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December 5, 2023

### **MEMORANDUM**

**TO: Council Members**

**FROM: John Ollis**

**SUBJECT: Report on Reserves Workshop**

### **BACKGROUND:**

**Presenters:** John Ollis, Manager of Planning and Analysis  
Dor Hirsh Bar Gai, Power Systems Analyst

**Summary:** On November 1st, the Council hosted a reserves workshop to discuss the reserves recommendations from the 2021 Power Plan with regional stakeholders to follow-up with stakeholders and assess regional implementation of the recommendation. This presentation will review the recommendation and discuss feedback from stakeholders.

**Relevance:** The 2021 Power Plan recommended a more conservative operation of the existing system as the preferred methodology for cost-effective reserve provision to ensure adequacy when implementing the resource strategy. The methodology identified some challenges with meeting the recommendation and posited that investing in more energy efficiency than highlighted in the resource strategy would also be an effective albeit more expensive options for providing needed reserves. A less expensive, but riskier alternative for meeting reserve needs is to plan on more generation external to the region to support the region in times of need. These three methods were reviewed in the reserves workshop and stakeholders

discussed current regional and WECC-wide efforts associated with planning for and implementation of reserves.

Workplan: A.1.4 Reporting on Plan Implementation: Tracking and reporting on progress across other elements of the 2021 Power Plan, including model conservation standards, research, etc.

Background: The Power Act indicates the power plan should include an analysis of reserve and reliability requirements and cost-effective methods of providing reserves designed to ensure adequate electric power at the lowest possible cost. Additionally, the Act recognizes that reserves can come either from generating resources or non-generation alternatives, including conservation measures and contract rights to curtail or interrupt power supplied to customers.

Analysis from the 2021 Power Plan showed that *the least-cost option to maintain an adequate, cost-effective regional system is to couple the investment recommendations (the listed amounts of renewable generation, energy efficiency, and demand response) in the resource development plan with some sort of reserve pooling effort via an organized market or regional collaboration to ensure that sufficient reserves can be held to mitigate the increasing uncertainty from increased investment in renewable generation.* Ensuring sufficient reserves, including increasing reserves beyond the Council's plan assumptions, was a critical element of the 2021 Power Plan resource strategy to ensure resource adequacy.

That collaborative effort called for in the Plan is not currently formalized in a way that ensures that the system will be operated in a way that would guarantee an adequate system. Some of aspects of the reserve provision are addressed by the Western Energy Imbalance Market (WEIM) resource sufficiency test, but not all. The Western Resource Adequacy Program (WRAP) seems to have sufficient implementation elements in its forward showing program that in conjunction with the WEIM the region covered by the WRAP footprint could assure enough generation will be online and available to address any reserve needs. However, the WRAP does not become binding until later in this decade. In the interim years until it becomes fully binding or a day-ahead market throughout the region is formalized, there seem to be some potential gaps.

More Info: [November 1<sup>st</sup>, 2023 Reserves Workshop](https://www.nwcouncil.org/meeting/reserves-in-power-planning-workshop-2023-11-01/)  
<https://www.nwcouncil.org/meeting/reserves-in-power-planning-workshop-2023-11-01/>  
[2021 Power Plan: Cost Effective Methodology for Providing Reserves \(pp. 102-107\)](https://www.nwcouncil.org/fs/17680/2021powerplan_2022-3.pdf)  
[https://www.nwcouncil.org/fs/17680/2021powerplan\\_2022-3.pdf](https://www.nwcouncil.org/fs/17680/2021powerplan_2022-3.pdf)

# Reserves in the 2021 Power Plan: Update on Regional Implementation

Tuesday, December 12, 2023

Power Committee



Northwest **Power** and  
Conservation Council

# Today's Discussion

## Review 2021 Plan Reserve Recommendation

- Context for recommendation within resource strategy

## Update on Reserves Workshop

- Participation and feedback

## Status of Implementation

- Are appropriate reserves being held? Is there a risk?

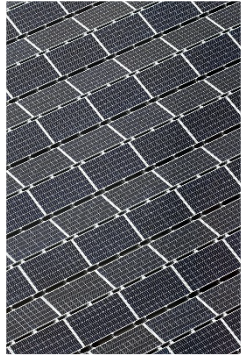




# Review of 2021 Power Plan Reserves Recommendation

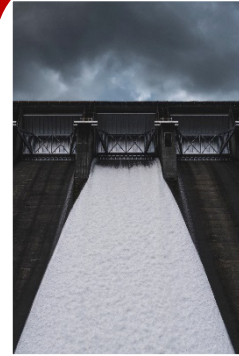
Background for the justification for the need for reserves and  
analytical support for the recommendation

# 2021 Power Plan: Regional Resource Strategy



## Renewables: >3.5 GW by 2027

- Significant renewable build recommended (>3.5 GW by 2027), due to their low costs, interruptibility, and carbon reduction benefits. This build out will impact the transmission system.



## Existing System: More flexibility

- Greater potential flexibility in the hydro system and the ability to more effectively use our thermal fleet to provide reserves is needed, collectively reducing regional needs and supporting the integration of renewables



## Energy Efficiency: 750 aMW by 2027

- Significantly less acquisition than prior plan due to greater cost-competitiveness with other resources, not being dispatchable, and being sensitive to market prices



## Demand Response: low-cost capacity

- Products that provide highest value to the system are those that can be regularly deployed at low cost and with minimal to no impact on customer (e.g. DVR, TOU)

Note: Plan includes projected impacts of climate change on future loads, hydro availability, and temperatures

# Role of Reserves in Power Planning at the Council per the Power Act

- The [Power Act](#) indicates the power plan should include an [analysis of reserve and reliability requirements](#) and [cost-effective methods of providing reserves](#) designed to ensure adequate electric power at the lowest possible cost.
- Additionally, the Power Act explicitly recognizes that reserves can come either from generating resources or non-generation alternatives, including conservation measures and contract rights to curtail or interrupt power supplied to customers.



# Role of Regional Planning for Reserves

## What?

### Planning reserves

- Longer term net coincident peak need and load growth uncertainty

### Operating reserves

- *Balancing reserves* - short term load and resource uncertainty due to forecast error on different time frames)  
*Contingency reserves* - short term resource uncertainty due to forced outage

## Why?

- Make sure a region is adequate and reliable based on uncertainties related to availability of resources and forecasted load on different time frames

## How?

- Requires some level of partnership/coordination with regional utilities, markets and transmission owners to ensure adequacy and reliability



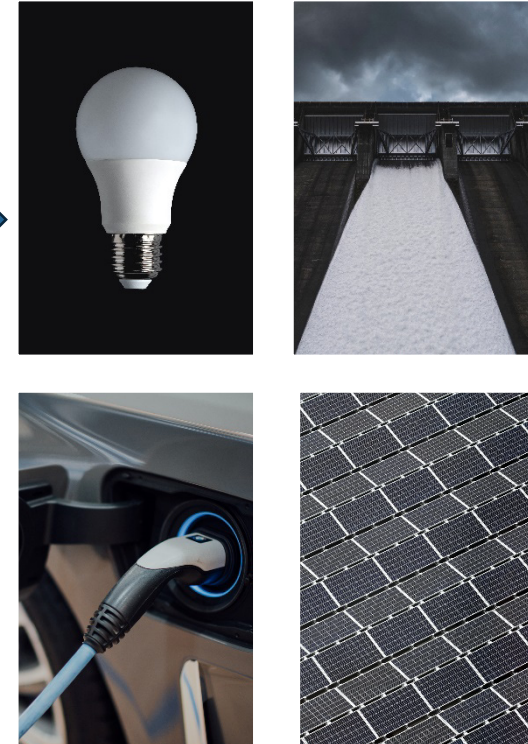
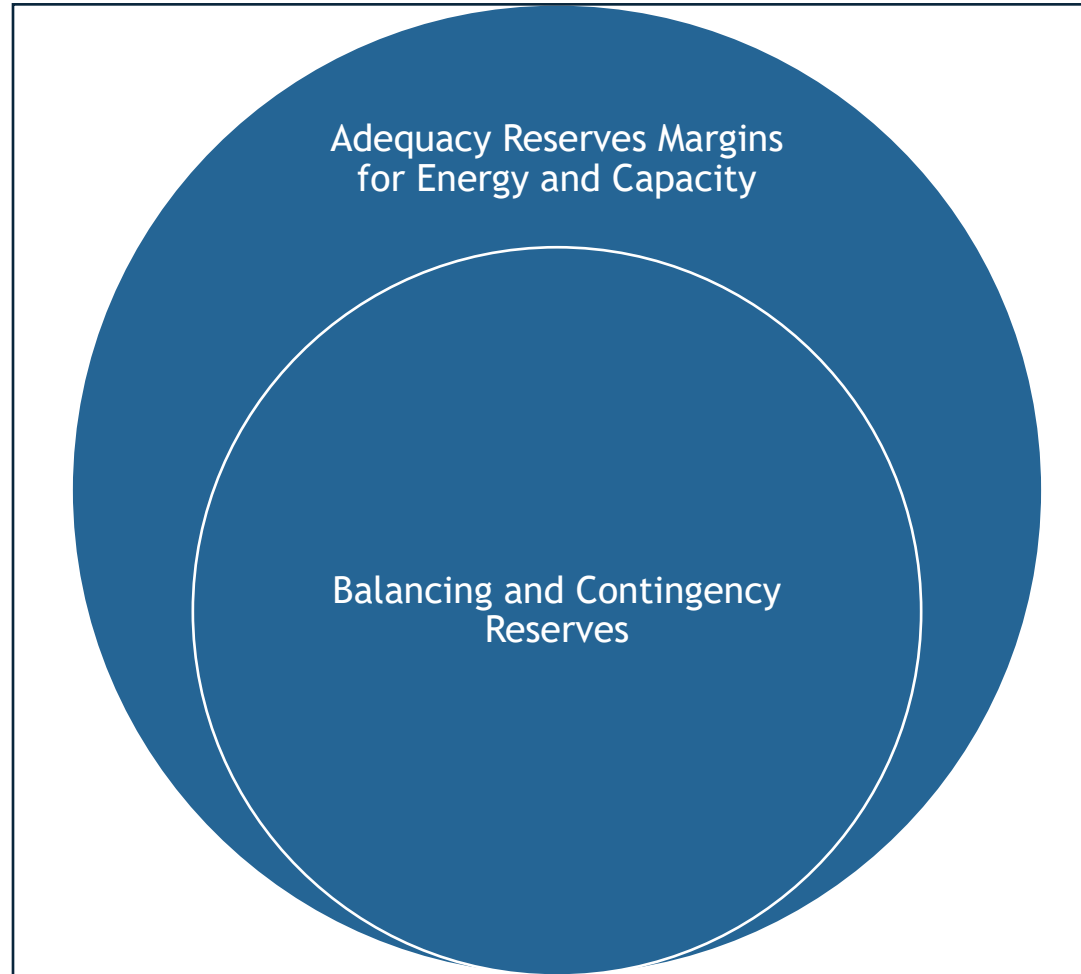
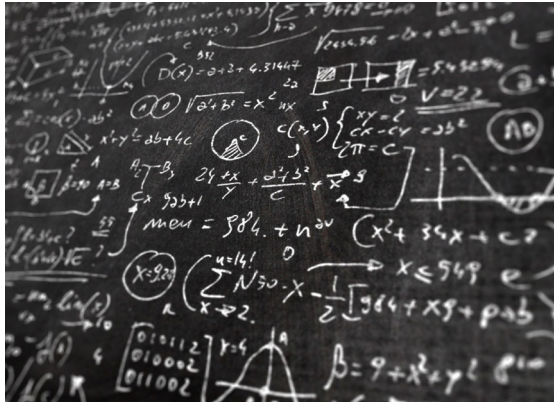
# Reserve Requirements in the Power Plan



# Calculate Planning Reserve Margin

In the 2021 Power Plan, the Council developed metrics that functioned like a planning reserve margin associated with meeting the Council's adequacy standard for the region.

Tuned to Adequacy Standard  
5% Loss of Load Probability



The candidate resource strategies and corresponding reserve recommendations were checked to make sure the reserve margins were enough to maintain adequacy.

# Used Vetted Operating Reserve Assumptions

- Initial assumptions about balancing requirements:
  - Calculated from implied sum of load following and regulation reserves from the regional footprint of the NWPP-EIM effort
  - External to the region assumptions consistent with 2026 WECC Common Case
- Initial assumptions about contingency reserve requirements:
  - Simplified methodology of the NWPP reserve sharing agreement
  - External to the region assumptions consistent with 2026 WECC Common Case

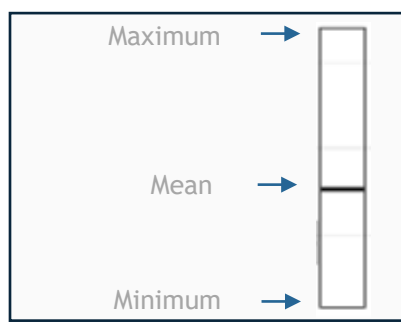
Type	Assumptions About Current Regional Reserves
Balancing Up	2,900 megawatts
Balancing Down	3,345 megawatts
Contingency Reserves	3% of load and 3% of generation

# Reserve Recommendation **After Checking for Adequacy**

- Cost-effective methodology for providing reserves
  - Pages 102-107 in [2021 Power Plan](#)
  - Balancing up and down in plan analysis includes both *load following* and *regulation*
  - Operating existing system more conservatively, lower cost than investing in additional resources and lower risk than higher market reliance

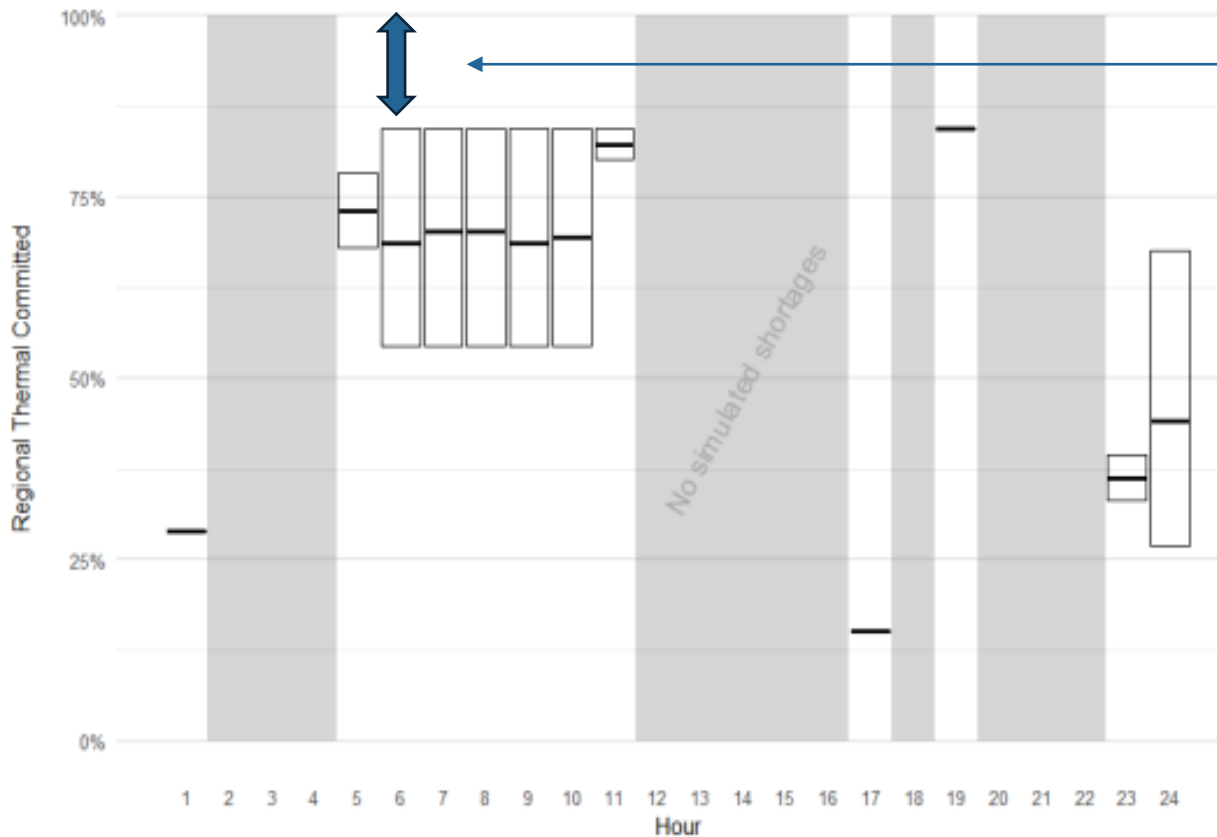
Type	Assumptions About Current Regional Reserves	Reflecting Plan Recommendations
Balancing Up	2,900 megawatts	➡ <b>6,000 megawatts</b>
Balancing Down	3,345 megawatts	3,345 megawatts
Contingency Reserves	3% of load and 3% of generation	3% of load and 3% of generation





# What Indicated the Higher Reserve Need?

Maximum Available Thermal Generation During Simulated Shortages<sup>90</sup>



- Main Indicator  
*Underutilization of thermal generation during time periods of regional shortfall*
- The only reasons it would not be fully utilized is that it would be on maintenance, forced out OR **there was insufficient information to commit and fuel the unit ahead of time** (forecast error).

# Lower Prices Midday and Higher Uncertainty During Ramping Periods Caused Issues

- Many of the region's thermal generators can only respond quickly enough to provide regulation and imbalance reserves if they are at minimum generation (Combined Cycle gas and coal plants)
- There is incentive to incorporate as much renewable generation as possible due to low variable costs and policies.
- This could sometimes create situations where not enough thermal generation is online because it would be “out of the money.”

Two ways to improve commitment of generators:

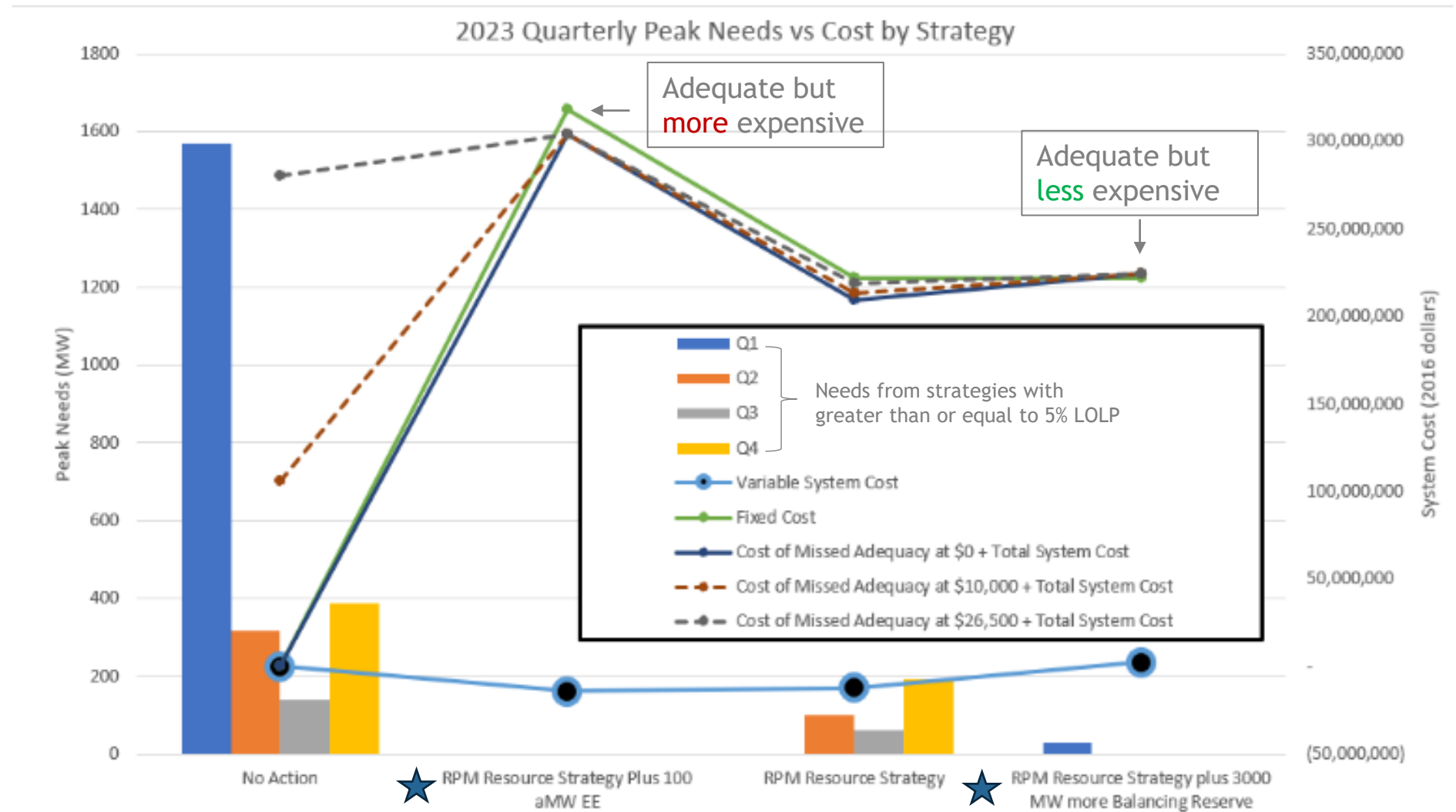
1. Have an explicit reserve price
2. Increasing the reserve requirements



# Adjusting Reserves to Meet Adequacy Needs

Analytical Process:  
*Tried many different tweaks on resources strategy with and without different amounts of reserves*

## Adequacy Check



[https://www.nwcouncil.org/2021powerplan\\_checking-adequate-system/](https://www.nwcouncil.org/2021powerplan_checking-adequate-system/)

# Identified Strategies to Maintain Cost-Effective Adequacy



- 1. The least cost option is to couple the investment recommendations in the recommended resource strategy with increased reserves (a more conservative operation of the existing system through an organized market or regional collaboration).**
2. A more expensive, but also effective option is to invest in more energy efficiency than was identified in the resource strategy should regional coordination to provide additional reserves prove unsuccessful.
3. Another less expensive, but riskier options is to plan on importing more power from outside the Northwest in times of need.



Pages 102-107 in [2021 Power Plan](#)





# November 1<sup>st</sup>, 2023 Reserves Workshop Update

Discussion of topics and feedback

# Reserves Workshop Guest Presenters

- Western Resource Adequacy Program (WRAP) → Discussed WRAP forward showing and operating programs prescheduled day check on transmission and resources
  - Ryan Roy, *Director of Operations and Technology*
- Pacific Northwest National Lab → Discussed reserves calculation and results from long term WECC planning studies (Anchor Data Set)
  - Allison Campbell, *Power Systems Data Scientist*
  - Nader Samaan, *Chief Power Systems Resource Engineer*
- Idaho Power → Discussed challenges related to increasing renewable generation in Idaho Power's recent IRP process
  - Jared Hansen, *Resource Planning Lead*
- California Independent System Operator → Discussed how weather dependent resources are planned for in the CAISO
  - Aditya Jayam Prabhakar, *Director of Resource Planning and Assessment*

# Participation Summary



Engaged participants

30 out of 67 Slido participants engaged with polls or Q&A.

A circular progress indicator with a pink outer ring and a white inner ring. The inner ring is filled with pink to represent 45% completion.

45%

- Uncertainty over increasing reserves due to renewable expansion
- Lack of clarity about size of uncertainty between day-ahead and real-time net obligations in the next 5-10 years
- Hesitancy over relying on **current** market mechanisms to mitigate short-term forecast error
- Confidence in **future** day-ahead market structures to mitigate reserve gaps
- Confidence in formation of WECC day-ahead market/s in the next few years
- Reserves provided in varied ways

# Uncertainty over increasing reserves due to renewable expansion

Does Your Organization Anticipate An Increase in Reserves to Hedge Against Shorter-Term Forecast Error?

0 2 5

Yes



No



Uncertain





# Lack of clarity about size uncertainty between day-ahead and real-time net obligations in the next 5-10 years



Only a few organizations responded to this questions (9)



A handful (2) provided an estimate:

100-200 MW  
>1,000 MW



Additional exploration is necessary moving forward

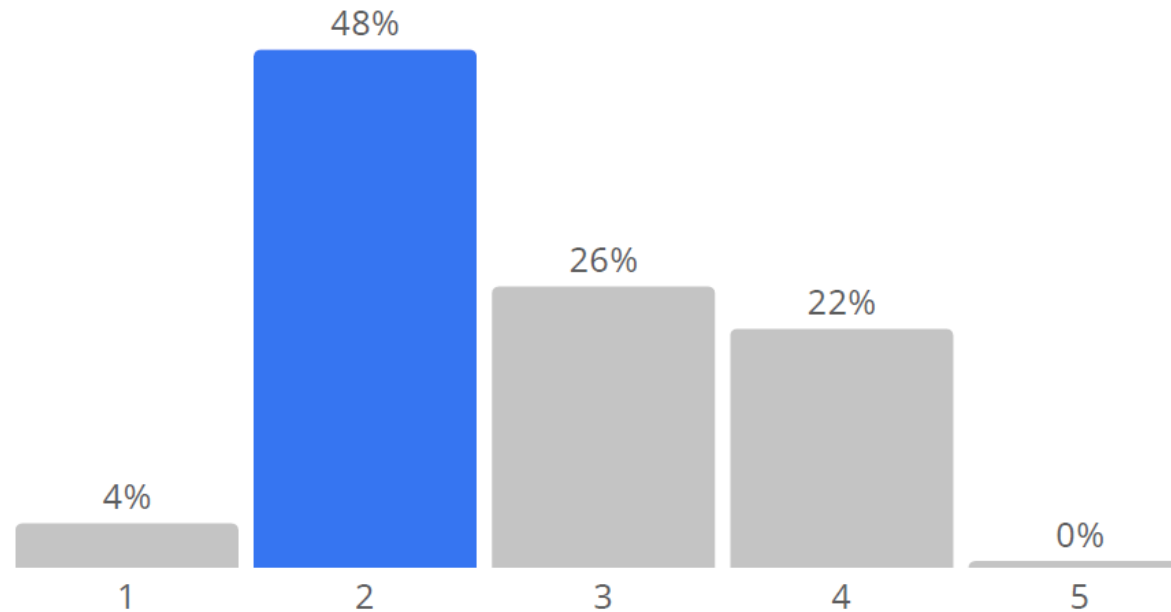
# Hesitancy over relying on *current* market mechanisms to mitigate short-term forecast error

How Effective are Current Planning Groups or Market Mechanisms at Ensuring Appropriate Generation Will Be Available and On-Call to Mitigate Short-Term Forecast Error Going Forward?

0 2 3

1 = least effective  
5 = most effective

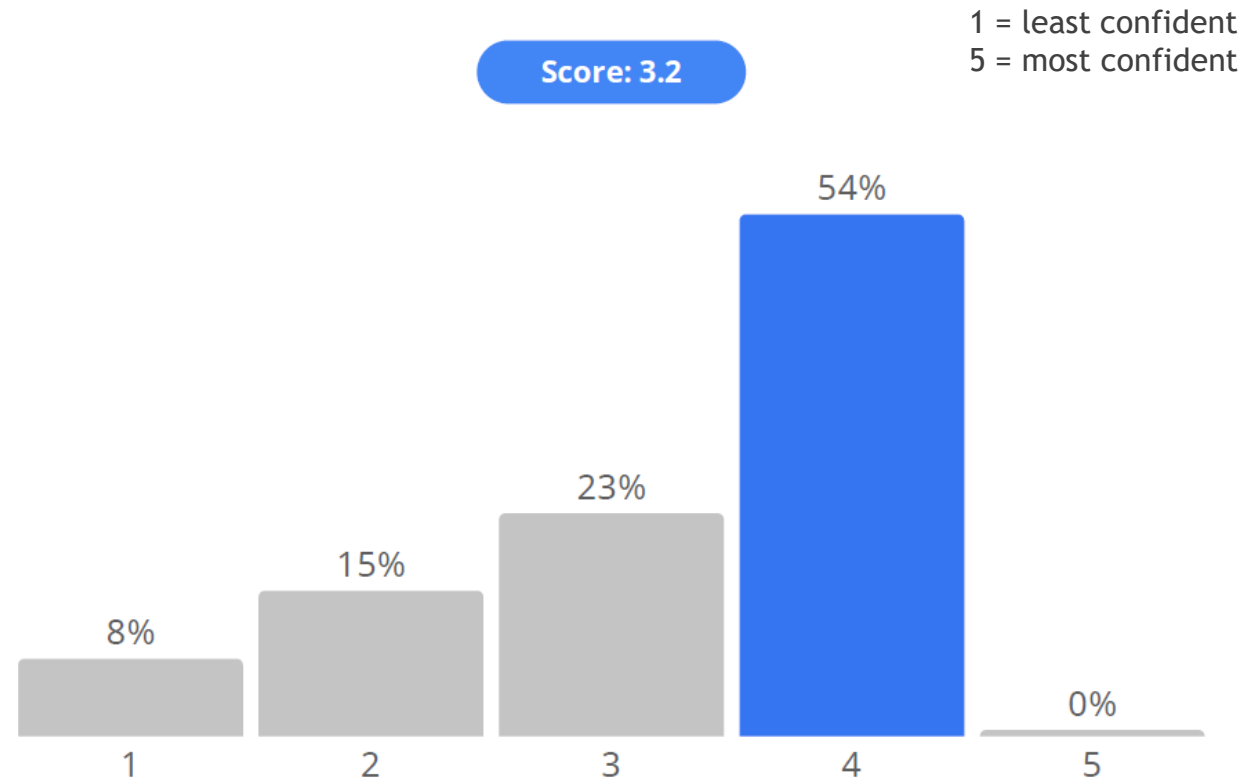
Score: 2.7



# Confidence in day-ahead markets to mitigate reserve gaps

How confident are you that day-ahead markets will address any reserve gaps?

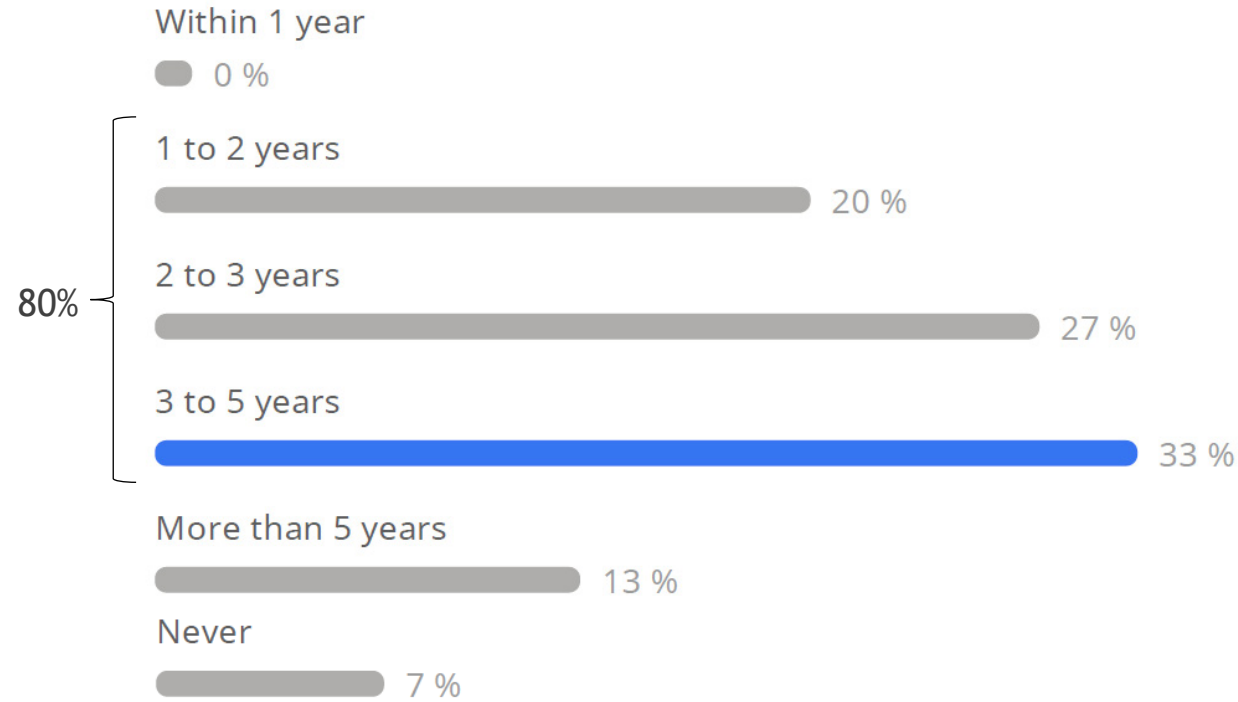
0 1 3



# Confidence in formation of WECC day-ahead market/s in the next few years

How soon do you think the WECC will coalesce on the structure of a day-ahead market or markets?

0 1 5





# Reserves provided in varied ways

Is the Region Operating More Conservatively,  
Getting More Energy Efficiency or Relying More  
on the Non-Regional Market?

009

Operating More Conservatively



More Energy Efficiency



Relying on Out of Region Market




Combination of the Options



Not Planning for More Reserves



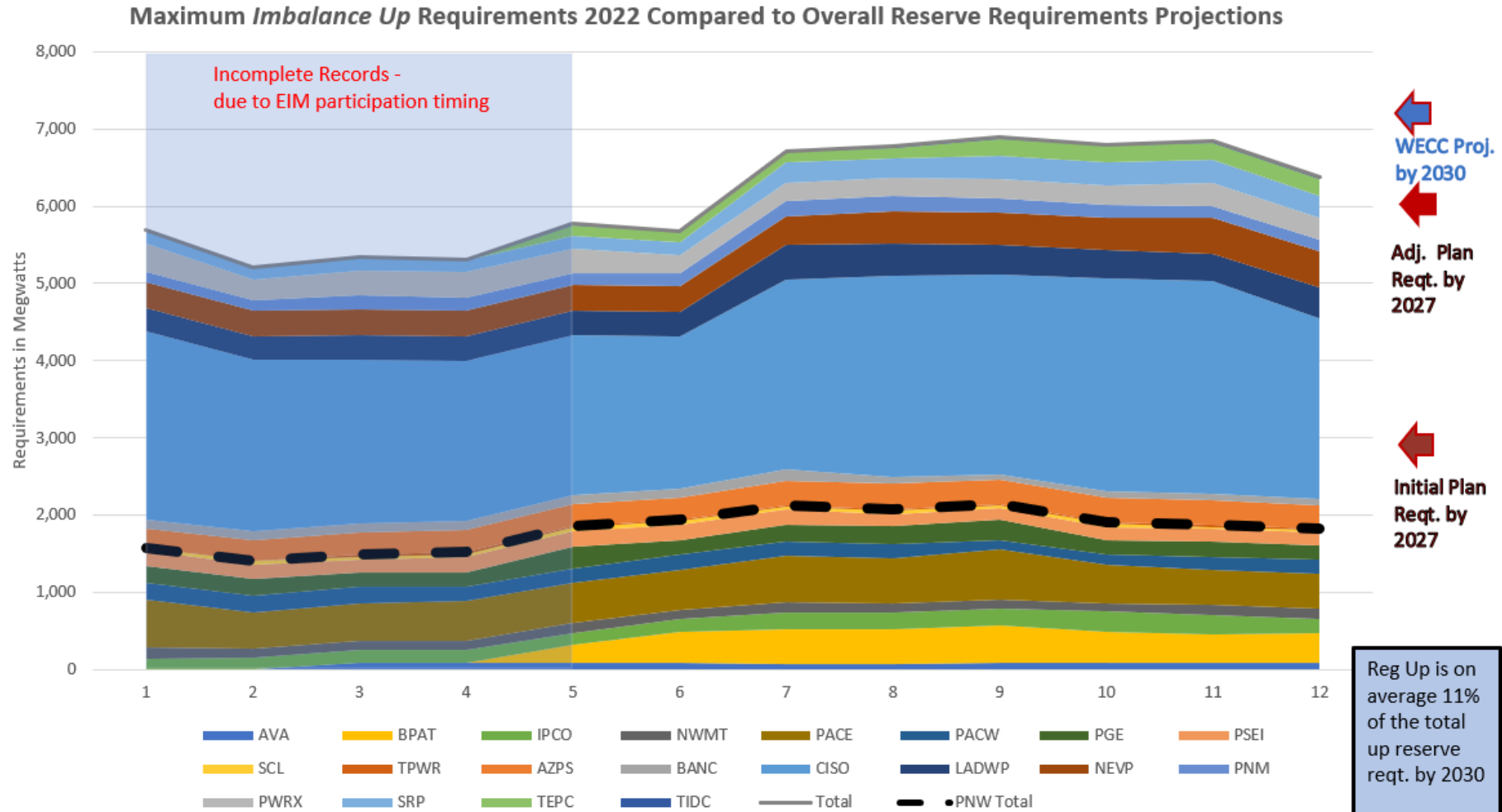


# Status of Regional Implementation of Council's Reserve Methodology

# Checking Plan Short-Term Reserves Conclusions

## When Do We Need These Additional Reserves?

- Initial plan balancing reserves input assumptions tracks to current use
  - Per Western EIM records
- Projected reserve need on similar trajectory to WECC planning assumptions





# Staff Assessment of Implementation So Far: Promising Long Term, Unclear Short Term

- **The region seems to be taking a combination of the approaches suggested by the Council**
  - Regional entities seem to be engaging in more conservative operations at times with an attempt to collaborate in programs like the WRAP and organized day-ahead market, but none of those efforts are likely to be available in the next few years.
  - Regional entities also seem to be relying more on external to the region market transactions currently but are not confident that current market mechanisms will mitigate all short-term forecast error.
  - In the long-term, folks seem fairly confident that between the WRAP and market development that operations will be calibrated correctly via market signals.
- **Regional entities aware of issue, but varied approaches on how to assess and plan for it**
  - Planners at utilities, labs and other organizations seem to agree increased renewable build needs to be coupled with increased reserves
  - Pace of renewable build throughout the WECC has been slightly less aggressive in the early 2020's than forecasted in the plan which could be mitigating some of the reserve issues in the short term.





# Questions?

John Ollis, [jollis@nwcouncil.org](mailto:jollis@nwcouncil.org)

Dor Hirsh Bar Gai, [dhirshbargai@nwcouncil.org](mailto:dhirshbargai@nwcouncil.org)



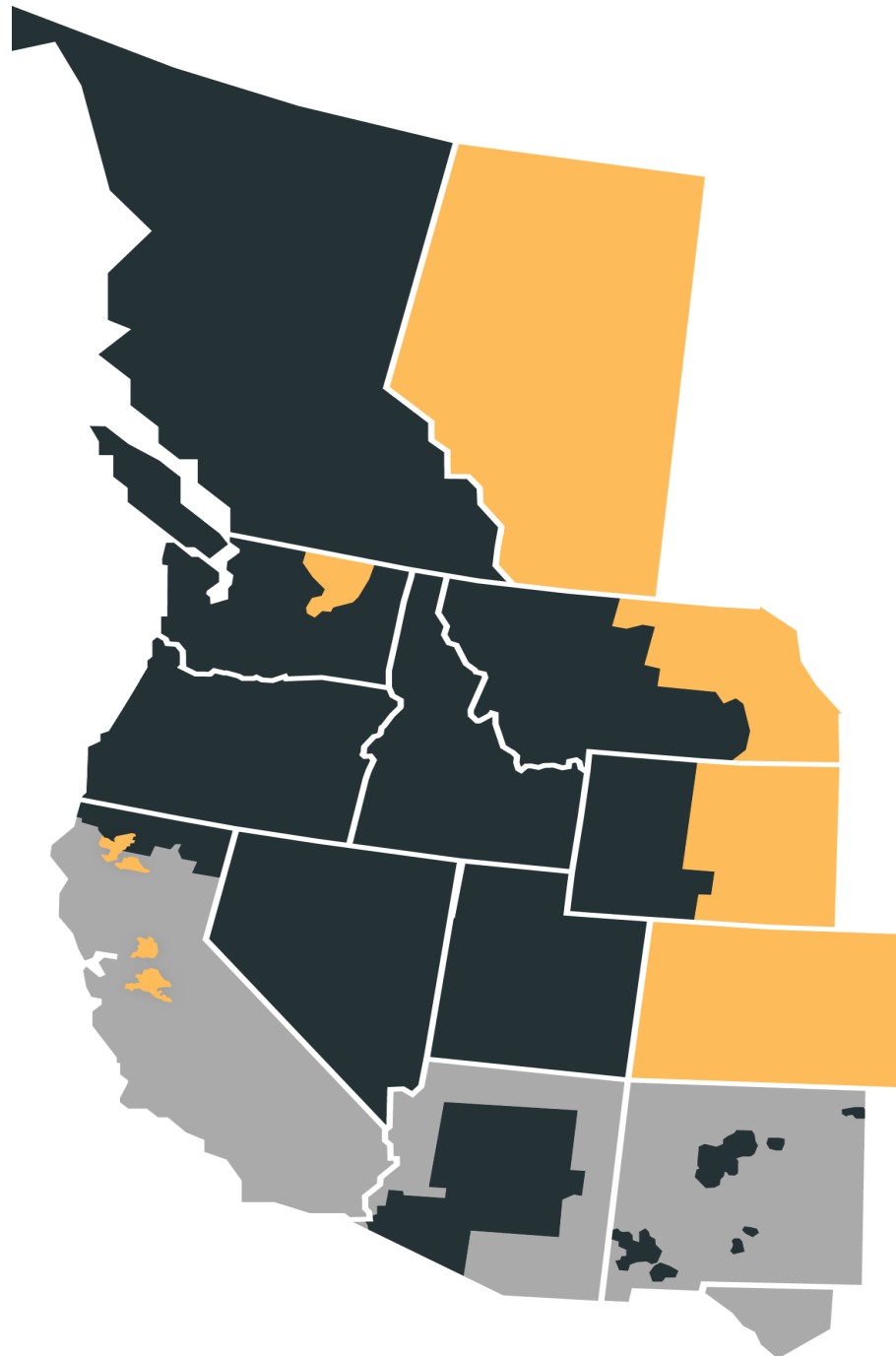


# Extra Slides for Reference

Compiled material from ongoing markets and WRAP discussion throughout region

# CURRENT PARTICIPANTS

- Arizona Public Service
- Avista
- Bonneville Power Administration
- Calpine
- Chelan County PUD
- Clatskanie PUD
- Eugene Water & Electric Board
- Grant PUD
- Idaho Power
- Northwestern Energy
- NV Energy
- PacifiCorp
- Portland General Electric
- Powerex
- Public Service Company of New Mexico
- Puget Sound Energy
- Salt River Project
- Seattle City Light
- Shell Energy
- Snohomish PUD
- Tacoma Power
- The Energy Authority



## WRAP LOAD

### Winter Peak

61,600 MW

70% of WECC load  
excluding CA+ Mexico and  
AESO region

### Summer Peak

68,900 MW

69% of WECC load  
excluding CA+ Mexico and  
AESO region

● ADDITIONAL  
WPP FOOTPRINT

● NON-WPP FOOTPRINT

● CURRENT WRAP  
FOOTPRINT

From July 2023 Council  
Presentation

# IMPLEMENTATION AHEAD

## Non-Binding Forward Showings

Winter 22-23\* through Winter 24-25 \*W22-23 and Summer 23 completed in 2022

## Transition Seasons (Ops and FS)

Summer 25 through Winter 27-28



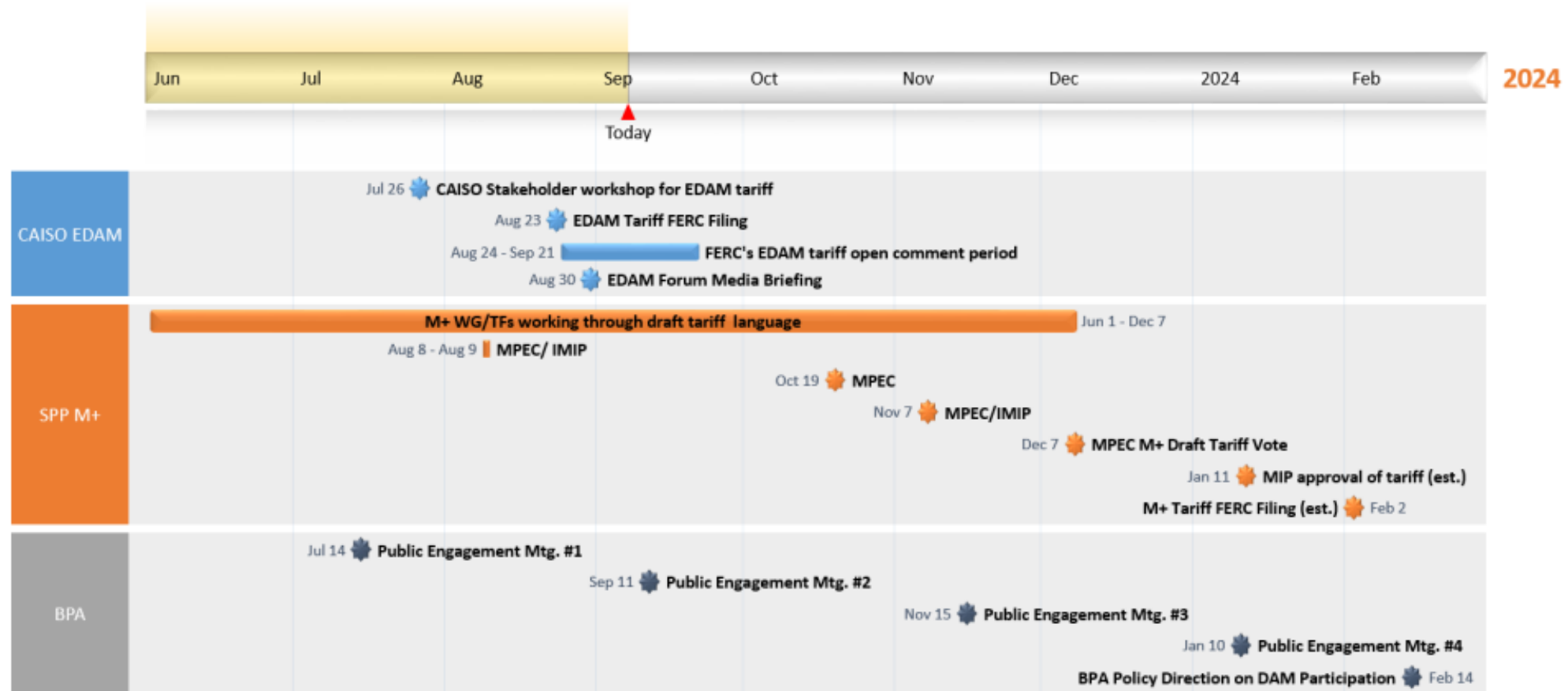
### 2023 Focuses:

- » Standing up tariff-approved governance (new board, stakeholder process)
- » Business Practice development, review, and approval
- » Implementation of the Non-Binding Operations Program
- » Work with WRAP participants and market operators about market interoperability

From July 2023 Council Presentation



# Day Ahead Market Activity



From 9/11/23 BPA DAM Presentation

<https://www.bpa.gov/-/media/Aep/projects/day-ahead-market/final-dam-workshop-2-presentation.pdf>

# What's Changing in an Organized Day-Ahead Market



Day-Ahead and Intra-Day bilateral markets lose significant liquidity



Day-ahead bilateral block trading is replaced by resource offers and load bids that result in optimized transactions through the market with hourly granularity



In the day-ahead and real-time horizons, the market operator optimizes all supply to the entire market footprint



Uncertainty between day-ahead and real-time is managed by the market through procurement of uncertainty and ramp products as well as intraday “reliability unit commitment” (RUC) processes

From 7/14/23 BPA DAM Presentation

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<https://www.bpa.gov/-/media/Aep/projects/day-ahead-market/final-presentation-for-20230714-dam-customer-workshop.pdf>