Exh. IZ-2T
Docket UE-250224
Witness: Isaiah M.R. Zacharia

**BEFORE THE WASHINGTON**

**UTILITIES AND TRANSPORTATION COMMISSION**

| | |
|---|---|
| WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION,<br><br>Complainant,<br><br>v.<br><br>PACIFICORP dba PACIFIC POWER & LIGHT COMPANY<br><br>Respondent. | Docket UE-250224 |

**PACIFICORP**

**REBUTTAL TESTIMONY OF ISAIAH M.R. ZACHARIA**

**September 2025**

## TABLE OF CONTENTS

## I. INTRODUCTION

**Q. Are you the same Isaiah M.R. Zacharia who previously submitted direct testimony in this proceeding on behalf of PacifiCorp d/b/a Pacific Power (PacifiCorp or Company)?**

A. Yes.

## II. PURPOSE AND SUMMARY OF TESTIMONY

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

A. I respond to the direct testimony of Bradley G. Mullins, filed on behalf of the Alliance of Western Energy Consumers (AWEC). Specifically, my testimony highlights and corrects errors featured in AWEC's Aurora modeling adjustments and provides a complete representation of the various modeling adjustments that AWEC provided.

## III. BACKGROUND ON AWEC'S AURORA MODELING

**Q. Please describe the Aurora production cost model.**

A. The Aurora production cost model is a highly sophisticated and powerful simulation tool used by the Company to forecast net power costs (NPC) across PacifiCorp's six-state service territory. In this power cost only rate case (PCORC), Aurora is employed to generate a least-cost forecast of system operations for calendar year 2026 by solving a complex optimization problem based on a wide range of input assumptions. Key inputs to the model include:

- Resource availability
- Demand obligations
- Capacity requirements
- Transmission constraints
- Market depth and pricing dynamics

These inputs, combined with other variables, collectively inform the model's simulation of hourly dispatch decisions, market purchases and sales, and overall system costs.

**Q. Please explain how AWEC uses the Aurora production cost model.**

A. AWEC has made several adjustments to the Company's input assumptions within the Aurora model, resulting in a system forecast that significantly diverges from operational reality. AWEC submitted an Aurora project containing seven distinct study cases, each representing a simulation in which one or more of the Company's original inputs were modified.

These study cases serve two primary purposes in AWEC's testimony:

1. **Proposed Adjustments to the Company's NPC forecast:** AWEC presents four study cases as alleged support for an alternative forecast, reflecting AWEC's proposed changes to key modeling assumptions. These are supposed to support AWEC's position on how the Company's NPC forecast should be revised.
2. **Analysis of Wind Curtailment Scenarios:** AWEC uses the remaining three study cases supposedly to explore wind curtailment impacts under various input conditions.

AWEC's Aurora input modifications are based on flawed assumptions and result in distorted outcomes that do not accurately reflect system operations.

**Q. What modifications did AWEC make to the Aurora input assumptions in the four study cases used to support their alternative NPC forecast?**

A. AWEC submitted an Aurora project containing seven study cases (four supporting

AWEC's alternative net power cost forecast, three providing support for "informational" analysis on wind curtailments), all run using Aurora version 16.0.1001. AWEC's approach begins with the Company's original study case, which supports the proposed net power costs in this rate case, and then builds upon it through modifications in three sequential study cases to develop their alternative forecast.

It is important to note that AWEC made changes not only to the Aurora model but also to the Washington net power cost allocation spreadsheet. My testimony focuses solely on the modifications within the Aurora model.

The three sequential study cases introduced the following key changes:

1. **Wind Valuation Adjustment:** AWEC prioritized Company-owned wind generation above physical plant minimum operating levels and regulation reserve requirements, which misrepresents operational constraints and reliability needs.

2. **Hedging Assumption Removal:** AWEC excluded forecasted hedge volumes that were included under the Company's expected hedging methodology.

3. **Forecast Improvement Reversion:** AWEC used outdated assumptions for model inputs such as market sales capacity limits that the Company has refined over time to improve accuracy in its forecasted net power costs.

**Q. Please explain each of the four study cases provided by AWEC to support their net power cost forecast in this proceeding.**

A. Here are the explanations for the four study cases:

**1. WA_PCORC_2026_Direct** – This is the initial or base study case in AWEC's sequence of modeling input adjustments and is identical to the "WA_PCORC_2026_Direct" study case provided by the Company in its direct filing, with the only difference being the Aurora version used to perform the simulation. AWEC uses this study case to set the base (Step 0), which is then adjusted in the following three sequential steps.

2. **WA_PCORC_2026_Direct_WindMR (Step 1)** – The first step in AWEC's sequential adjustments. AWEC defined this adjustment as modeling wind resources as "must-run."[1] In this study case, AWEC:

- Increased the cost of curtailing Company-owned wind resources when modeled operational constraints were reached to $99,999,999,999 per megawatt, meaning that wind would be curtailed as the very last option by the model. This resulted in the Aurora model violating physical minimum operating level constraints at thermal resources as well as not holding sufficient regulation reserves, which are necessary to integrate the variable energy resources on the Company's system.[2]

- Adjusted the relaxation cost for power purchase agreements (PPA), qualifying facilities (QF), and short-term firm resources (representing the Company's executed forward term deals) from a global setting of $500 per megawatt to $999,999,999 per megawatt. This change also results in physical minimum operating levels being violated as well as the model not holding sufficient reserves, although the effects are minor compared to the adjustment of owned wind curtailment pricing.

- Reduced the penalty for not meeting regulation reserve requirements from $10,000 per megawatt to $2,000 per megawatt, thereby making it even easier for the model to disregard regulation reserve requirements. It is important to note that changing the pricing of curtailing company-owned wind and other resources has already shifted the model's priorities however this adjustment further devalues the model's need to hold sufficient capacity for regulation reserves and is not explained or mentioned by AWEC in testimony.

3. **WA_PCORC_2026_Direct_WindMRxHedge (Step 2)** – This second step incorporated all adjustments from the previous study case and additionally removed the forecasted hedge volumes. These volumes were calculated based on formulas aligned with the expected hedging policy for the 2026 forecast period. Removing these forecast hedges results in a forecast that is inconsistent with the Company's expected actions within its actual operations for calendar year 2026.

4. **WA_PCORC_2026_Direct_NonPrecedential (Step 3)** – This final step included all prior adjustments and introduced two additional changes:

- Replaced the percentile-based day-ahead/real-time price modifier with the flat dollar modifier. This reversion flattened the price curve used by the Aurora model for market transactions by switching from a percentile modifier, which produces "peakier prices" consistent with reality to a flat

[1] Mullins, Exh. BGM-1CT at 38:12-14.
[2] Mitchell, Exh. RJM-13CT, Section II(5)(iv).

dollar adder; as the name suggests, this "flattens" the prices across the hours in comparison.

- Assumed the Company could sell up to 9,999 megawatts in every hour of the simulation at three sales hubs: Four Corners, Mid-Columbia, and Palo Verde. This adjustment resulted in the model significantly increasing sales volumes and revenues and is not consistent with the sales volumes the Company has experienced in recent history.[3]

This final study case represented the culmination of AWEC's proposed modeling input adjustments and was used to generate a total-Company NPC forecast, which was subsequently allocated to Washington and further modified.

**Q. Please explain the three additional informational study cases provided by AWEC.**

A. AWEC provided three additional one-off study cases, comparing the result from each study case to the "WA_PCORC_2026_Direct" study case for the purposes of analyzing the model's wind curtailment:

1. **WA_PCORC_2026_Direct_xCoalConstraints** – This informational study case removed the minimum annual coal delivery constraints at each coal plant owned or partially owned by the Company. These minimum annual coal deliveries are based on the minimum take requirements included in each plant's applicable coal contract(s). Additionally, AWEC re-priced all coal using the highest available dollar per MMBtu price from each coal contract. These two adjustments provided the Aurora model with input variables that were inconsistent with expectations for actual operations and thus decreased forecast accuracy, resulting in meaningless analysis.

2. **WA_PCORC_2026_Direct_SitusSolar** – This study case removed a seemingly arbitrary selection of solar resources from the Aurora model. The rationale for the specific resources removed was not clearly documented although AWEC referenced "Utah green tariff programs."[4] The resulting analysis was used to determine how much more company-owned wind generation could be forecasted in the model if resources that exist in real life were simply removed from the model.

[3] Mitchell, Exh. RJM-4C at 8: Confidential Figure CAPS-1.
[4] Mullins, Exh. BGM-1CT at 38:3-4.

3. **WA_PCORC_2026_Direct_SitusSolarxCoalCon** – This informational study case combined the adjustments from the previous two study cases, incorporating both the removal of coal delivery constraints and pricing as well as the exclusion of randomly selected solar resources.

## IV. CORRECTIONS AND REBUTTAL

### AWEC's "Must Run" Wind Modeling

**Q. AWEC claims that it made company-owned wind resources "must-run" in its modeling.[5] Can you describe AWEC's use of "must-run"?**

A. AWEC's "must-run" adjustment changes the priorities or importance of inputs provided to the Aurora model, as the adjustment re-orders curtailing wind to be the most expensive option to the model, meaning it ensures that the model prioritizes producing company-owned wind generation over holding sufficient regulation reserves as well as the physical minimum operating levels at thermal plants.

**Q. Is holding sufficient regulation reserves important and necessary in the Company's actual operations?**

A. Yes. Regulation reserves represent the necessary capacity held back on dispatchable resources (such as thermal or hydro resources), which are important for maintaining a consistent level of energy on the system. Wind and solar resources deviate from their forecasts in actual operations (unlike in the Aurora model), and this held back capacity is important to ensure demand obligations are met and blackouts do not occur. AWEC's "must-run" modeling ignores this necessary modeling parameter through its extreme repricing of company-owned wind curtailment, which significantly prioritizes producing company-owned wind generation over other modeling inputs.

[5] Mullins, Exh. BGM-1CT at 34:12.

**Q. How is "must run" defined in the context of the Aurora model's inputs?**

A. It is important to understand that the term "must run" has meaning in the Aurora model, as it represents an actual column featured in one of the model's input tables. The Company uses the Must Run column in Aurora to model the company-owned wind, to ensure that customers receive as much forecast owned wind generation as is physically possible for the system. The screenshot below from the Aurora "Help" file provides an explanation of this column.

**Aurora Help – Must Run**

**Must Run Column**

Column Type = Text

The Must Run column allows the user to set resources to a Must Run condition. Users can select from the following input flags:

- **1** - A flag of "1" will always dispatch the minimum capacity specified for the resource. The minimum capacity for this resource will assume a zero dispatch cost and will always dispatch the minimum capacity of the unit.
- **0** - A "0" flag will not apply a Must Run condition.

As explained in the screenshot above, flagging a "1" for a resource means that the model "must run" the resource no lower than its minimum capacity for the entire simulation. All company-owned wind resources are flagged as "1" in the Aurora model.

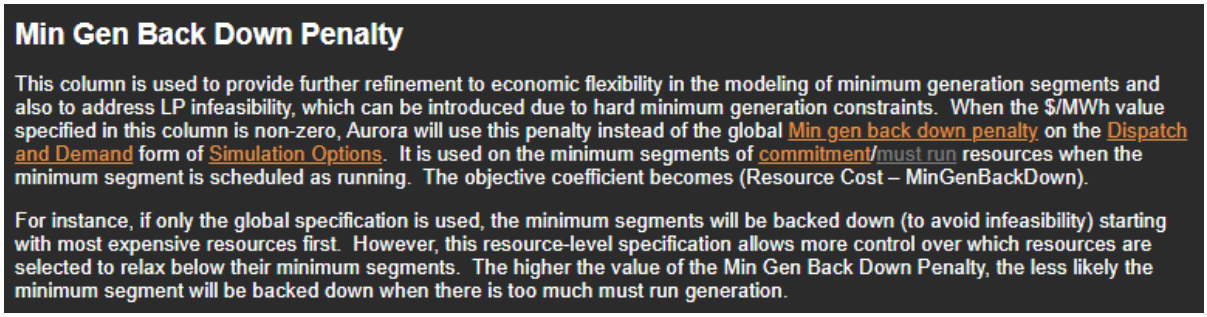
**Q. For curtailable company-owned wind resources, what "minimum capacity" does the Company provide to Aurora?**

A. The Company defines the "minimum capacity" for all curtailable wind resources as 100 percent in the Aurora model, meaning that the model must run each of the resources at its maximum generation output level for every hour of its forecast simulation.

**Q. If the Company models the curtailable wind resources as "must run," with a minimum capacity of 100 percent, how is the Aurora model able to curtail wind resources consistent with actual operations?**

A. The Company uses another column featured in the same Aurora input table to provide the model with the capability to curtail wind. This is done using the "Min Gen Back Down Penalty" column, for which the definition is provided in the screenshot below.

**Aurora Help – Min Gen Back Down Penalty**



**Min Gen Back Down Penalty**

This column is used to provide further refinement to economic flexibility in the modeling of minimum generation segments and also to address LP infeasibility, which can be introduced due to hard minimum generation constraints. When the $/MWh value specified in this column is non-zero, Aurora will use this penalty instead of the global Min gen back down penalty on the Dispatch and Demand form of Simulation Options. It is used on the minimum segments of commitment/must run resources when the minimum segment is scheduled as running. The objective coefficient becomes (Resource Cost – MinGenBackDown).

For instance, if only the global specification is used, the minimum segments will be backed down (to avoid infeasibility) starting with most expensive resources first. However, this resource-level specification allows more control over which resources are selected to relax below their minimum segments. The higher the value of the Min Gen Back Down Penalty, the less likely the minimum segment will be backed down when there is too much must run generation.

There are two important points to consider from the above screenshot:

(1) This "Min Gen Back Down Penalty" setting is used to address infeasibilities. Infeasibilities can be defined as hours in the simulation where the model is unable to satisfy one of the model's constraints, such as reserve obligations or actual thermal generation capabilities, without adjusting or relaxing constraints that it is given the ability to do so with. If a user was to make this penalty greater for a resource than the penalty for relaxing reserve obligations or violating physical minimum operating levels, like AWEC did in their modeling, then the model would prioritize producing company-owned wind generation over those constraints.

(2) The Min Gen Back Down penalty is a $/MWh price setting, meaning the user must define the penalty price to allow the model to use the appropriate logic to determine curtailment order. In the initial filing, the Company used the same "dispatch prices" that are used by the Company in its dispatch in actual operations to tell the Aurora model at what cost the model can curtail the wind. These prices are calculated off the various production tax credits (PTC) that customers receive from company-owned wind generation.

**Q. Please explain why the $/MWh price in the Min Gen Back Down penalty is so important.**

A. The Company has provided the Aurora model with the current priority order for the following constraints:

1. **Serve Load:** The Aurora model must satisfy all demand obligations (Load). This is innate to the Aurora model as configured by the Company and consistent with the real-world obligation for an electric utility to serve customer's demand.

2. **Hold Contingency Reserves:** The Aurora model must satisfy all contingency reserve obligations. To ensure this occurs, the model includes a penalty of $999,999 per megawatt that is incurred if the model reduces this obligation.

3. **Hold Regulation Reserves:** The Aurora model must satisfy all regulation reserve obligations. To ensure this occurs, the model includes a penalty of $10,000 per megawatt if the model reduces this obligation.

4. **Maintain Physical Minimum Operating Levels:** The Aurora model must not violate minimum operating generation levels based on the minimum capacity input for each resource. These minimum operating levels include, for example, physical limitations associated with thermal generation. In order to prevent Aurora from violating these minimum operating levels, the model includes a global "Min Gen Back Down Penalty" setting of $500 per megawatt relaxed. For curtailable company-owned wind resources, relaxing this constraint is priced specifically using the PTC value in the "Min Gen Back Down Penalty" column as described above and not the global $500 per megawatt setting.

**Q. Please explain how AWEC's "must-run" wind modeling re-orders these four modeling priorities and adds two more for the model to consider.**

A. By changing the "Min Gen Back Down Penalty" prices for owned wind to $99,999,999,999 per megawatt and $999,999,999 for PPAs, QFs, and other "must run" resources, AWEC re-ordered Aurora's priorities so that the model prioritizes obligations in the following order:

1. **Serve Load:** The Aurora model still must satisfy all demand obligations. This does not change as it is innate to the Aurora model.

2. **Dispatch Wind:** The Aurora model must not curtail owned wind resources. If the model would like to relax this constraint it must do so at the cost of $99,999,999,999 per megawatt curtailed.

3. **Dispatch PPAs:** The Aurora model must not curtail PPAs, QFs, and other "must run" resources. If the model would like to relax this constraint it must do so at the cost of $999,999,999 per megawatt curtailed.

4. **Hold Contingency Reserves:** The Aurora model must satisfy all contingency reserve obligations. Relaxing this constraint is priced at $999,999 per megawatt.

5. **Hold Regulation Reserves:** The Aurora model must satisfy all regulation reserve obligations. Relaxing this constraint is priced at $2,000 per megawatt.[6] The relaxation cost of this constraint is significantly below the relaxation cost of curtailing owned wind, resulting in a significant decrease of reserves being held by the model, as the model prioritizes not curtailing wind.[7]

6. **Maintain Physical Minimum Operating Levels:** The Aurora model must not violate minimum operating generation levels based on the minimum capacity input for each resource. Relaxing this constraint is priced using the global "Min Gen Back Down Penalty" setting $500 per megawatt. It is important to note that this setting now only applies to the resources for which AWEC did not change the penalty price to $999,999,999, such as coal-fired resources. One of the many impacts of this change is easily seen by the model's violation of minimum operating generation levels,[8] with the model decreasing the coal units' output below physical operational minimums for a considerable amount of the simulation.

In other words, the Company's Aurora modeling mirrored actual operations, by prioritizing load service, reserve requirements, and minimum operating levels ahead of wind so that if one of these constraints cannot be met the model will decrease wind generation before compromising the reliability of the system. AWEC's modeling, on the other hand, prioritized wind generation ahead of reserves or minimum operating

[6] As mentioned in my testimony, AWEC changed the relaxation price of regulation reserves, although this was not explicitly mentioned in their testimony.
[7] *See* Mitchell, Exh. RJM-13CT, Section II(5)(iv).
[8] Mitchell, Exh. RJM-13CT, Section II(5)(iv).

levels, which produces system dispatch that is not possible in actual operations and therefore inherently inaccurate.

**Q. With this background in mind, is true that the Company uses a "modeling method that imposes major penalties on the amount of wind production that is allocated to Washington customers[,]" as AWEC claims?[9]**

A. No. As is described above, AWEC uses the exact same approach that allows Aurora to curtail owned wind resources, with the only difference being the order in which the model gets to the curtailment of the wind. AWEC prioritizes wind generation over holding reserves and thermal minimum operating level constraints, which results in an inaccurate forecast that is not achievable in actual operations. Company witness Mitchell explains these flaws in AWEC's modeling in greater detail in his rebuttal testimony.[10]

**AWEC's Removal of Regulation Reserve Requirements**

**Q. Does AWEC's "WA_PCORC_2026_Direct_WindMR" (Step 1) study case result in the Aurora model violating minimum operating levels and insufficiently meeting regulation reserve requirements?**

A. Yes. AWEC's Step 1 "must-run" adjustment provides the Aurora model with direction that aside from meeting demand obligations, curtailing company-owned wind is the most expensive and therefore the last option for the Aurora model to take. AWEC's repricing of regulation reserves deprioritizes that requirement in Aurora thereby allowing the model to hold fewer reserves than are required in the Company's

[9] Mullins, Exh. BGM-1CT at 22:1-3.
[10] Mitchell, Exh. RJM-13CT, Section II(5)(iv).

forecast.[11] Therefore, AWEC's modeling cannot be replicated in actual operations. This error in AWEC's first sequential study then affected the subsequent two cases.

**Q. Aside from the repricing of company-owned wind curtailments, did AWEC disclose that the modeling adjustments relaxed the regulation reserve requirements such that the model no longer maintained the same level of reserves that are required in the Company's 2026 forecast?**

A. No. AWEC neither disclosed this change nor justified it. Furthermore, AWEC did not mention their modeling adjustment also repriced violating regulation reserve requirements from $10,000 per megawatt to $2,000 per megawatt.

**Q. What happens if you correct AWEC's modeling so that regulation reserves are held consistent with the Company's 2026 forecast?**

A. Correcting AWEC's modeling to reprioritize the importance of inputs consistent with actual operations, results in completely removing AWEC's incorrect and physically impossible adjustments in the first step of their sequential changes. Table 1 below provides a side-by-side comparison of the updated sequential sensitivities on both a total-company and Washington-allocated basis based on removing AWEC's unrealistic modeling adjustment.[12]

[11] *See* Mitchell, Exh. RJM-13CT, Section II(5)(iv).
[12] AWEC did not provide these sequential steps in this exact order, there were other adjustments made through spreadsheets that were layered in-between. I have ignored all such adjustments for the purpose of this comparison.

**Table 1[13]**

| $/MWh | | | | | |
|---|---|---|---|---|---|
| Step | Scenario | AWEC | | Company Corrected | |
| | | Total Company | WA Allocated | Total Company | WA Allocated |
| Base | V16.0.1001 | $ 36.33 | $ 44.10 | N/A | N/A |
| 1 | WindMR | $ 34.80 | $ 41.47 | $ 36.33 | $ 44.10 |
| 2 | WindMRxHedge | $ 33.69 | $ 34.75 | $ 35.10 | $ 35.52 |
| 3 | NonPrecedential | $ 32.86 | $ 32.36 | $ 34.42 | $ 33.79 |

| Dollars | | | | | |
|---|---|---|---|---|---|
| Step | Scenario | AWEC | | Company Corrected | |
| | | Total Company | WA Allocated | Total Company | WA Allocated |
| Base | V16.0.1001 | $ 2,445,053,468 | $ 195,862,681 | N/A | N/A |
| 1 | WindMR | $ 2,342,173,348 | $ 184,193,860 | $ 2,445,053,468 | $ 195,862,681 |
| 2 | WindMRxHedge | $ 2,267,918,336 | $ 154,344,590 | $ 2,362,198,501 | $ 157,785,991 |
| 3 | NonPrecedential | $ 2,211,428,545 | $ 143,752,509 | $ 2,316,412,423 | $ 150,107,504 |

Company witness Mitchell addresses the removal of forecasted hedge volumes (Step 2) and the reversion back to outdated modeling methodologies (Step 3).[14]

**AWEC's Coal Constraint Modeling**

**Q. Turning now to AWEC's one-off informational Aurora simulation "WA_PCORC_2026_Direct_xCoalConstraints," do you have any concerns with that modeling?**

A. Yes. As background, in the "WA_PCORC_2026_Direct_xCoalConstraints" study case, AWEC made two key adjustments:

1. First, AWEC removed the minimum expected annual coal delivery volumes from each coal contract.

2. Second, AWEC priced all coal at the highest available dollar per MMBtu price within each coal contract.

[13] It is important to note that the sequential approach used by AWEC results in changes from previous affecting runs downstream. Although the combined result in the final step contains all changes, each step is not necessarily representative of the isolated modeled impact of making an adjustment. The Company in the direct filing used one off adjustments, which provide the modeled impact of each change individually.
[14] Mitchell, Exh. RJM-13CT, Sections II(4) and II(6).

Both adjustments introduce significant inaccuracies to the model inputs thereby producing an inaccurate and unreliable NPC forecast.

**Q. If PacifiCorp has removed coal from Washington's allocation of electricity, why is it necessary to model the operation of the coal facilities in Aurora?**

A. PacifiCorp operates and balances its system as a whole, therefore in order to accurately model the entire system, you have to model all the resources on the system including those resources that are not allocated to Washington. Therefore, even PacifiCorp's coal resources must be accurately modeled in Aurora.

**Q. Please explain why providing the Aurora model with the minimum expected annual coal delivery volumes is necessary for an accurate NPC forecast.**

A. First, modeling the minimum expected annual coal volumes accurately reflects how the Company contracts for coal and ensures that Aurora is accurately modeling the real-world fueling constraints at coal plants, which is discussed in more detail by Company witness Mitchell.[15]

Second, modeling minimum coal volumes is necessary to ensure that Aurora produces an accurate forecast given the ability of the model to transact in the forecasted market in ways that cannot be achieved in actual operations. To understand the flaw in AWEC's modeling, it is important to first understand that the Aurora model is not configured to limit market power purchases to only the incremental 25 megawatt heavy-load hour (HLH) or light-load hour (LLH) blocks that are available in the actual, real-world power markets in the Pacific Northwest. The model instead can purchase whatever quantity of power it deems as necessary through its least cost

[15] Mitchell, Exh. RJM-13CT, Section II(5)(v).

optimization as it solves for the system. This means that in one hour the model could purchase 17 megawatts and in the next hour the model could purchase 500 megawatts. This is inconsistent with the Company's actual capability in the forward day-ahead markets, where purchases are made in incremental 25 megawatt blocks.

Dispatchable thermal resources, such as coal-fired resources, are important in actual operations because the Company can increase generation over certain hours and decrease generation in other hours. Dispatchable generation from thermal resources can be at a significantly lower cost when compared to purchasing an incremental 25 megawatt block over that same day, which can create excess power over certain hours of the block where there is not a system need. Because Aurora can make market purchases of whatever amount, over whatever time period, without regard for the incremental 25 megawatt blocks, Aurora does not rely on and value dispatchable thermal resources to the same extent as actual operations.

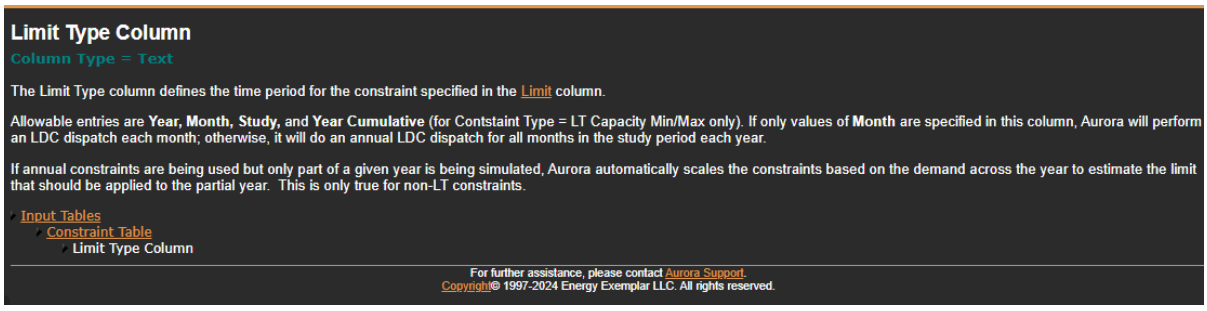
**Q. So why is it problematic to compare an Aurora simulation without annual minimum coal delivery constraints to an Aurora simulation with annual minimum coal delivery constraints?**

A. Providing the model with the total minimum amount of coal expected to be delivered to each coal plant allows the model to burn coal in a manner that is more consistent with the Company's abilities in actual operations. Analyses that remove these annual minimum delivery volumes from the model increase the model's ability to make perfect and unrealistic purchases, which are not achievable in actual operations.

**Q. Are there any other corrections to AWEC's testimony related to its modeling that removed coal constraints?**

A. Yes. AWEC incorrectly testifies that the Company modeled annual minimum delivery volumes on an hourly basis rather than allowing the model to optimize the minimum coal volumes across the year.[16] This reflects AWEC's incorrect understanding of the use of columns in an Aurora input table. Aurora has a table with a column named "Chronological Method," which has a possible entry of "Hourly Limit." In the same table, Aurora has a column named "Limit Type," which has a possible entry of "Year." The column named "Limit Type" is the column that defines the constraint. The entry in that column, in the Aurora model, is "Year." This means that an annual amount of coal is the volumetric constraint, not an hour-by-hour minimum burn. AWEC's interpretation confuses one column name with the purpose of another, separately named column. The Aurora help explanation of these two columns are presented in "Aurora Help – Limit" and "Aurora Help – Chronology" below.

**Aurora Help – Limit**



**Limit Type Column**

Column Type = Text

The Limit Type column defines the time period for the constraint specified in the Limit column.

Allowable entries are **Year, Month, Study,** and **Year Cumulative** (for Contstaint Type = LT Capacity Min/Max only). If only values of **Month** are specified in this column, Aurora will perform an LDC dispatch each month; otherwise, it will do an annual LDC dispatch for all months in the study period each year.

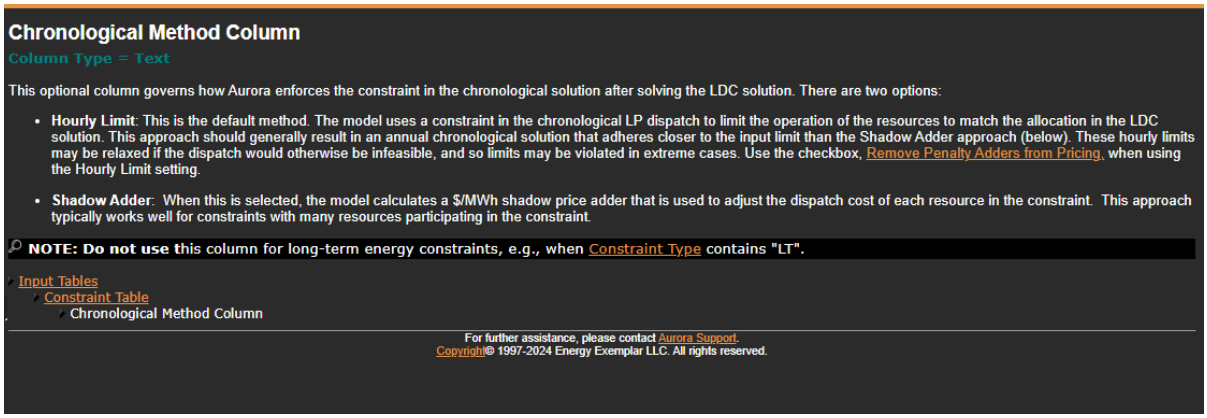
If annual constraints are being used but only part of a given year is being simulated, Aurora automatically scales the constraints based on the demand across the year to estimate the limit that should be applied to the partial year. This is only true for non-LT constraints.

Input Tables
Constraint Table
Limit Type Column

For further assistance, please contact Aurora Support.
Copyright© 1997-2024 Energy Exemplar LLC. All rights reserved.

[16] Mullins, Exh. BGM-1CT at 36:16-19.

**Aurora Help – Chronology**



**Chronological Method Column**

Column Type = Text

This optional column governs how Aurora enforces the constraint in the chronological solution after solving the LDC solution. There are two options:

- **Hourly Limit**: This is the default method. The model uses a constraint in the chronological LP dispatch to limit the operation of the resources to match the allocation in the LDC solution. This approach should generally result in an annual chronological solution that adheres closer to the input limit than the Shadow Adder approach (below). These hourly limits may be relaxed if the dispatch would otherwise be infeasible, and so limits may be violated in extreme cases. Use the checkbox, Remove Penalty Adders from Pricing, when using the Hourly Limit setting.
- **Shadow Adder**: When this is selected, the model calculates a $/MWh shadow price adder that is used to adjust the dispatch cost of each resource in the constraint. This approach typically works well for constraints with many resources participating in the constraint.

**NOTE: Do not use this column for long-term energy constraints, e.g., when Constraint Type contains "LT".**

Input Tables
Constraint Table
Chronological Method Column

For further assistance, please contact Aurora Support.


**Q. In addition to removing the minimum coal delivery volumes, AWEC also repriced all the coal in the model.[17] Please explain why providing the Aurora model with correct tier pricing is necessary for an accurate NPC forecast.**

A. Certain coal contracts include take-or-pay provisions, which represent volumes the Company has purchased already. These volumes should be priced at zero or blank (no price) in the Aurora model, as assigning an additional cost misrepresents the financial reality that these volumes are already paid for (a sunk cost). This is especially important for contracts with tiered pricing structures. The Aurora model must reflect the marginal cost of each tier appropriately. For example, tier one volumes (the first tier in a coal contract after the take or pay tier volume) are optional and should be modeled to reflect their incremental cost. The same principle applies to tier two, tier three, and any additional tiers specified in each of the coal contracts. Correct pricing of the different volumes featured in each coal contract is also important for the model to get a more accurate dispatch of resources.

[17] Mullins, Exh. BGM-1CT at 37:3-4.

For example, using the most expensive tier price as the fuel price for each coal plant provides the Aurora model with the wrong signal for dispatching coal units in comparison to gas units and market purchases. Although, as already mentioned in my testimony, the Aurora model can make market purchase transactions in a way that is not consistent with actual operations, using the highest coal tier price encourages the model to further worsen this issue. The highest coal tier pricing adjustment combined with AWEC's modeling change to remove annual coal deliveries results in an inaccurate net power cost forecast and provides analysis associated with modeled wind curtailments that is therefore meaningless.

AWEC's two informational adjustments relating to coal contract modeling are simply incorrect and adjust modeling input in ways that are inconsistent with actual operations and further rely on the unrealistic capabilities of the Aurora model's market purchase transactions.

**AWEC's Solar Situs Modeling**

**Q. Turning to AWEC's second one-off informational Aurora simulation "WA_PCORC_2026_Direct_SitusSolar," do you have any concerns with that modeling?**

A. Yes. In AWEC's second informational one-off simulation ("WA_PCORC_2026_Direct_SitusSolar") AWEC removed a seemingly arbitrary combination of solar resources. AWEC described this adjustment as targeting solar resources procured under Utah green tariff programs.[18] However, none of the resources removed in AWEC's modeling were procured under the Utah green tariff

[18] Mullins, Exh. BGM-1CT at 38:3-9.

program. For instance, AWEC excluded a 55-megawatt QF located in Klamath County, Oregon—an asset unrelated to any Utah green tariff program. Setting aside the rationale behind AWEC's modeling (which is discussed below), the execution of the modeling is flawed and therefore the results are entirely unreliable.

**Q. What is AWEC's rationale for removing the solar resources supposedly procured under the Company's Utah green energy tariff?**

A. AWEC's overall reasoning for the removal of these resources in the total-company NPC forecast was that "Washington does not benefit from those contracts, and the costs and benefits of those contracts should be situs assigned to Utah[.]"[19] This idea misses the fact that total-company NPC are forecasted under expected total system conditions and then ***allocated*** to Washington.

**Q. Are there any other conceptual flaws in AWEC's reasoning?**

A. Yes. If the Company were to forecast NPC using only the resources allocated to Washington (*i.e.*, removing all coal generation and all gas generation except Chehalis), then the NPC forecast would be not only missing system resources that are part of total system dispatch but also would be significantly short in system reserve obligations, which are necessary for modeling a reliable total system. For example, removing thermal resources from the Aurora model that are not allocated to Washington but are necessary to provide reliable power and integrate wind and solar resources allocated to Washington would result in a total system forecast that is not consistent with reality.

[19] Mullins, Exh. BGM-1CT at 38:4-5.

**Q. How did you correct AWEC's modeling?**

A. I corrected this informational sensitivity by eliminating the "solar resource removal scenario" entirely from the provided informational one-offs. Resources that are online or forecasted to be online to serve system load in real-world operations must be included in forecast modeling to ensure an accurate total-company NPC forecast, whether Washington customers are ***allocated*** the resource's costs or benefits or not.

## V. CONCLUSION

**Q. Please summarize your testimony.**

A. In summary, my rebuttal testimony addressed and corrected key modeling errors in the Aurora simulations submitted by AWEC. Specifically:

- I identified and corrected an unsupported adjustment to regulation reserve pricing in AWEC's incorrect adjustment to reprice curtailing wind, ensuring consistency with the Company's modeling approach, which reflects actual operations.
- I clarified the impact of this correction and provided an updated forecast leaving only the adjustments made by AWEC regarding hedging and outdated modeling inputs, which are addressed in the rebuttal testimony of Company witness Mitchell.
- I discussed the pricing errors in AWEC's coal modeling, ensuring that take-or-pay volumes were appropriately priced and that tiered pricing structures featured in each coal contract were accurately represented.
- I discussed the volume assumptions errors in AWEC's coal modeling associated with annual minimum coal deliveries.

- I discussed an arbitrary and unsupported set of solar resource exclusions from AWEC's informational simulations, which lacked alignment with AWEC's stated rationale and even included resources unrelated to Utah green tariff programs.
- As a result of these corrections, none of AWEC's informational study cases provide analyses that are meaningful here, and are particularly meaningless when considering consistency with actual operations.

These corrections are necessary to ensure that the Aurora modeling used in this proceeding reflects operational realities and produces an accurate NPC forecast.

**Q. What is your recommendation to the Commission?**

A. Accurate modeling is essential for fair and reliable allocation of costs from a total-company forecast of NPC to Washington customers. I propose that the Commission review the Company's corrected versions and descriptions of AWEC's modeling inputs and resulting outputs, as presented in this rebuttal testimony, to ensure complete transparency regarding the modeling adjustments proposed by AWEC in this proceeding.

Finally, I recommend that the Commission review the testimony provided by Company witness Mitchell, which provides further rebuttal to AWEC's sequential modeling adjustments related to forecast hedge volumes and the reversion to outdated modeling inputs.

**Q. Does this conclude your rebuttal testimony?**

A. Yes.