

DOCKETED	
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SB 846 – Diablo Canyon Extension and Clean Energy Reliability Investment Plan

Lead Commissioner Workshop

January 20, 2023



Introduction

- Q&A & Comments: Zoom Q&A function
- Administrative questions: Zoom Chat function
- Public comments due 5 pm, February 2, 2023
- CEC Docket 21-ESR-01



Comments from the Dais





Agenda

- **Introduction** (9:30 – 9:35)
- **Comments from the Dais** (9:35 – 9:45)
- **Workshop Overview** (9:45 – 9:50)
- **SB 846 Update** (9:45 – 10:45)
 - Legislative Requirements
 - Summer 2022 Recap
 - Reliability Analysis 2023 – 2032
 - Prudency of Extending Diablo Canyon
 - Clean Energy Reliability Investment Plan
- **Q&A** (10:45 – 11:00)
- **Public Comment** (11:00 – 12:00)



Two Key Topics in Today's Discussion

- Prudency of Extending Diablo Canyon
 - Determine whether forecasts for 2024 – 2030 show potential reliability deficiencies if Diablo Canyon is not extended
 - Determine whether extending Diablo Canyon is prudent to ensure reliability and consistent with state's emission reduction goals
- Clean Energy Reliability Investment Plan
 - Investments that:
 - Accelerate deployment of clean energy resources
 - Support demand response
 - Increase reliability - reduce demand during net peak
 - Support loading order
 - Support state greenhouse gas emission goals



SB 846 Update

Presenters: David Erne, Deputy Director, Energy Assessments Division
Mark Kootstra, Lead Reliability Modeler Energy Assessments Division



CEC has Multiple Responsibilities in Reliability and Clean Energy

Assembly Bill 205

- Strategic Reliability Reserve Fund
 - Distributed Electricity Assets Program
 - Demand Side Grid Support Program
 - Certification of DWR SRR Facilities
- Opt-In Permitting
- Long-Duration Energy Storage
- Summer 2022 Reliability Report

Assembly Bill 209

- Planning Reserve Margin
- Climate Innovation Program
- Clean Energy Programs
- Offshore Wind Infrastructure

Senate Bill 846

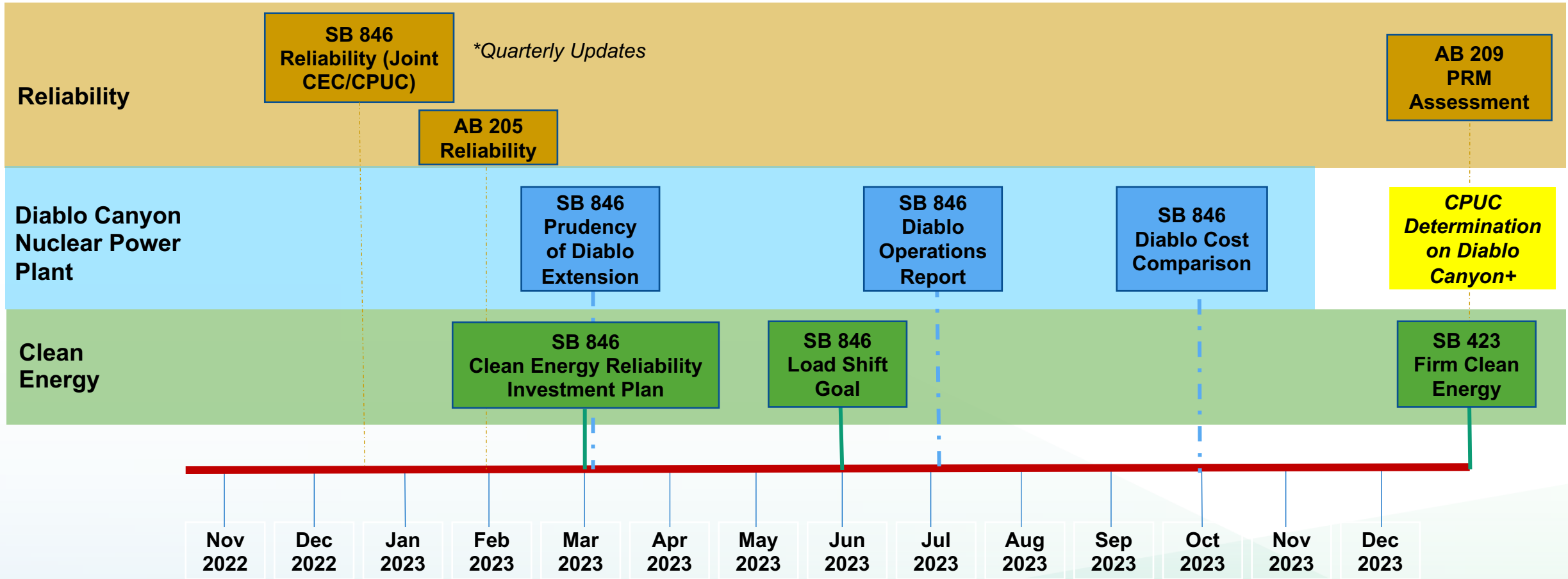
- Reliability Planning Assessment
- Clean Energy Reliability Investment Plan (CERIP)
- Determination on the Need for Extension of Diablo Canyon
- Report on Diablo Canyon Operations
- Load Shift Goal and Policies
- Cost Comparison of Diablo Canyon
- Reevaluating Cost Effectiveness of Diablo Canyon

Senate Bill 423

- Report on Firm, Zero-carbon Resources



Relevant Deadlines



+CPUC action added for reference



Multi-Agency Effort to Make a Decision on Diablo Canyon

CEC

- DCPD Extension Prudency Determination (Mar 2023)
- DCPD Operations Report (Jul 2023)
- Cost Analysis of Alternatives (Sep 2023)

CPUC

- Open DCPD Proceeding (Sep 2022)
- Establish, continue & fund Diablo Canyon Independent Safety Committee and Independent Review Panel for Diablo Canyon (Oct 2022)
- Report on New Resource Additions and Need for DCPD (Dec 2023)

CNRA

- Plan for DCPD Extension (Jan 2023)
- Convent a Joint Public Process on environmental impacts and mitigation of extended DCPD operations (Feb 2023)
- Land Conservation and Economic Development Plan (Mar 2023)

DWR

- Execute Loan (Oct 22)
- Establish Semiannual True-up Methodology and Process (Apr 2023)
- Oversee operator's actions funded by loan (Ongoing)
- Administer state funding for state agency (CPUC/CEC/CNRA) participation (Ongoing)



Reliability Analysis

- **SB 846 – Joint CEC/CPUC Reliability Planning Assessment**
 - Estimates for the electrical supply and demand, for next 5- and 10-year periods
 - Prospective info on existing & new resources
 - Report on delays or barriers affecting timely deployment
- **AB 205 – CEC Reliability Report**
 - Evaluation of how the state, utilities and BAs managed summer 2022 reliability
 - Projected reliability for 2023 to 2026
 - Potential solutions to addressing reliability concerns
- **Both to be provided January 31, 2023**

Framework for Reliability Analysis





Three Key Themes on Reliability

- Ensuring appropriate levels and types of resources are authorized for procurement in a timely fashion across all jurisdictions
 - Meet industry planning standards for reliability (LOLE & PRM)
 - Support climate goals and affordability
 - Resources are typically rate-based
- Ensuring that the authorized resources are brought online in a timely fashion
 - Resources are permitted, built and interconnected
- Ensuring additional capacity beyond planning standards is available to weather extreme climate events
 - Extreme heat, drought and fire
 - Resources intended to be funded outside the rate-base



State Processes Ensure Sufficient Procurement is Authorized

- CPUC Integrated Resource Planning authorizes procurement:
 - An unprecedented 11.5 GWs authorized in 2021
 - A proposed decision would authorize an additional 4,000 MWs, pending a CPUC decision
- CPUC, CEC, & CAISO continually assess the reliability of ordered procurement levels, as well as IRP's Preferred System Plan.
 - Preliminary LOLE analysis suggest that the current levels of authorized procurement for 2023 and 2024 meet a 1-in-10 LOLE
 - Agencies continue to evaluate climate impacts on demand and supply and will take active steps to ensure appropriate levels of procurement are authorized in a timely fashion



Challenges Remain to Timely Deployment of Authorized Resources

- Success requires record resource build rates, which are impacted by:
 - Supply chain vulnerabilities
 - Interconnection and permitting delays
 - Increasing prices and competition for equipment
- Uncertainties in availability of existing resources
 - Hydro
 - West-wide tight RA market

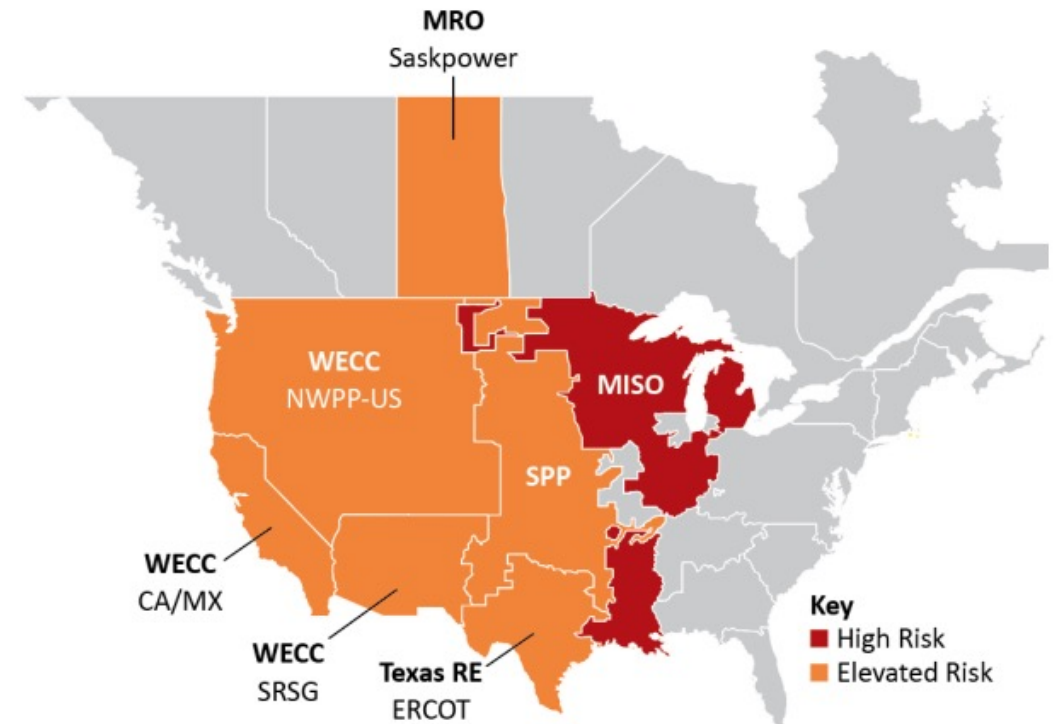


Figure 1: Summer Reliability Risk Area Summary

Seasonal Risk Assessment Summary	
High	Potential for insufficient operating reserves in normal peak conditions
Elevated	Potential for insufficient operating reserves in above-normal conditions
Low	Sufficient operating reserves expected

Source: NERC 2022 Summer Reliability Assessment



Success Requires Sustained Record Build Rates

- Average annual resource build requirements generally exceed the average of the last 10 years.
- Max resource builds are in the next 2-3 years and are generally double the highest observed annual build.

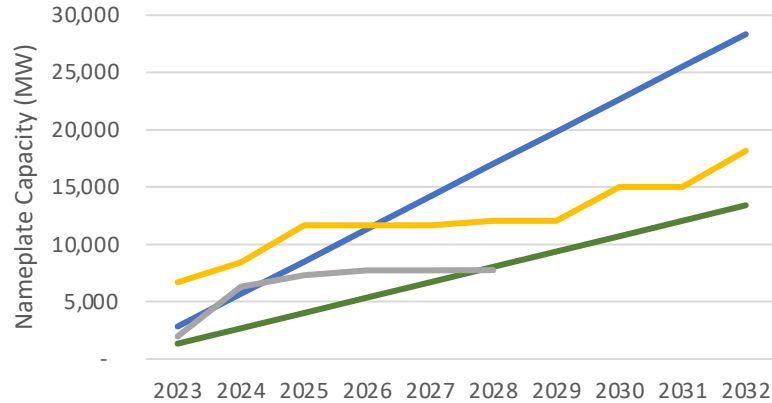
Build Rates			
Solar Nameplate (MW)	Average	Maximum	Max Year
EIA CA Additions*	1,582	2,807	2022
PSP CAISO Additions	2,270	6,693	2023
Procurement Additions	1,289	4,305	2024
Battery Nameplate (MW)	Average	Maximum	Max Year
EIA CA Additions*	623	2,656	2022
PSP CAISO Additions	1,545	5,573	2024
Procurement Additions	2,131	5,716	2024
Wind Nameplate (MW)	Average	Maximum	Max Year
EIA CA Additions*	223	305	2021
PSP CAISO Additions	399	1,482	2025
Procurement Additions	76	220	2024

*EIA CA Additions include state-wide resource additions from 2015-2022

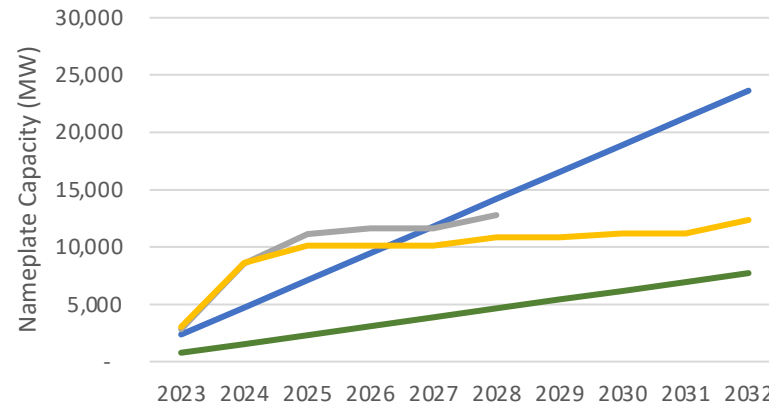


Success Requires Sustained Record Build Rates (cont.)

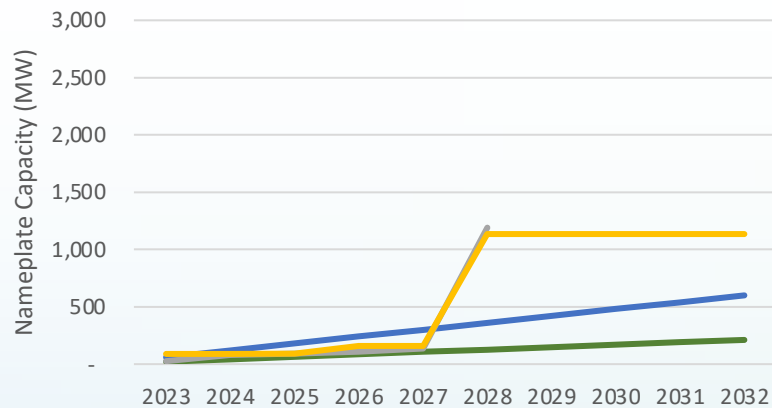
Solar Build Rates



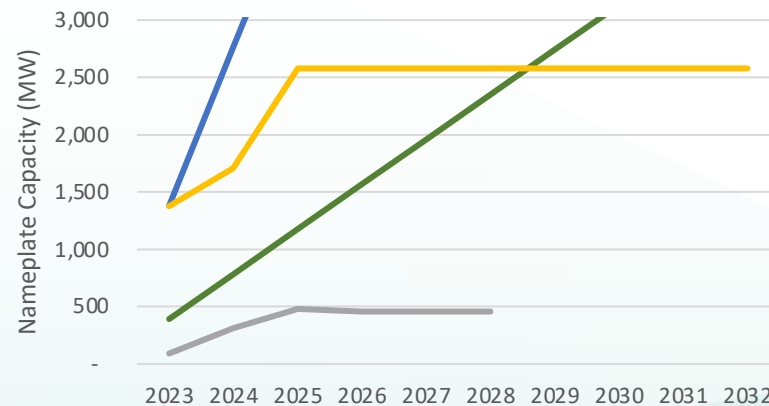
Battery Build Rates



Geothermal Build Rates



Wind Build Rates



- CAISO Maximum Since 2011
- CAISO Average Since 2011
- CPUC Procurement Order
- CPUC Preferred System Plan

- CAISO maximum and average build rates since 2011 by technology type
- Average build rates are generally insufficient to reach:
 - The procurement order before the end of the order
 - The PSP before 2032
- Maximum build will not exceed all builds by 2027, except geothermal



Evaluating Alternatives

- CEC gathered information on alternatives through a Request for Information (RFI) on November 7
- RFI responses suggest many opportunities, but the exact viability and scalability need further investigation
 - Received more than 60 responses relative to technologies
 - Strong support for expanding demand flexibility
 - Expanded list of supply resources for consideration, including fuel cells, linear generators, and fossil fueled resources with carbon capture
 - Analysis of options is ongoing and will be the subject of a future public workshop to receive feedback on alternatives
- Report is due September 30
 - CEC working to complete by August 30 to support CPUC proceeding timeline

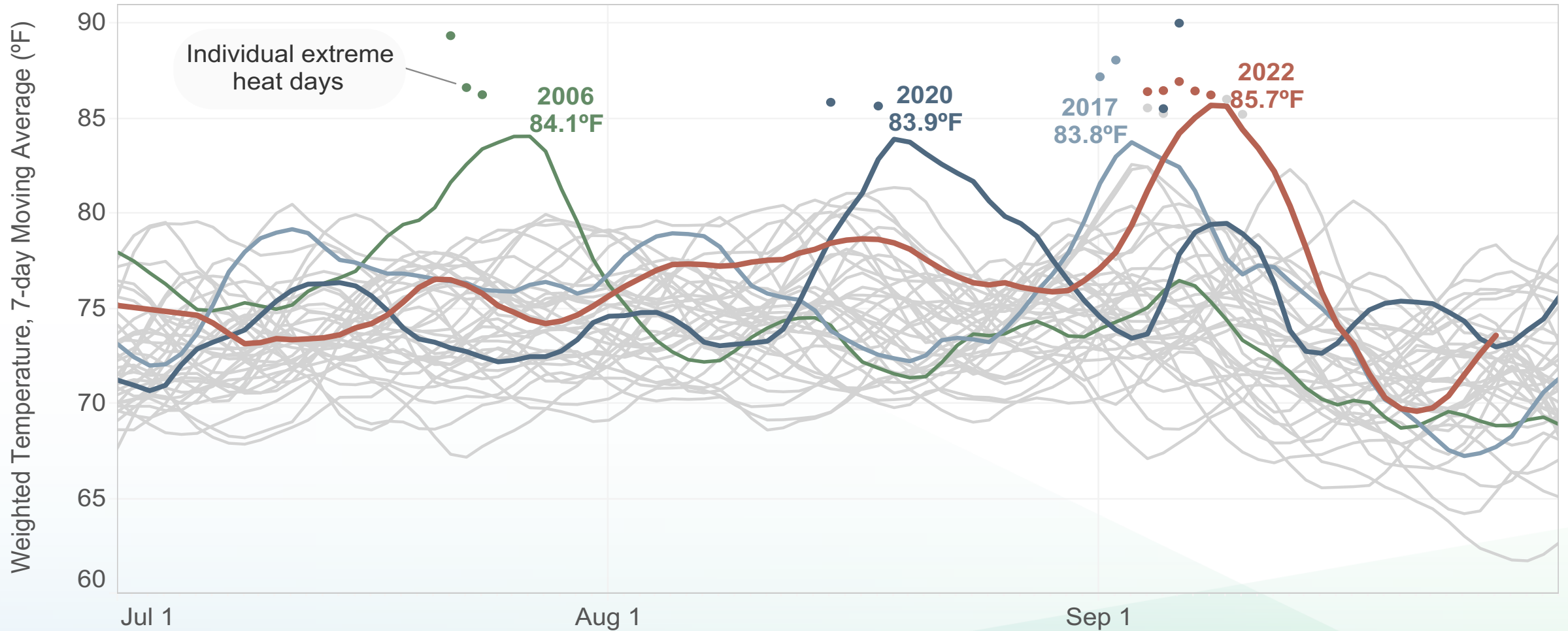


Lessons from 2020 - 2022





Recent Heat Waves Have Been Historic



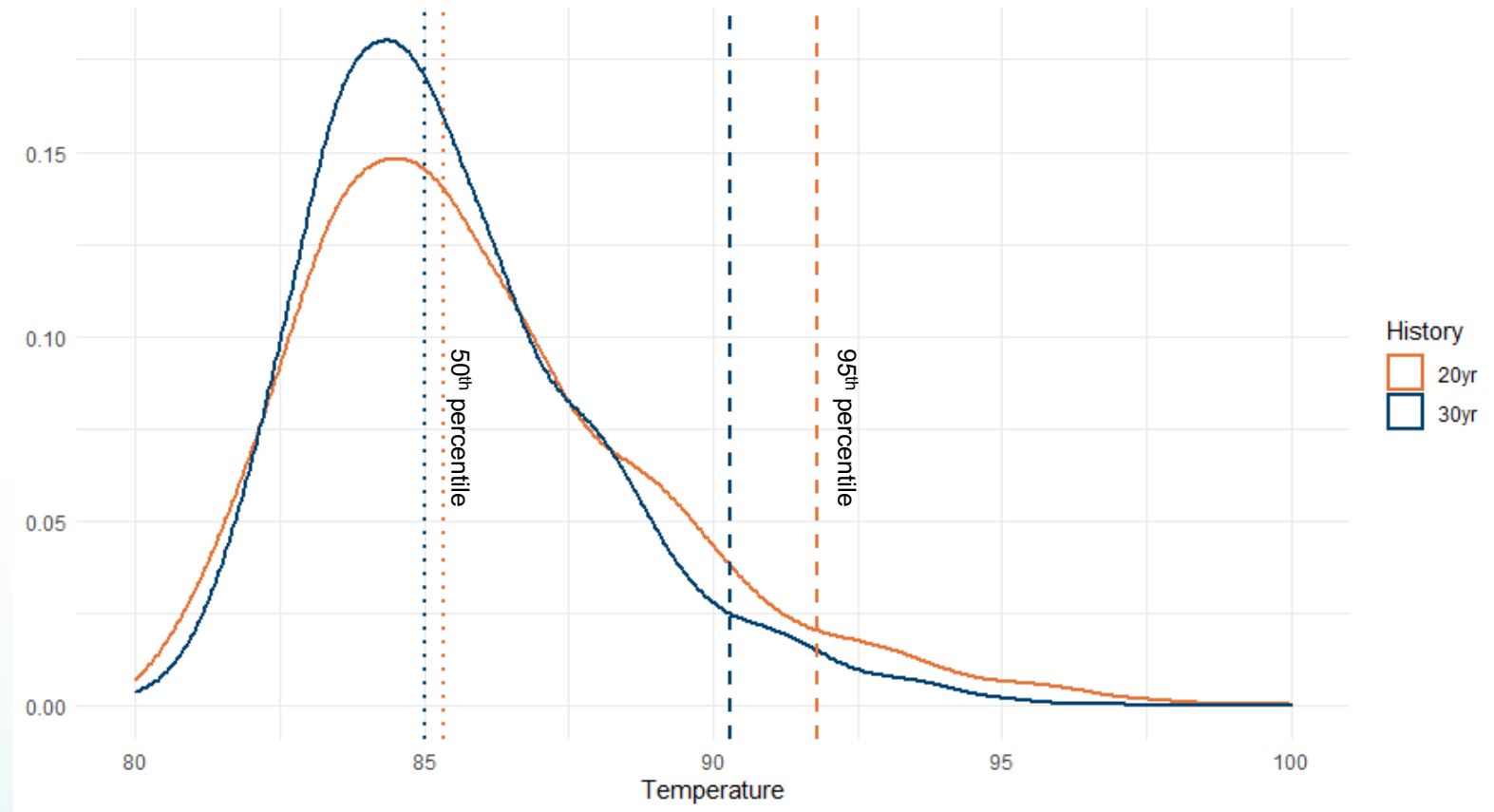
Composite Statewide Temperature 7-day Moving Average, Summers 1985–2022



Probability of Tail Events Increasing

- Recent years are characterized by generally higher temperatures
- Truncating the historical record has a greater impact on extremes than on median values
- Staff found the September 6 temperature to be a 1-in-14 event based on a 20-year weather history vs 1-in-27 based on 30 years

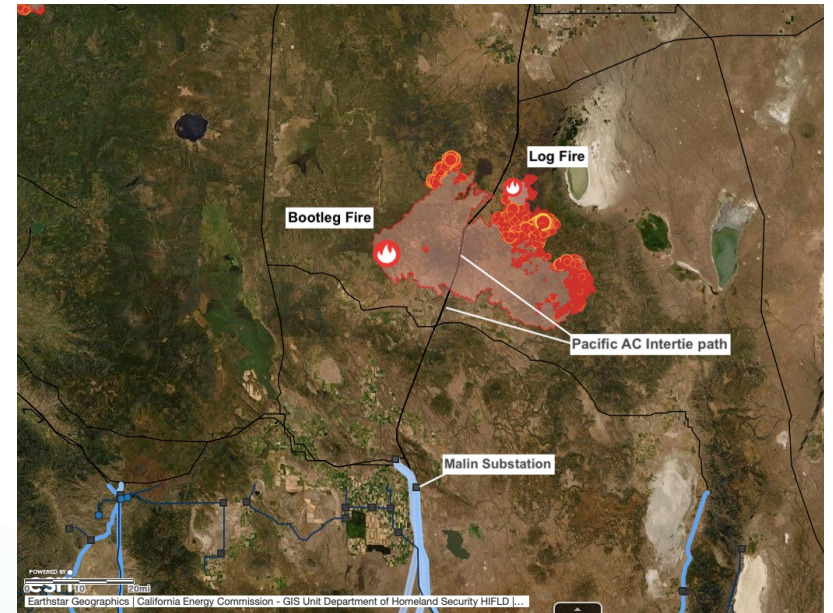
Distribution of Peak Average Temperature (CAISO)





2020 and 2021 Challenges

- 2020
 - CAISO experienced rolling outages on August 14 and 15
- 2021
 - Oregon Bootleg Fire in July
 - Lost 4,000 MW of capacity simultaneous to a heat event





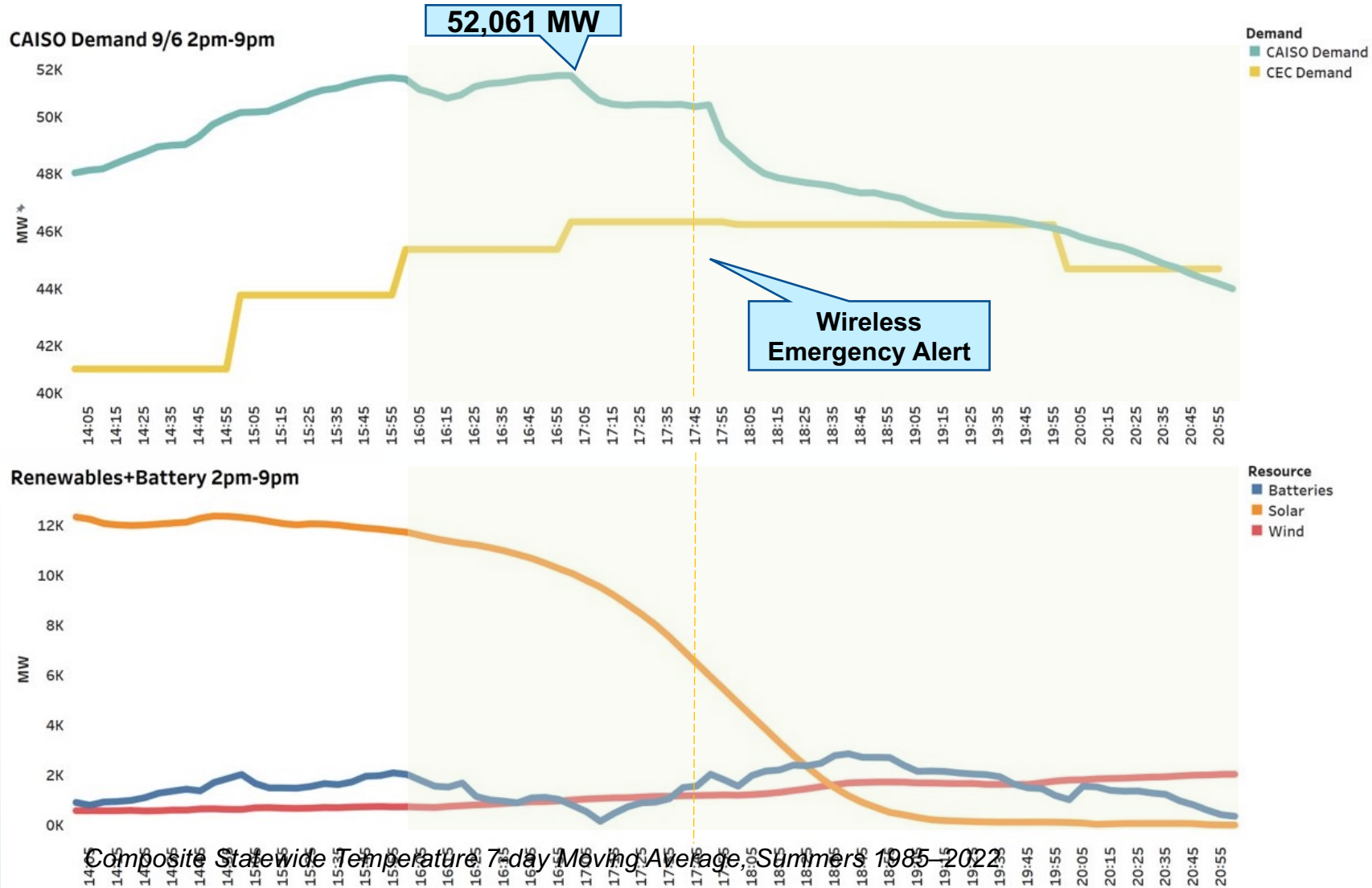
2022 Estimated Reliability Impact

Issue	2022	2025
Inherent difference between procurement and updated forecast	1,700 MWs	1,800 MWs
Project Development Delay Scenarios (estimated)	600 MWs	1,600-3800 MWs
Extreme weather and fire risks	4,000-5,000 MWs	

In total the risk in a coincidental situation could be 7,000MW in 2022 & 10,000MW in 2025



CAISO Experienced Highest Load in its History on Sept 6



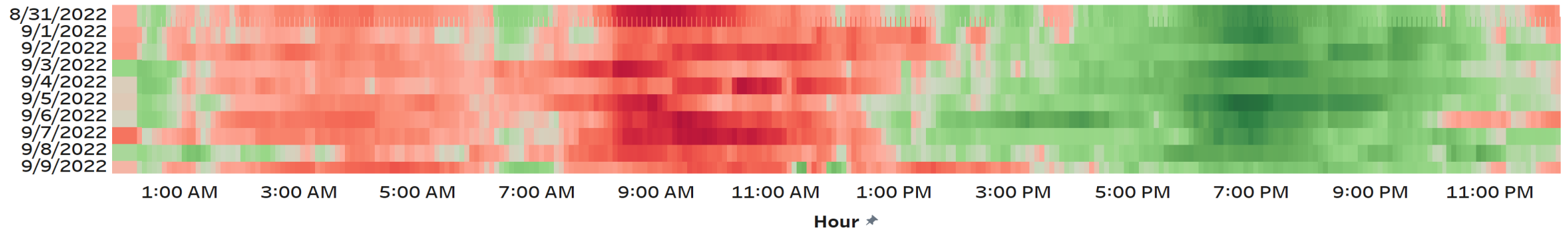
- Expected 1-in-2 Demand for Sept 2022 based on 2020 CED was ~44,600 MW
- We were on track for a peak of ~53,000 before demand side load reductions were called on
- Preliminary analysis suggest we would have needed to plan for a near 26% PRM to get through a day such as Sept 6th



Storage is Performing as Expected

- Low outages
- Fires not impacting resources
- Strong imports
- Strong battery performance

CAISO Battery Resource Performance 8/31-9/9



Charge/Discharge (MW)





Analysis of Extreme Events 2023 - 2032





Updated Hourly Stack Analysis

- Consistent with the Summer Stack Analyses
- Modified stack analysis with hourly profiles
- Utilize scenarios to account for risks (project delays, extreme weather, etc.)
- Input updates made in consultation with the CPUC and CAISO, including on Resource Adequacy (RA) imports



Scenario

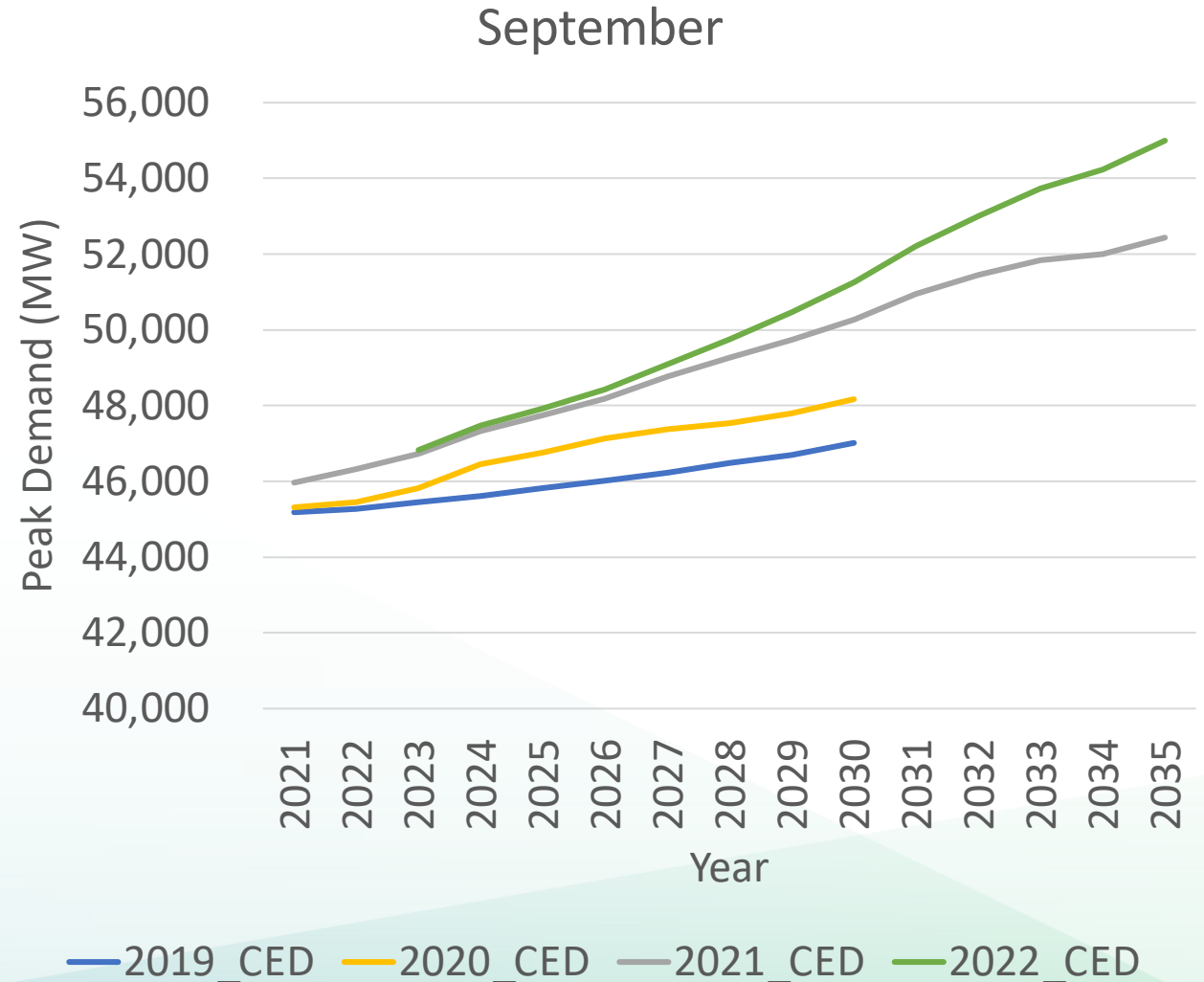
Condition Relative to 1-in-2 Forecast	Operating Reserves	Outages	Demand Variability	Coincidental Fire Risk	Notes
Current RA Planning Standard – 17%	6%	5%	6%		16% for 2023 & 17% beginning 2024
2020 Equivalent Event: Additional capacity needed to weather heat event like 2020	6%	7.5%	9%	4,000 MW	9% higher demand over median, and 2.5% higher levels of outages
2022 Equivalent Event: Additional capacity needed to weather heat event like 2022	6%	7.5%	12.5%	4,000 MW	12.5% higher demand over median, and 2.5% higher levels of outages

$$Demand\ Variability = \frac{Observed\ instantaneous\ CAISO\ peak}{Forecasted\ 1\ in\ 2\ peak} - 1$$



Changes in Peak Demand Forecasts

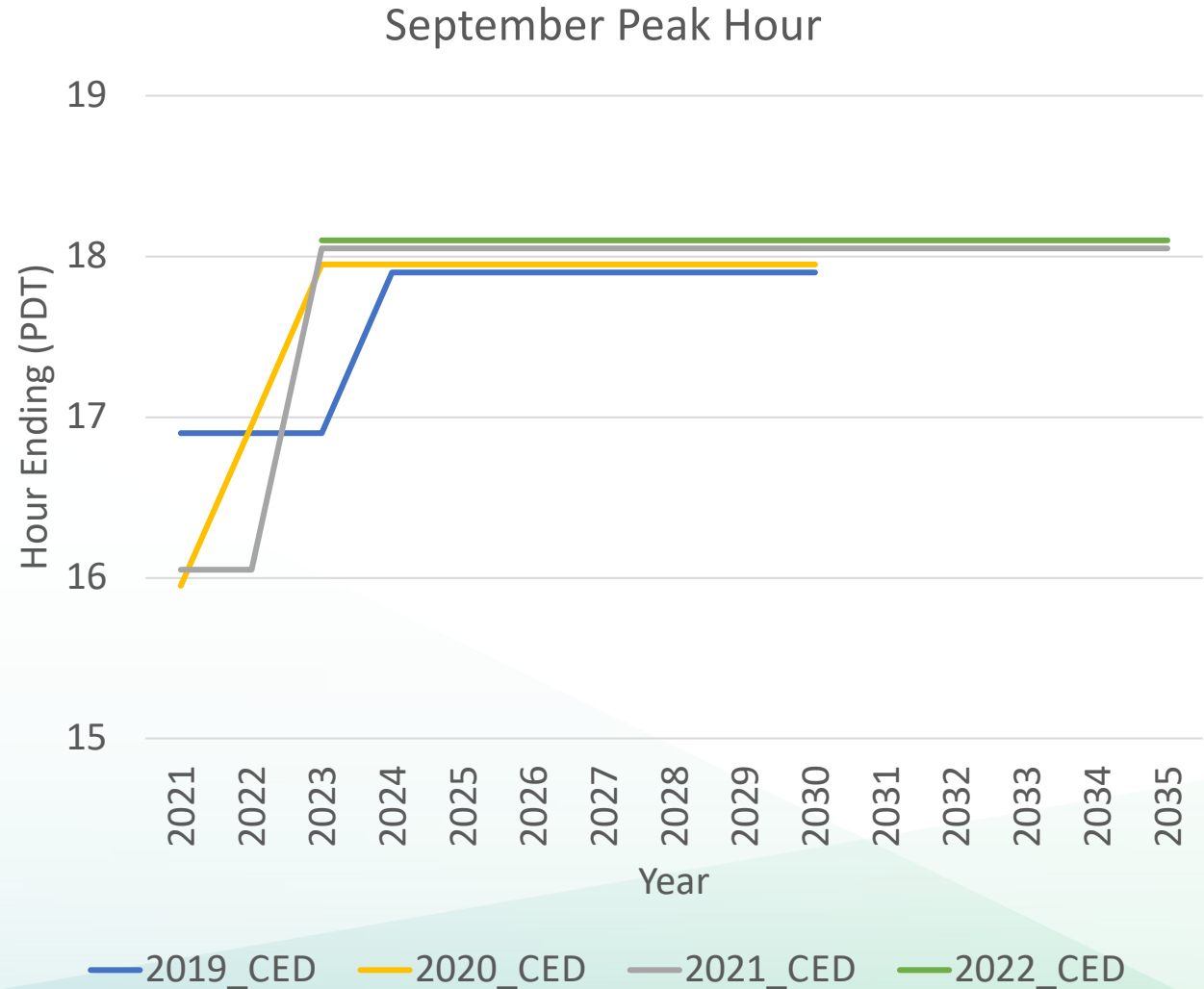
- Demands are the peak day for each summer month from the September draft 2022 CED Planning Forecast
 - The Draft - CED Hourly Forecasts CAISO Planning Scenario





Peak Demand Time Shift

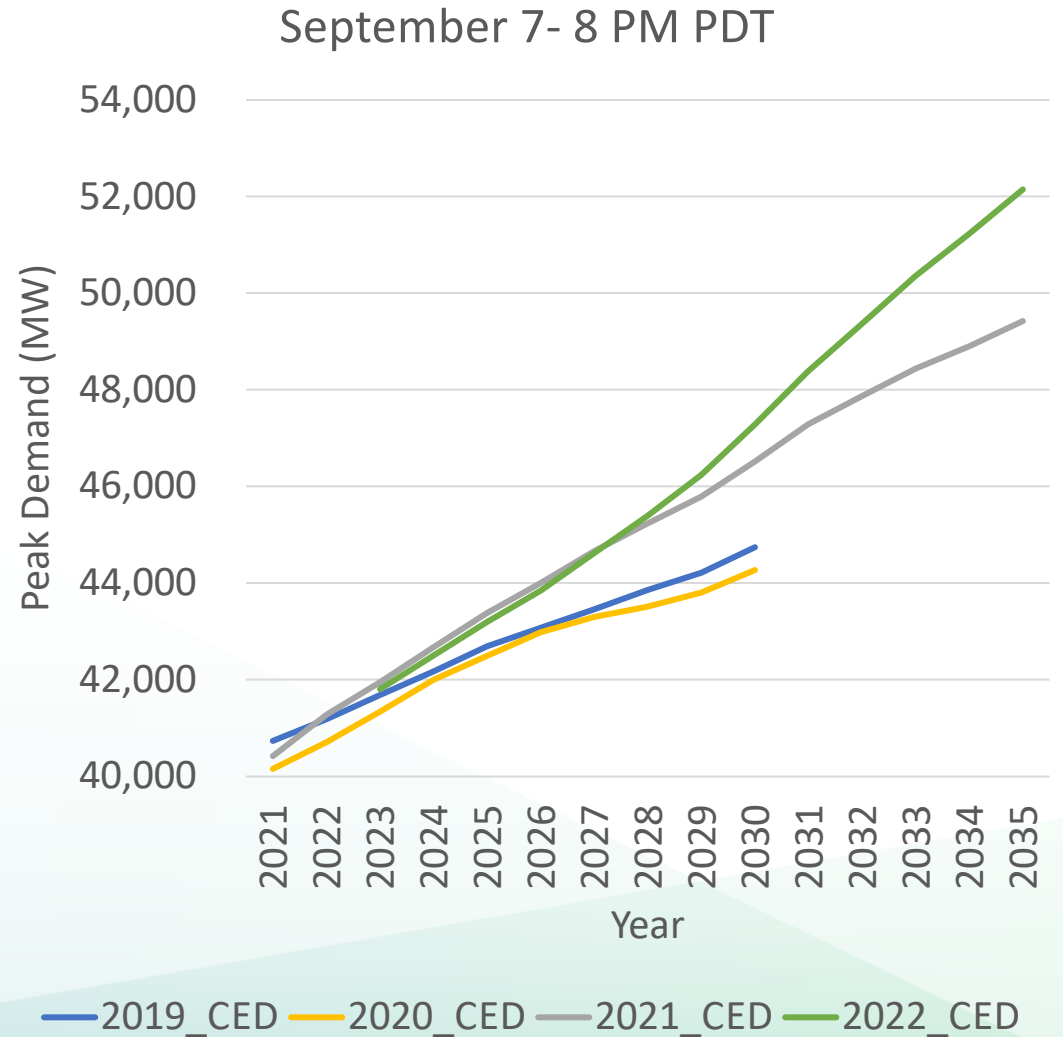
- Peak time is shifting to later in the day, from late afternoon to early evening, specifically the 5-6 pm (PDT) hour.





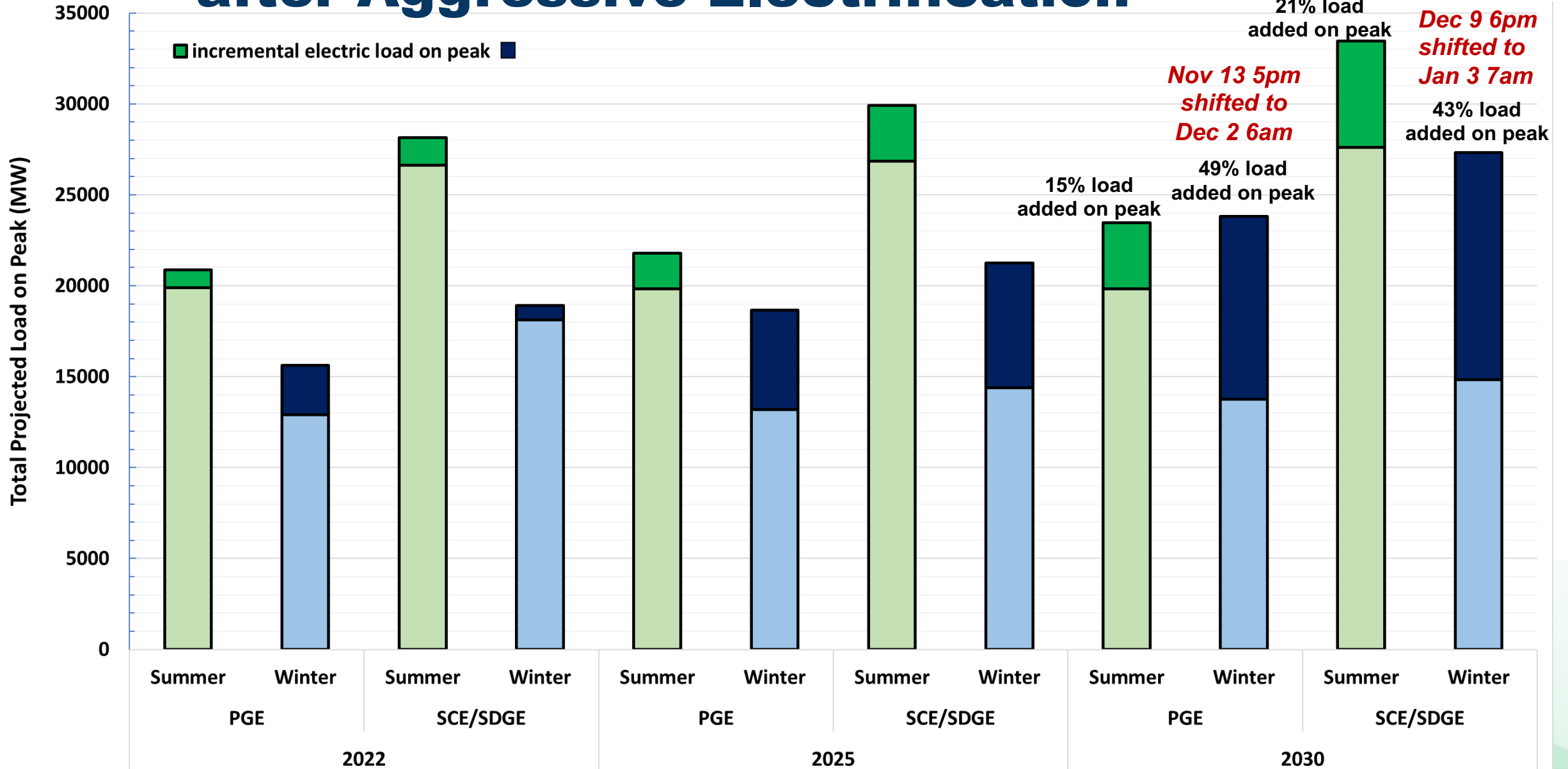
Demand Between 7 pm and 8 pm

- Demand between 7 and 8 pm PDT show a rapidly increasing trend through the CED
 - For the 2022 CED the annual increase is nearly 900 MW
 - An almost 200 MW higher annual increase than the peak





Summer and Winter Peak Load Impacts after Aggressive Electrification





Supply: Overview

- Existing Resources
 - CPUC November 2022 NQC list, includes resources as of October 2022
- Resource updates:
 - Procurement order additions
- Demand Response:
 - IOU DR monthly projections published by the CPUC in the Load Impact Protocol Reports

	July	August	September
Demand Response (MW)	1,159	1,194	1,202

- RA Imports:
 - 5,500 MW, across all hours and months, this increases by approximately 350 MW NQC from new OOS resources
- Unavailable Resources:
 - 3,700 MW of OTC plants (retired or unavailable for RA by end of 2023)
 - 2,280 MW of DCCP (assumed retired starting in 2025 analysis year)



Supply: Wind and Solar

Hourly shapes are developed and used from actual generation in the CAISO region 2014-2021

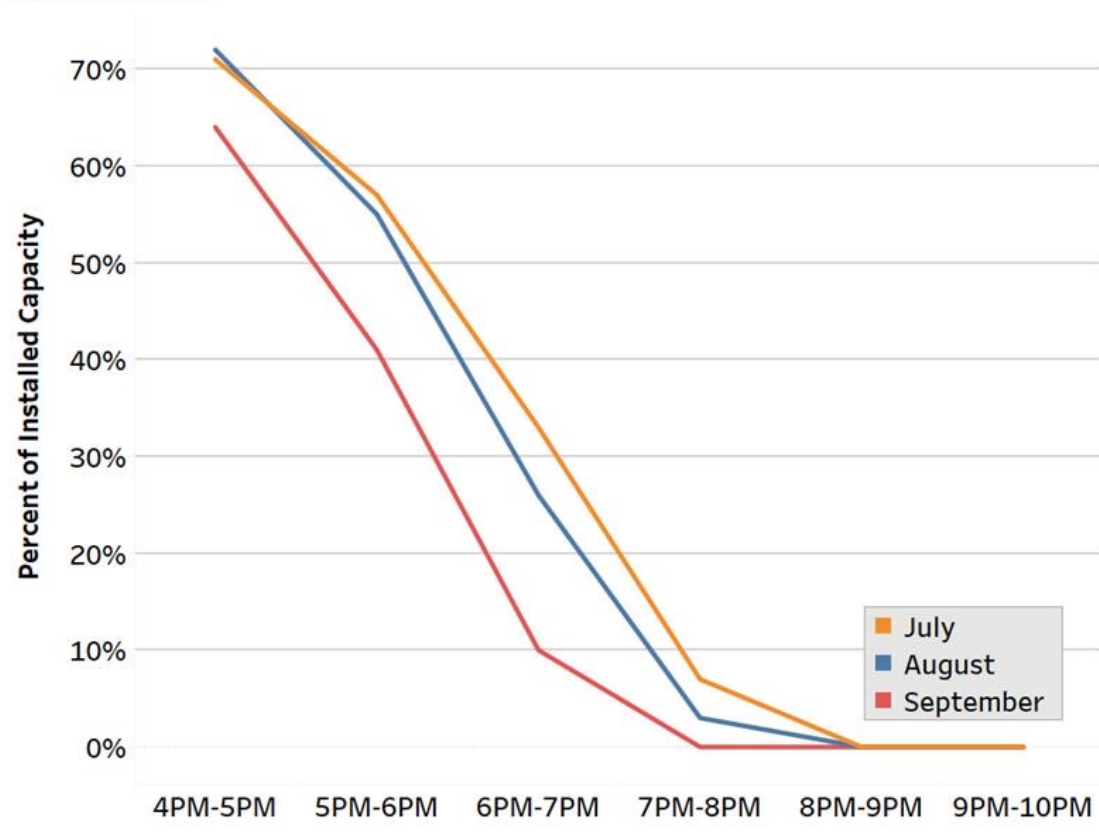
1. Individual profiles are normalized by installed capacity and added together
2. Using historic hourly demand data, the five highest load days of each month for each year were found
3. The median and 20th percentile daily profile was identified for each resource
4. The hourly profile is

$$\text{Hourly Profile} = (0.2 \times 20^{\text{th}} \text{ percentile}) + (0.8 \times \text{Median})$$

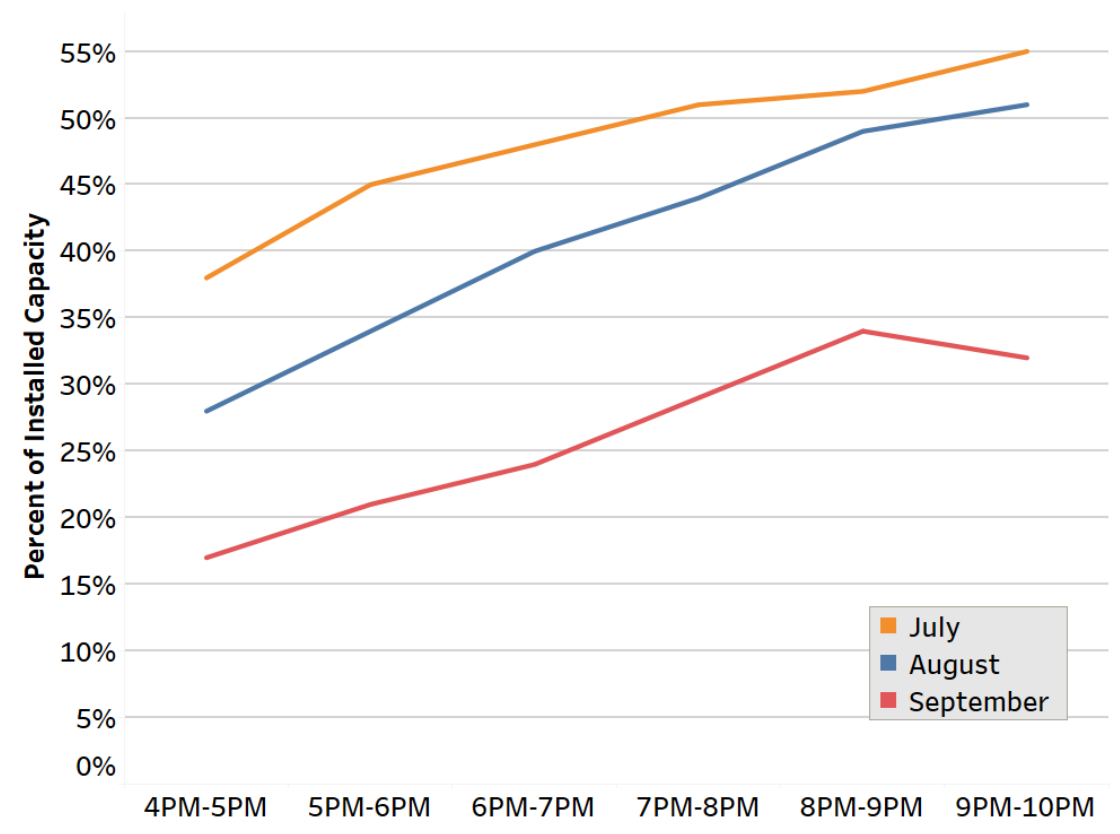


Supply: Wind and Solar

Solar_Profile



Wind_Profile





Supply: Battery Storage

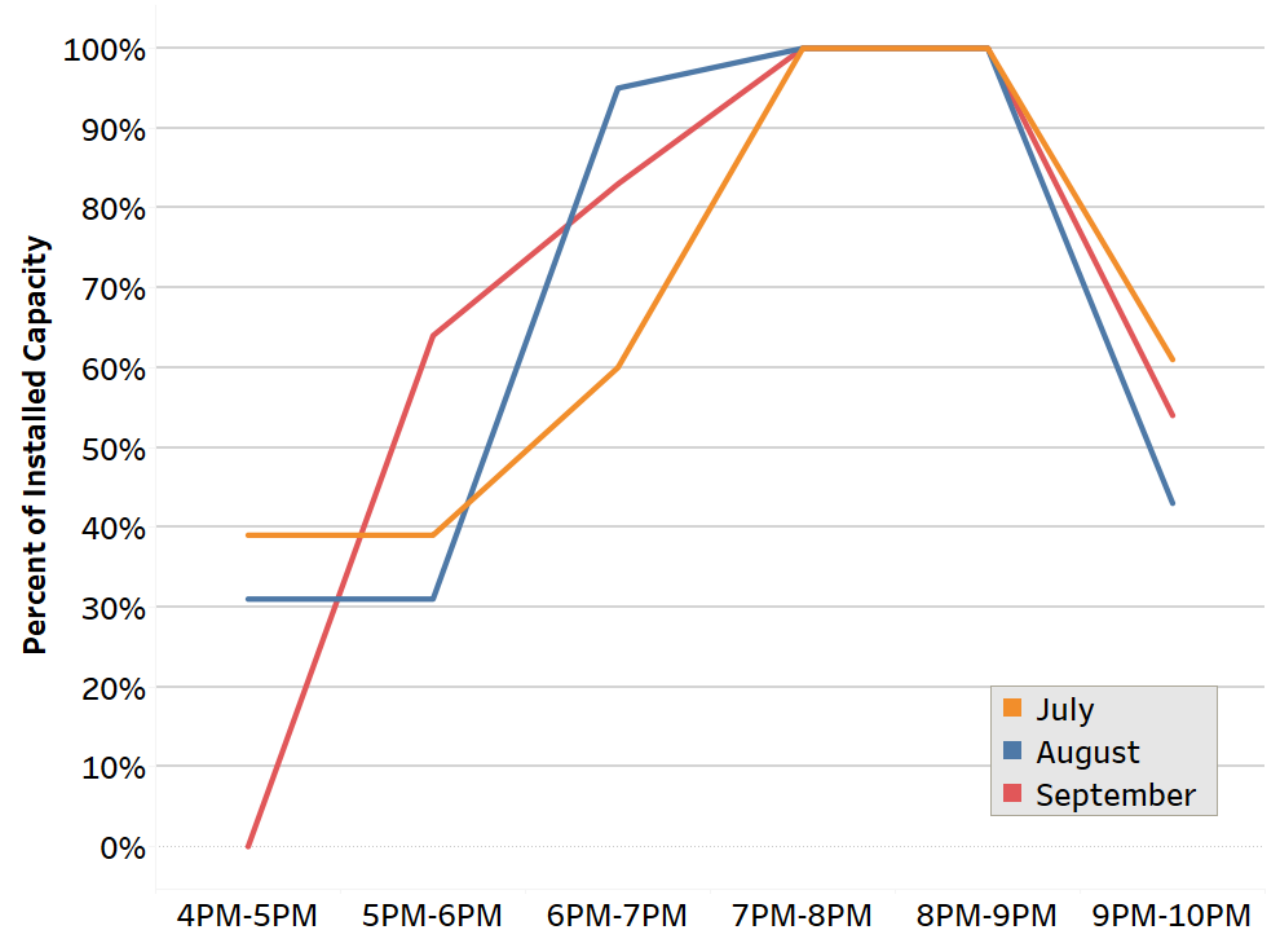
- Battery storage was optimized for each month, year, and scenario
- It is assumed that the total battery power capacity is available, and a full 4 hours of energy capacity is available for each day
- Battery Optimization process:
 1. Find the capacity shortfall if batteries discharge at full all day
 2. Eliminate batteries from the stack
 3. Redistribute discharge only to hours where the new shortfall exceeds the capacity shortfall from step 1
 4. If additional energy is available, it is used to reduce the duration of the shortfall event
 5. If additional energy is available, remaining energy is applied to hours 4 pm through 10 pm



Supply: Battery Storage

- Battery discharge shape:
 - 2023
 - Procurement Order Additions
 - 40 percent resource delay
- Shapes will be different for other years, resource additions, and delay or reduction scenarios

Battery_Profile





Resource Additions: Authorized Procurement to date

The procurement order resource build includes the remaining procurement associated with D.19-11-016 and D.21-06-035.

MW NQC	2021	2022	2023	2024	2025	2026	2027	2028
D.19-11-016	1,650	2,475	3,300	3,300	3,300	3,300	3,300	3,300
D.21-06-035	-	-	2,000	8,000	9,500	9,500	9,500	11,500
Total Ordered	1,650	2,475	5,300	11,300	12,800	12,800	12,800	14,800
Contracted Procurement	1,536	3,428	6,453	9,061	9,529	9,683	9,619	9,587
Remaining Need	114	(953)	(1,153)	2,239	3,271	3,117	3,181	5,213
Incremental NQC from 2022	-	-	3,025	8,825	10,325	10,325	10,325	12,325



Resource Additions: Authorized Procurement to Date

The nameplate capacity additions recommended by the CPUC and adjusted to match the October 2022 Baseline.

Nameplate (MW)	2023	2024	2025	2026	2027	2028
Solar	1,973	6,278	7,306	7,732	7,732	7,731
Battery	2,820	8,536	11,138	11,601	11,601	12,784
Wind	91	311	480	458	458	458
Geothermal	26	80	94	108	134	1,191
Biomass/Biogas	0	0	0	0	0	0
Offshore Wind	0	0	0	0	0	0
Pumped Hydro	0	0	0	0	0	0
Shed DR	42	63	69	68	68	69
Thermal	0	0	7	7	7	7
OOS Wind on New Transmission	0	0	0	0	0	0
Total	4,952	15,268	19,094	20,001	20,001	22,241

Note: The procurement order build has the procurement of the long lead time resources in 2028. Shown as geothermal and battery resources.



Reliability Outlook Scenarios

- **Capacity Additions:** Procurement Orders
 - One-year delay of 0%, 20%, 40% of the incremental additions
- **Demand Forecast:** The 2022 Draft - CED Hourly Forecasts CAISO Planning Scenario
- **Extreme Conditions:** 2020 Equivalent Event and 2022 Equivalent Event
- **Compounding Condition:** High Fire Impact Risk

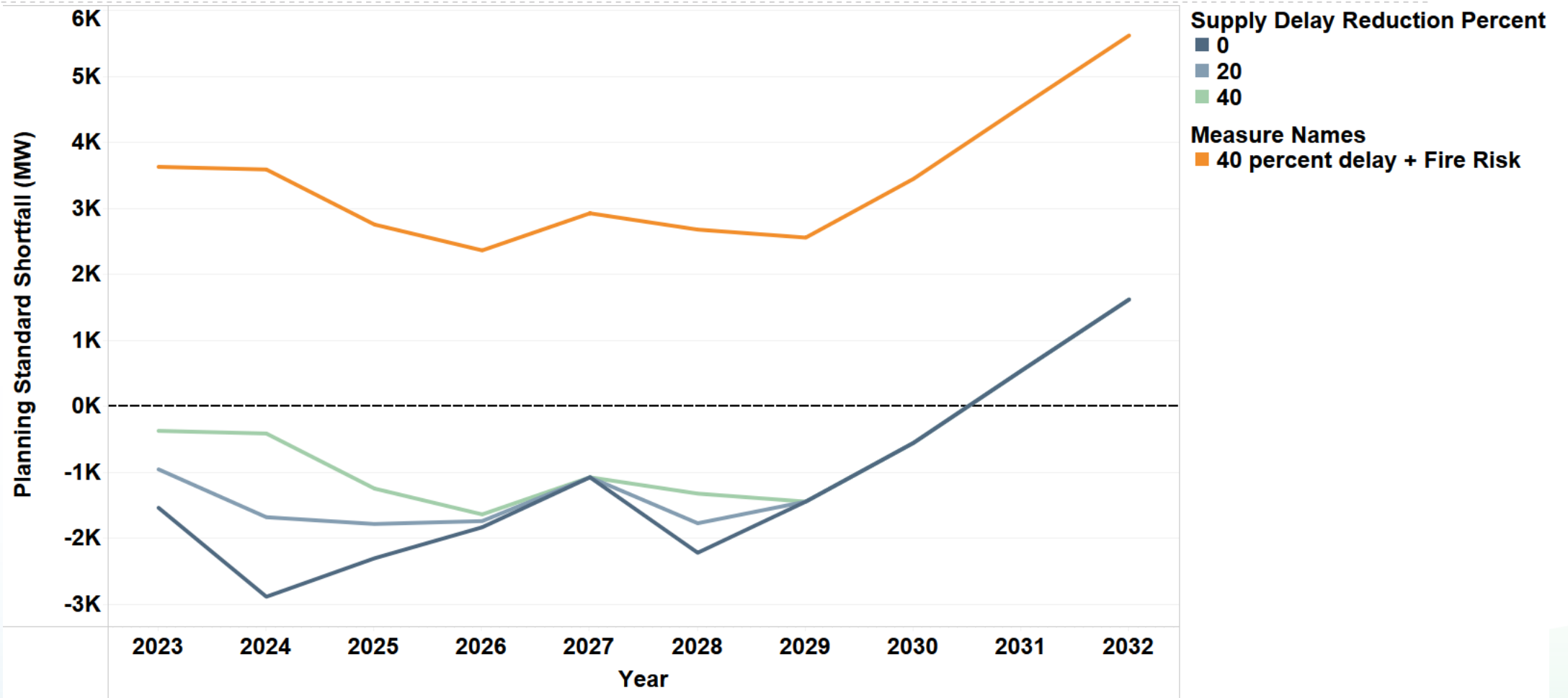


Extreme Event Analysis Results for the Procurement Order Build



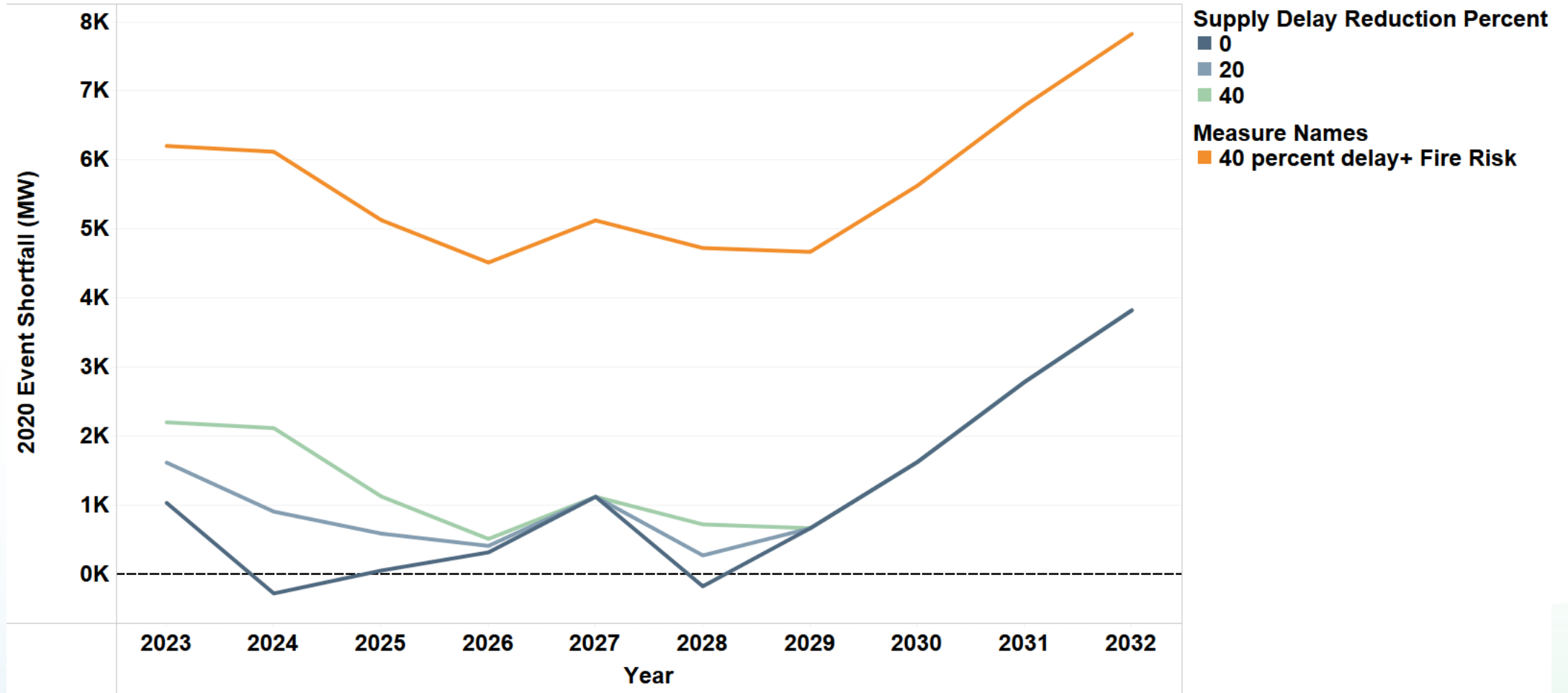


17% PRM Planning Standard Case



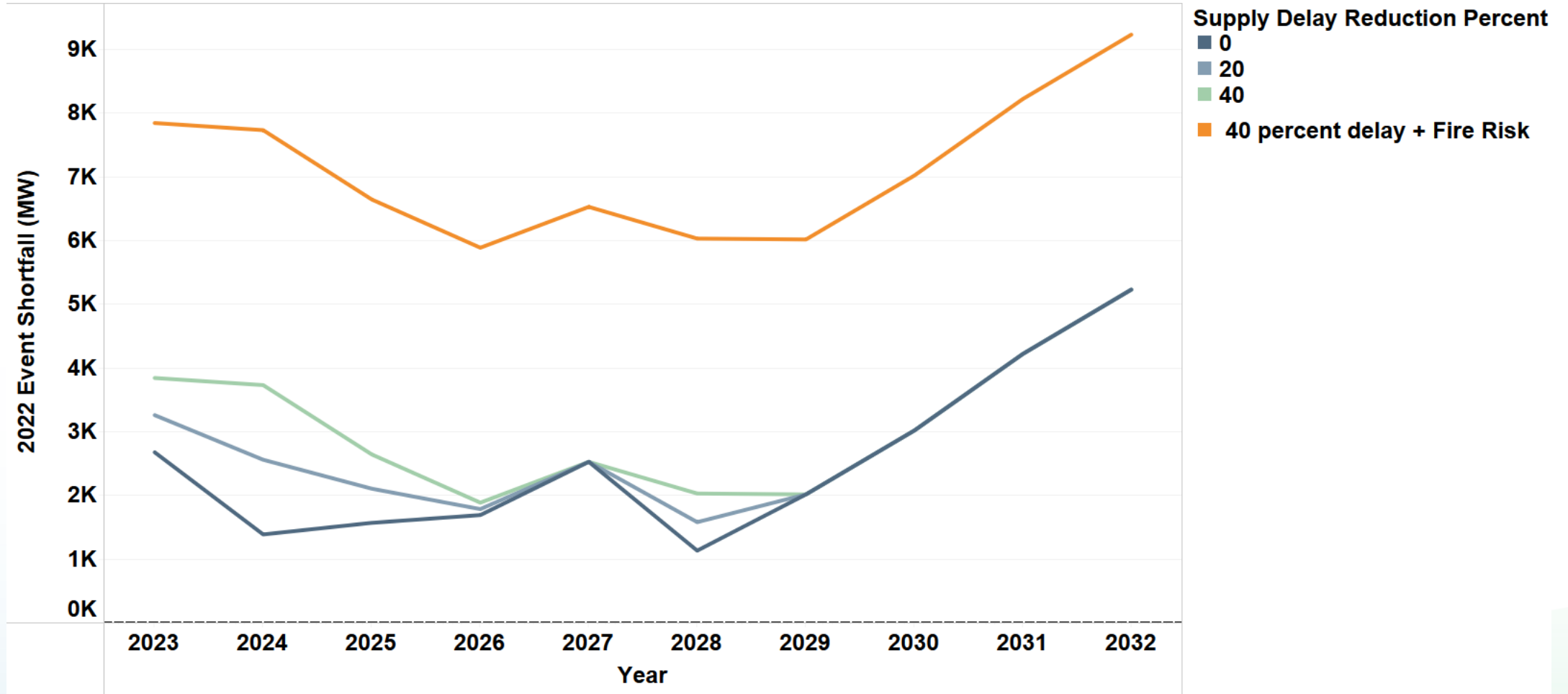


2020 Equivalent Event





2022 Equivalent Event





Conclusion

Based on the assumptions discussed (authorized procurement with up to 40 percent annual delay in project development and 5500 MWs of import availability during critical hours), **significant grid reliability risks persist through 2030 under conditions experienced in 2020 and 2022**



Prudency of Extending Diablo Canyon





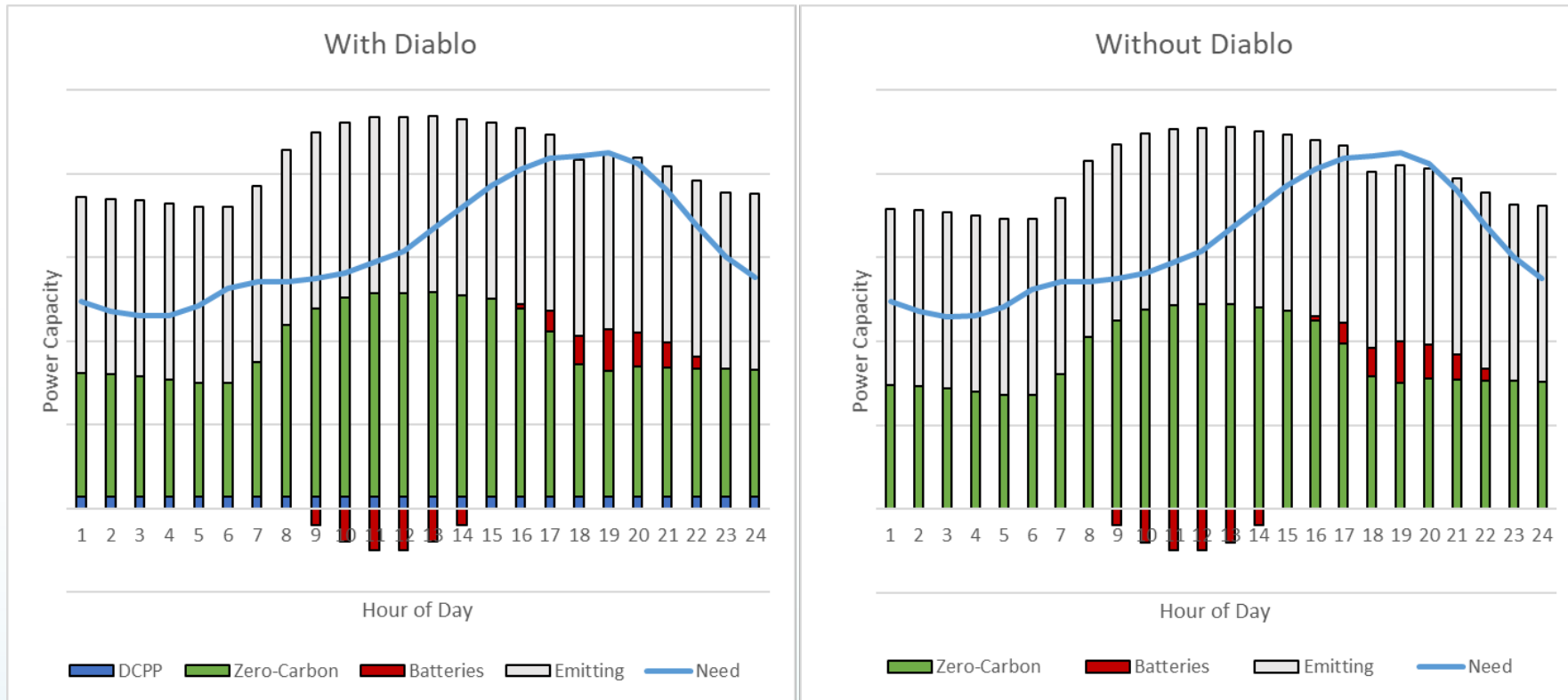
Uncertainties Impact Reliability

- Current authorized procurement meets planning standards in the near term
- Uncertainties
 - Modeling – does not capture the complete picture
 - Demand changes from electrification and new trends in usage patterns
 - Lack of historical data and high variability in future projections of climate impacts, availability in imports, hydro conditions etc.
 - Build Rate & Market Dynamics – unprecedented rate of build is required yet there are potential challenges we must address
 - Build impacted by supply chain, interconnection, permitting, and costs
 - Increasing levels of authorized procurement does not automatically result in proportionate levels of build out rates
 - Tightness in the RA Market – although 2023 looks good in analysis, RA showings reflect resource tightness
 - Extreme events becoming more frequent
 - Analysis continues to suggest high levels of supply shortfall under conditions experienced in 2020 or 2022



Extending Diablo Canyon

- Maintains availability of a low carbon, firm resource



Note: Figures are for illustrative purposes only. Diablo Canyon Power Plant's power capacity is approximately to scale with the total power capacity of the system.



Preliminary Staff Determination

- Staff conclude that it would be prudent to continue to pursue Diablo Canyon extension until necessary resources are online or assessment of viable alternatives is clearly established



Extending Diablo Canyon

- Next Steps
 - Report on Cost Comparison of Alternatives (CEC – Sept 2023)
 - Report on new additions and the need for Diablo Canyon (CPUC – Dec 2023)



Clean Energy Reliability Plan





Clean Energy Reliability Investment Plan

- SB 846 requirement
 - Accelerate the deployment of clean energy resources
 - Support demand response
 - Support reliability
 - Advance the state's clean energy and greenhouse gas emissions policies
 - Support the loading order
- Proposed funding (not currently appropriated)
 - 2023/24 - \$100M
 - 2024/25 - \$400M
 - 2025/26 - \$500M



Critical Reliability Challenges

- Planning
 - Modeling not sufficiently accounting for climate change
 - Lag in procurement to meet demand
 - Insufficient transmission capacity for anticipated resource build
 - Limited bandwidth in communities to provide input
 - Structural challenges in bringing new resources online in a timely manner
 - Interconnection, permitting and supply chain delays
 - Difficulty financing large resources
- Insufficient scale and diversity of viable and diverse commercial technologies (supply and demand side)
 - Insufficient deployment of demand side resources
 - Lack of developer/customer acceptance for newer technologies
 - Potentially higher costs until scale is reached
- Extreme events
 - Potentially need additional resources to provide grid support for reliability
 - Need to diversify and expand clean energy options



Proposed CERIP Funding Initiatives

- Planning
 - Support additional transmission planning
 - Provide financial support to community-based organizations to support planning
 - Support existing institutions and develop new ones, as needed, to ensure timely development of long lead time resources
 - Provide resources to entities to overcome interconnection and permitting delays
- Diversify and support clean energy technology deployment (bulk grid), such as
 - Incentives or cost share to scale up commercially ready technologies
- Expand and diversify demand side resource options, such as
 - Demand flexibility
 - Community scale assets (e.g., microgrids)
 - Solutions such as vehicle-grid integration and building to grid
- Strategies to support extreme events
 - Provide additional resources to DSGS and DEBA programs
 - New programs to support higher tiers of demand flex that can be relied on in the net peak



Proposed Governor's Budget

Initiative	Proposed Funding
Planning and Enabling Structures to Support Clean Energy Deployment	
• Transmission Planning	\$2M
• Assistance for Community Based Organizations Working with State	\$8M
• Standup Central Procurement	\$32M
• Resources for State & Local Agencies Involved in Development Process	\$15M
Extreme Event Support	
• Augment Resources in Extreme Events (e.g., DSGS, Ag/Water Agencies)	\$33M
Administration	\$10M
Total	\$100M



Q&A



Public Comment



Zoom

- Use the “raise hand” feature to make verbal comments



Telephone

- Dial *9 to raise your hand
- *6 to mute/unmute your phone line. You may also use the mute feature on your phone



When called upon

- Your microphone will be opened
- Unmute your line
- Spell your name and identify your organization, then start your comment



Closing Comments