



# APS RPAC Meeting

12/14/2022



# MEETING AGENDA



## Welcome & Meeting Agenda

Matt Lind  
1898 & Co.



## ACC Updates

Elizabeth Lawrence  
Manager, State Regulatory Strategy & Compliance



## Western Markets Evolution (WME)

Brian Cole  
General Manager, Western Market Affairs



## Timeline of New Resource Additions

Nick Schlag  
E3



## 2023 IRP Framework

Mike Eugenis  
Manager, Resource Planning



## IRP Base Case Assumptions

Mike Eugenis  
Manager, Resource Planning



## Gas Price Modeling and Forecasting

Patrick Bogle  
Director, Financial Control



## Integration Cost and Market Price Update

Nick Schlag  
E3



## Next Steps & Open Discussion

Matt Lind  
1898 & Co.



# Meeting Guidelines

- RPAC Member engagement is critical. Clarifying questions are welcome at any time. There will be discussion time allotted to each presentation/agenda item, as well as at the end of each meeting.
- We will keep a parking lot for items to be addressed at later meetings.
- Meeting minutes will be posted to the public website along with pending questions and items needing follow up. We will monitor and address questions in a timely fashion.
- Consistent member attendance encouraged; identify proxy attendee for scheduling conflicts.
- Meetings and content are preliminary in nature, and prepared for RPAC discussion purposes. Litigating attorneys are not expected to participate.



# Following Up

- Action Items from previous meetings:
- Ongoing Commitments:
  - ☐ Distribute meeting materials in a timely advance fashion (3 bd prior)
  - ☐ Transparency and dialogue







# October Meeting Recap

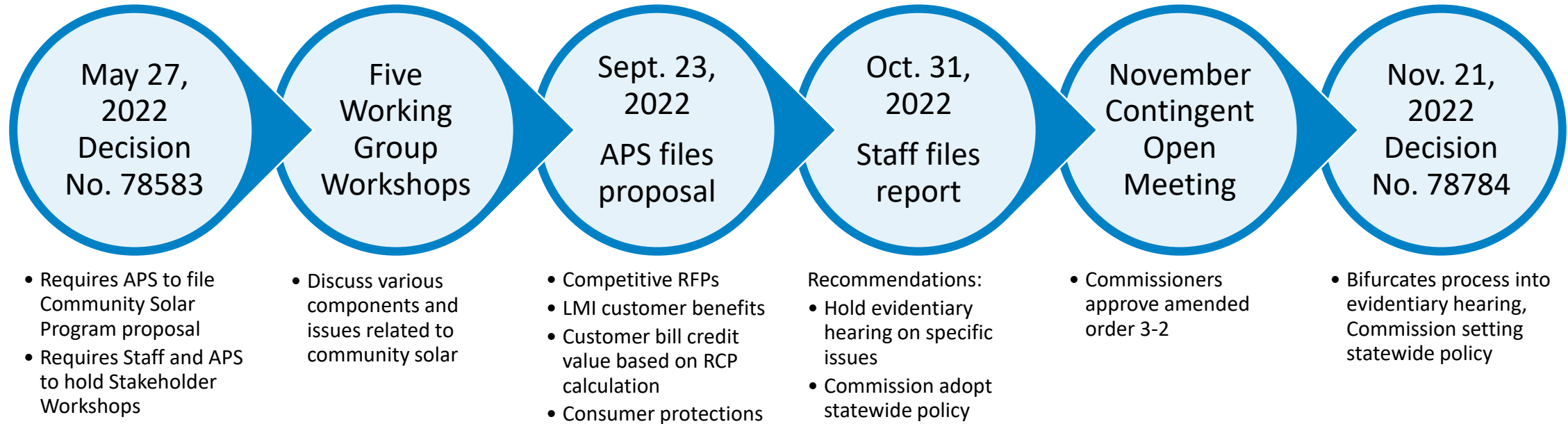
- APS effectively managed summer peak demand periods while navigating natural gas delivery challenges.
- EPRI is developing a climate change scenario analysis study to help APS navigate future uncertainties and risks surrounding climate change. APS requested RPAC member feedback on physical climate conditions that should be considered in the EPRI study.
- APS summarized 2023 IRP requirements and considerations that will continue to be a focus of RPAC meetings moving forward.
- E3 highlighted new technology risks primarily focused on outage trends of battery storage resources.
- 2022 ASRFP contract negotiations are in progress and are expected to be completed in the first half of 2023.





# ACC Updates

# Community Solar



## Next Steps

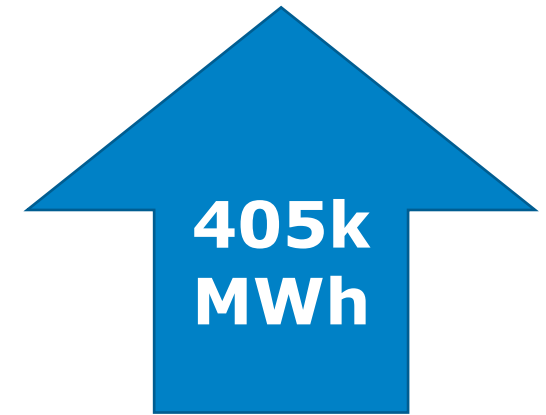
Procedural conference for evidentiary hearing held Tuesday (Dec. 13)

Staff developing policy proposal with stakeholders for January Open Meeting

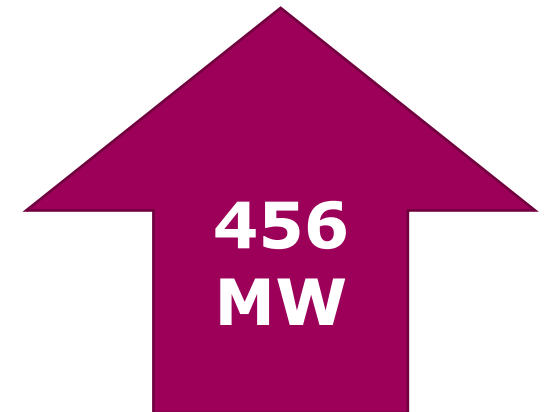


## DSM

- 2022 DSM Plan approved in November Open Meeting
  - \$78.4M budget, \$10.2M increase from 2021 approved budget
  - Program highlights
    - 15 new EE measures for non-residential customers
    - Expanded residential DR programs
    - Reintroduced Shade Tree program
    - Continued support for limited- and moderate-income customers
- 2023 DSM Plan filed Nov. 30
  - \$88M budget
  - Includes an EE savings goal of 1.4%, totaling 421,000 MWhs of EE savings and 223 MW of dispatchable DR
  - Includes DDSR Aggregation Tariff consistent with Decision No. 78165



Incremental annual  
EE savings (2022)



Peak demand  
savings (2022)



# Transportation Electrification

- 2023 TE Plan supplement filed Nov. 30
  - Includes:
    - A plan budget of \$5M for Take Charge AZ
    - An accompanying \$4.2M DSM request for the Managed EV Charging pilot
    - Requests approval of a new Commercial Make-Ready initiative
    - Request for approval of a revised Residential EV rate



*Take Charge AZ DCFC station  
Show Low*



# Discussion & Questions





# Western Markets Evolution (WME) RPAC Update

# Goals of WME Effort

- Reliability
  - Maintain or improve
  - Will be challenged with changing resources
- Customer cost savings
  - Via utilization of both load and resource diversity
  - Needed to offset increases in costs
- Integration of clean energy
  - Can't meet clean energy goals without it



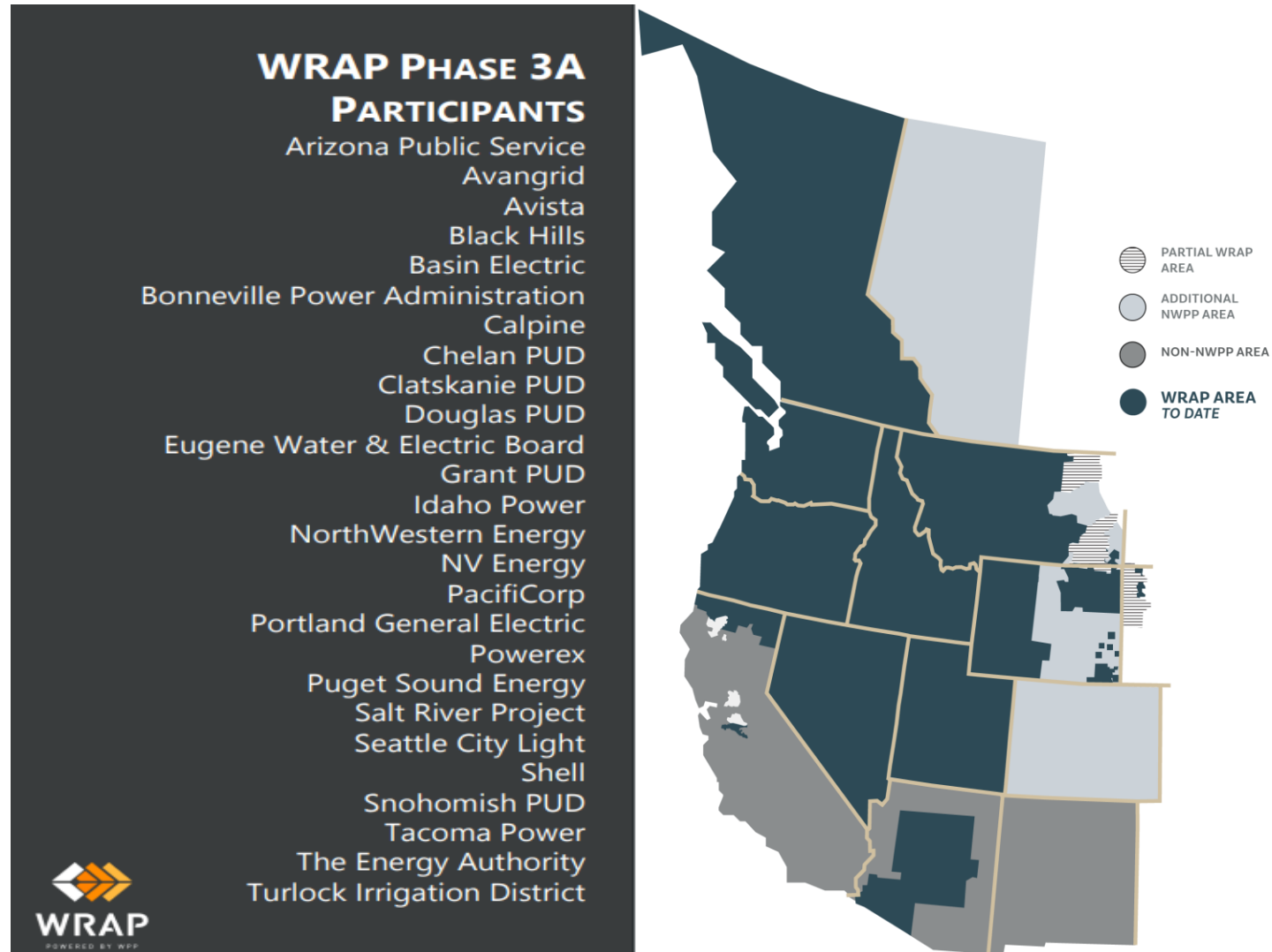
# Background & Drivers

- Previous Efforts
  - RTO discussions have occurred intermittently for over 20 years
- Current Effort(s)
  - It is different this time
  - Needed for clean energy integration
- APS Stated Goals
  - Reliability
  - Customer savings
  - Clean energy integration
- ACC Docket
  - Tracking market efforts

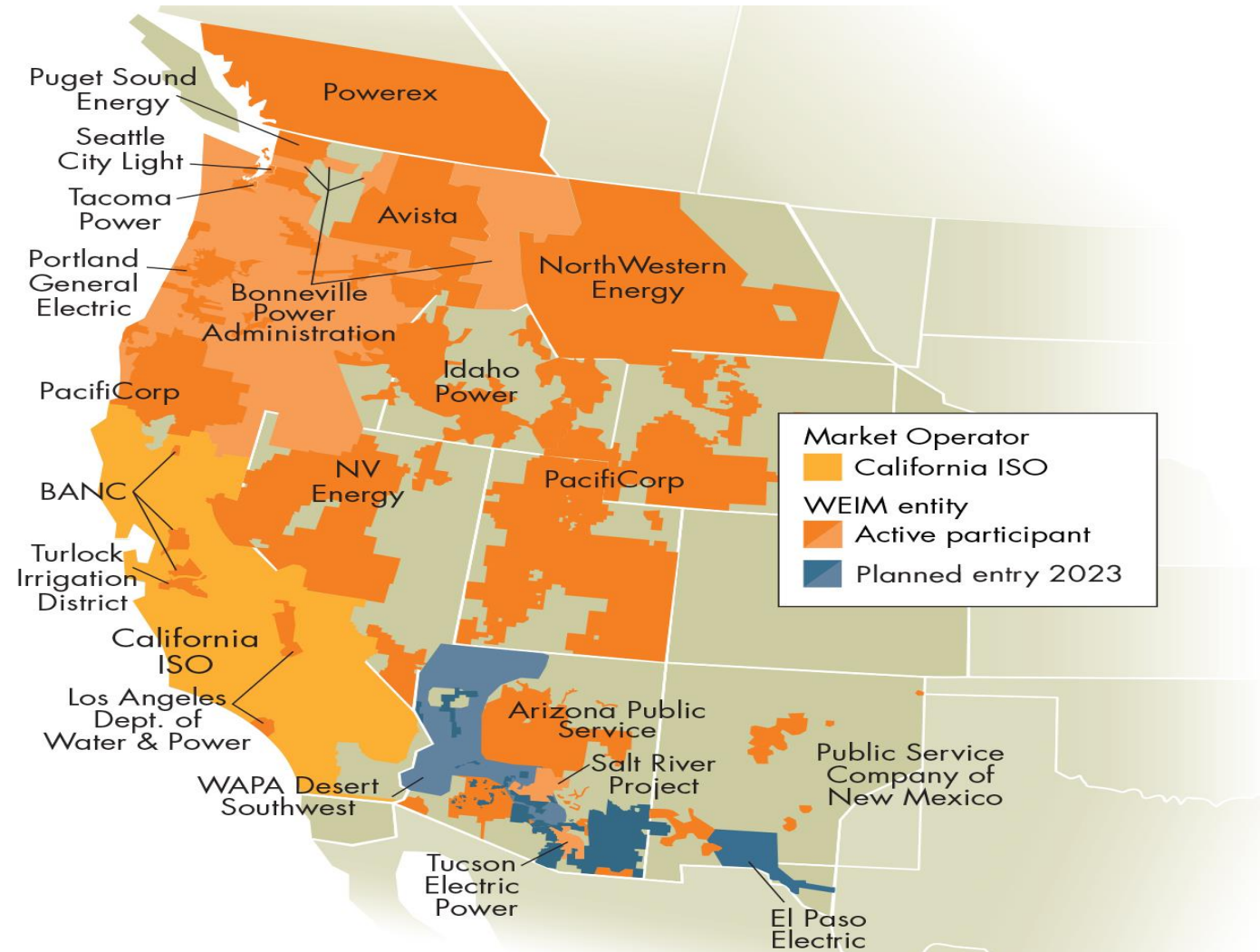
# Ongoing Efforts

- Western Resource Adequacy Program (WRAP)
- CAISO Extended Day-Ahead Market (EDAM)
- Southwest Power Pool Markets+ Day-Ahead Market (SPP Markets+)
- Western Markets Exploratory Group (WMEG)

# Western Power Pool - WRAP



# CAISO – WEIM

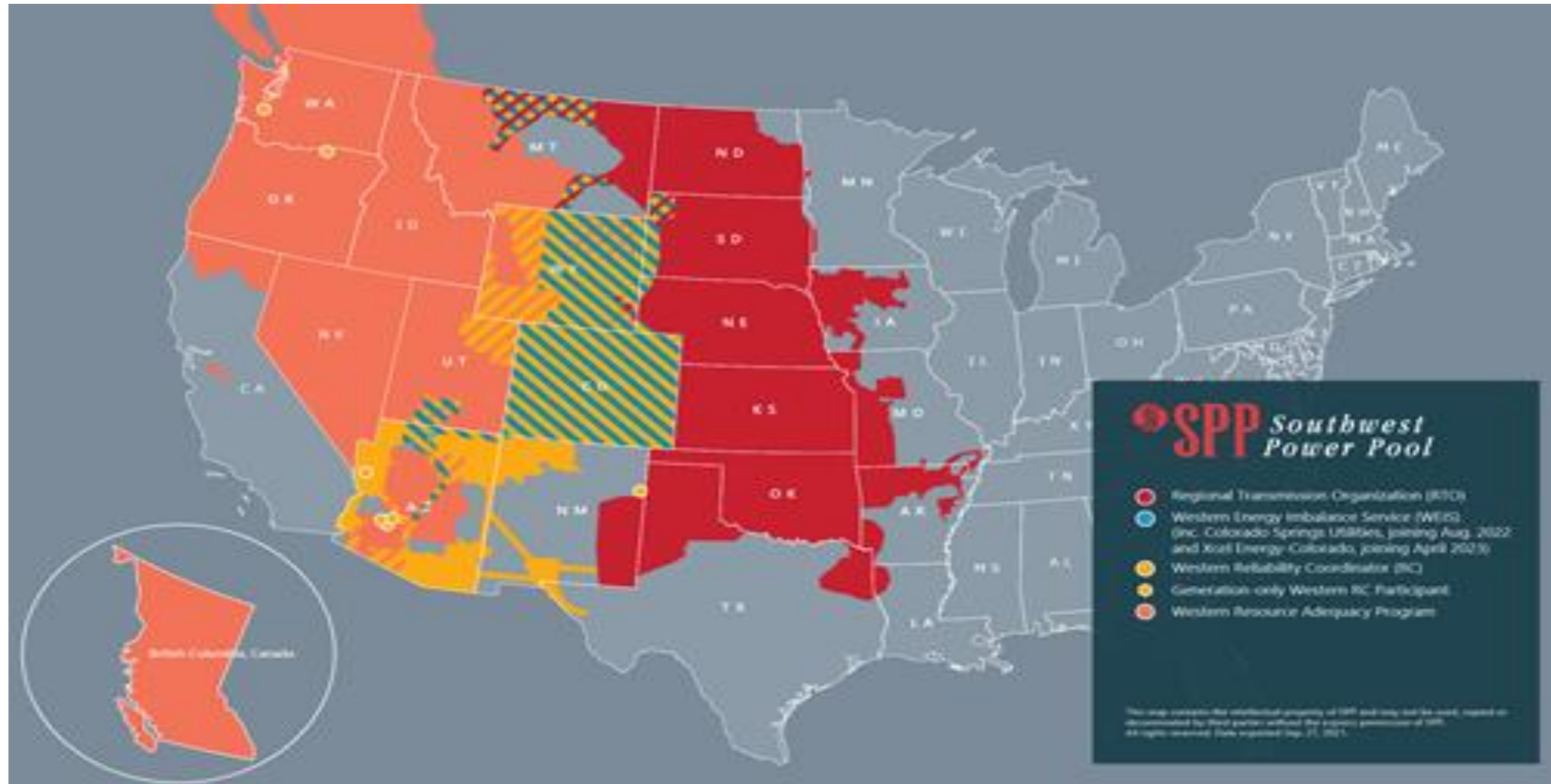


Map boundaries are approximate and for illustrative purposes only.

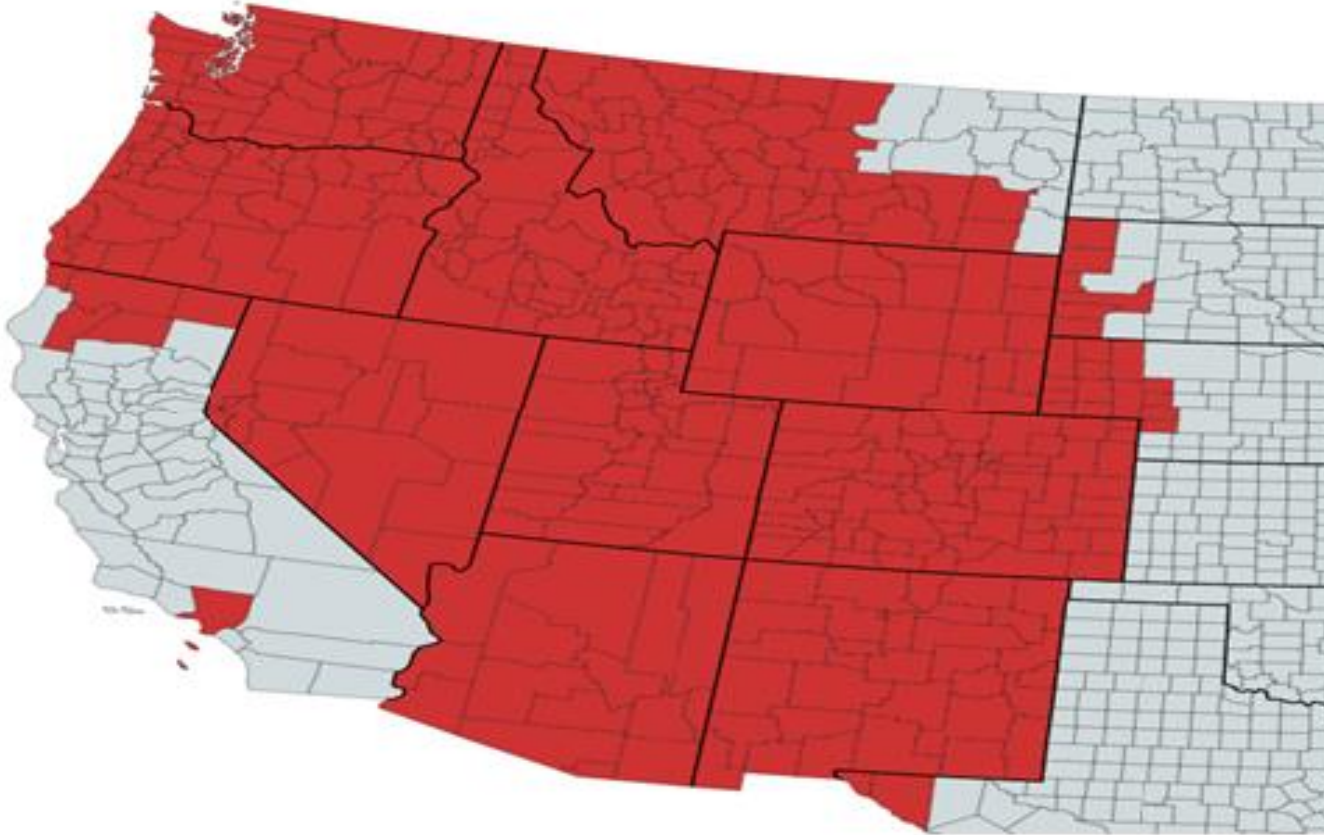
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# SPP WEIS & WPP RA



# WMEG



1. APS
2. SRP
3. TEP
4. PNM
5. Black Hills
6. LDWP
7. Portland General
8. Seattle City & Light
9. Platte River
10. NV Energy
11. PacifiCorp
12. Idaho
13. Puget Sound
14. Xcel Energy
15. Arizona Electric Co-Op
16. Avista Corp.
17. BANC
18. BPA
19. Chelan County PUD
20. El Paso Electric
21. Grant County PUD
22. NorthWestern Energy
23. Tacoma Power
24. Tri-State
25. WAPA

# Timelines – High Level

	<u>Timeline</u>
• WRAP transition period begins	January 1 <sup>st</sup> , 2023
• Day-Ahead market option evaluation and commitments	2023/2024
• Day-Ahead market operation	Summer 2026
• Future market steps “up to and including RTO”	2026-2030



## Discussion & Questions

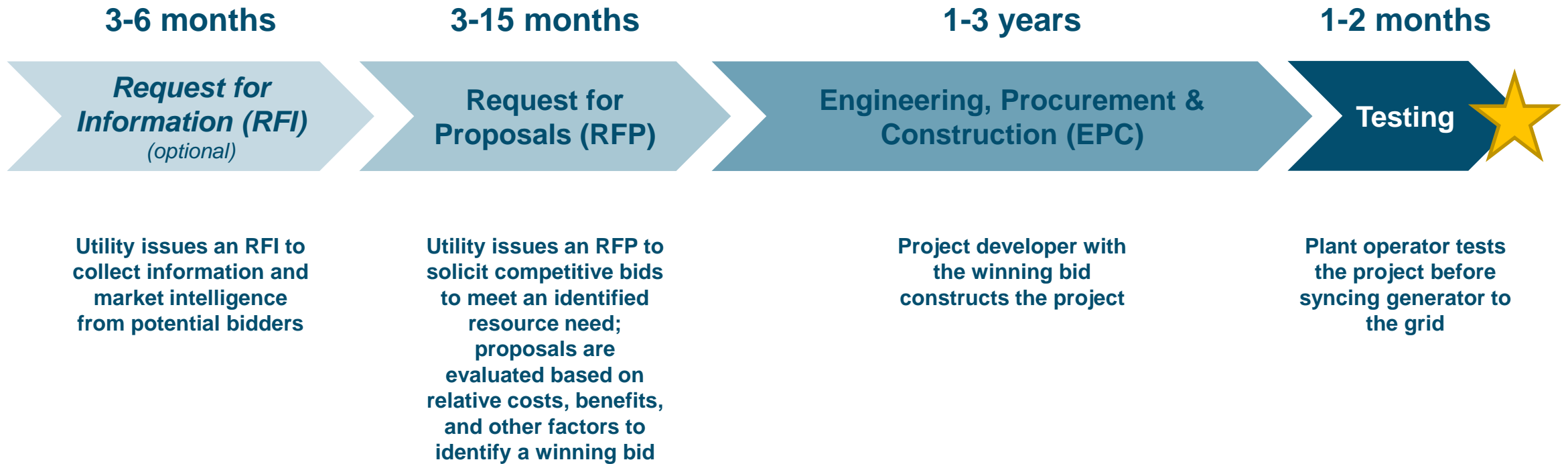






# Timeline of New Resource Additions

# New resource procurement is a multi-year process



*Timelines shown are indicative; actual development timelines may vary significantly depending on the characteristics of projects, regulatory environment, transmission requirements, and a range of other factors.*

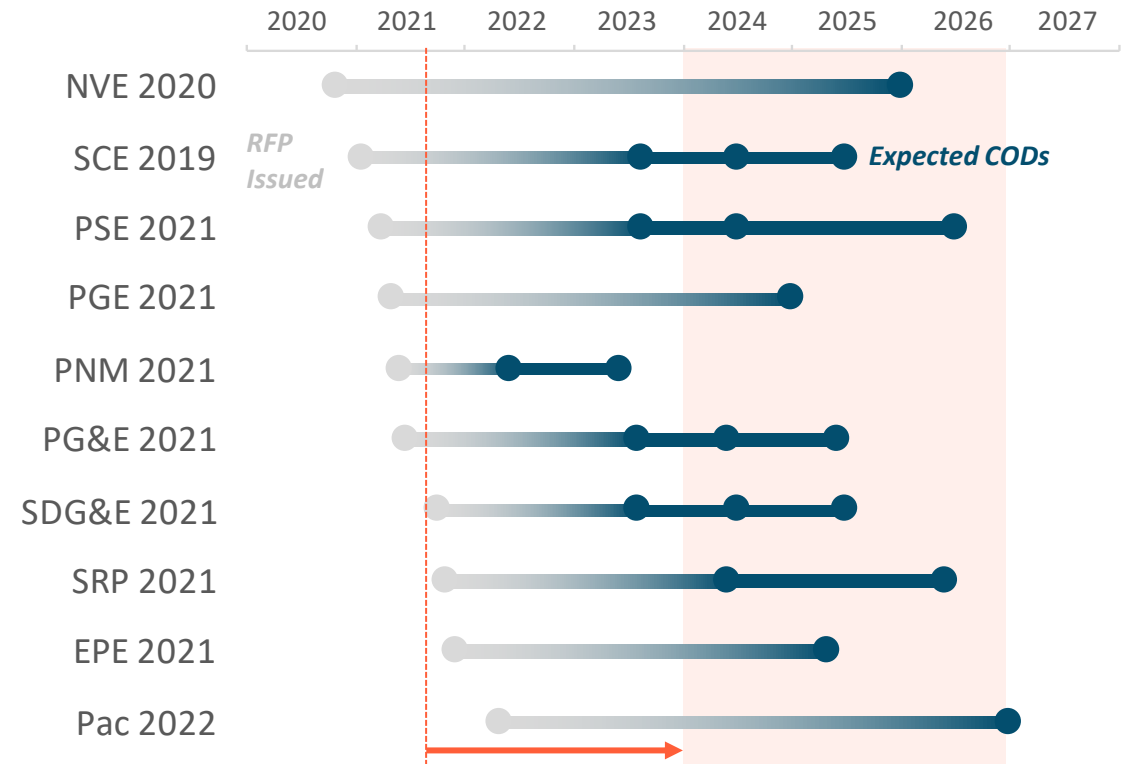
# Current RFPs are targeting resources online in 2024-2026

## + Most current active RFPs focus on procurement resources that can come online between 2024-2026

- Reflects a 2-4 year timeline for procurement and development that begins when a utility issues an RFP
- Many include procurement targets for multiple years, which naturally increases RFP evaluation complexity

## + All all-source RFP – including bid evaluation and negotiation – can require up to 15 months to complete, and is just the first step in new resource development

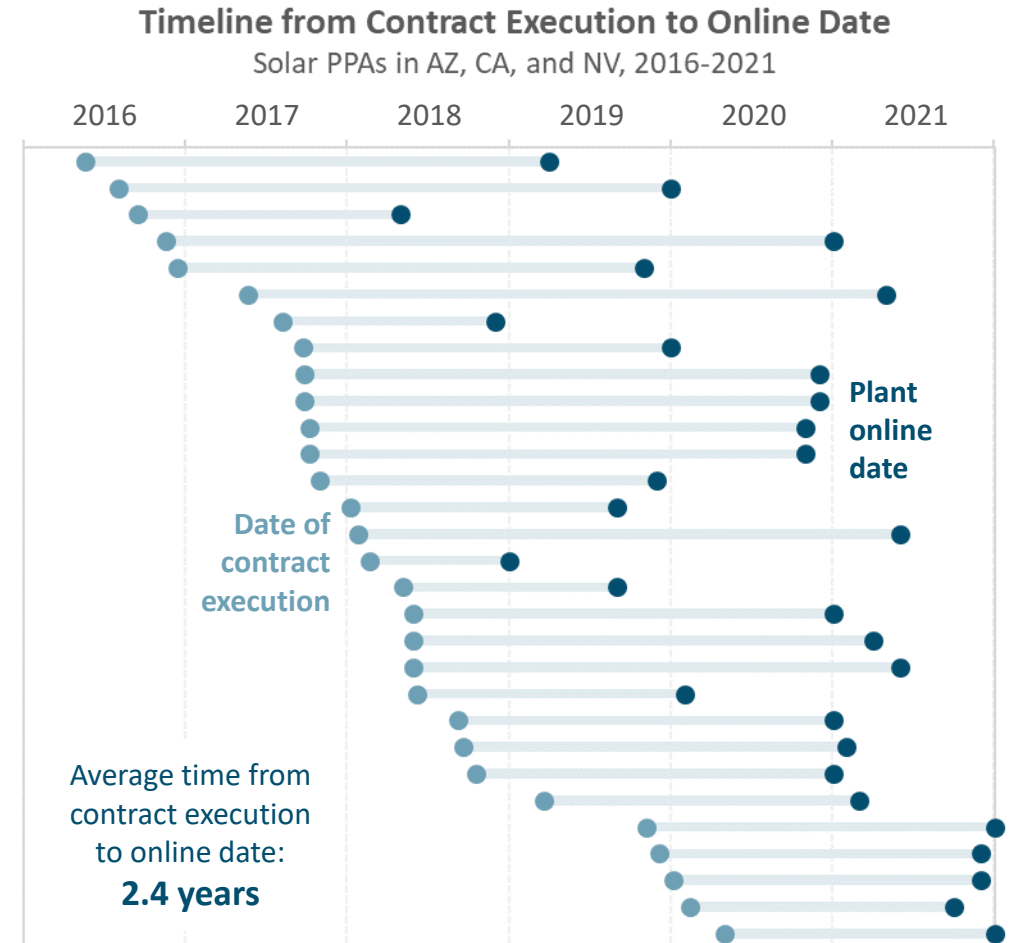
Procurement Timelines for Recent RFPs



Recent RFPs are typically targeting online dates between summer 2024 and 2026

# Multiple years are typically needed for resource development once a utility executes a contract

- + Once a utility has decided to move forward with a project (either utility-owned or PPA), multiple concurrent processes are required to turn that project into a reality
  - Permitting
  - Regulatory approval
  - Financing
  - Transmission
  - Engineering, procurement & construction (EPC)
- + In total, these processes typically take years to complete, underscoring the importance of a proactive, forward-looking planning process



Each line represents a single project/PPA. Based on data from LBNL's Utility Scale Solar 2022 report



# Example timelines for new resource development (wind and solar)

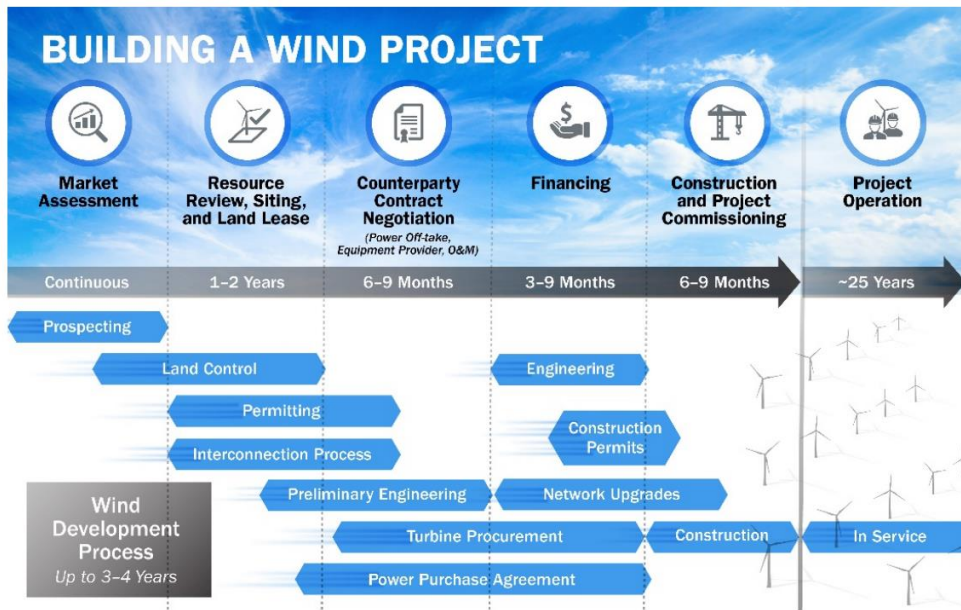


Figure 4. The development of a new wind power plant is a multistep process that can take years to complete.  
Source: American Clean Power (2020)

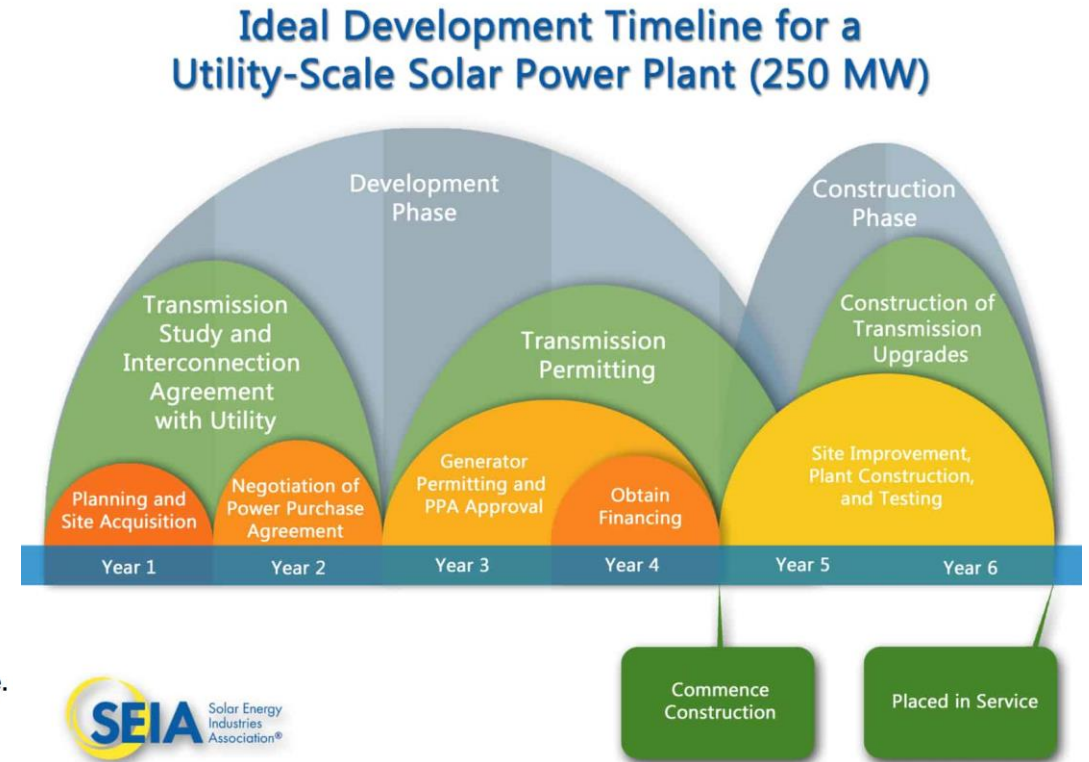


Image Source: <https://www.seia.org/sites/default/files/Development%20Timeline.jpg>

# Recent supply chain issues continue to stretch development timelines

- + Continued supply chain pressures have resulted in construction delays for new power projects – particularly solar and energy storage
  - Delays have typically pushed back project online dates by months – or in some cases, years
- + Prospect of continued disruptions in upstream industries and further delays increase importance of building enough time into planning process
  - Particularly important when replacing retiring resources, where large amounts of new capacity are needed over short periods of time to enable a successful retirements

**Between Jan & Jun 2022, 20% of planned utility-scale solar projects reported delays**

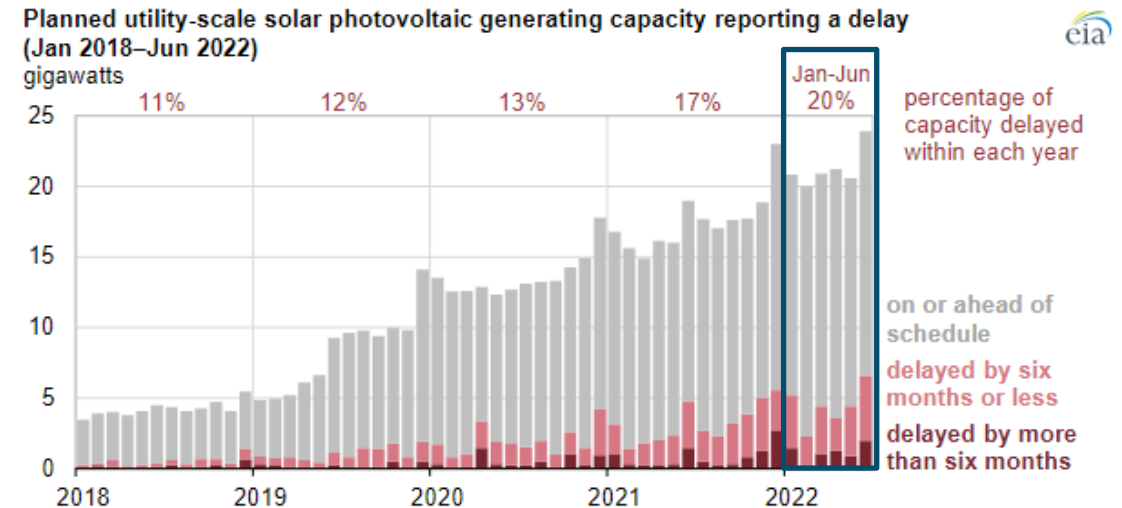


Image Source: EIA, <https://www.eia.gov/todayinenergy/detail.php?id=53400>



# Discussion & Questions





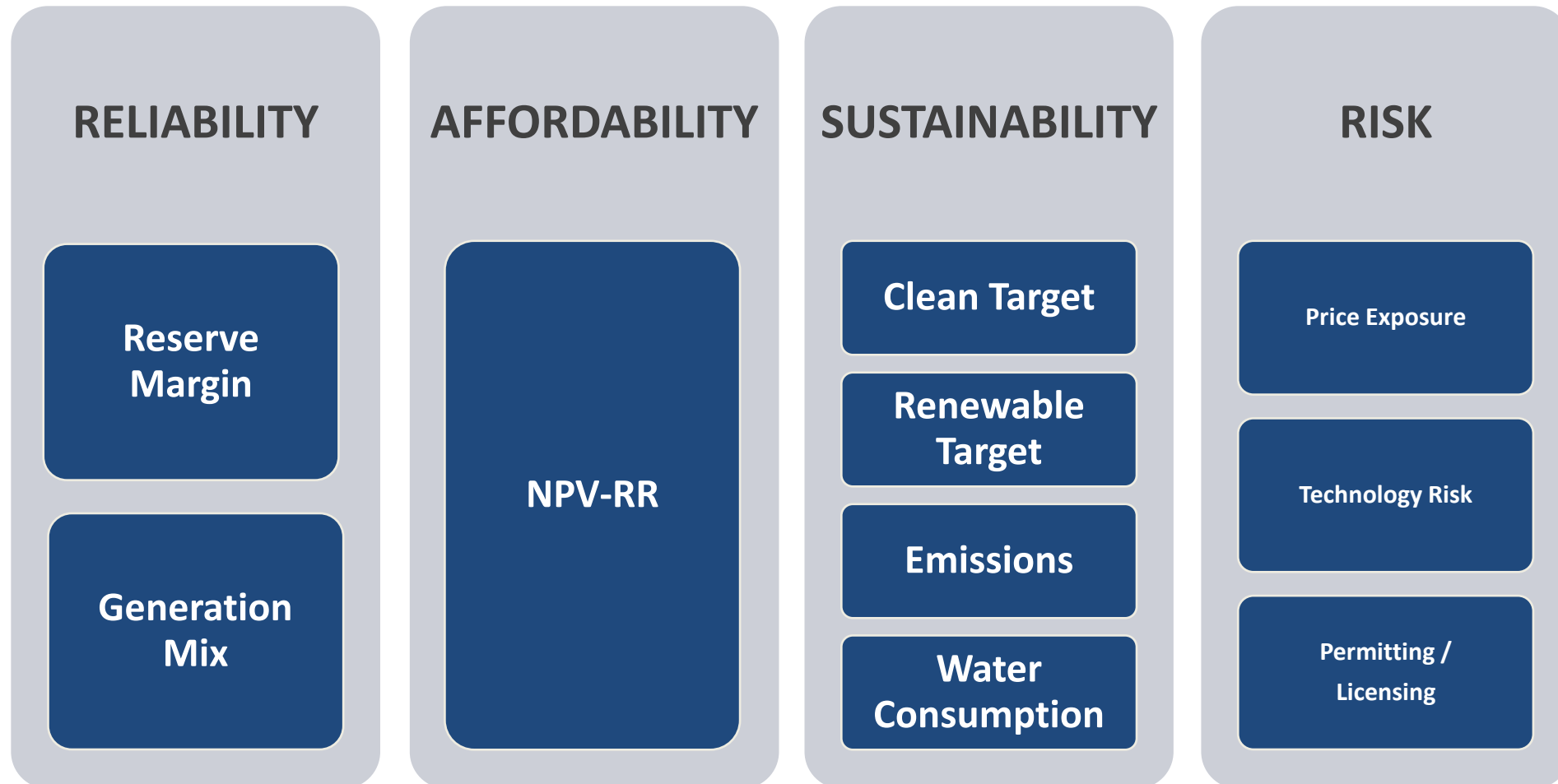
Break



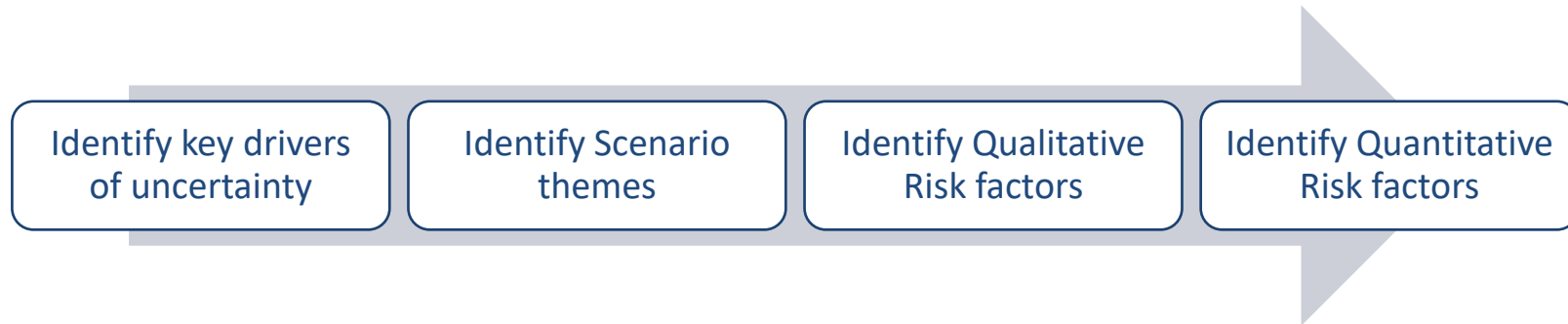
# 2023 IRP Framework



# IRP Objectives and Evaluation Framework



# Managing Risk And Uncertainty



## KEY CASE INPUTS

- Load Growth
- Fuel Price
- CO<sub>2</sub> Price
- New Resource Capital Costs
- Energy Efficiency / Demand Response



# APS Proposed Scenarios

## REFERENCE

- The Reference scenario a future scenario using base forecast assumptions.
- Utilizes current expectations for load growth, fuel prices, technology development, and environmental regulation.

## RAPID TECHNOLOGY DEVELOPMENT

- Technology cost reductions for renewables, storage, DSM and EE.
- Carbon price and fundamental drivers remain consistent with the Reference scenario.

## ENHANCED ENVIRONMENTAL REGULATION

- Fuel and CO<sub>2</sub> prices are increased to reflect accelerated environmental regulation.
- Technology costs remain consistent with the Reference scenario.

## ACCELERATED ELECTRIFICATION

- Technology development and federal incentives.
- Higher load growth
- Technology cost reductions for renewables, storage, DSM and EE.



# Scenarios Overview

	SCENARIOS	LOAD GROWTH	COMMODITY PRICE	CO <sub>2</sub> PRICE	CAPITAL COST	EE/DR COST
PROPOSED SCENARIOS	REFERENCE	BASE	BASE	BASE	BASE	BASE
	RAPID TECHNOLOGY	BASE	BASE	BASE	LOW	LOW
	ENHANCED REGULATION	BASE	HIGH	HIGH	BASE	BASE
	ACCELERATED ELECTRIFICATION	HIGH	BASE	BASE	LOW	LOW
REQUIRED SCENARIOS	TECHNOLOGY AGNOSTIC <sup>1</sup>	BASE	BASE	NONE	BASE	BASE
	EXPANDED DSM <sup>2</sup>	BASE	BASE	BASE	BASE	BASE
	EXPANDED EE <sup>3</sup>	BASE	BASE	BASE	BASE	BASE
	FOUR CORNERS RETIREMENTS 2028, 2029, 2030	BASE	BASE	BASE	BASE	BASE

1. Least-cost method without regard for emissions reduction goal or renewable energy standards.
2. Demand-side resource capacity equal to at least 35 percent of 2020 peak demand.
3. No limit on the amount of energy efficiency. Achieve an annual minimum of 1.5 percent energy savings.



# Risk/Sensitivity Analysis

## Quantitative Risk Analysis

Fuel Price  
Load  
CO<sub>2</sub> Price  
Capital Cost  
Intermittent Renewable Resource Profiles  
Plant Forced Outages

## Qualitative Risk Analysis

Power Supply  
Market Volatility  
Siting and Permitting  
State and Federal Policy





# IRP Base Case Assumptions

# Reference Case Assumptions

## Inflation

- Base assumption = 2.5%

## Compliance with Standards

- Meet RES/EE Standard

## Discount Rate

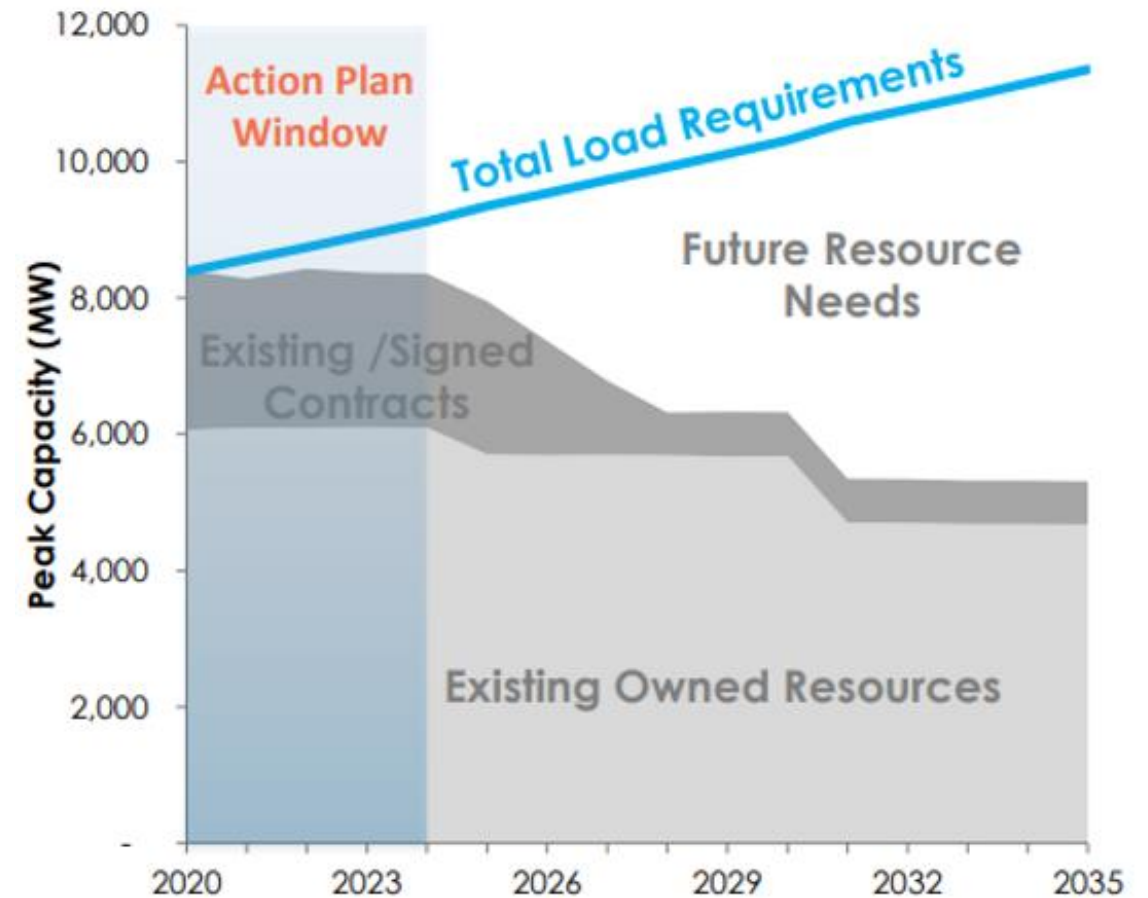
- WACC currently 6.30%



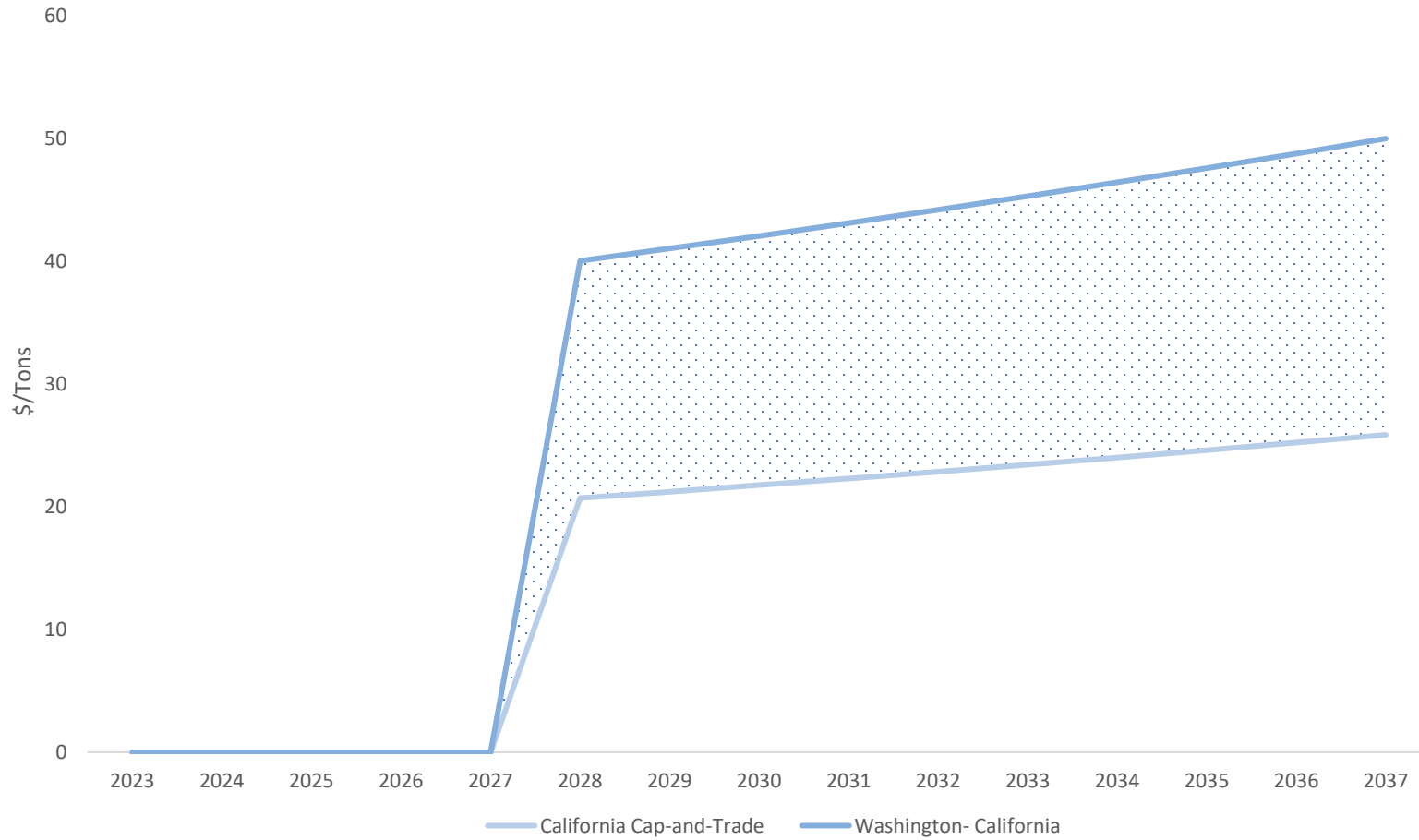
# Load Forecast

Load Forecast Update Imminent

- Large Customer Growth
- Recession Risk
- Impact of DSM & DE



# Carbon Cost



Assumes that environmental legislation will be passed beyond action plan period.

Modeled after Cap-and-trade program in CA and WA.



# Future Resource Capital Costs

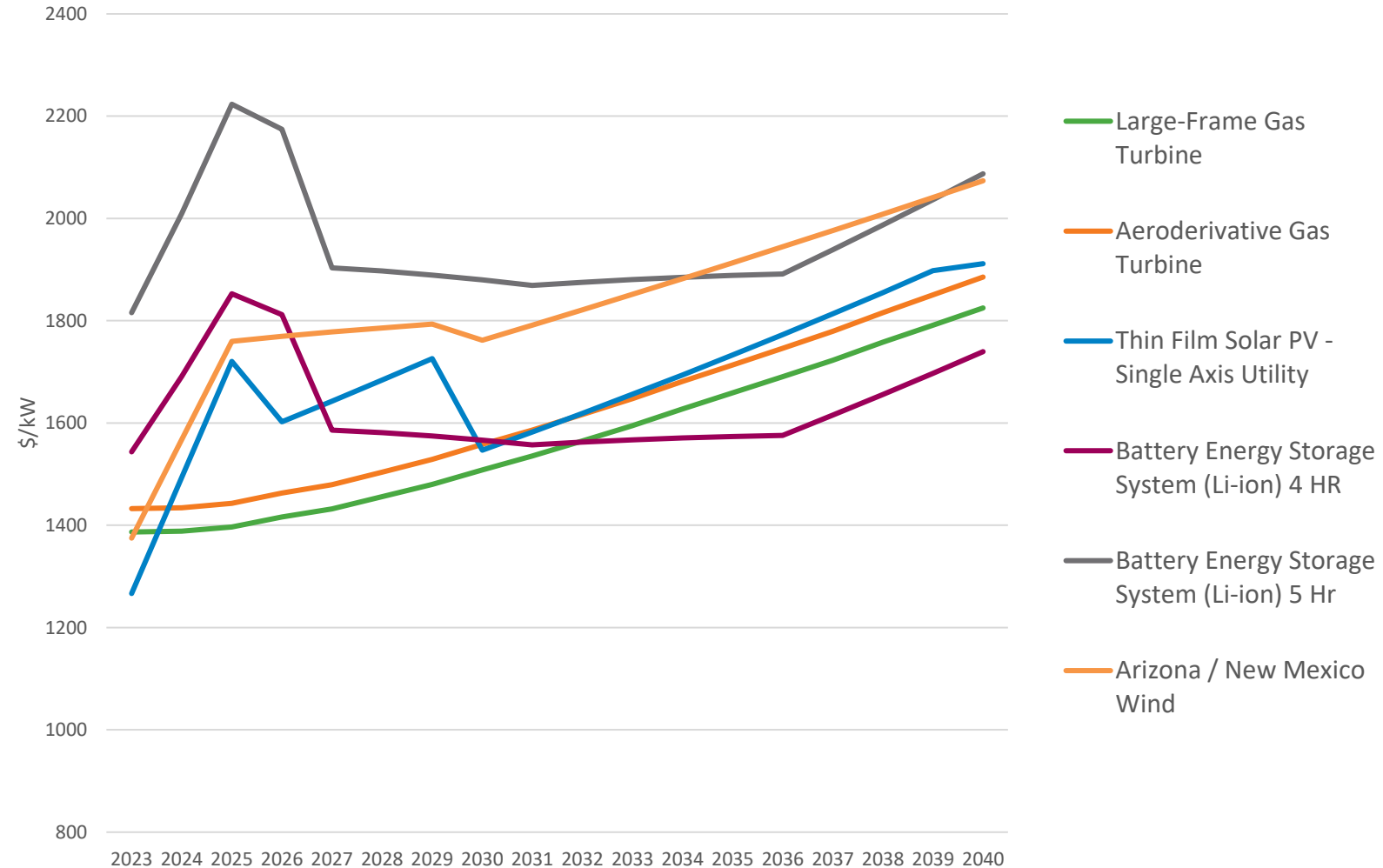
Baseline:

2022 ASRFP

Escalation:

NREL ATB Cost Curves

Sensitivities based off  
high/medium/low scenarios





# Planning Reserve Margin Requirements

- Maintain 1-in-10 LOLE
- SERVVM: Planning Reserve Margin Study
  - Improve understanding of resource adequacy risks.
  - Identify additional cost-effective solutions to meet given resource adequacy standards.
  - Clarify the link between economically efficient planning reserve margins and physical reliability standards such as the 1-in-10 LOLE standard.



## CLEAN

We are committed to generating 100% carbon-free energy by 2050.



## AFFORDABLE

We will manage our costs and keep rates affordable.



## RELIABLE

We will keep the lights on for our customers.



## Discussion & Questions



# Gas Price Modeling and Forecasting

# Gas Markets Overview

- Henry Hub - Primary trading location for natural gas in the U.S.
- Basins – Location where gas physically flows to APS.
  - San Juan (SJ)
  - Permian (PE)
- Price Construction
  - San Juan = Henry Hub + SJ Basis
  - Permian = Henry Hub + PE Basis



# Pricing Process

- Forward Price Curves are received from independent pricing brokers.
- Broker prices are selected based on granularity to create **primary** curve.
  - Henry Hub, San Juan Basis, Permian Basis
- Primary curves are combined to create **secondary** curve.
  - $\text{San Juan} = \text{Henry Hub} + \text{San Juan Basis}$
- Secondary curve are shaped and escalated into a **compiled** curve.
- Compiled curve is reviewed for reasonableness based on market conditions.





# Shaping and Escalation Factors

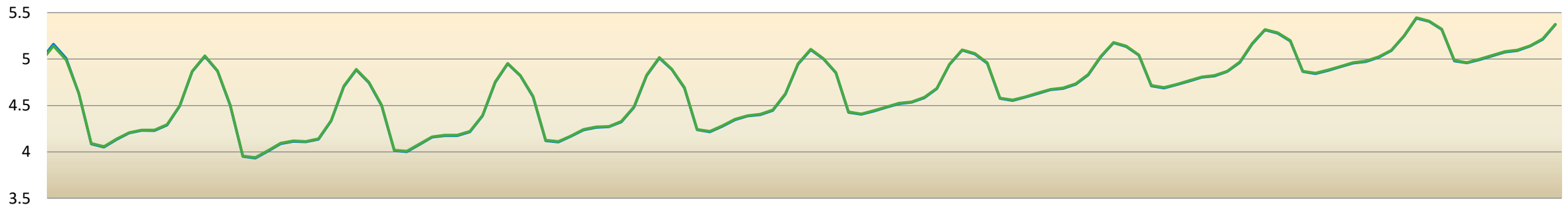
**Shaping** – Process of taking multi-month quotes and approximating monthly prices.

Example: Seasonal broker quote for April – October of \$4.

Price (\$)	Month							Average
	4	5	6	7	8	9	10	
Quoted	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$4
Shaped	\$3.83	\$4.74	\$4.31	\$3.62	\$3.40	\$3.83	\$4.27	\$4

**Escalation** – Process of creating outer year forward prices where broker quotes are unavailable. Escalation factors are based on analysis of historical price data.

**NYMEX Forward Curve**



# Control Processes

- Pricing function is independent of forecasting and planning teams.
- Shaping factors are reviewed monthly.
- Escalation factors are reviewed monthly.
- Broker quotes are reviewed quarterly to ensure pricing data is not stale.
- Margining process gives comfort our prices are reasonable to peers.
- SOX-controlled process
  - Valuation
  - Financial Reporting
  - IT Systems





## Discussion & Questions

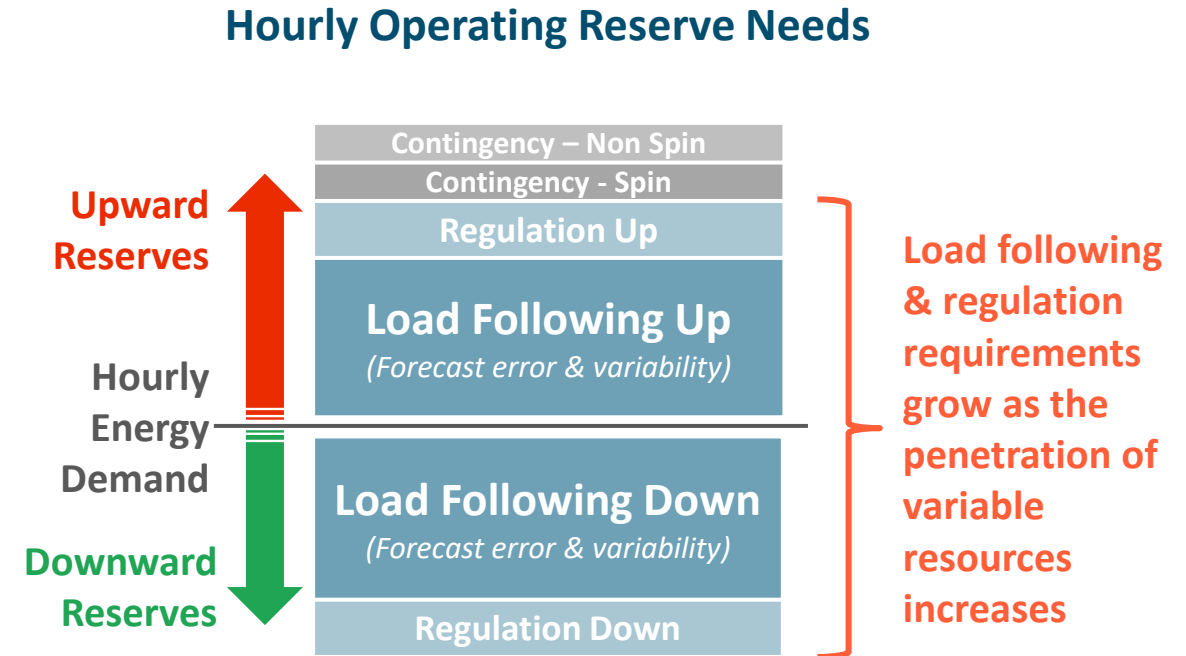


# Integration Cost and Market Price Update



# Planned updates to renewable integration cost assumptions

- + “Renewable integration costs” refer to costs associated with balancing the subhourly variability and forecast uncertainty of renewable resources
  - Higher levels of variability and uncertainty require increased operating reserves
  - Higher operating reserve requirements result in less efficient dispatch of the entire generation fleet
- + Integration cost study for APS’ 2020 IRP calculated costs on the order of \$1-3/MWh for solar and wind
- + Using industry-standard production cost modeling, E3 will update integration cost analysis for 2023 IRP will account for:
  - Updates to natural gas prices
  - Anticipated changes to composition of APS’ portfolio since 2020 (including impacts of energy storage)
  - Improved understanding of required increases in operating reserve needs

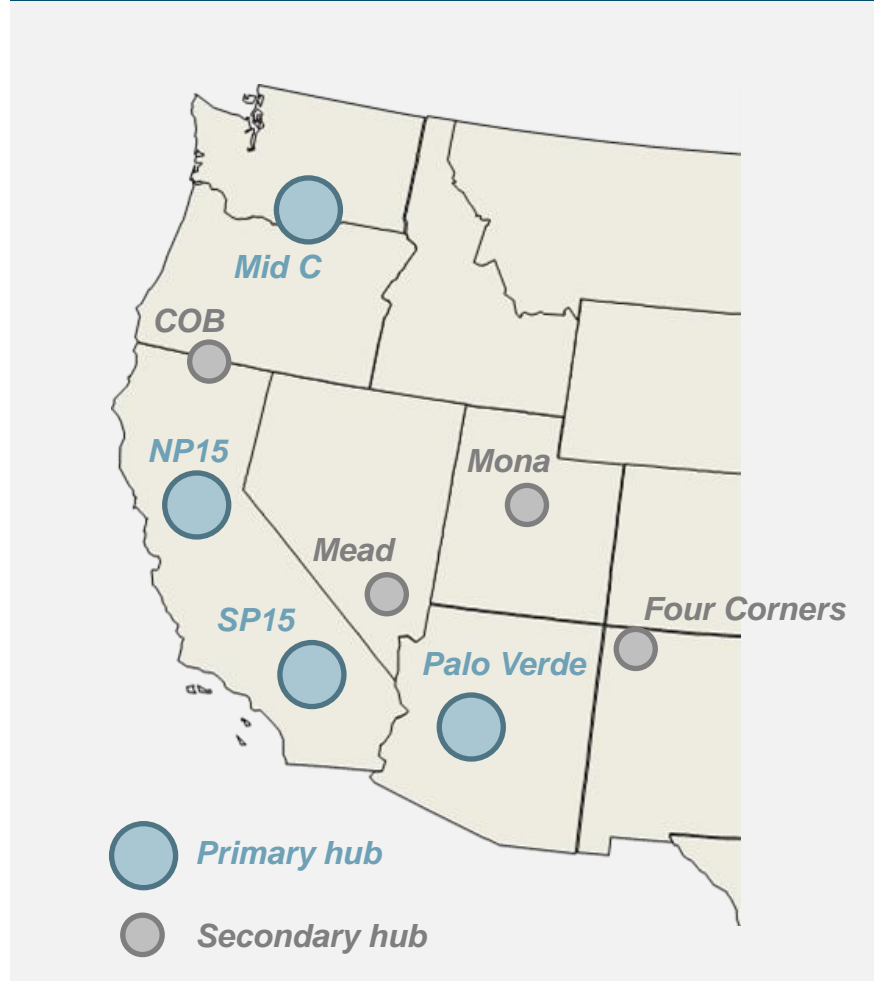




# Updated wholesale market price forecasts

- + **E3 uses a fundamentals-based approach to project how changing energy supply mix will propagate throughout Western electricity markets**
  - Prevailing historical patterns of electricity trade will shift with increasing scales of renewable deployment
  - Heuristics for market price forecasting tied to natural gas prices will break down as other resources increasingly set marginal price
- + **To simulate these dynamics, E3 uses AURORAxmp, a production simulation model of the Western electricity system**
  - Provides a fundamentals-based method to evaluate future market prices as the electricity system evolves
  - Enables scenario analysis of possible alternative futures

## Western Market Pricing Hubs





## Discussion & Questions



Next Steps



# Looking Ahead... January 2023

- EPRI Climate Change Scenario Analysis Update
- Load forecast update
- **Reminder:** APS has limited Aurora licenses for stakeholder use; access will be provided to interested stakeholders that have responded via email

