend to keep its day-ahead and real-time trading desks even though such optimization is out of its control?

Fifth, Avista claims that "deadbands skew risks in favor of one party or the other."[31] This vague statement (which party is favored and which is not) is followed by the assertion that the conditions Avista posits for deadbands to work do not exist: The Company can take actions to reduce costs and the NPE forecast must be accurate. As discussed above, both these conditions do hold. Avista can take actions to reduce costs, and the NPE forecast, while not perfect, has a track record that supports the idea that costs are forecastable.

Sixth, Avista argues that customers have not benefited on balance from having the current deadbands and sharing bands.[32] The historical comparison that Avista makes is problematic because it assumes that changes to the incentive structure would not have changed behavior. This assumption is, of course, unrealistic. The incentives provided by the current risk sharing mechanism are designed to incentivize the Company to make choices such that the actual NPE is as small as possible. The assumption that changing the ERM would not change

[31] Kinney, Exh. SJK-1T at 53:7–8.
[32] *Id.* at 54:10–55:9.

incentives is belied by Avista's own testimony where it blithely dismisses error in the EIM forecast if its ERM proposal is granted.[33]

A proper calculation of the different outcomes under various risk sharing mechanisms should take into account the effects of the risk sharing mechanisms on NPC variance. The Commission should reject any conclusions from Avista's historical comparison as being dispositive.

IV. FORECAST OF EIM BENEFITS

A. Background on EIM Benefits

Q. Please describe the EIM and how utilities benefit from participation in it.

A. The EIM is a real-time energy market run by the California Independent System Operator (CAISO) with 15-minute and 5-minute markets that dispatch across a wide area of the Western Interconnect. Avista began participating in the EIM on March 2, 2022.[34]

Utilities benefit from participation in the EIM by the ability to adjust their hour-ahead schedules in response to real-time market conditions. Consider a hypothetical generator that can be dispatched[35] with a capacity of 100 MW and a variable operating costs including any fuel costs of $47.50/MWh.[36] Suppose for a

[33] Kalich, Exh. CGK-1T at 14:8–13.
[34] Cal. Indep. Sys. Operator, *Western Energy Imbalance Market: Benefits Report, First Quarter 2022* at 4–5 (Apr. 21, 2022) (*supra* WEIM Report), https://www.westerneim.com/Documents/ISO-Western-Energy-Imbalance-Market-Benefits-Report-Q1-2022.pdf (WEIM Economic Benefits in Q1 2022).
[35] Hydropower and gas fired can often be dispatched (output varied up or down on command), but wind and solar, for instance, cannot typically be dispatched.
[36] The operating costs could be based on fuel and O&M costs as for a gas fired unit, or could be the opportunity cost for a hydro generator – sell now (use the water behind the dam) or sell later (save the water for later use). The example starts with the number from Mr. Kalich, but elaborates with an operating cost to motivate the further discussion (Kalich, Exh. CGK-1T at 12:13–13:12).

given hour the unit is scheduled to provide 50 MW over the hour. For the 5-minute market the unit bids its marginal cost of generation of $47.50/MWh to sell (increase its output)[37] and the market prices for its location are as shown in Table 1.[38]

Table 1
5-Minute Interval Prices for One Hour

5-Minute Interval	5-min price ($/MWh)
1	20.00
2	25.00
3	30.00
4	35.00
5	40.00
6	45.00
7	50.00
8	55.00
9	60.00
10	65.00
11	70.00
12	75.00

The table shows a price of $20/MWh in the first 5-minute interval, rising up to $75/MWh for an hourly price of $47.50/MWh (the average across the intervals). With a bid equal to its marginal cost of $47.50/MWh, the generating unit will not be dispatched until interval 7 when the 5-min price rises above its bid to $50.00/MWh (note that the hourly price, the average of the 5-minute prices over the hour is equal to $47.50/MWh, the generator's marginal cost). For each interval from 7 to 12, the unit will be instructed by the 5-minute market to increase its output by 50 MW for a total of 100 MW (50 more than its base schedule). Table 2 shows the MW sold in each interval, the revenues received, and the profit for the unit.

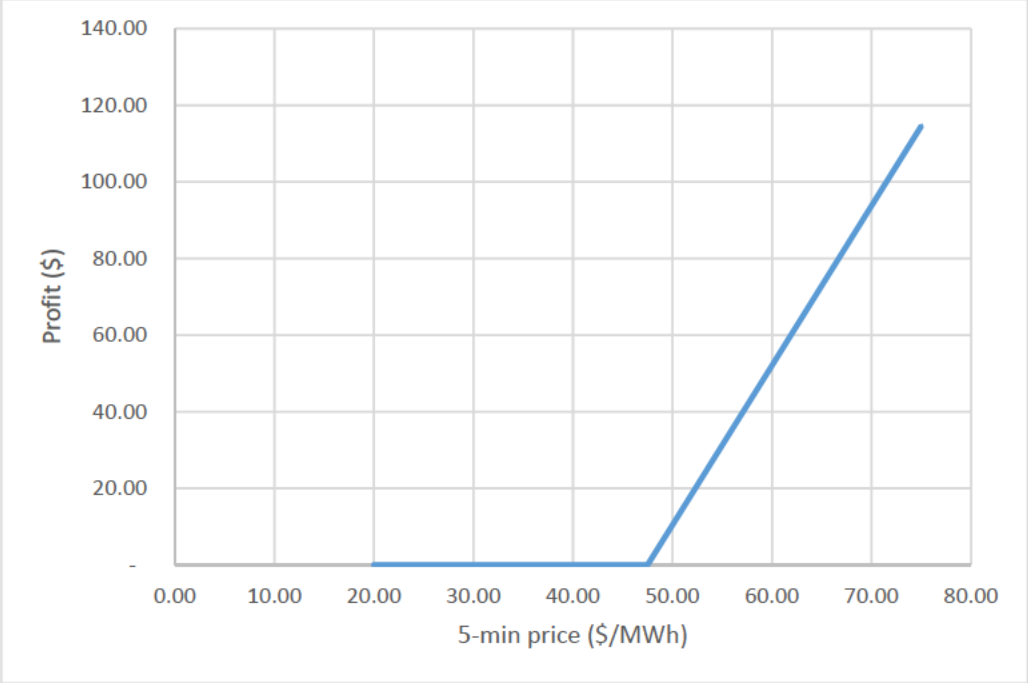
[37] In this first case, only incremental bids (bids to increase output) are discussed.
[38] This discussion ignores issues such as ramp rates and unit commitment that complicate but would not illuminate the discussion.

Table 2
Unit with Bid of $47.50/MWh to Sell into 5-Minute Market

5-Minute Interval	5-min price ($/MWh)	MW Sold	Revenue $	Profit $
1	20.00	0	-	-
2	25.00	0	-	-
3	30.00	0	-	-
4	35.00	0	-	-
5	40.00	0	-	-
6	45.00	0	-	-
7	50.00	50	208.33	10.42
8	55.00	50	229.17	31.25
9	60.00	50	250.00	52.08
10	65.00	50	270.83	72.92
11	70.00	50	291.67	93.75
12	75.00	50	312.50	114.58
		Total	1,562.50	375.00
Revenue = (5-min price * MW Sold/12)				
Profit = Revenue - (MW Sold* Operating Cost)/12				
Marginal Cost = $47.50/MWh				

As the table shows, the unit gains revenue of $1,562.50 from its sales with a profit of $375.00. If all of the 5-minute prices were equal to the hourly price across the intervals of $47.50, then the unit would be dispatched for every interval, but would have no profit because its marginal cost would equal the 5-minute price. So, the ability of a generator to profit from the 5-minute market depends not just on the average level of the 5-minute market, but also on the variability of the prices within the hour. Figure 3 shows the relationship between the market price and generator profit.

Figure 3
Profit vs. 5-Minute Price



Profit is flat at zero until the 5-minute price exceeds the marginal cost of the generator. The profit curve resembles the payoff curve for a call option with the strike price at $47.50.[39] Figure 4 shows the payoff for a call option on a stock. The diagram is the same as that for Figure 3. The payoff is zero until the strike price is reached, and then linearly increases after that. This is the reason that electric power generators are sometimes valued using methods that are used to value financial options. Just like call options, the value (profit) of a generator increases with the volatility of the underlying prices.

[39] A call option is the right, but not the obligation, to buy an asset at a pre-specified price, on, or before, a specified date in the future.

Figure 4
Payoff for a Call Option on a Stock[40]

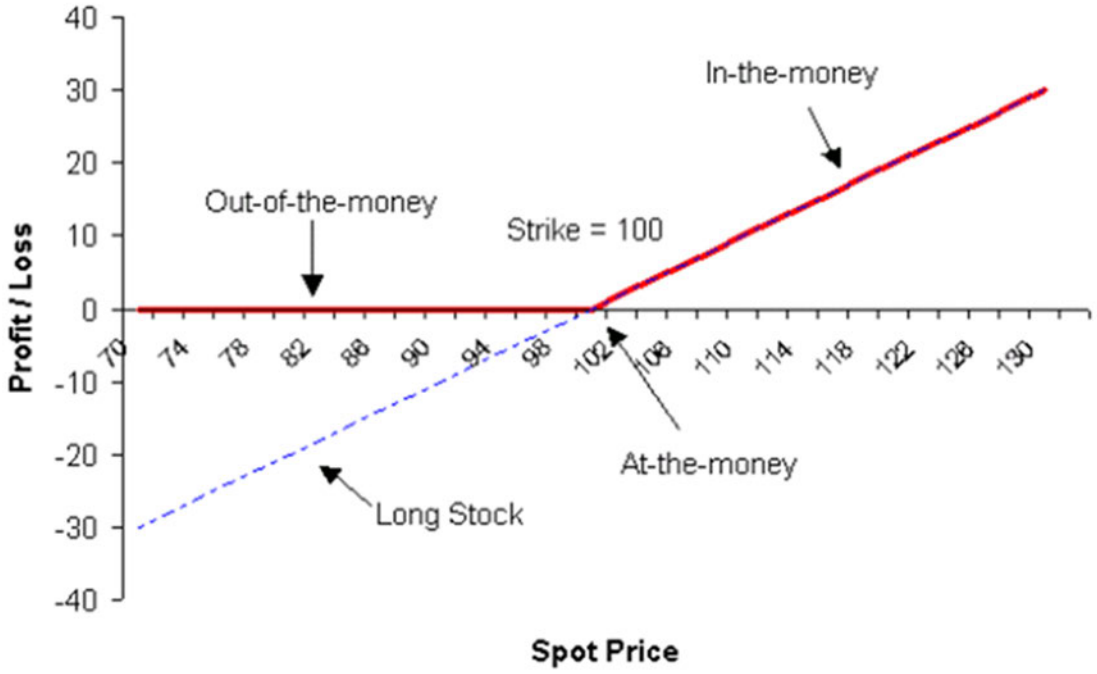


Table 3 illustrates how increased variability in hourly prices results in increased profits.[41] Two equally probable scenarios are posited. The low price scenario has prices five dollars lower than those in Table 2 for each interval, while the high price scenario has prices five dollars higher than those in Table 2. On average, the prices are the same as those in Table 2 which represents the results of an averaged scenario. That is, one averages the prices from the two scenarios and then calculates the profit.

[40] Finance Train, *Option Payoff Diagrams* https://financetrain.com/option-payoff-diagrams (last visited June 25, 2024).
[41] While there may be pathological cases where increased volatility does not increase the payoff for generators, the proposition is generally true and applies to understanding and valuing participation in the EIM.

Table 3
Increased Variability in Prices Results in Increased Profits

5-Minute Interval	Low 5-min price ($/MWh)	MW Sold	Revenue $	Profit $	High 5-min price ($/MWh)	MW Sold	Revenue $	Profit $
1	15.00	0	-	-	25.00	0	-	-
2	20.00	0	-	-	30.00	0	-	-
3	25.00	0	-	-	35.00	0	-	-
4	30.00	0	-	-	40.00	0	-	-
5	35.00	0	-	-	45.00	0	-	-
6	40.00	0	-	-	50.00	50	208.33	10.42
7	45.00	0	-	-	55.00	50	229.17	31.25
8	50.00	50	208.33	10.42	60.00	50	250.00	52.08
9	55.00	50	229.17	31.25	65.00	50	270.83	72.92
10	60.00	50	250.00	52.08	70.00	50	291.67	93.75
11	65.00	50	270.83	72.92	75.00	50	312.50	114.58
12	70.00	50	291.67	93.75	80.00	50	333.33	135.42
		Total	1,250.00	260.42		Total	1,895.83	510.42
Revenue = (5-min price * MW Sold/12)								
Profit = Revenue - (MW Sold* Operating Cost)/12								
Marginal Cost = $47.50/MWh								
Average profit		**$ 385.42**						

As can be seen in the table, the profit in the low price scenario at $260.42 is lower than the profit of $370.00 of the averaged scenario in Table 3, while the profit in the high price scenario at $510.42 is higher than that of the averaged scenario. The expected profit from combining the two scenarios is $385.42,[42] higher than the profit from the averaged scenario in Table 2. This illustrates that using an averaged scenario, or scenarios that do not include sufficient variability in prices, as Avista does, for the level of the hourly price, will tend to undervalue benefits from participation in the EIM.

A generator can also benefit from participation in the EIM by buying power from the market. For the generation unit that has been discussed here, if the price is $40.00/MWh for an interval, the generator could back off the unit and purchase power from the market, saving its marginal cost of $47.50/MWh and

[42] Assigning equal probability to each, that is averaging them.

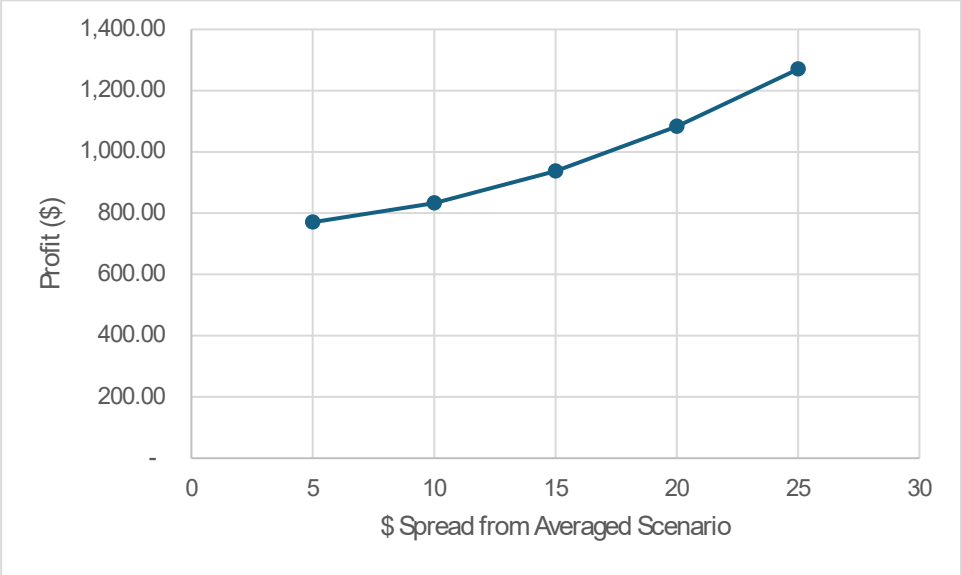
paying $40.00/MWh to market for a savings of $7.50/MWh. Table 4 shows the averaged price scenario when the generator both buys and sells from the EIM.

Table 4
Unit with Bid of $47.50/MWh Buy/Sell in 5-Minute Market

5-Minute Interval	5-min price ($/MWh)	MW Sold	Revenue $	Profit $
1	20.00	-50	(83.33)	114.58
2	25.00	-50	(104.17)	93.75
3	30.00	-50	(125.00)	72.92
4	35.00	-50	(145.83)	52.08
5	40.00	-50	(166.67)	31.25
6	45.00	-50	(187.50)	10.42
7	50.00	50	208.33	10.42
8	55.00	50	229.17	31.25
9	60.00	50	250.00	52.08
10	65.00	50	270.83	72.92
11	70.00	50	291.67	93.75
12	75.00	50	312.50	114.58
		Total	750.00	750.00
Revenue = (5-min price * MW Sold/12)				
Profit = Revenue - (MW Sold* Operating Cost)/12				
Marginal Cost = $47.50/MWh				

The profit in Table 4 is $750.00, double that in the sell-only situation in Table 2. If the low price and high price scenarios are used, the expected profit is $770.83, again as in the sell-only case, higher than in the averaged scenario in Table 4. Figure 5 shows the increased profits as the spread of prices in the low price scenario and high price scenario increases. The five dollar spread is the spread presented in Table 3 and the other spreads increase the difference between the low price scenario and the high price scenario. Figure 5 shows that profits (value) increase faster than linearly with the spread of the hourly prices.

Figure 5
Profit in the EIM Increases Faster than Linearly in the Spread of Prices



To confirm the mean or expected value of two scenarios (high and low) produces more profit than an averaged scenario (that averages the two hourly prices), I conducted two Monte Carlo simulations each with ten million samples. Both simulations found no cases where the averaged scenario produced more profit than the expected value of the high and low scenarios. Moreover, the expected profit from the high and low scenarios exceeded that of the averaged scenario 88 percent of the time in the first simulation, and 34 percent of the time in the second simulation.

The first simulation randomly picked prices for the five-minute intervals and generator costs, while the second simulation used EIM data for prices and randomly picked generator costs. In the second simulation, the average hourly prices were increased in the high price scenario and decreased in the low price scenario from the EIM price by a random amount in each sample. The pattern of

5-minute prices within the hour[43] in the low and high priced scenarios as well as the averaged scenario were kept to the same pattern as in the EIM data.

These two simulations show that the first step in Avista's forecast results in an underestimate of EIM benefits.

B. The Role of the EIM in Avista's ERM Calculations

Q. Please describe the EIM and its role in Avista's ERM calculations.

A. The forecasted benefits from participation in the EIM are part of the calculation of the ERM baseline. An increase in forecast EIM benefits decreases the baseline and therefore decreases costs to ratepayers, while a decrease in forecast EIM benefits increases the baseline and, as a result, increases costs to ratepayers. It is therefore important to get the forecast of EIM benefits correct, even though Avista seems to think that it would not matter if its ERM proposal was granted by the Commission.[44] Regardless of the ERM deadbands and sharing mechanisms, getting forecast costs right helps with rate stability.

C. Avista's Proposal

Q. Please describe Avista's forecast of EIM benefits.

A. Avista estimates a $5.5 million system benefit from its EIM participation to customers in 2025.[45] This estimate is justified by Avista in two ways. First, it implements a new methodology for valuing participation in the 5-minute market

[43] The pattern of 5-minute prices within the hour, or the intra-hour pattern or intra-hour ratios, is the twelve ratios of the 5-minute prices divided by the hourly price. So, if the 5-min prices for the hour are (50, 50, 50, 50, 50, 50, 100, 100, 100, 100, 100, 100), that is 50 for the first six intervals, and 100 for the last six, the hourly price is 75.The intra-hour pattern is (2/3, 2/3, 2/3, 2/3, 2/3, 2/3, 4/3, 4/3, 4/3, 4/3, 4/3, 4/3) because 50/75 = 2/3 and 100/75 = 4/3.
[44] Kalich, Exh. CGK-1T at 14:8–13.
[45] *Id.* at 14:3–4.

of the EIM. It does this by first running its hourly dispatch model, and then running the model with intra-hour modeling to obtain the incremental value of EIM participation. Second, Avista favorably compares its $5.5 million forecast with a benefit of $5.8 million based on an E3 study.[46]

Q. Do you think Avista's approach is reasonable?

A. No, I do not. Avista's approach is not reasonable for three reasons. First, Avista's new methodology for valuing participation in the 5-minute market is flawed and should be rejected because of errors in estimating the levels of five-minute prices. These errors result in an under forecast of EIM benefits. Second, the E3 study cited by Avista is now seven years old. Using a seven-year old study that uses data that is at least seven years old to justify a forecast in 2025 is unreasonable. The Commission would not countenance the use of seven year old data that has changed in setting other parts of power costs, nor should it do so here. Moreover, the $5.8 million benefit based on an E3 study is in 2017 dollars. The value to compare against Avista's modeling forecast of $5.5 million in 2025 dollars is $7.4 million, 35 percent higher than Avista's estimate.[47] Third, Avista's estimate of EIM benefits is completely out-of-line with the estimates of historical EIM benefits from the CAISO which are on the order of $25.3 million per year on a Balancing Area Authority (BAA) basis, or $22.3 million per year for Avista taking into account the other entities in the Avista BAA.

[46] *Id.* at 12:13–14:13.
[47] U.S. Bureau of Labor Statistics, *June 2017 – May 2024*, https://data.bls.gov/cgi-bin/cpicalc.pl?cost1=5.8&year1=201706&year2=202405.

Q. What are the errors in Avista's modeling methodology for calculating EIM benefits?

A. To estimate EIM benefits, Avista forecasts 5-minute EIM prices by first forecasting the average hourly EIM prices across the five minute intervals, and then from those average hourly prices forecasts the 5-minute prices. Both steps of Avista's forecast of 5-minute prices are flawed and result in 5-minute prices that lack the variability that gives rise to the value in the EIM markets.

In the first step, to forecast the average hourly EIM prices, Avista performs a regression of an index of historical hourly prices against the historical hourly average of 5-minute EIM prices.[48] Avista uses hourly price data from the vendor, Powerdex for the time period January 1, 2022, through January 31, 2023, and data from the CAISO for 5-minute prices at one of the MID-C nodes. Inexplicably, about four percent of the hours are missing from the CAISO data (including the whole month of February 2022).[49]

Avista incorrectly claims an astounding R-squared of 0.92 for the regression[50] even though the reported results only show an R-squared of 0.852.[51]

[48] Kalich workpapers, *5 minute Analysis interval analysis and modeling 20230612.pptx*.
[49] *Id*. at 5.
[50] Earle, Exh. RLE-8 (Avista Response to Public Counsel Data Request 134). Kalich workpapers, *5 minute Analysis interval analysis and modeling 20230612.pptx*, at 8. Avista's assertion about the R-squared in this response is incorrect. What is also interesting is that no sensitivities were performed, or alternatives tested, at least to Avista's knowledge apart from running the regression model on negative prices only. In fact, Avista appears to have received little information about the work performed by Borismetrics. Earle, Exh. RLE-9 (Avista Responses to Public Counsel Data Requests 272), Earle, Exh. RLE-10 (Avista Responses to Public Counsel Data Requests 273), Earle, Exh. RLE-11 (Avista Responses to Public Counsel Data Requests 274), Earle, Exh. RLE-12 (Avista Responses to Public Counsel Data Requests 275), Earle, Exh. RLE-13 (Avista Responses to Public Counsel Data Requests 276), and Earle, Exh. RLE-14 (Avista Responses to Public Counsel Data Requests 277).
[51] Avista appears to have used the multiple R for the R-squared. Multiple R is the square root of the R-squared.

There are technical errors that make the interpretation of the statistics concerning the quality of Avista's regression problematic, however, regardless of the calculated R-squared.[52]

Instead of relying on statistics calculated for the regression performed by Avista, one can show that there are problems with Avista's regression directly by applying the regression results to out-of-sample data. Out-of-sample data are data that were not included in calculating the regression coefficients so are a good test of how well the regression will perform in predicting future prices (which is the purpose of Avista's regression).

When the regression results are applied to out-of-sample data, the resulting R-squared is [redacted] Avista's calculations will tend to result in an underestimate of EIM benefits as discussed above. As a result, Avista's regression model is unsuitable for use in forecasting EIM benefits and Avista's EIM forecast should be rejected.

The second step in Avista's forecast of 5-minute prices is also flawed. No statistical procedures or scenario analysis are used. Rather, Avista simply averaged historical patterns of intra-hour, 5-minute prices (using the intra-hour

[52] Amongst the problems with Avista's regression analysis is that the residuals are auto correlated and not normally distributed (heteroskedasticity). This makes the interpretation of various statistics concerning the quality of the regression problematic. *See* confidential workpaper, *residual analysis (C).xlsx*.
[53] The out-of-sample data spans February 1, 2023, through April 1, 2024.

ratio as discussed above) to obtain fixed ratios to apply to the forecast 5-minute hourly averages across sets of hours. By ignoring the variability of the distribution of 5-minute prices within the hour, Avista's calculations will also tend to under-forecast the value of EIM benefits. To confirm that this is the case, I performed a simulation with ten million samples using 5-minute prices and intra-hour price patterns from the out-of-sample dataset. I picked two intra-hour price patterns (scenarios one and two) and averaged them. An averaged scenario was created by averaging the intra-hour price patterns. Using an hourly price from the out-of-sample dataset, the three intra-hour price patterns were used to generate a set of 5-minute prices for an hour. The profit from the averaged price pattern scenario never exceeded the expected profit of the scenarios one and two, and 30 percent of the time was less. This shows that the second step in Avista's forecast of 5-minute prices will also contribute to Avista's underestimation of EIM benefits.

Because of the flaws in both steps to forecast EIM 5-minute prices and their tendency to underestimate benefits, Avista's estimate of EIM benefits should be rejected.

Q. Does the E3 study cited by Avista provide any support for Avista's forecast?

A. Not at all. The E3 study Avista uses to bolster its flawed forecast is from 2017, seven years ago.[54] Using a seven-year old study that uses data that is at least seven years old, *inter alia*, fuel prices that are seven years old to justify a forecast in 2025 is unreasonable. In calculating ERM values, Avista does not appear to

[54] *See*, Direct Test. of Clint G. Kalich, Exh. CGK-1T at 14:4–7, *Wash. Utils. & Transp. Comm'n v. Avista Corp.*, Dockets UE-220053, UG-220054, & UE-210854 (consolidated) (filed Jan. 25, 2022); *see also*, Kalich, Exh. SJK-3.

endorse using fuel prices or load projections from seven years ago but makes an exception for forecasting EIM benefits without reason. Moreover, the $5.8 million benefit Avista cites based on the E3 study is in 2017 dollars. The value to compare against Avista's modeling forecast of $5.5 million in 2025 dollars is $7.4 million, 35 percent higher than Avista's estimate. The Commission should reject Avista's use of E3's outdated study as support for its EIM forecast.

Q. Why do you say that Avista's estimate of EIM benefits is completely out-of-line with the estimates of EIM benefits from the CAISO?

A. Avista estimates benefits of $5.5 million for the year 2025 for the customers on its system. However, CAISO, which runs the EIM, has estimated benefits for the period March of 2022 through March 2024 of $25.3 million for the Avista BAA on an annualized basis.[55] There are other entities in the Avista BAA, though Avista comprises about 88 percent of the BAA. This leaves a benefit to Avista customers of $22.3 million.

Avista will no doubt argue that the benefits from EIM depend on a variety of factors, such as the amount of hydro available, price volatility, and transmission interconnection. While these factors influence the level of benefits from EIM, it is unreasonable to think that the benefits from EIM in 2025 would be only slightly more than a fifth of those received so far on an annualized basis. Moreover, 2022 and 2023 were bad years for power costs for Avista as Avista itself has pointed out. So, the EIM benefits in 2022 and 2023 would likely be less

[55] Direct Test. of Clint G. Kalich, Exh. CGK-1T at 14:4–7, *Wash. Utils. & Transp. Comm'n v. Avista Corp.*, Dockets UE-220053, UG-220054, & UE-210854 (*consolidated*) (filed Jan. 25, 2022); *see also*, Kalich, Exh. SJK-3..

than average, not more than average. For 2022, Avista says the problems were primarily due to weather resulting in increased customer load and "very high electric and natural gas prices,"[56] while in 2023, there was lower than anticipated hydro generation and significant weather variations.[57] Despite these adverse circumstances, Avista benefited from participation in the EIM by $24.1 million ($28.9 million annualized) and $20.1 million in 2022 and 2023, respectively.

D. Alternative, More Accurate Forecasting Is Possible

Q. Have you developed an alternative forecast of EIM benefits?

A. Yes. I started with the 25 months of historical data available so far for Avista's performance in the EIM.[58] This amount of data is consistent with how much data Avista said would be "needed to predict future opportunities."[59] The average monthly benefit for the Avista BAA is $2.11 million. Annualizing this number yields a yearly benefit of $25.3 million. Multiplying the BAA benefit by Avista's proportion of sales in the BAA yields benefits for the Company of $22.3 million.

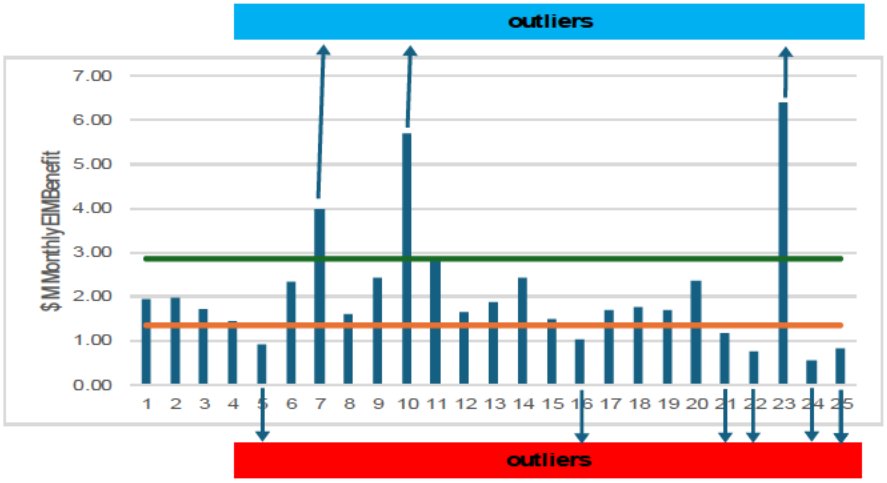
To test the robustness of this calculation I performed a bootstrapping analysis to see if the monthly average calculated was a good estimate of the expected monthly value. A bootstrapping analysis samples from an existing

[56] Direct Test. of Scott J. Kinney, Exh. SJK-1T at 8:16–18, *Wash. Utils. & Transp. Comm'n v. Avista Corp.*, Docket UE-230214 (filed Mar. 31, 2023).
[57] Direct Test. of Scott J. Kinney, Exh. SJK-1T at 15:6–9, *Wash. Utils. & Transp. Comm'n v. Avista Corporation*, Docket UE-240276 (filed Apr. 26, 2024). In Earle, Exh. RLE-15 (Avista Response to Staff Data Request 35), Avista shows historically low hydro generation in 2023.
[58] Avista participated in the EIM starting in March 2022. CAISO has released studies of benefits through the first quarter of 2024. As a result 25 months of data is available. After CAISO releases its 2nd quarter 2024 benefits study, Public Counsel will file supplemental testimony updating its findings.
[59] Rebuttal Test. of Scott J. Kinney, SJK–13T at 8:9–10, *Wash. Utils. & Transp. Comm'n v. Avista Corporation*, Dockets UE-220053, UG-220054, & UE-210854 (*consolidated*) (filed Aug. 19, 2022). "A minimum of a year and more likely two years of EIM operations are needed to predict future opportunities."

sample of data to construct a distribution for a statistic of interest, in this case the average monthly benefit from the EIM. The bootstrap used one million resamples of the data and a 95 percent confidence interval was calculated for the monthly average.[60] The estimated average from the bootstrap differed from the direct estimate of the average by less than one-tenth of a percent.

Next, outliers in the data were excluded from the dataset of twenty five months as shown in Figure 6. Data points above the upper horizontal line were considered to be outliers, as were those below the lower horizontal line.

Figure 6
Exclusion of Outliers in Calculating Average Monthly Benefit



[60] Standard bootstrapping techniques typically requires the variables to be independent and identically distributed. In the case of the EIM data, the monthly benefits have no significant autocorrelation (autocorrelation is -0.10), so can be considered to be independent. The identically distributed requirement might not hold in the case of the EIM data, but if it does not, then that means that the confidence intervals are conservative (broader than they would be if there was identical distribution). *See*, Earle, Exh. RLE-16 "Using i.i.d. bootstrap inference for general non-i.i.d. models." The workpaper, EIM Benefits Calculation, contains the analysis and code for the bootstrap.

The resulting average excluding outliers was $1.96 million per month, slightly lower than if outliers were included. Table 5 shows the results of the analysis.

Table 5
EIM Annual Benefits Estimate ($M)

	BAA benefit	Avista benefit
Lower bound (95% confidence interval)	18.9	16.6
Average	25.3	22.3
Upper bound (95% confidence interval)	31.7	27.9
Average no outliers	23.5	20.7

The EIM benefit for Avista has a 95 percent confidence interval of $16.6 million to $27.9 million per year with an average benefit of $22.3 million per year. Removing outliers results in an estimated benefit of $20.7 million. Taking a conservative approach, the Commission should adopt a $20.7 million annual EIM benefit for Avista customers.

It is notable that in the one million bootstrapping resamples, the smallest average monthly BAA EIM benefit in the million resamples was $1.22 million resulting in an Avista customer benefit of $12.37 million, over twice Avista's proposal. Put another way, based on the data available, Avista's EIM benefits forecast has less than one in a million chance of occurring.

Q. How do you respond to criticism by Avista of the use of CAISO's estimates of EIM benefits?

A. Avista has two main criticisms of the CAISO EIM methodology. First, Avista claims that the "CAISO methodology assigns no costs or limitations to the transmission utilized for EIM transactions" resulting in elevated estimated

benefits depending on a participant's transmission utilization.[61] Avista misrepresents the CAISO EIM benefits methodology. The CAISO calculation takes the actual EIM results in which, of course, transmission cost and limitations are taken into account and compares it with a counterfactual. The difference between the actual EIM results and the counterfactual gives the value of the EIM markets. The "counterfactual dispatch for an EIM BAA mimics the market operations without importing or exporting through the EIM transfers. The counterfactual dispatch moves units inside the BAA to meet the same real-time load imbalance as the EIM dispatch based on economic merit order without considering transmission constraints."[62] However, as CAISO points out, neglecting transmission constraints in the counterfactual will tend to underestimate the EIM benefit, because neglecting transmission constraints will decrease the cost of the redispatch in the counterfactual, resulting in a smaller difference between the actual dispatch and the counterfactual.

Second, Avista complains that baseline dispatch costs are based on participants' bids, not actual costs. This complaint misrepresents the operation of the CAISO EIM. It surely cannot refer to the actual EIM results – when dispatching units in the EIM, CAISO starts with the base schedule and then uses the bids to perform a transmission constrained dispatch. So, Avista must be referring to the counterfactual. But, if it refers to the counterfactual, then it also

[61] Rebuttal Test. of Scott J. Kinney, SJK-13T at 7:7–11, *Wash. Utils. & Transp. Comm'n v. Avista Corporation*, Dockets UE-220053, UG-220054, & UE-210854 (*consolidated*) (filed Aug. 19, 2022).
[62] *EIM Quarterly Benefit Report Methodology*, at 3 (2021) https://www.westerneim.com/Documents/EIM-BenefitMethodology.pdf.

makes no sense. Participants' bids for a unit reflect the participants' willingness to redispatch the unit, whether it is to provide power outside the BAA (as can happen in actual dispatch), or inside the BAA, (as can happen in actual dispatch or the counterfactual). So, the CAISO methodology appropriately uses participant bids to perform a redispatch in the counterfactual. Whether the bids reflect actual costs is a different matter entirely having to do with the exercise in market power, perceived opportunity cost, or mistakes in bidding (which is why the CAISO warns against not bidding a unit's marginal costs in the EIM).

It is useful to note that E3 endorsed the CAISO EIM benefits methodology as an accurate measure for the benefits that Puget Sound Energy receives from the EIM market.[63]

Q. If Avista were to properly estimate EIM benefits, what kind of analysis should they perform and what would a conservative result look like?

A. Avista's proposal of $5.5 million in benefits is ungrounded. Avista's model contains major conceptual flaws and demonstrably under-forecasts EIM benefits. Moreover, its results do not comport with the findings of the CAISO on Avista's EIM benefits.

Avista's proposed methodology is unsound and Avista should develop an EIM forecast methodology that more accurately forecasts EIM benefits. There are a number of ways to do this that Avista could pursue. First, it could use historical results as Public Counsel has done in this testimony. Second, it could perform a

[63] Paul K. Wetherbee, Exh. PKW-13 at 1–2, *Wash. Utils. & Transp. Comm'n v. Puget Sound Energy*, Dockets UE-220066 & UG-220067 (*consolidated*) (Jan 1, 2022) (Review of Puget Sound Energy's EIM Accounting Methodology," E3, Dec. 16, 2021).

stochastic analysis such as a Monte Carlo approach to estimating EIM benefits to incorporate both the difference in the average hourly prices in the 5-minute market and the variability in the distribution of 5-minute prices across the hour, as discussed above. Third, Avista could take a scenario approach which might require less computational power than a stochastic approach.

A conservative estimate would have alignment with the after-the-fact estimates of the CAISO and use a sound methodology.

Q. Does this conclude your testimony?

A. Yes, it does.