

DOCKETED	
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Docketed Date:	8/30/2021



Lead Commissioner Workshop

**Midterm Reliability Analysis & Incremental Efficiency
Improvements to Natural Gas Power Plants**

The workshop will begin shortly

August 30, 2021



Lead Commissioner Workshop

Midterm Reliability Analysis & Incremental Efficiency Improvements to Natural Gas Power Plants

August 30, 2021



Introduction

- Liz Gill – Advisor to Commissioner Gunda
 - Remote meeting consistent with EO N-08-21
 - Single session: 9:30 – 12:30
 - Public comments by September 7, 2021



CEC Docket 21-ESR-01

Submit comments by 9/7/2021



Review docketed comments





Agenda

- Opening Comments (9:35-9:45)
- Background (9:45-9:55)
- Midterm Reliability Analysis (9:55 – 10:55)
- Energy Storage and Reliability (10:55 – 11:45)
- Role of Jurisdictional Power Plant Program to Support Reliability (11:45 – 12:15)
- Public Comments and Closing Remarks (12:15 – 12:30)





Opening Comments

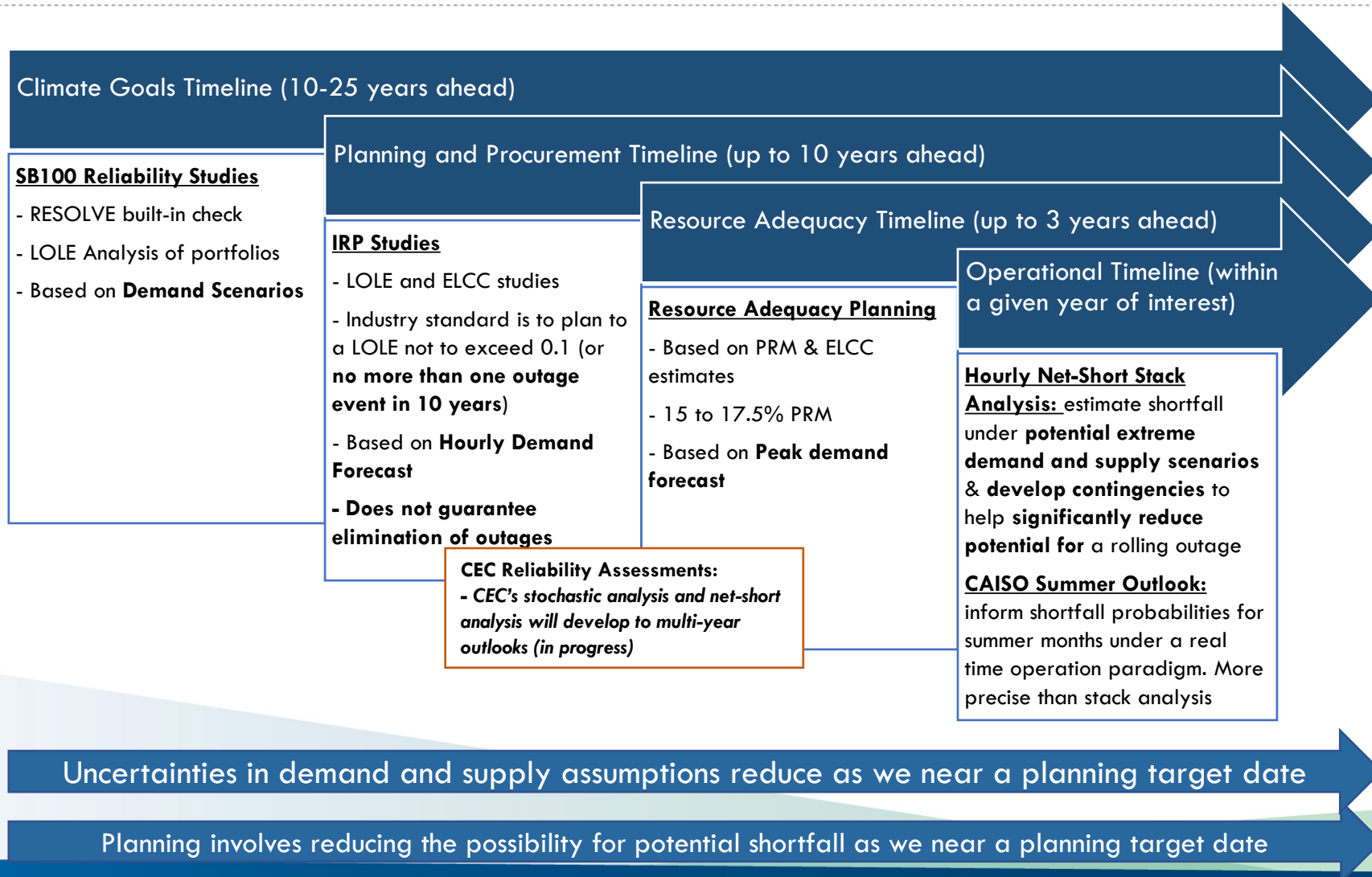
- **Siva Gunda, Commissioner, CEC**
- **Karen Douglas, Commissioner, CEC**
- **Cliff Rechtschaffen, Commissioner, CPUC**
- **Darcie Houck, Commissioner, CPUC**

Midterm Reliability Analysis & Incremental Efficiency Improvements to Natural Gas Power Plants: Background





Reliability Analysis Over Different Planning Horizons





Scope of the Midterm Reliability Assessment

Track 1a- Midterm Capacity Needs

Is additional capacity beyond current procurement orders needed to maintain reliability?

Approach: Loss of load expectation (LOLE) analysis on the CAISO system with:
1) CPUC Ordered Procurement
2) Proposed Preferred System Plan

Limitations:
Resource retirement assumptions
Climate risk to supply and demand

Track 1b- Evaluating Thermal Need

Do incremental thermal resources provide an additional reliability benefit compared to a portfolio of preferred resources?

Approach: LOLE analysis with 1:1 NQC basis replacement of preferred resources with thermal resources.

Limitations:
Extreme scenarios exploring resource insufficiency for charging of batteries

Track 2- Battery Risks

What are the potential risks to battery deployment and performance?

Approach: Evaluate battery performance in 2021. Stakeholder perspective of supply chain and development risks.

Track 3- Permitted and Potential Thermal Capacity Additions

What are the range of options available for incremental additions of thermal resources?

Approach: Assessment of thermal incremental capacity options at existing natural gas facilities

Discussion of permitting timeline for incremental capacity options



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Midterm Reliability Analysis

August 30, 2021
Mark Kootstra





Agenda

- Purpose
- Assumptions
- Scenarios
- Results
- Takeaways



Purpose

Primary: Determine if additional capacity beyond current procurement orders needed to meet the standard LOLE of 1 day with unserved energy every 10 years, or 0.1 days/year?

Secondary: Does new gas capacity improve reliability compared to a portfolio of new preferred resources with equivalent NQC values?



This Study

Is Designed to:

- Provide more insight into reliability from the RA program than a deterministic supply stack.
- Incorporate some chronological impacts on system operation (energy storage).
- Focus on May – October.

Is not Designed to:

- Model actual dispatch of the system.
- Analyze actual system reliability from all available power plants.
- Consider energy demands outside of the CAISO.
- Incorporate RPS, GHG, or other policy and environmental impacts or limits on system operations.
- Study November – April.
- Incorporate recently observed extreme weather events.
- Qualitative concerns related to resource deployment.



This Study v. the 2022 Supply Stack

	MTR	Supply Stack
Demand	Considers a wide spread of demand possibilities, built with the 2020 CED	2020 CED with different PRM adjustments to account for average and extreme weather impacts
Hydro	NQC from the CPUC's reliability needs assessment	Supports implications of the drought continuing into 2022
Imports	CPUC modeling assumptions	2015-2020 average CAISO RA showings
Resource Build	Multiple resource builds aligned with the proposed preferred system plan	Anticipated resource procurement, prior to the proposed PSP
Wind	7 years of historic CAISO wind generation	Anticipated 2022 NQC values for wind
Solar	7 years of historic CAISO solar generation	Average projected solar shapes by month
Forced Outages	Probability based	Incorporated into the PRM
Reserves	Directly modeled	Incorporated into the PRM



Important Note

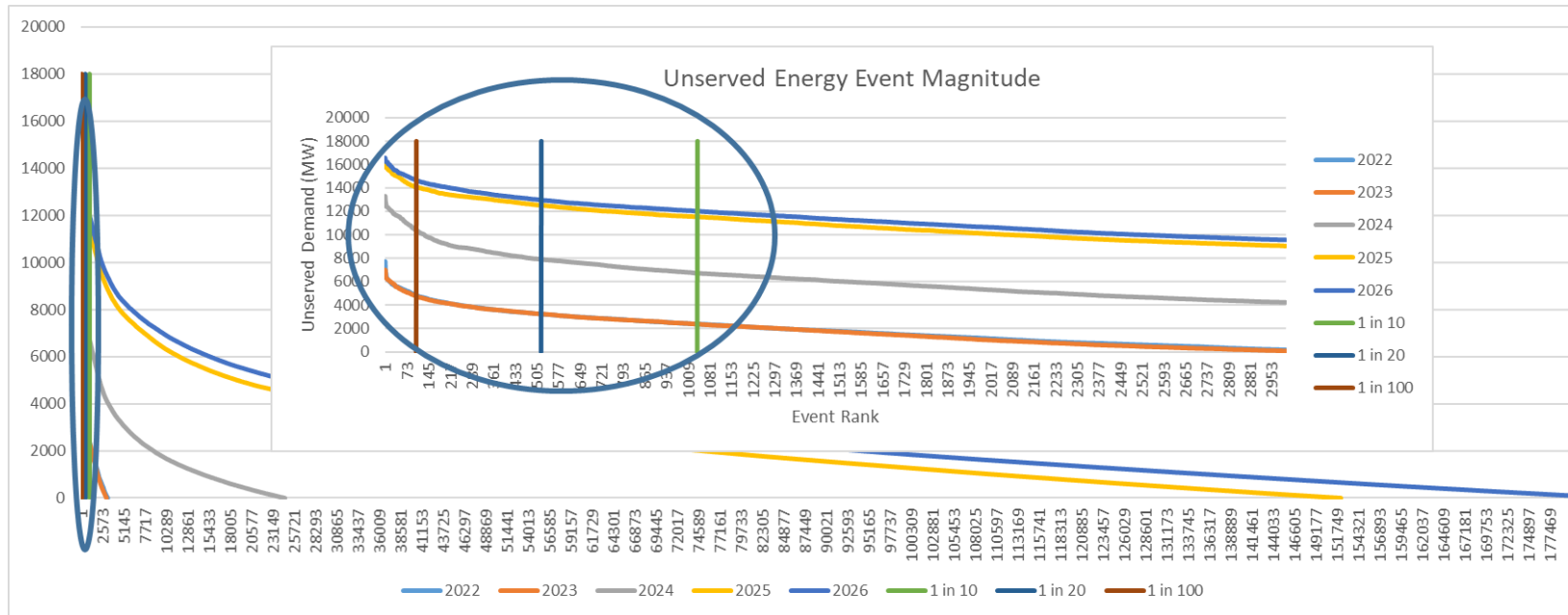
All models are at best an approximation of the system they represent, not exact replicas.

The model used in this analysis is intentionally selecting simplified assumptions to increase the number of samples evaluated of an increased number of scenarios, in a short time period. Thus, outputs of the model are dependent on the inputs and assumptions used in the model.

Results of this study should be viewed as information that can help determine appropriate courses of action, and not a prediction of the future.



Unserved Energy Event Duration Curves



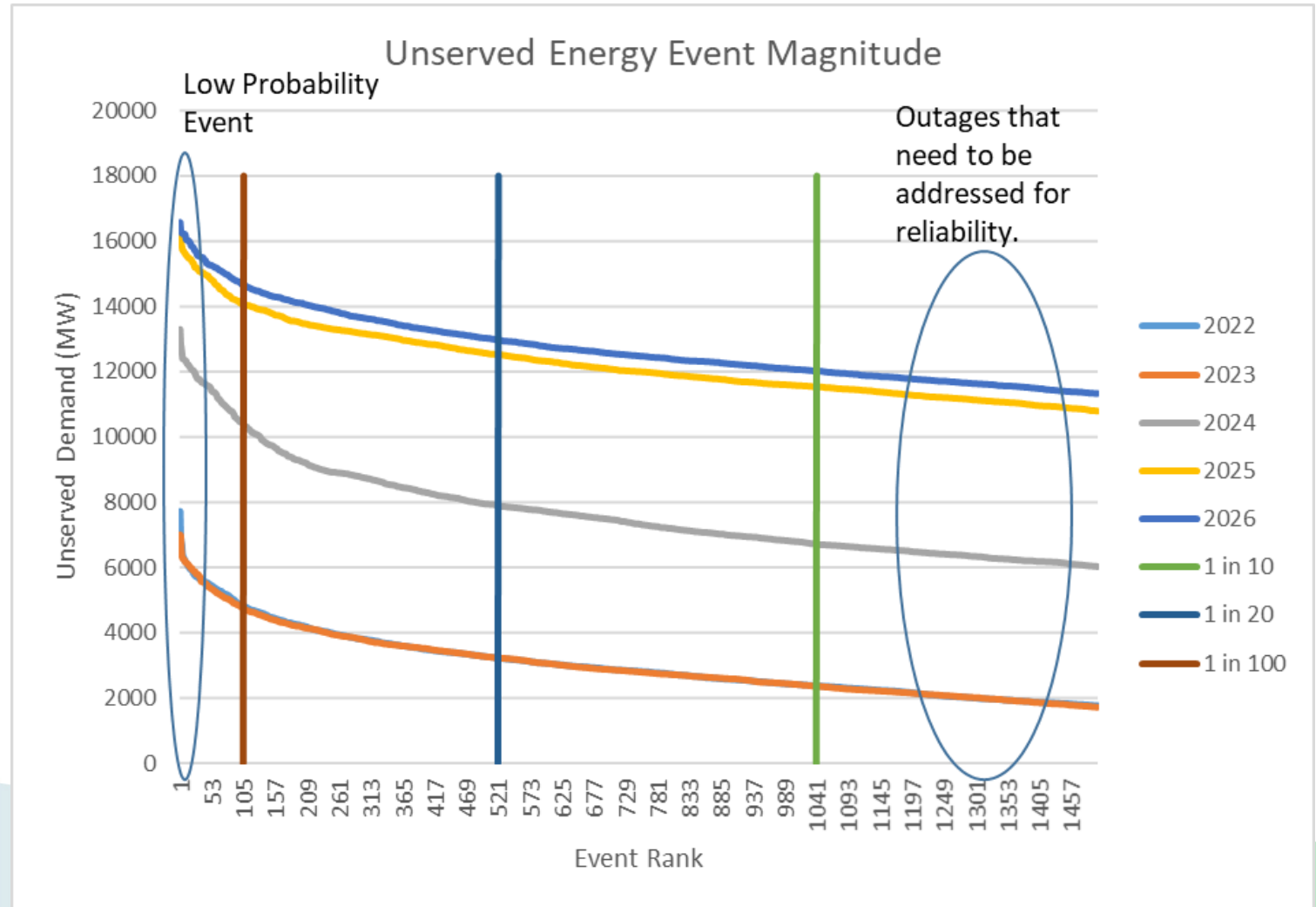
- Each unserved energy event is ranked from greatest to least
- Graphics focus in on rankings up to the 1 in 10 shortfall capacity

- For 10,400 samples (years modeled) 1 shortfall event in:
 - 10 years is the 1,041st highest event
 - 20 years is the 521st highest event
 - 100 years is the 105th highest event



Continuing with the Curves

- Events to the right of the 1 in 10 vertical line must be addressed to meet reliability accounting
- Events near rank 1 are low probability events



Inputs and Assumptions





General Inputs

- **Demand:** 140 demand distributions, built using assumptions for the 2020 CED. 7 profiles for 20 weather years (2000-2019).
- **Wind and Solar:** CAISO data from 2014-2020, 1 wind and 1 solar profile per year. Modeled as full capacity, with the profiles, not ELCC or NQC values.
- **Hydro:** Modeled as an the applicable NQC value, a hydro budget was determined to have little impact on the model with the given assumptions.
- **Demand Response:** Energy limited to 4 hours budget per day, and 80 hours budget per year.
- **ELCC and Technology Factors:** Made use of the marginal ELCC values and technology factors from the CPUC's Reliability Needs Assessment.



Imports

- Import Assumptions align with the CPUC's Reliability Needs Assessment used to inform the 11,500 MW of NQC procurement for Hours Ending 17-22 PST.

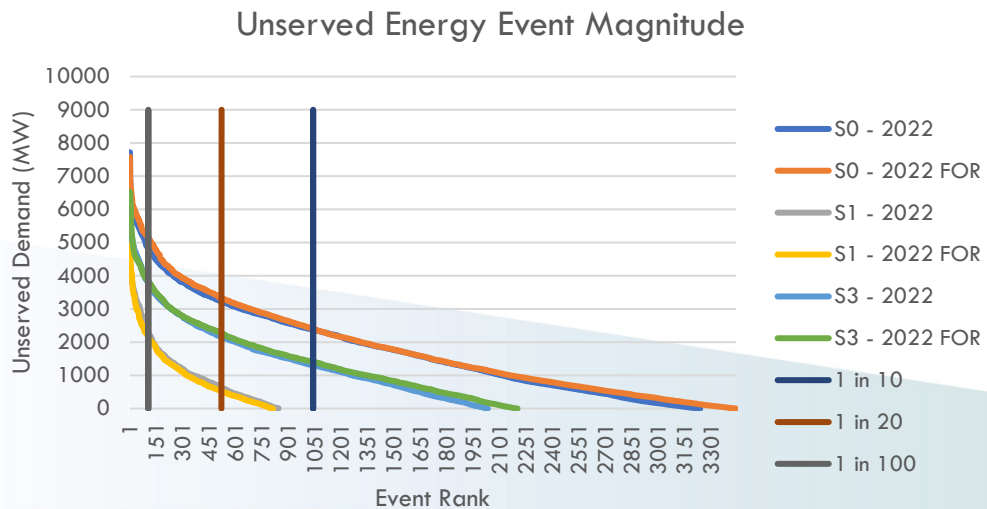
	2022	2023	2024	2025	2026
Imports - Unspecified	5,000	5,000	4,000	4,000	4,000
Imports - Specified	1,981	1,981	1,981	1,592	1,600

- Imports for all other hours are capped at the maximum import capacity of 10,800 MW.



Forced Outages

- Outages were applied on a standard unit size.
- Capacity weighted Thermal FOR:
 - 2022: 7.6%
 - 2026: 6.8%
- Tests were performed for different unit sizes.
 - Little impact was noted.



Technology	Forced Outage Rate (%)	Mean Time to Repair (h)	Standard Unit Size (MW)	Test Unit Size (MW)	CAISO Median Unit Size (MW)	CAISO Mean Unit Size (MW)
Combined Cycle	3.69	24	100	600	583	619.0
Gas Turbine	11.66	24	100	125	49.8	125.4
Cogen	13.84	24	100	50	49.8	125.4
Gas-Other	13.84	24	100	40	9.9	40.1
Nuclear	1.92	24	1140	1140	N/A	N/A
Geothermal	7.2	24	25	25	N/A	N/A
Biomass	8	24	10	10	N/A	N/A
Imports - Specified	3.69	24	100	100	N/A	N/A
Energy Storage 4 h	5	24	10	10	N/A	N/A
Energy Storage 8 h	5	24	10	10	N/A	N/A
Pumped Hydro Storage	5.77	24	100	100	N/A	N/A

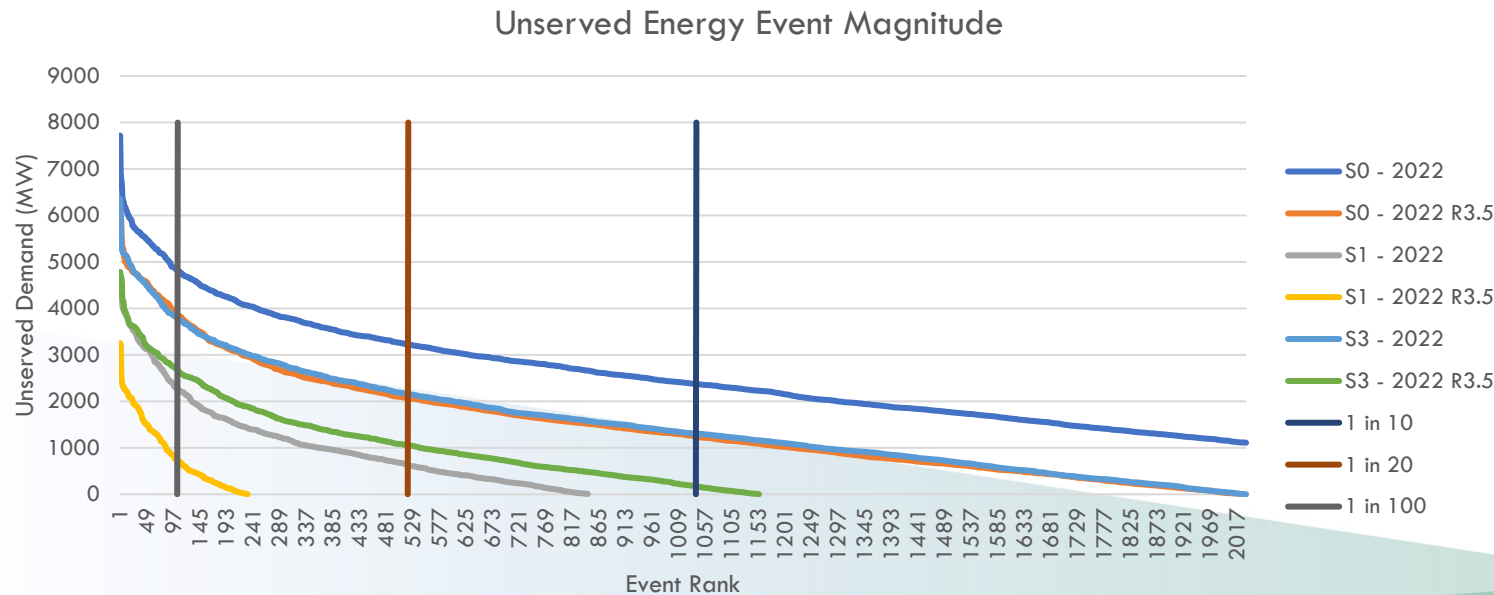
Forced outage rates source: January 25, 2021 presentation to WECC by Yi Zhang of the CAISO.
<https://www.wecc.org/layouts/15/WopiFrame.aspx?source=doc=/Administrative/Zhang%20-%20FOR%20PCMS.pdf&action=default&DefaultItemOpen=1>

CAISO Unit Size: CEC Staff Analysis



Reserves

Technology (MW)	2022	2023	2024	2025	2026	Price (\$)
Combined Cycle	2,500	2,500	2,500	2,500	2,500	2
Gas Turbine	2,500	2,500	2,500	2,500	2,500	2
Hydro	1,000	1,000	1,000	1,000	1,000	3
Energy Storage 4 h	1,000	1,250	1,500	1,750	1,750	1
Energy Storage 8 h	-	-	-	-	250	1



- Reserves were independently modeled at 6%.
 - Tests were done at 3.5%.
- Resources are required to be able to deliver energy for 30 minutes to offer reserves.
- Price was used only to set a dispatch priority.
- Max reserve contribution by resource type is in the table below.



Cumulative Age Based Gas Retirements

- The CPUC's MTR retires 815 MW (NQC) that reaches 40 years of age.
- This retirement is backed out of several scenarios.

Cumulative (MW NQC)	2022	2023	2024	2025	2026
Gas Turbine	263	263	263	483	578
Cogen	44	60	66	175	237
TOTAL	307	323	329	659	815

Source: CPUC's Reliability Needs Assessment

Note: Due to an error, the CHP NQC values were used instead of the reconstructed nameplate capacity, decreasing the CHP capacity by 35 MW in 2026. This represents less than 0.05% of the total capacity in all years and was deemed to be a negligible impact on results.

Scenarios





Scenarios

We looked at three core scenario groupings

1. No resource build – to identify the baseline need if no new procurement occurred, just the baseline resources in the CPUC's Reliability Need Assessment.
2. PSP based resource builds
 - a. Just the PSP
 - b. PSP with no age-based gas retirement
 - c. Gas in place of the PSP
3. Procurement order builds (1,505 MW NQC from D.19-11-016, and either 9,500 or 11,500 MW NQC from D.21-06-035)
 1. Just the base procurement
 2. Procurement with no age-based gas retirements
 3. Gas in place of the procurement

All gas-based scenarios build 1/3 CCGT and 2/3 GT



Scenarios

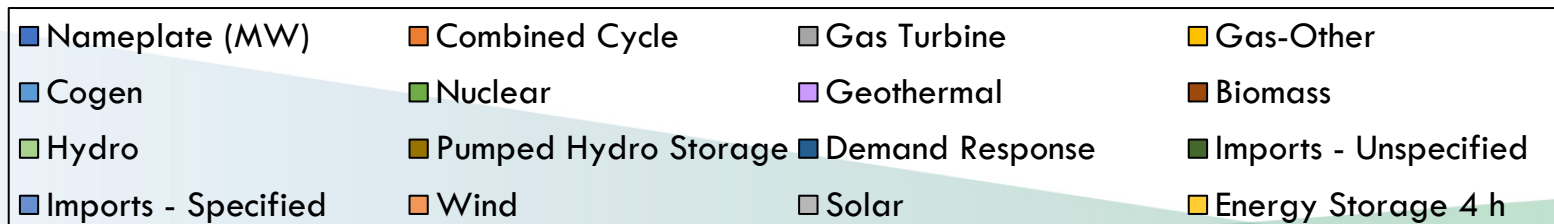
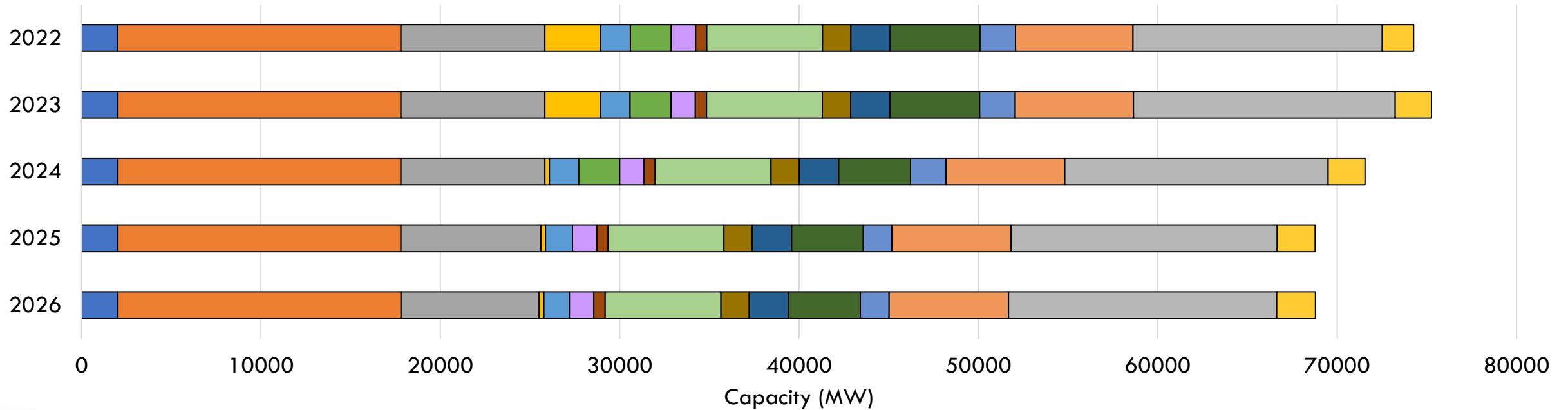
Scenarios	Build	2022	2023	2024	2025	2026	2026a
S0	No Build	S0	S0	S0	S0	S0	N/A
S1	PSP	S1/S2	S1/S2	S1/S2	S1/S2	S1	S2: PSP+
S5	PSP, no Age Based Gas Retirement	S5/S6	S5/S6	S5/S6	S5/S6	S5	S6: PSP+, no Age Based Gas Retirement
S7	Gas in place of PSP	S7/S8	S7/S8	S7/S8	S7/S8	S7	S8: Gas in place of PSP+
S9	Procurement, PSP Ratios	S9/S10	S9/S10	S9/S10	S9/S10	S9	S10: Procurement+, PSP Ratios
S11	Procurement, PSP Ratios, no Age Based Gas Retirement	S11/S12	S11/S12	S11/S12	S11/S12	S11	S12: Procurement+, PSP Ratios, no Age Based Gas Retirement
S3	Gas in place of Procurement	S3/S4	S3/S4	S3/S4	S3/S4	S3	S4: Gas in place of Procurement+

	Double Duty Runs
	Single Scenario Runs



Base Resources (No Build)

Nameplate Capacity for Resource Adequacy

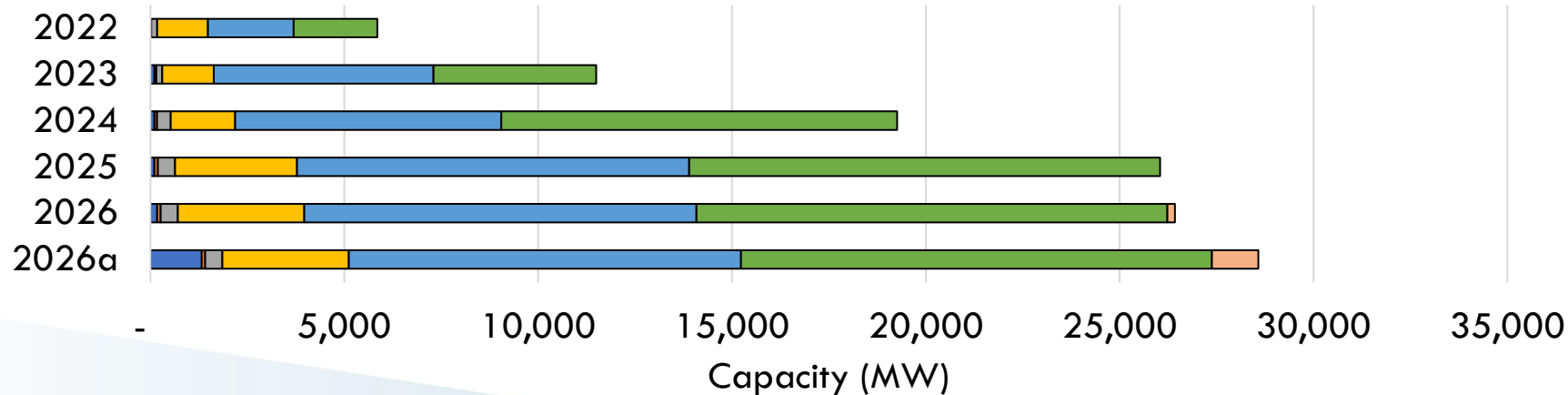




PSP Scenario Additions

- The proposed system plan was adapted in two ways:
 - Offshore wind was rolled into onshore wind.
 - 1,727 MW of capacity counted in the PSP and the baseline resources in the CPUC's Reliability Need Assessment were removed from the PSP.

Cumulative Nameplate Additions



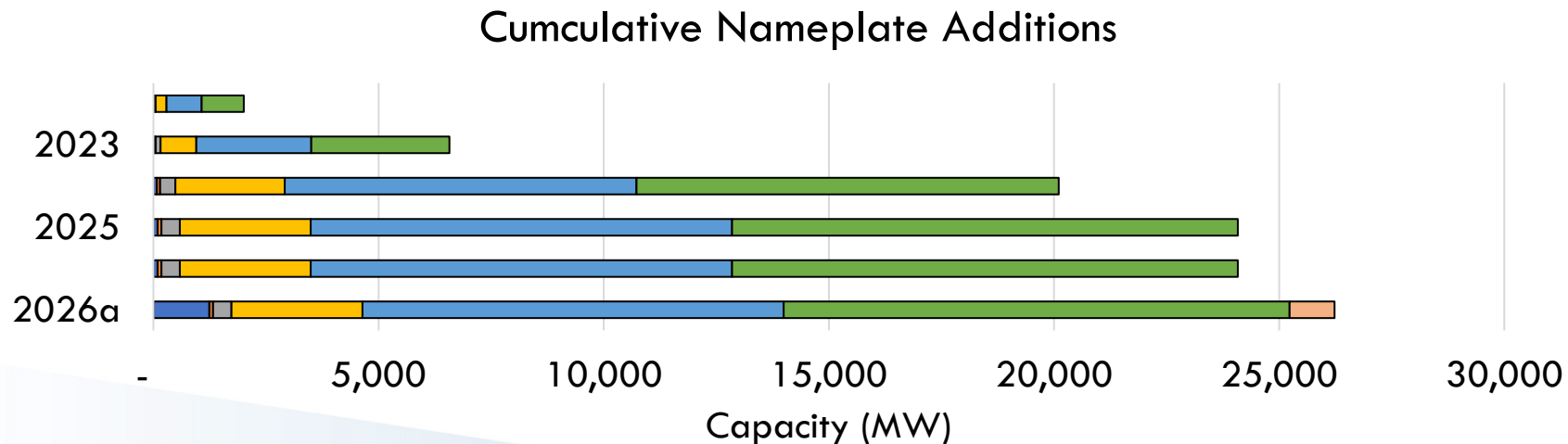
Est. NQC (MW)	
2022	2,753
2023	4,916
2024	9,907
2025	11,712
2026	12,012
2026a	14,012

■ Geothermal ■ Biomass ■ Shed DR ■ Wind
■ Solar ■ Energy Storage 4 h ■ Energy Storage 8 h



Procurement Scenario Additions

- Procurement builds are based on remaining NQC procurement in D.19-11-016 (1,505 MW NQC) and D.21-06-035 (9,500 to 11,500 MW NQC)
- Resources were built consistent with the 2026 resource ratio in the PSP, but only up to the needed NQC value for each year.



Est. NQC (MW)	
2022	1,070
2023	3,505
2024	9,505
2025	11,005
2026	11,005
2026a	13,005

Geothermal Biomass Shed DR Wind
Solar Energy Storage 4 h Energy Storage 8 h

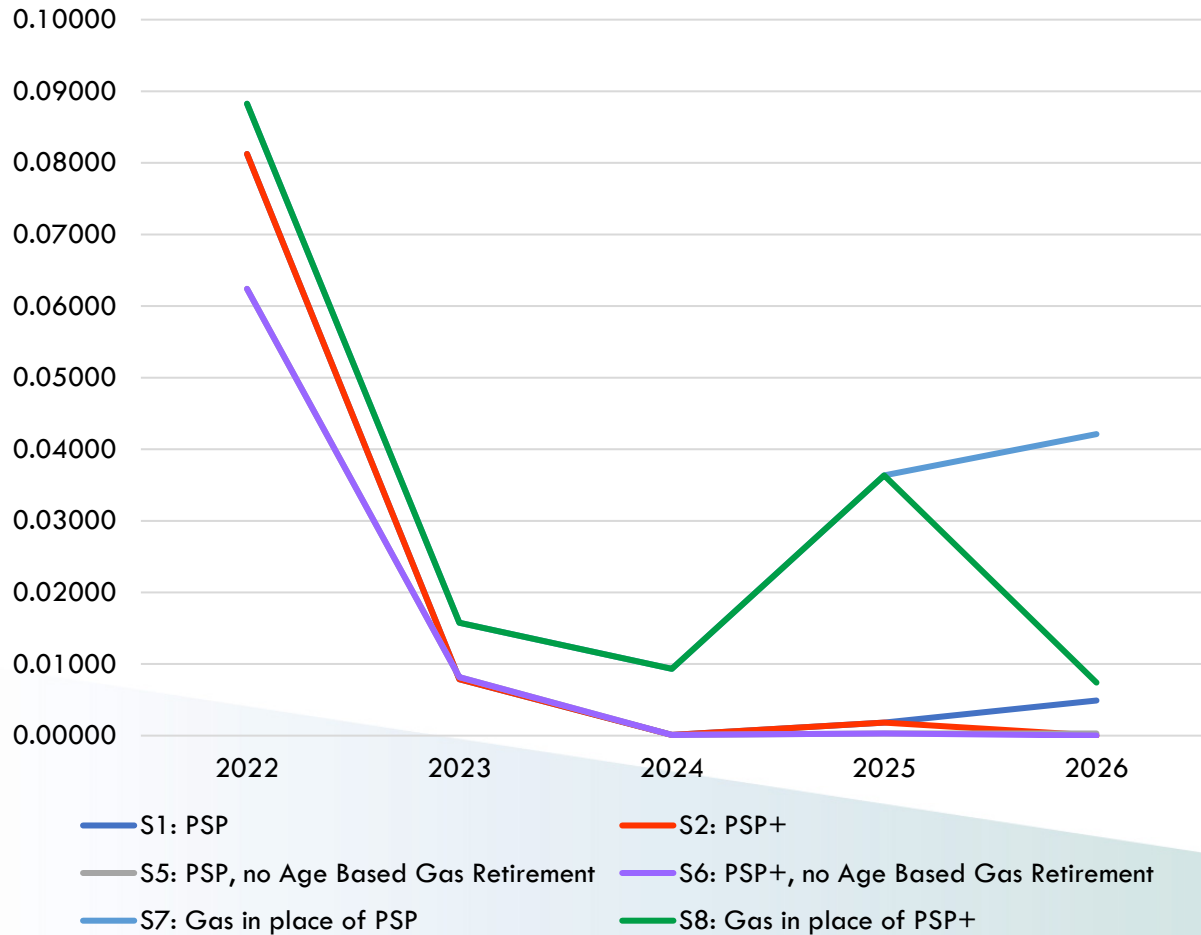
Results



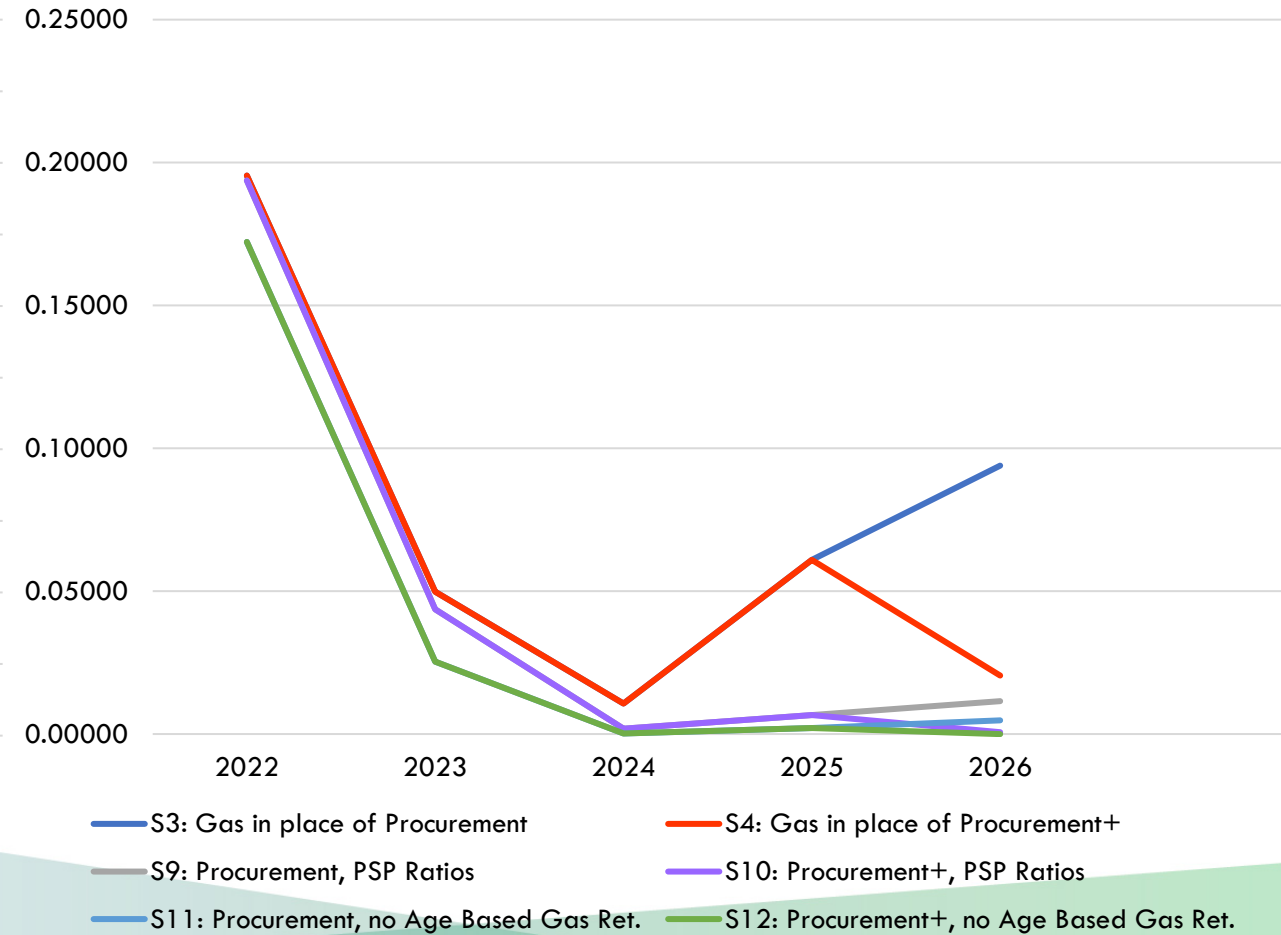


Loss of Load Expectation

Loss of Load Expectation



Loss of Load Expectation





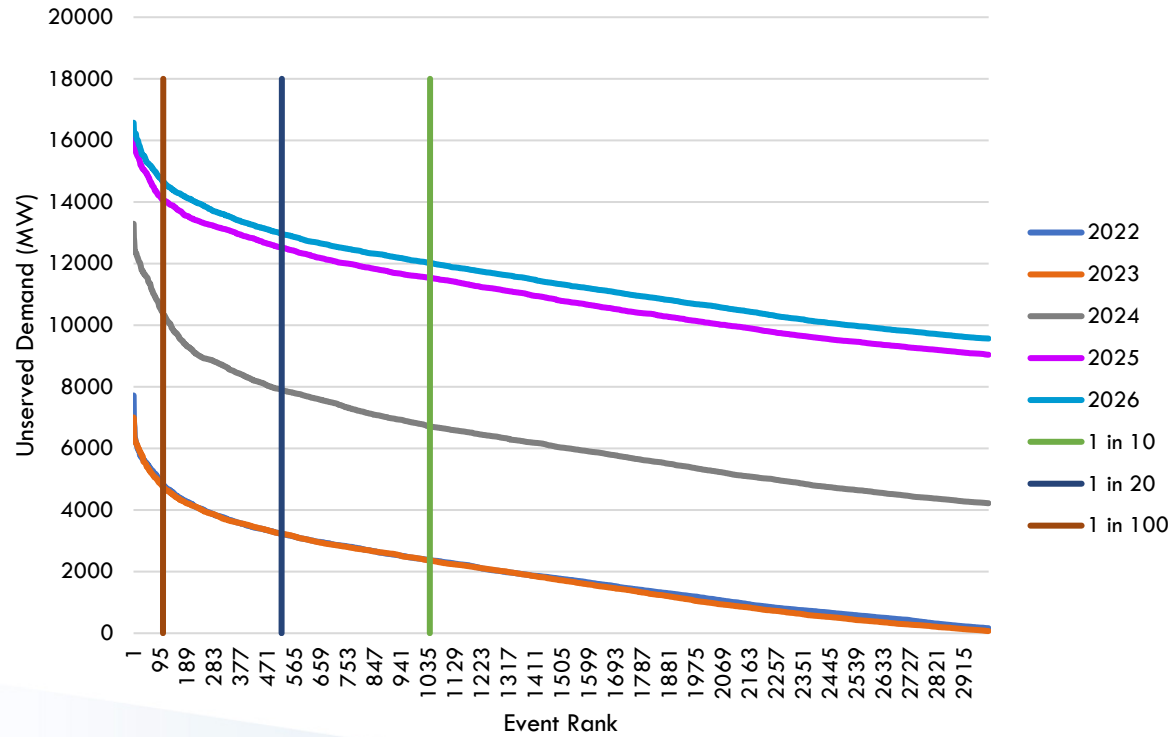
Results Summary Table

LOLE	2022	2023	2024	2025	2026	2026a
S0: No Build	0.311	0.303	2.369	14.639	17.839	N/A
S1: PSP	0.081	0.008	0.000	0.002	0.005	-
S5: PSP, no Age Based Gas Retirement	0.062	0.008	0.000	0.000	0.000	-
S7: Gas in place of PSP	0.088	0.016	0.009	0.036	0.042	0.007
S9: Procurement, PSP Ratios	0.194	0.044	0.002	0.007	0.012	0.001
S11: Procurement, no Age Based Gas Ret.	0.172	0.025	0.000	0.002	0.005	-
S3: Gas in place of Procurement	0.195	0.050	0.011	0.061	0.094	0.020
1 in 10 Shortfall	2022	2023	2024	2025	2026	2026a
S0: No Build	2,372	2,391	6,711	11,540	12,022	N/A
S1: PSP	-	-	-	-	-	-
S5: PSP, no Age Based Gas Retirement	-	-	-	-	-	-
S7: Gas in place of PSP	-	-	-	-	-	-
S9: Procurement, PSP Ratios	1,296	-	-	-	-	-
S11: Procurement, no Age Based Gas Ret.	1,029	-	-	-	-	-
S3: Gas in place of Procurement	1,306	-	-	-	-	-



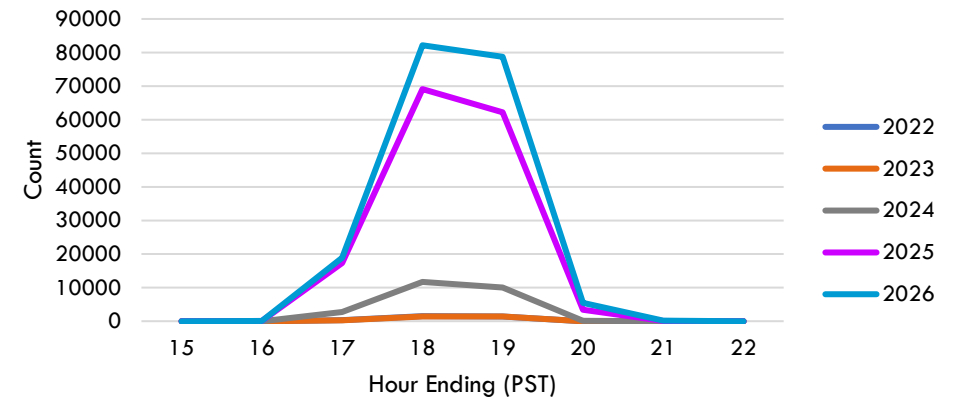
S0: No Build

Unserved Energy Event Magnitude

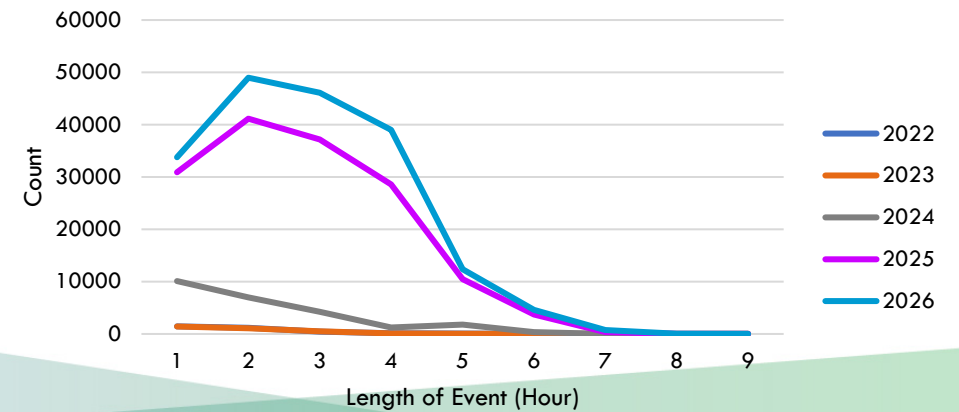


Total Samples: 10,400

Time of Day with Unserved Energy

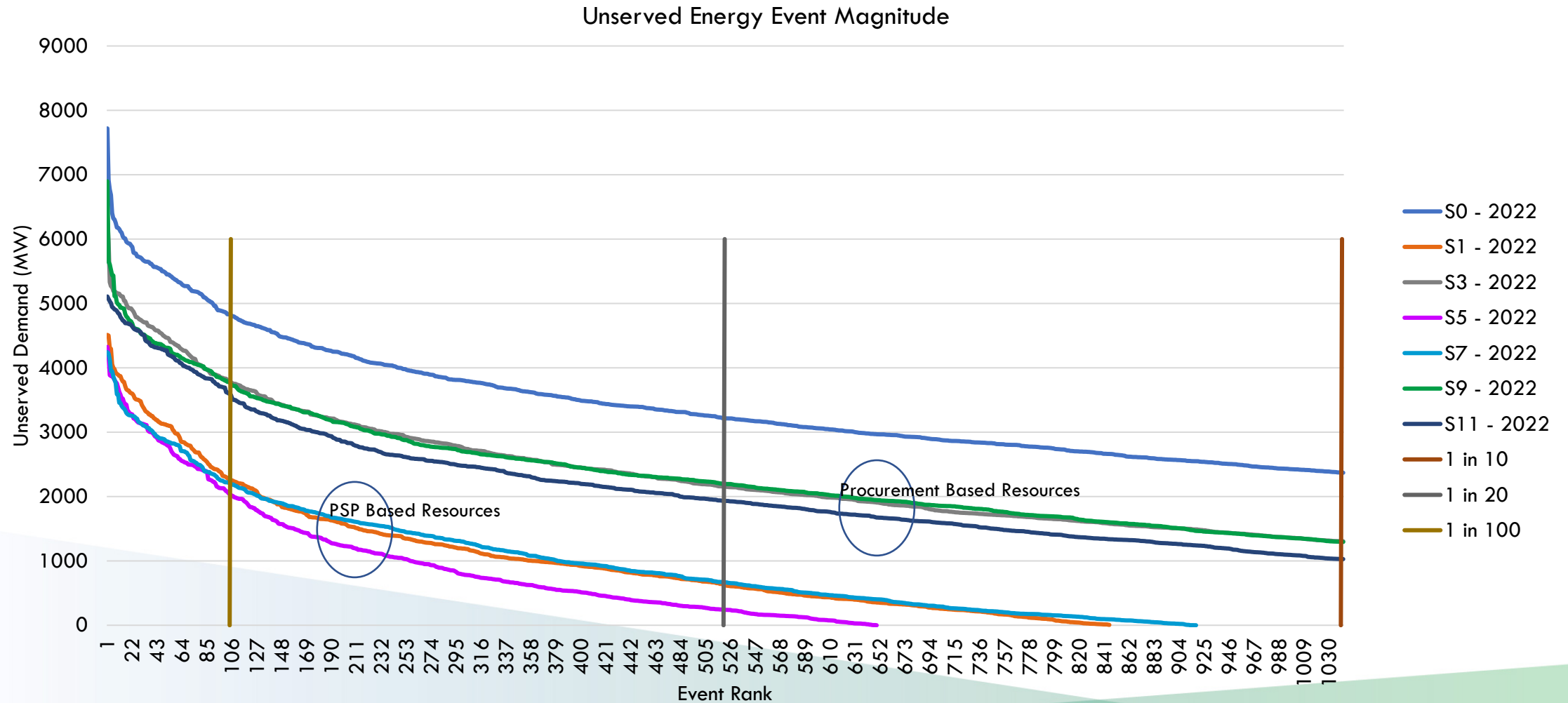


Event Duration





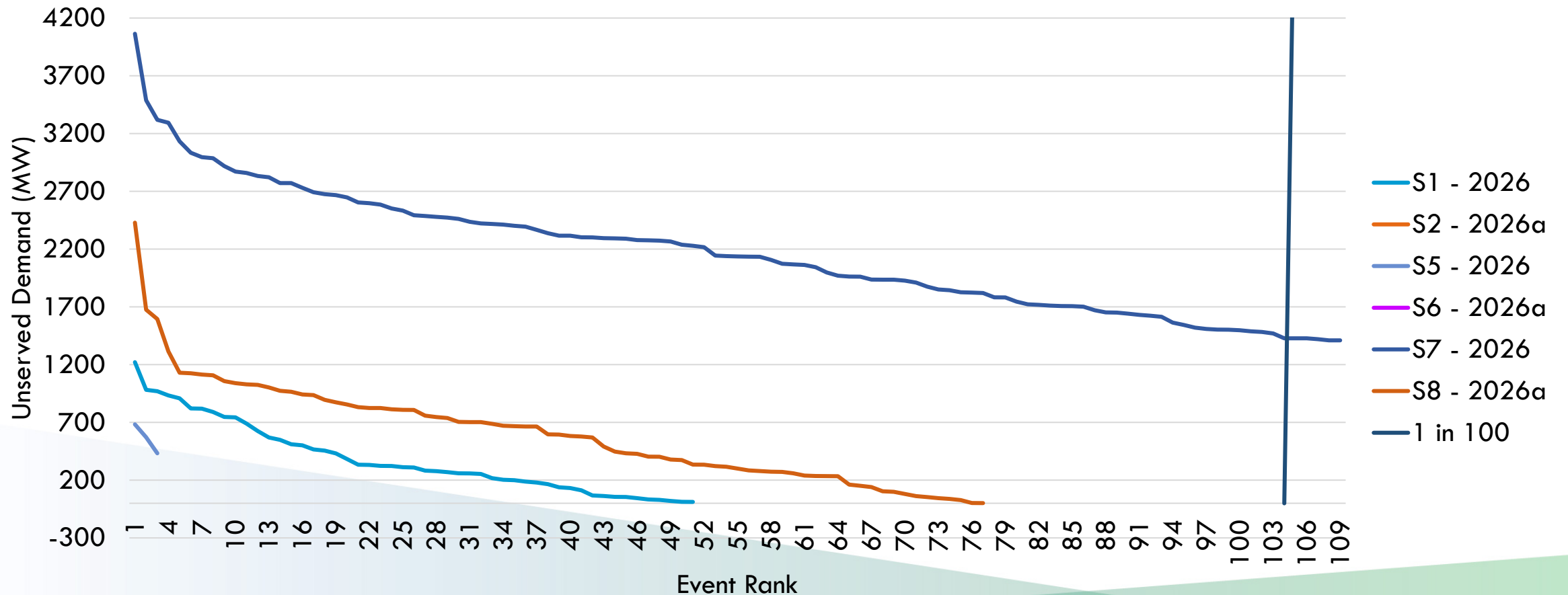
2022 Comparison





2026, PSP Scenario Comparison

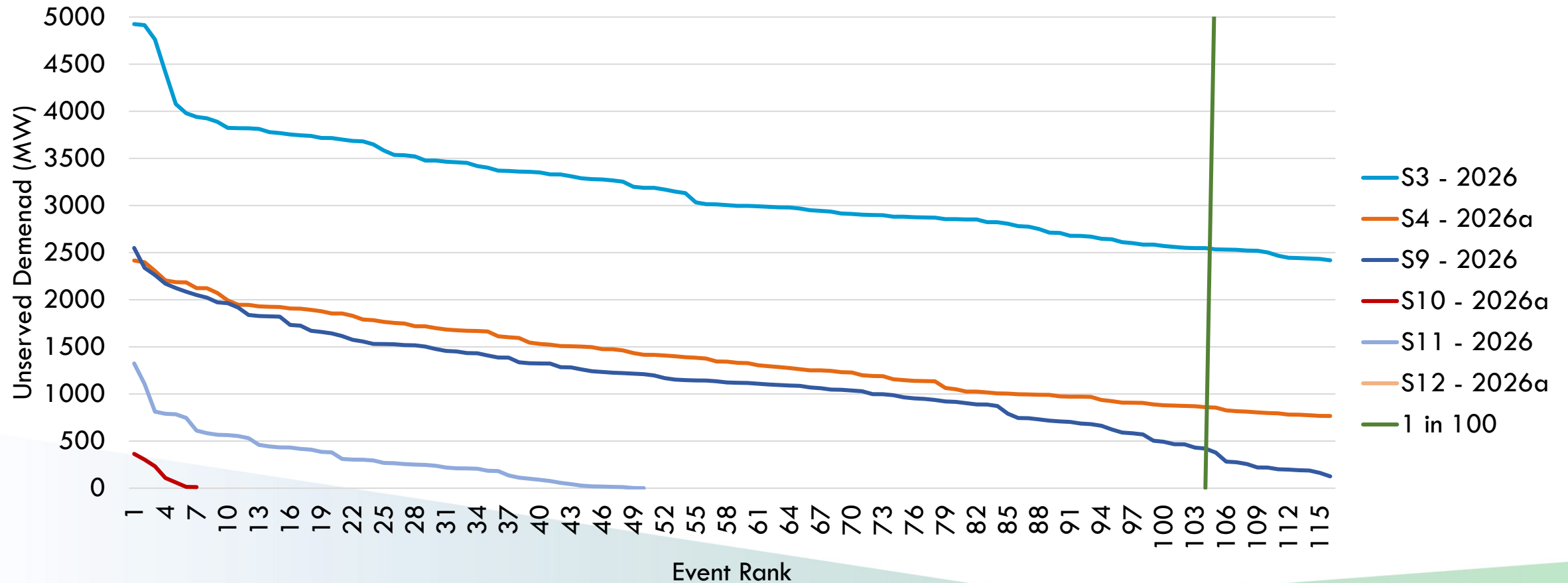
Unserved Energy Event Magnitude





2026, Procurement Scenario Comparison

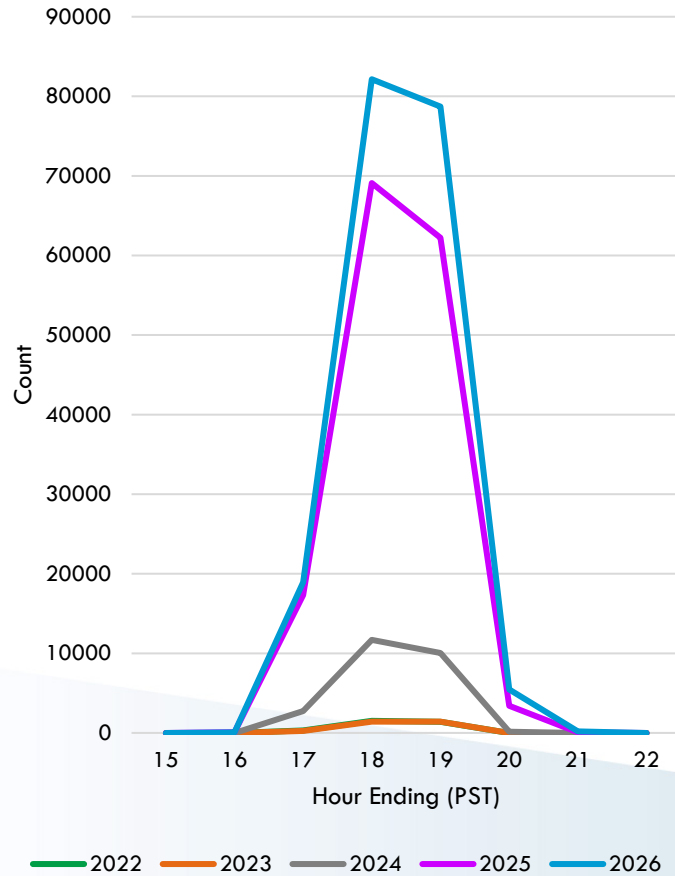
Unserved Energy Event Magnitude



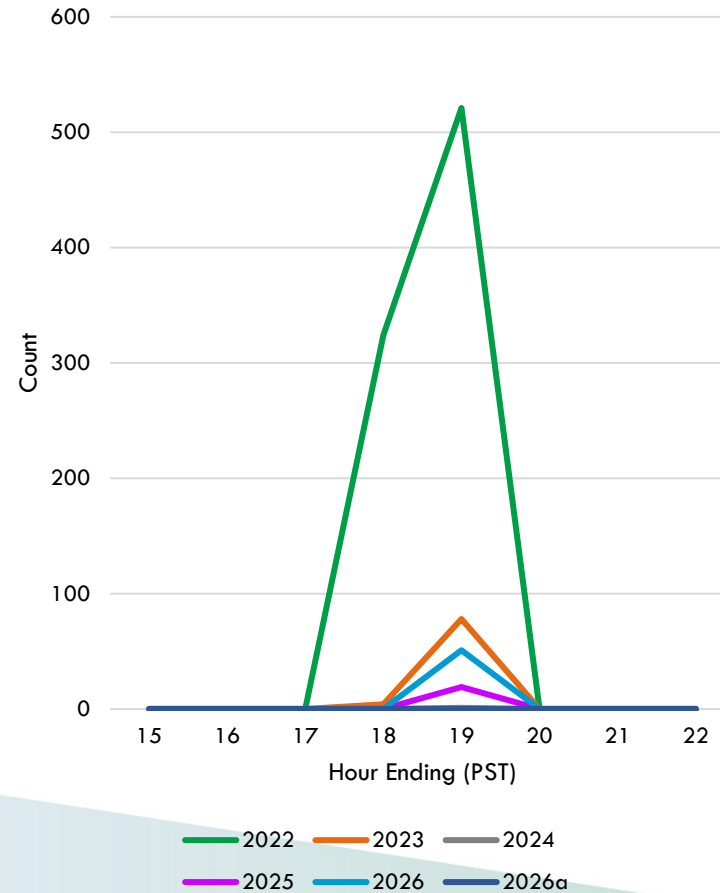


What time of Day is the Issue

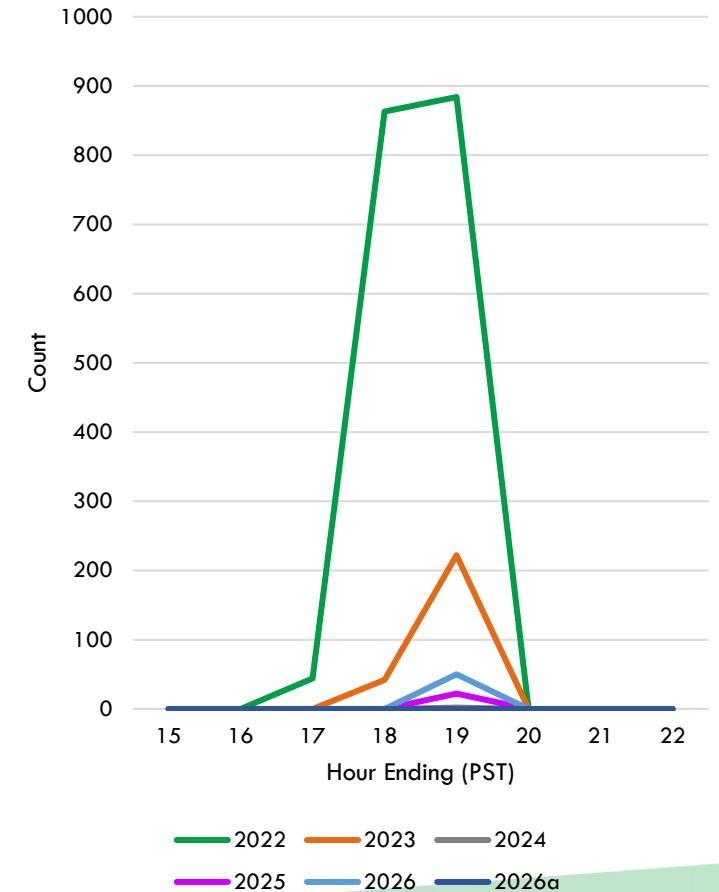
No Build Outage Times



PSP Outage Times



Procurement Build Outage times



Takeaways





Takeaways

- There is a large capacity need without the resources envisioned in D.19-11-016, D.21-06-035, and/or the proposed PSP.
- Assuming no additional gas retirement beyond what is considered in the analysis:
 - If the resource build in the PSP is realized, reliability concerns are diminished beginning in 2022 through 2026.
 - Capacity ordered through D.19-11-016 and D.21-06-035 are insufficient to address the potential capacity shortfall in 2022, should be sufficient to diminish reliability concerns from 2023 through 2026.



Takeaways

- A portfolio of preferred resources can provide equivalent system reliability to gas resources.
- Both the PSP and the procurement scenarios require a large amount of nameplate additions of preferred resources.
- Potential procurement risk:
 - Supply chain risk
 - Development risk
 - Resource performance



Next Steps

- Test capacity additions for 2022 to determine what is necessary to reduce unserved energy to acceptable levels.
- Run additional scenarios with the new ELCC values when available to determine if any results change.
- Prepare an inputs and assumptions document, with detailed results, to accompany the MTR white paper.

Questions?





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Battery Storage Performance Across the Net Peak Period

Presenter: Christopher McLean, Analyst

Date: August 30, 2021

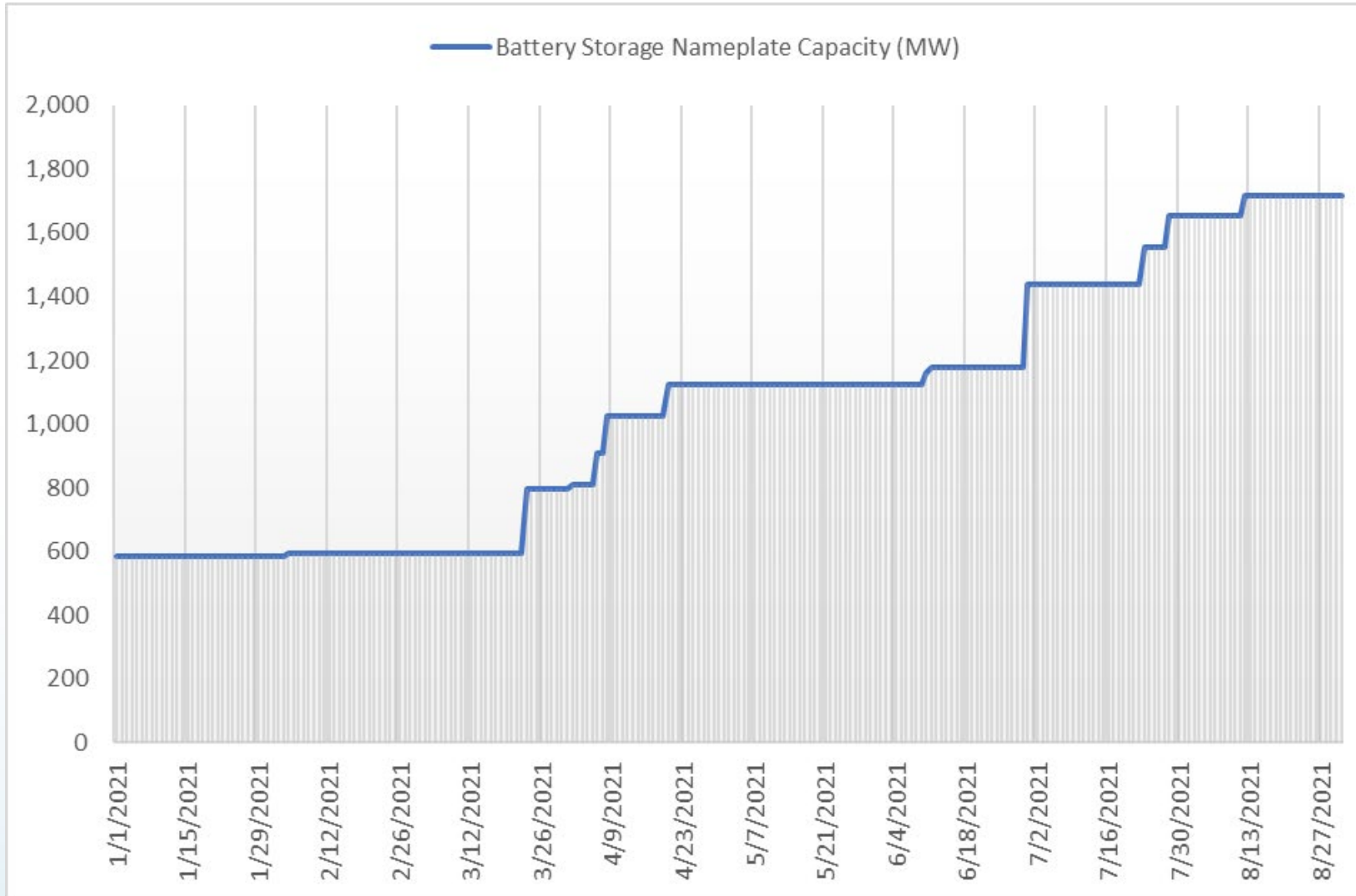


California hit a major battery storage milestone on July 16

- Over a five-minute period, grid-connected batteries across the state provided over one-thousand Megawatts (MW) of electricity to the California ISO controlled grid.
- A year earlier, the record was just 126 MW
- This marks a clear transition in the operating mode of battery storage resources from an early history of ancillary services provision to an expected future of energy shifting across operating hours.



Growing Storage Capacity



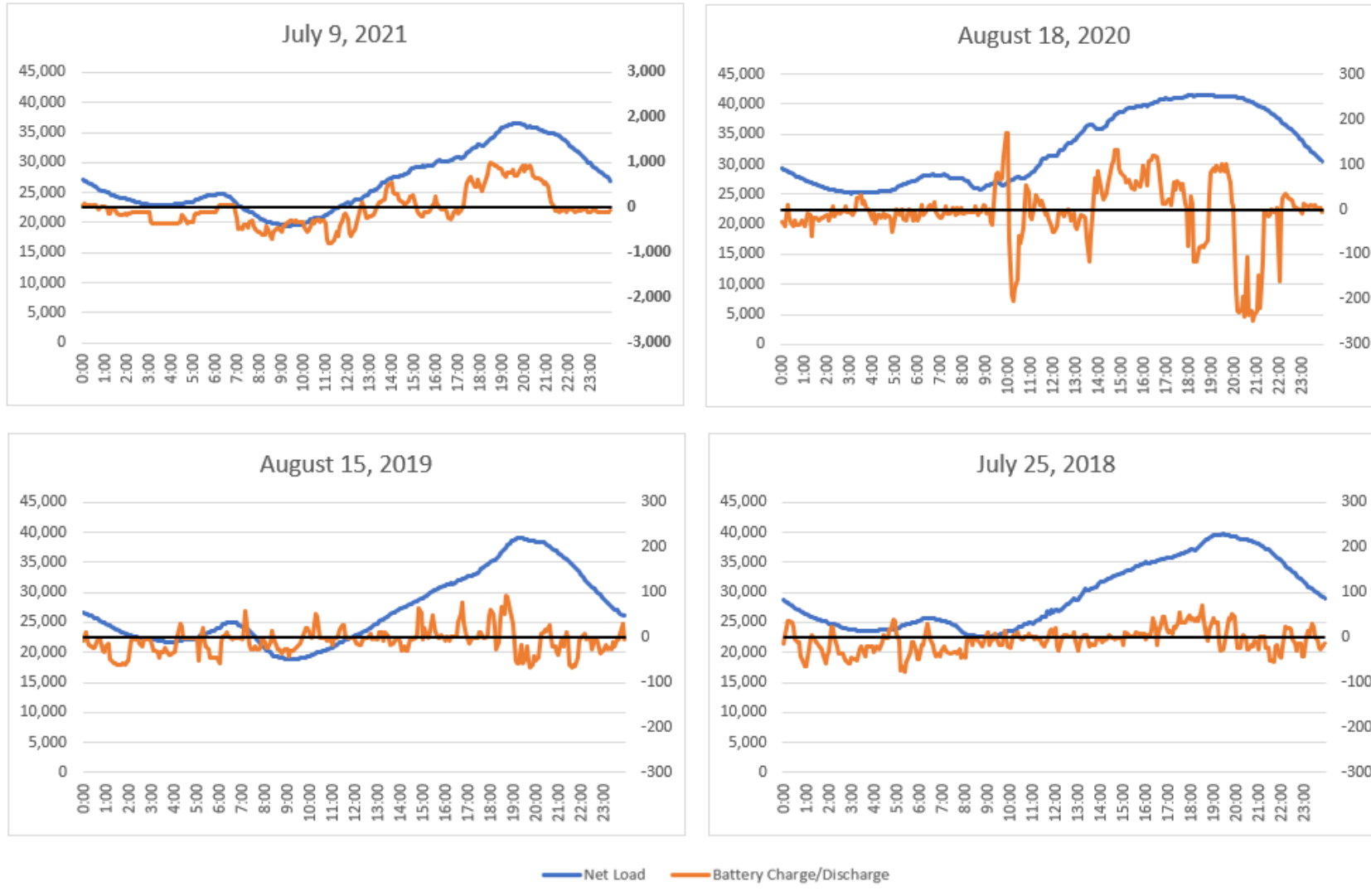


California ISO Summer Monthly Performance Report for June 2021

- In June 2021, there were 28 storage resources actively participating in the CAISO markets.
- Of these 28 resources, 26 storage resources participated in both the energy and ancillary service market.
- The remaining 2 resources participated only in the regulation market.



Performance Across the Net Peak

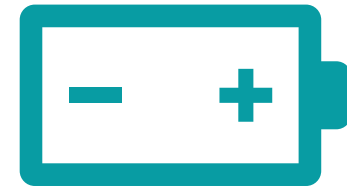




Thank You!

Energy Storage and Reliability

- **Cody Hill**
SVP, Battery Systems, Rev Renewables
- **Dan Patry**
Manager, Policy Innovation, Fluence Energy
- **Jin Noh**
Policy Director, California Energy Storage Alliance
- **Gus Flores**
Principal Manager, Energy Procurement & Management,
Southern California Edison
- **Gabe Murtaugh**
Storage Sector Manager, California Independent System
Operator



An aerial, high-angle view of a port or shipping yard. The image is heavily stylized with a blue and teal color gradient. Numerous shipping containers are visible, stacked in rows and some being moved by cranes. The perspective is from above, looking down at the containers and the infrastructure of the port.

FLUENCE

A Siemens and AES Company

MIDTERM RELIABILITY ANALYSIS

Introduction to Fluence

Dan Patry – Manager, Policy Innovation

Fluence is the global leader in grid connected energy storage

Joint Venture of Siemens & The AES Corporation delivers complete, proven storage systems.

OUR TRACK RECORD



13+
YEARS



150+
PROJECTS



24
COUNTRIES
AND TERRITORIES



2,750
TOTAL MW DEPLOYED
OR AWARDED



7,600+
GW-HOURS OF DELIVERED
SERVICE GLOBALLY

INDUSTRY RECOGNITION

#1

IN GUIDEHOUSE UTILITY-
SCALE ENERGY STORAGE
LEADERBOARD



#4

IN ENERGY
FAST COMPANY MOST
INNOVATIVE COMPANY



OUR CUSTOMERS





FLEXIBLE PEAKING POWER

AES Alamosa

Long Beach, California, United States

100 MW / 400 MWh

SERVICES

- Capacity, local reliability
- Peak power/off peak mitigation
- Ancillary services

IMPACT

- Competitive bid vs thermal peaker, cost effective
- Replaces environmental retired units
- Meets flexibility (duck curve)



Challenges (and Solutions) to Rapid Storage Deployment In California

Local Permitting Risks Project COD

- Fragmented local permitting processes are often a critical path to deployment

Procurement/Regulatory Approval Timelines Risk Deployment

- Suggest minimum timelines for utility procurements, filings and CPUC approvals.
- Would give the market more certainty and reflect storage's ability to quickly deploy capacity in the field.

Commercial Considerations in Storage Deployment

- The global storage industry is booming!
- Compressed project schedules of less than 18 months bring a host of challenges and risks that are typically passed on to developers and technology providers.

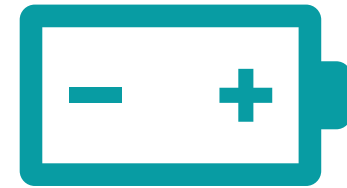




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California ISO

Energy Storage Performance Panel

CEC Midterm Reliability Analysis and Jurisdictional Plant Upgrade Workshop

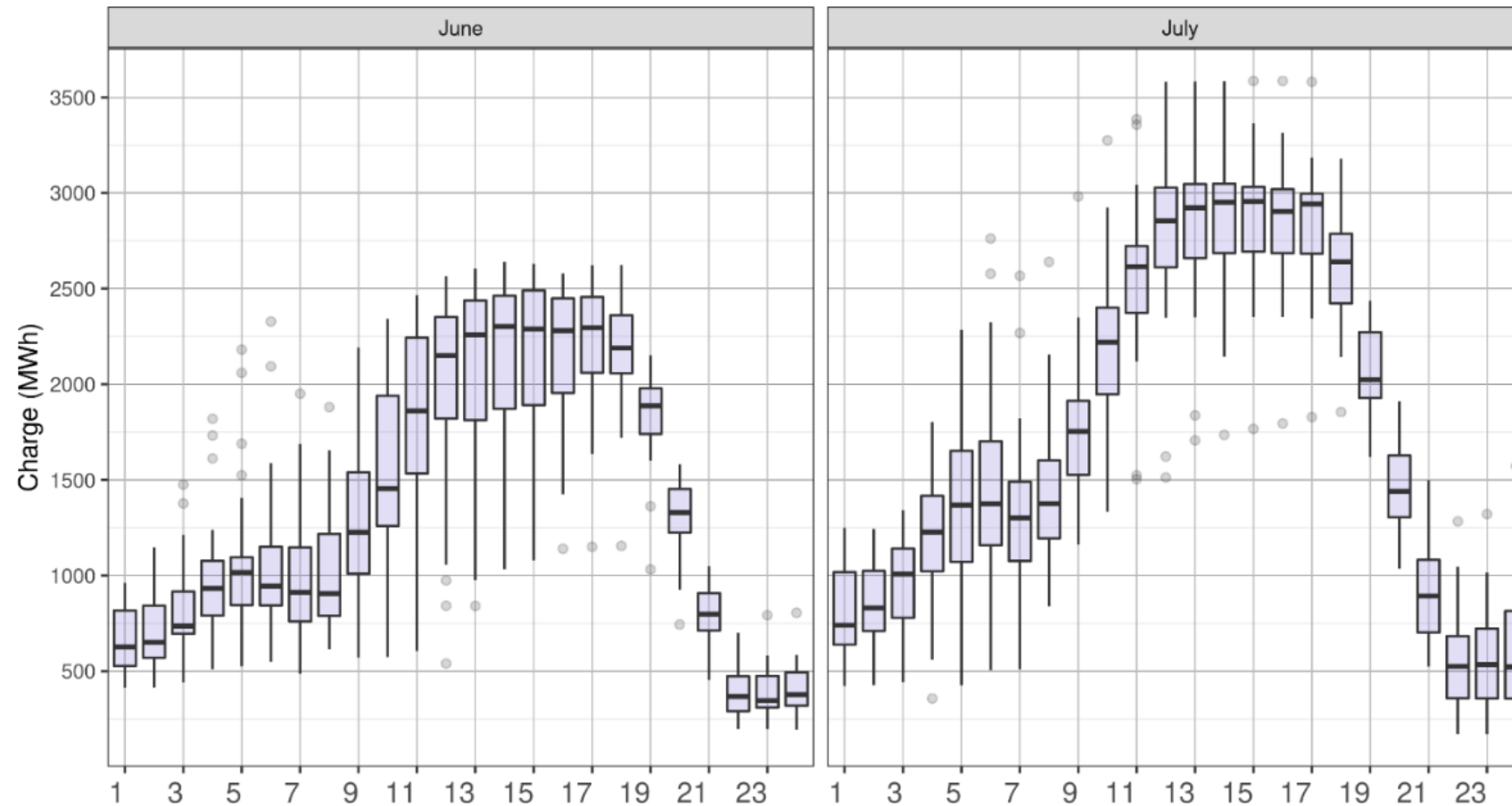
Gabe Murtaugh

August 30, 2021

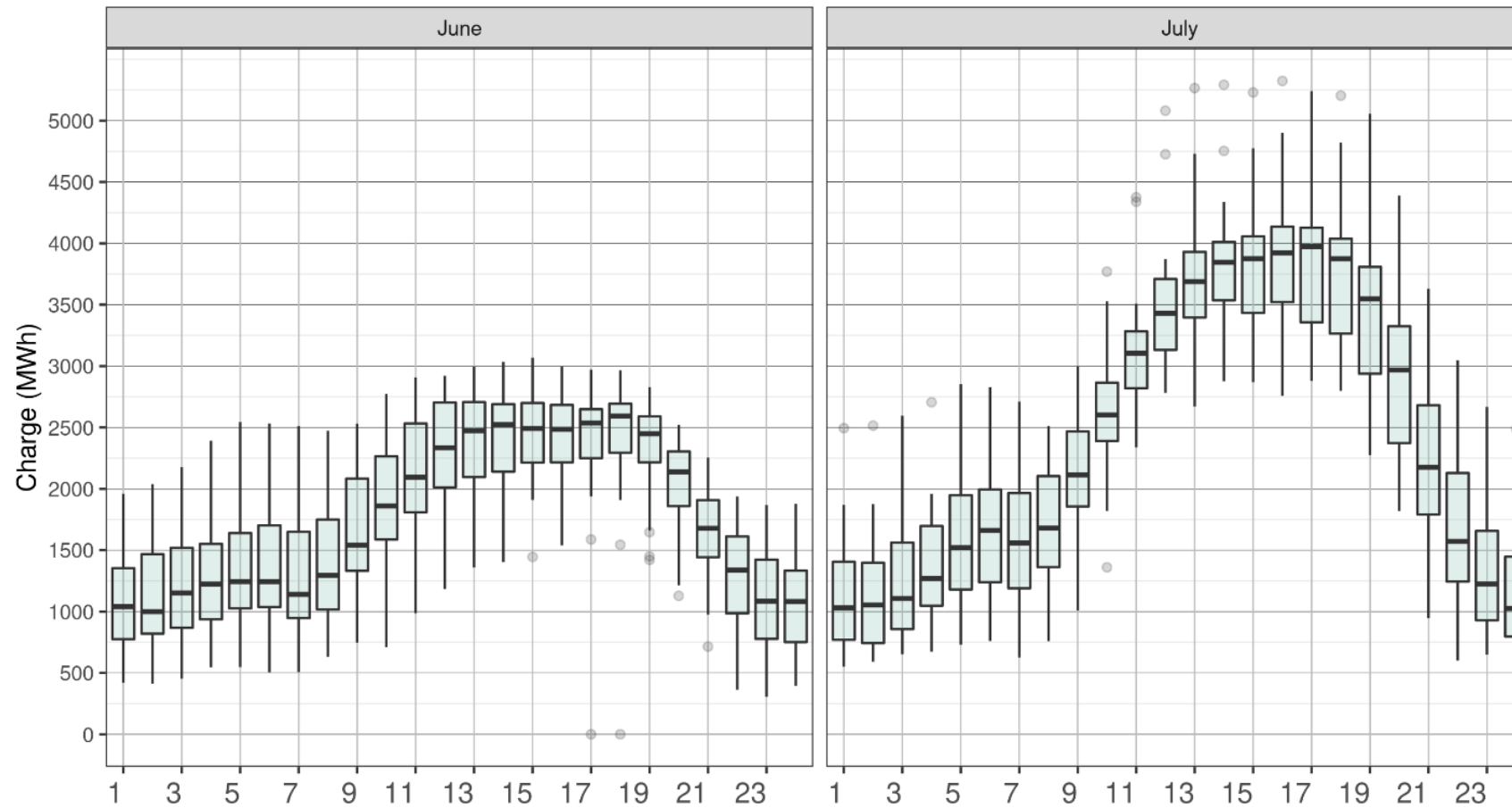
Storage Sector Manager

CAISO Public

Storage resources shifted energy from low priced periods to the evening peak in the day-ahead market

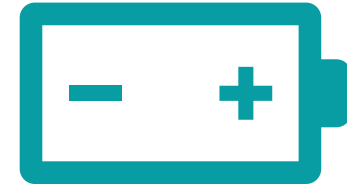


Additional state of charge from storage was available and performed in the real-time market



Energy Storage and Reliability

- **Cody Hill**
SVP, Battery Systems, Rev Renewables
- **Dan Patry**
Manager, Policy Innovation, Fluence Energy
- **Jin Noh**
Policy Director, California Energy Storage Alliance
- **Gus Flores**
Principal Manager, Energy Procurement & Management,
Southern California Edison
- **Gabe Murtaugh**
Storage Sector Manager, California Independent System
Operator





Scope of the Midterm Reliability Assessment

Track 1a- Midterm Capacity Needs

Is additional capacity beyond current procurement orders needed to maintain reliability?

Approach: Loss of load expectation (LOLE) analysis on the CAISO system with:

- 1) CPUC Ordered Procurement
- 2) Proposed Preferred System Plan

Limitations:
Resource retirement assumptions
Climate risk to supply and demand

Track 1b- Evaluating Thermal Need

Do incremental thermal resources provide an additional reliability benefit compared to a portfolio of preferred resources?

Approach: LOLE analysis with 1:1 NQC basis replacement of preferred resources with thermal resources.

Limitations:
Extreme scenarios exploring resource insufficiency for charging of batteries

Track 2- Battery Risks

What are the potential risks to battery deployment and performance?

Approach: Evaluate battery performance in 2021. Stakeholder perspective of supply chain and development risks.

Track 3- Permitted and Potential Thermal Capacity Additions

What are the range of options available for incremental additions of thermal resources?

Approach: Assessment of thermal incremental capacity options at existing natural gas facilities

Discussion of permitting timeline for incremental capacity options



California Energy Commission

Role of Jurisdictional Power Plant Program to Support Reliability

August 30, 2021

Presenters: Shawn Pittard, Jim Bartridge, and Elizabeth Huber



Power Plant Program by the Numbers



238

project applications submitted
for Certification and Small
Power Plant Exemption
over past 45 years.



41

project applications submitted
in 2001 during the peak of
the energy crisis.

128

PROJECTS CERTIFIED

25

PROJECTS EXEMPTED

106

PROJECTS CONSTRUCTED

76

CURRENTLY OPERATIONAL

6 PROJECTS

in decommissioning process or
license terminated

CALIFORNIA ENERGY COMMISSION JURISDICTIONAL POWER PLANTS

76 power plants providing 26,660 MW

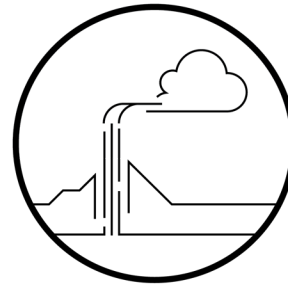
63

natural gas
24,479 MW



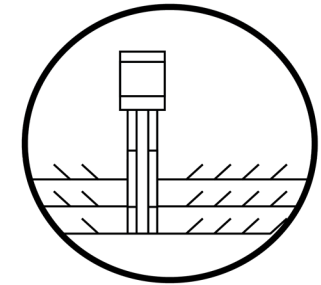
8

geothermal
875 MW



5

solar
1,311 MW



POWER PLANTS BY TYPE OF THERMAL FACILITY AND YEAR THEY CAME ONLINE

Natural Gas



63

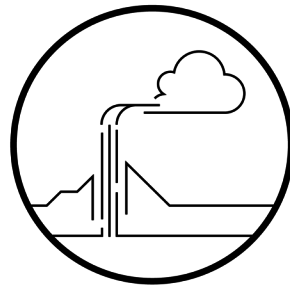
1980-90s

11

2000-20s

52

Geothermal

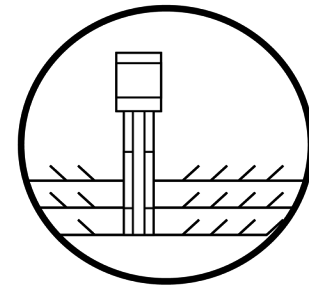


8

1980s

8

Solar Thermal/PV Facilities



5

1990s

1

2010s

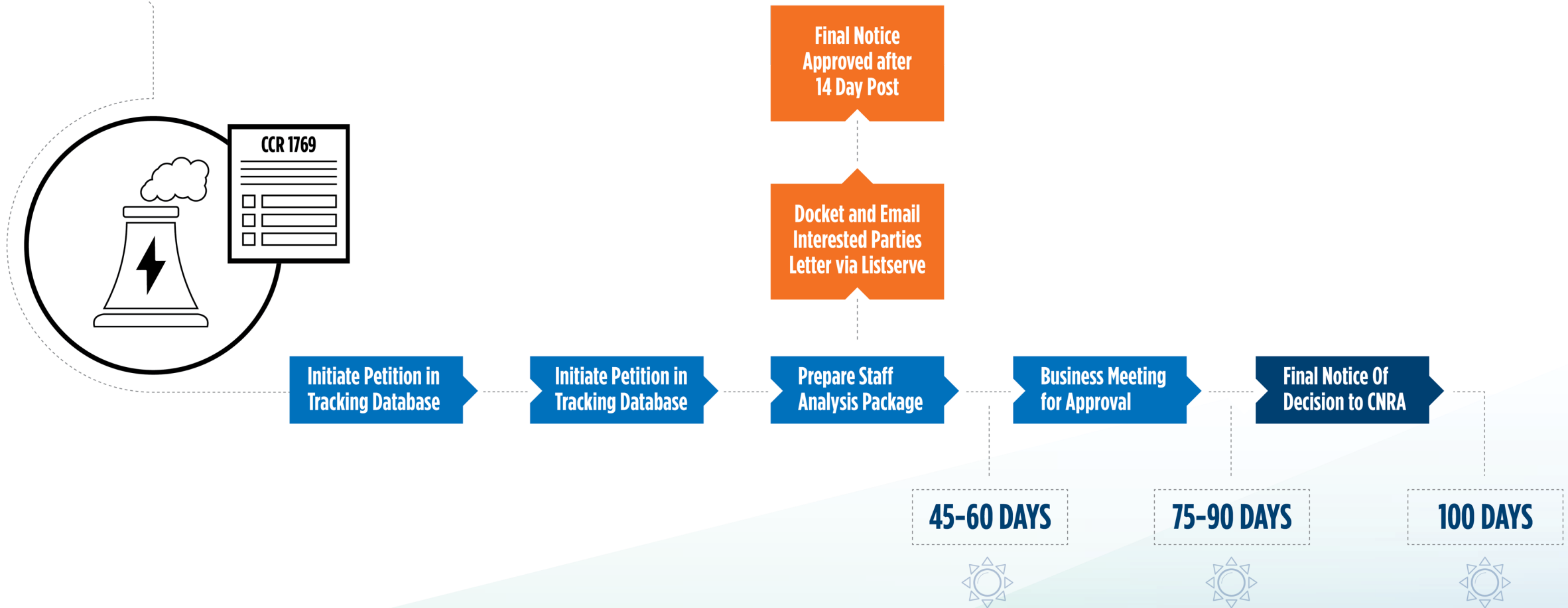
4

Forced outage data specific to 50 MW and at least 24 hours from when they came online



Staff concludes that with regular maintenance, there is little correlation between the age of a power plant and the number of outages.

Project Change Petition Process



2020 Extreme Heat Events



Western U.S. experienced unprecedented heat storms



Energy demand exceeded supply AND planning targets



Multiple active wildfires raged across the Western U.S.



Heat and wildfires significantly impacted energy generation and transmission



Smoke from wildfires decreased solar output

LEAD COMMISSIONER WORKSHOP

Incremental Efficiency Improvements to the Natural Gas Power Plant for Electric System Reliability and Resiliency

Panel 1:



Incremental Technology Improvements at Existing Power Plants

Panel 2:



Opportunities, Challenges, and Process Modifications

Panel 3:



Finance and Governance.



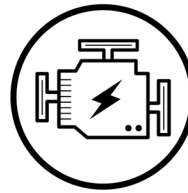
Workshop: Incremental Technology Improvements and Benefits

Vendors and owners presented information on potential and deployed incremental improvements:



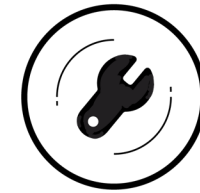
Existing Natural Gas Generation

- Increased peak output
- Improved to ramp rate, turndown, efficiency
- Reduced start-times
- Payback periods of <2 years



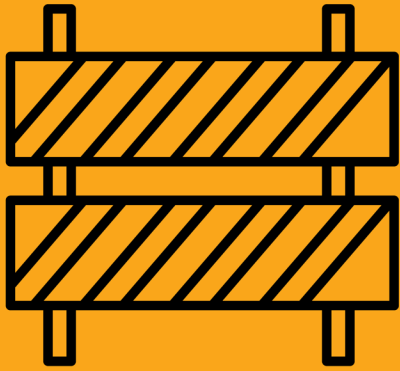
Storage/Combustion Turbine Hybrids

- Increased flexibility
- Reduction in natural gas operations and emissions



Upgrades/Storage Projects

- Equipment lead time may present problems
- Some upgrades require more extensive planning and design



Workshop: Opportunities, Challenges, and Process Changes

The regulatory process can be managed with planning, but...



Improvements targeted for 2021 are challenging;



Some project owners and regulators voiced concerns about schedule if the permits were opened;



Planning should not be limited to 2021 and 2022



Procurement through postponed retirements easier than new construction/permitting.

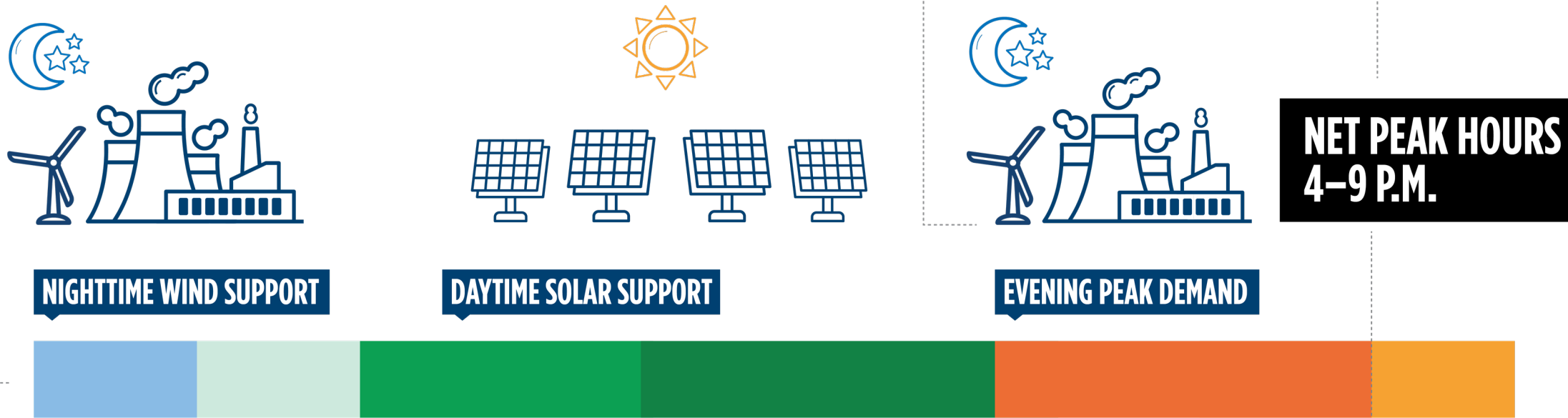
Opportunities exist to gain additional MW and efficiency out of a diverse generation portfolio



Early outreach,
Clear Descriptions &
Requesting Expediting



CEC Process
Improvements &
Pre-File Meetings



CPUC identified new OIR for Summer 2021 Reliability, 20-11-003

Purpose: to increase energy supply or decrease demand during peak and net-peak hours

CHALLENGES

1. Energy resource mix always changing (limited to no solar during these net peak hours)
2. We are only procuring 1 for 1 MW for retiring power plants and new clean energy facilities coming online
3. Environmental concerns with air quality in disadvantaged communities, and cost associated with long term planning

Projects Already Online Supporting 2021 Reliability



Marsh Landing Generating Station



11.5 MW



Pastoria Energy Facility



10MW



Palomar Energy Project



22 MW



Roseville Energy Park



5 MW



Otay Mesa Energy Center



10 MW



Metcalf Energy Center



30MW



Walnut Creek Park



17.4MW



El Segundo Energy Center



30 MW

NET QUALIFYING CAPACITY SINCE NOVEMBER 2020

TYPE OF PROJECTS	ACTION TAKEN	APPROVAL TIMELINE	ADDITIONAL GENERATION CAPACITY
Efficiency Upgrades	Staff-level Project Change Petition Process	March – June 2021 (45-90-day process)	 89 MW
Equipment Upgrades	Business Meeting Petition Process	March – June 2021 (45-90-day process)	 47 MW
Package Units	Temporary Power Generator Licensing Process	August - September 2021 (10-day process)	 120 MW
Governor's Emergency Proclamation and DOE 202 (c) Waiver	Expedited Facility Changes Petition Process	August – October 2021 (10-day process)	 100-150 MW

Supporting Summer 2021 Reliability

CEC STEP Division reviewed and approved:

8

projects

136 MWs

added to support 2021 reliability

<90%

of the approved projects were located outside
of designated-disadvantaged communities.

**These included efficiency upgrades, CEQA-triggering improvements,
and a battery energy storage system expansion.**

Emergency Proclamation

Governor Issued an Emergency Proclamation on July 30



Climate change threatening California's energy supply

Up to 3,500 MW shortfall in 2021

Up to 5,000 MW shortfall for summer 2022

Authorizes CEC to license emergency and temporary power generators

10 megawatts or more

Deliver peak energy by October 31, 2021



Expedited Project Change Petitions

The Process

PETITION

STEP 1 – Project Owner docket petition

DISTRIBUTE

STEP 2 – Compliance Project Manager (CPM) for facility immediately distributes petition to Technical Review Team (TRT) and posts to Dashboard

REVIEW

STEP 3 – TRT/CPM review petition for completeness (1 day)

ANALYSIS

(Alt) **STEP 4** – CPM notifies the Project Owner of deficiencies, if not complete
STEP 4 – TRT conducts and prepares analysis of complete petition (3 days)

DECISION

STEP 5 – CPM compiles TRT responses into Executive Director's (ED) Decision Letter (1 day)

ROUTE

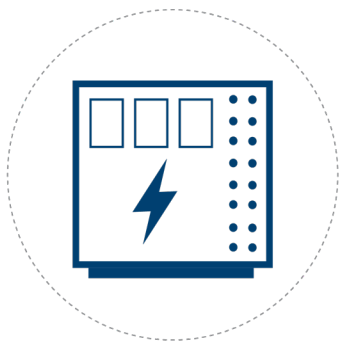
STEP 7 – CPM routes draft Decision Letter for STEP Management and Chief Council's Office (CCO) review (2 day)

FINAL

STEP 8 – CPM routes final draft Decision Letter to ED for signature (2 days)

POST

STEP 9 – CPM docket and posts to Dashboard the Decision Letter (1 day)



Temporary Power Generator Licensing

The Process

APPLY

STEP 1 – Applicant uploads completed self-certification template and associated documents

ASSIGN

STEP 2 – Project Manager (PM) assigns unique docket number (21-EP-G-01,-02, -03...) and posts to Dashboard

REVIEW

STEP 3 – PM distributes to Technical Review Team (TRT) to verify self-certification is complete and meets the criteria specified in the Order

DECISION

STEP 4 – TRT provides its written determination to PM (3-5 days)

ROUTE

STEP 5 – PM drafts Executive Director's (ED) Decision and routes for STEP Management and Chief Council's Office (CCO) review (2 days)

FINAL

STEP 6 – PM routes final draft Decision to ED for signature (2 days)

POST

STEP 7 – PM sends Decision to Applicant and posts to Dashboard



Battery Storage System Licensing



The proclamation expands the CEC's authority under the Public Resources Code to provide the CEC authority to establish an expedited process for approving licenses for new or expanded battery storage systems of 20 MW or more that the CEC determines are capable of discharging for at least two hours and will deliver net peak energy by October 31, 2022. The CEC is required to implement this provision in consultation with local jurisdictions and state agencies.

Permitted and Potential Capacity Additions



2022-2023 Potential Efficiency and Equipment Upgrades (50–200 MW)



New and Expanded Battery Energy Storage Systems (200–1000 MW)



Power Plant Projects Permitted But Not Yet Built (1200 MW)

Potential Projects for 2022

CEC STEP has been working with project owners to identify potential efficiency improvements that could be online by 2022 to support reliability.

Approximately



200 MW

INCLUDING:

17

Software upgrades at 17 existing facilities

3

Equipment upgrades (more extensive)

80%

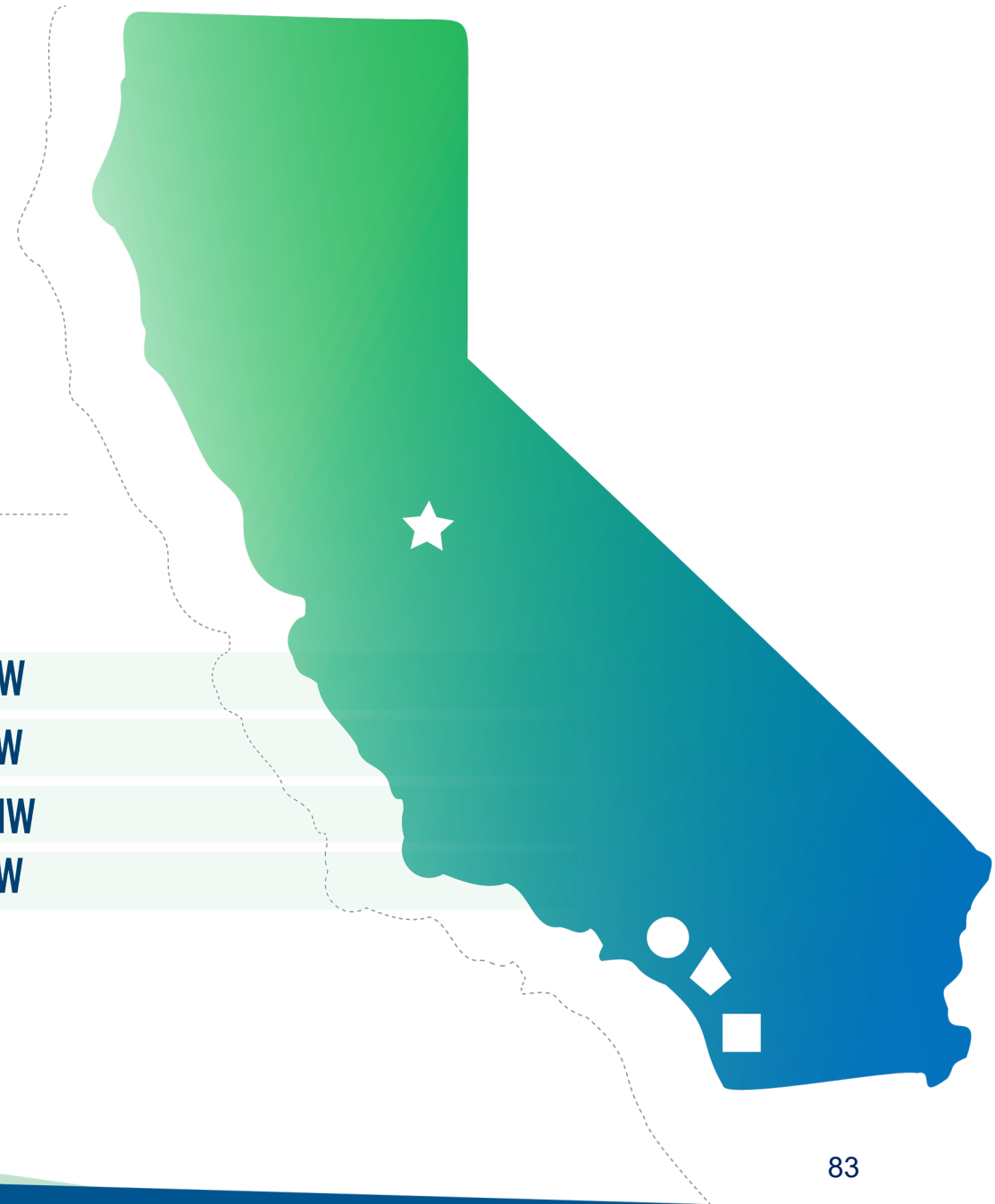
Located outside disadvantaged communities

POWER PLANT PROJECTS PERMITTED BUT NOT BUILT

CEC Permitted Projects at Existing
Facilities Could Bring Online an Additional

1200 MWs

- Alamos Energy Center
 - ◆ Huntington Beach Generating Station
 - Carlsbad Energy Center Project
 - ★ Cosumnes Power Plant
- | |
|----------------------|
| ⚡ Phase 2 = 400 MW |
| ⚡ Phase 2 = 200 MW |
| ⚡ 6th Train = 100 MW |
| ⚡ Phase 2 = 500 MW |





Thank You!



Next Steps

- Additional work
 - Changes to analysis based on stakeholder feedback
 - Exploring resource sufficiency for battery charging
- Timeline and Process
 - Comments due Sept 7th
 - Sept 30th Business Meeting Adoption of Deliverables
- Deliverables
 - Executive Summary
 - Technical and Informational Appendices



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

Appendix 1:

Detailed Inputs and Assumptions





Demand

- 140 demand distributions, built using assumptions for the 2020 CED.
 - 20 weather years (2000-2019)
 - 7 different start day of the week
 - All load modifiers are held constant, but aligned with the day of the week as appropriate
- The distribution of annual peaks centered within half a percent of the adopted CEC 2020 peaks
- Demand profiles were not weather year correlated to other variables.



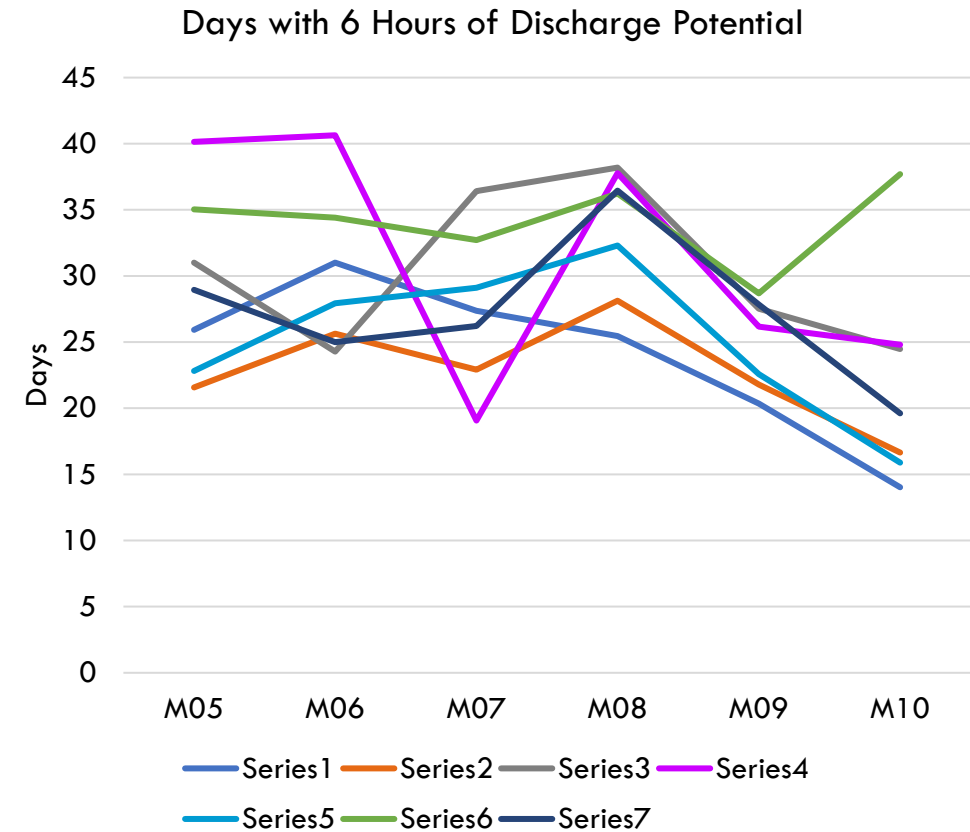
Wind and Solar

- 7 wind and 7 solar profiles were used
 - CAISO data from 2014-2020, 1 wind and 1 solar profile per year
- Individual plant profiles were added together and normalized to the monthly available capacity for those resources.
- Wind and solar profiles were not weather correlated
- Since this is historic data, outages and curtailment are included in the profiles.



Hydroelectric Plants

- Modeled as able to fully deliver at the NQC value during all hours of the day.
- Adding a monthly hydro budget had little impact on results.
- With a monthly hydro budget 6 hours of full NQC capacity is available most days. See the figure.
- Limiting hydro output to the maximum observed did impact results but is not consistent with the Reliability Needs Assessment from the CPUC.





Demand Response

- Base Assumption: 2,195 MW
- Dispatch is energy limited
 - 4 hours max generation per day
 - 80 hours max generation per year.
- DR is modeled on the supply side.
 - Total DR capacity is scaled up by 6% to account for the reduction in reserves.



ELCC Values

ELCC values used in this study are duplicated below. The CPUC is in the process of adopting NQC values for D.21-06-035, so these are rough estimates.

Technology	Tranche	2022	2023	2024	2025	2026	Min Capacity (MW)	Max Capacity (MW)
Wind		28.5%	28.5%	28.6%	28.6%	28.6%	N/A	N/A
Solar		2.3%	2.3%	1.9%	1.9%	1.9%	N/A	N/A
4 h Battery	1	100.0%	100.0%	100.0%	100.0%	100.0%	-	5,265
4 h Battery	2	88.8%	89.1%	89.5%	89.8%	90.1%	5,265	7,674
4 h Battery	3	76.2%	76.7%	77.1%	77.6%	78.0%	7,674	10,530
4 h Battery	4	66.4%	67.1%	67.8%	68.5%	69.3%	10,530	13,034
4 h Battery	5	54.2%	55.6%	57.0%	58.4%	59.9%	13,034	15,795

Source: CPUC's Reliability Needs Assessment



Technology Factors

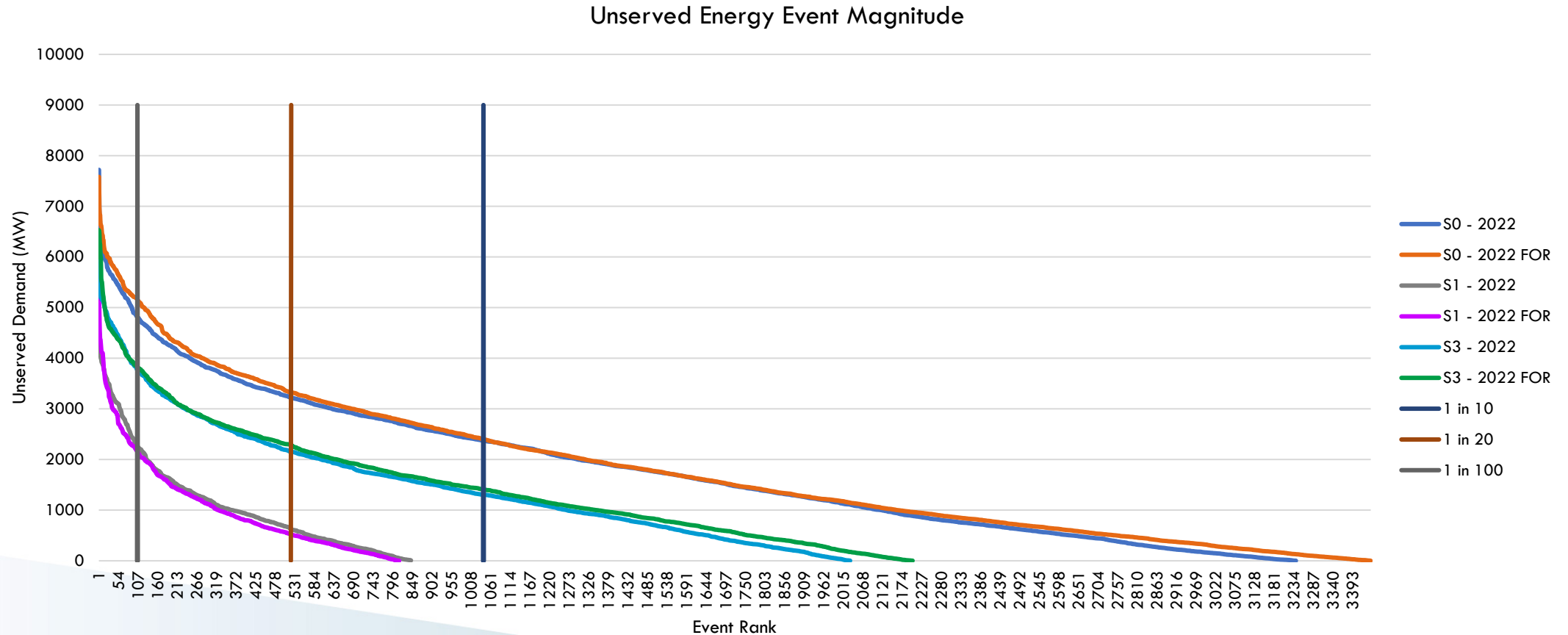
- Technology factors were used to translate annual capacity values into monthly values.
 - Resources without technology factors were assumed to have a technology factor of 1.
 - Wind and solar technology factors were not use.

Technology	May	June	July	August	September	October
Cogen	80%	88%	84%	87%	83%	75%
Geothermal	82%	78%	90%	88%	87%	87%
Biomass	90%	93%	92%	94%	94%	87%
Hydro	70%	72%	79%	72%	73%	68%

Source: CPUC's Reliability Needs Assessment

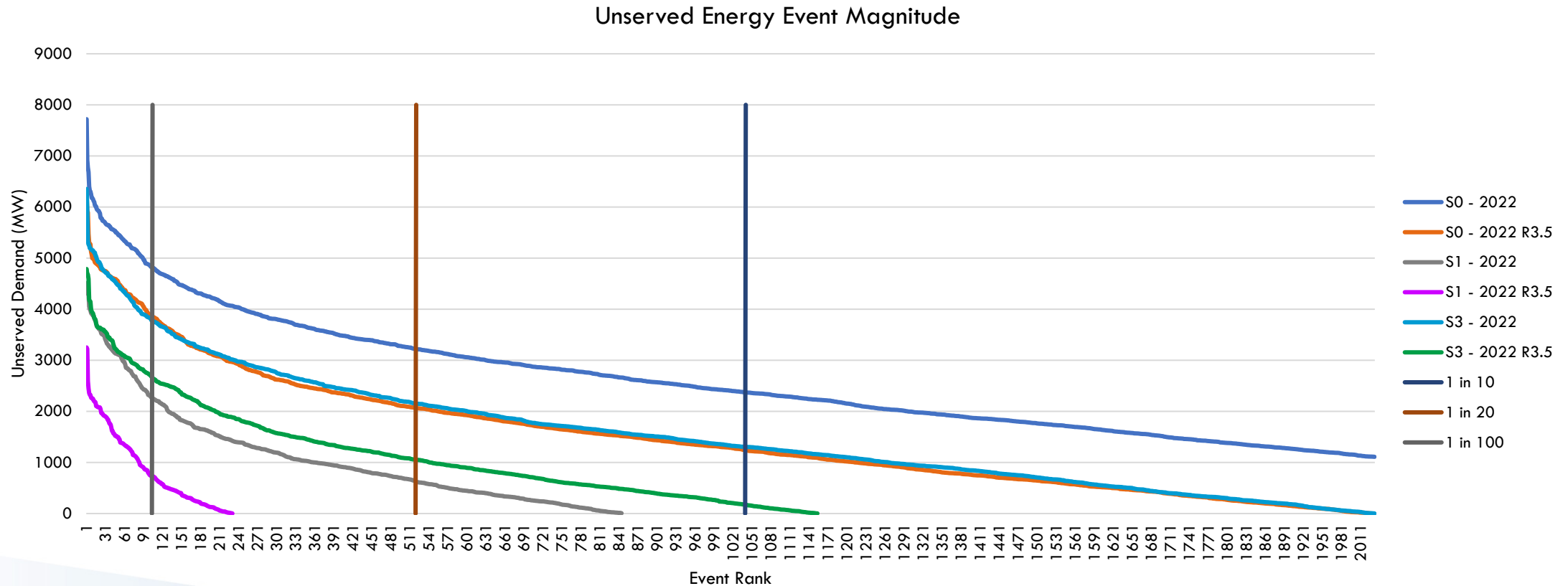


Forced Outage Unit Size Impact





Reserve Requirement Test



Decreasing the minimum reserves before energy goes unserved had a meaningful impact on results. However, to maintain alignment with CPUC modeling practices, a 6% minimum reserve was maintained.

Appendix 2:

Supplemental Scenario Information and Resource Tables





Scenarios

- “+” in the build name equates to 2,000 MW (NQC) of long duration resources built in 2026, above the similar build.
- Year 2026 results for “+” scenarios are reported with the other results, as year 2026a.
- Each year and scenario were run separately.

Scenarios	Build	2022	2023	2024	2025	2026
S0	No Build					
S1	PSP					
S2	PSP+	S1	S1	S1	S1	
S3	Gas in place of Procurement					
S4	Gas in place of Procurement+	S3	S3	S3	S3	
S5	PSP, no Age Based Gas Retirement					
S6	PSP+, no Age Based Gas Retirement	S5	S5	S5	S5	
S7	Gas in place of PSP					
S8	Gas in place of PSP+	S7	S7	S7	S7	
S9	Procurement, PSP Ratios					
S10	Procurement+, PSP Ratios	S9	S9	S9	S9	
S11	Procurement, PSP Ratios, no Age Based Gas Retirement					
S12	Procurement+, PSP Ratios, no Age Based Gas Retirement	S11	S11	S11	S11	

	Scenario Run
	Duplicate Scenario/Year Combination



Base Resources (No Build)

Nameplate (MW)	2022	2023	2024	2025	2026
Combined Cycle	15,781	15,781	15,781	15,781	15,781
Gas Turbine	8,023	8,023	8,023	7,802	7,707
Gas-Other	3,109	3,109	255	255	255
Cogen	1,659	1,640	1,633	1,502	1,428
Nuclear	2,280	2,280	2,280	-	-
Geothermal	1,359	1,360	1,361	1,361	1,362
Biomass	620	622	624	626	627
Hydro	6,457	6,457	6,457	6,457	6,457
Pumped Hydro Storage	1,579	1,579	1,579	1,579	1,579
Demand Response	2,195	2,195	2,195	2,195	2,195
Imports - Unspecified	5,000	5,000	4,000	4,000	4,000
Imports - Specified	1,981	1,981	1,981	1,592	1,600
Wind	6,548	6,591	6,622	6,644	6,658
Solar	13,902	14,589	14,679	14,836	14,955
Energy Storage 4 h	1,747	2,024	2,055	2,116	2,156
Total	72,240	73,232	69,524	66,746	66,759



PSP Scenario Additions

- The proposed system plan was adapted in two ways:
 - Offshore wind was rolled into onshore wind.
 - 1,727 MW of capacity counted in the PSP and the baseline resources in the CPUC's Reliability Need Assessment were removed from the PSP.

Nameplate (MW)	2022	2023	2024	2025	2026	2026a
Geothermal	-	100	100	100	170	1,319
Biomass	19	50	68	92	92	92
Shed DR	151	151	353	441	441	441
Wind	1,310	1,332	1,662	3,144	3,264	3,264
Solar	2,211	5,666	6,867	10,117	10,117	10,117
Energy Storage 4 h	2,159	4,198	10,211	12,147	12,147	12,147
Energy Storage 8 h	-	-	-	-	196	1,196
Total	5,850	11,497	19,261	26,041	26,427	1,852
NQC	2,753	4,916	9,907	11,712	12,012	14,012



Procurement Scenario Additions

- Procurement builds are based on remaining NQC procurement in D.19-11-016 (1,505 MW NQC) and D.21-06-035 (9,500 to 11,500 MW NQC)
- Resources were built consistent with the 2026 resource ratio in the PSP, but only up to the needed NQC value for each year.

Nameplate (MW)	2022	2023	2024	2025	2026	2026a
Geothermal	8	25	77	92	92	1,241
Biomass	7	23	71	85	85	85
Shed DR	34	111	340	408	408	408
Wind	242	794	2,427	2,908	2,908	2,908
Solar	780	2,554	7,811	9,356	9,356	9,356
Energy Storage 4 h	936	3,066	9,378	11,233	11,233	11,233
Energy Storage 8 h	-	-	-	-	-	1,000
Total	2,007	6,573	20,105	24,082	24,082	26,231
NQC	1,070	3,505	9,505	11,005	11,005	13,005

Appendix 3: Additional Results





Additional Shortfall Tables

1 in 20 Shortfall	2022	2023	2024	2025	2026	2026a
S0: No Build	3,215	3,246	7,893	12,525	12,968	N/A
S1: PSP	620	-	-	-	-	-
S5: PSP, no Age Based Gas Retirement	243	-	-	-	-	-
S7: Gas in place of PSP	669	-	-	-	-	-
S9: Procurement, PSP Ratios	2,197	-	-	-	-	-
S11: Procurement, no Age Based Gas Ret.	1,933	-	-	-	-	-
S3: Gas in place of Procurement	2,154	-	-	271	930	-

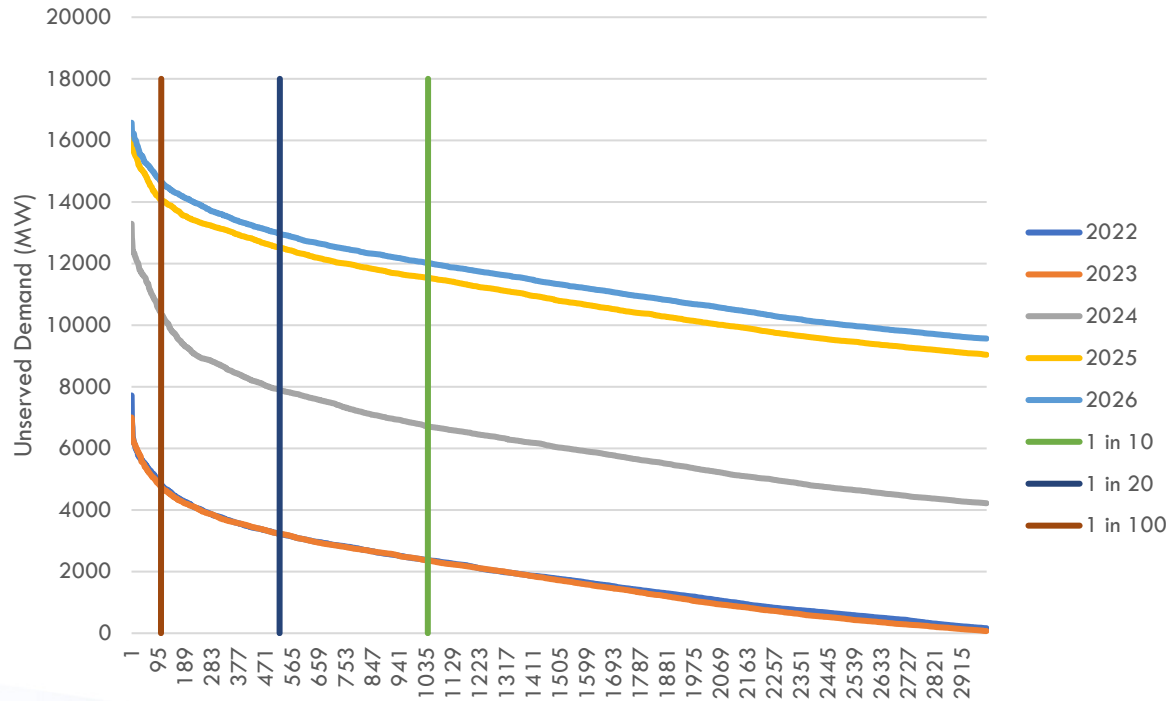
1 in 100 Shortfall	2022	2023	2024	2025	2026	2026a
S0: No Build	4,817	4,774	10,351	14,065	14,662	N/A
S1: PSP	2,256	-	-	-	-	-
S5: PSP, no Age Based Gas Retirement	2,017	-	-	-	-	-
S7: Gas in place of PSP	2,193	394	-	1,302	1,428	-
S9: Procurement, PSP Ratios	3,753	1,377	-	-	378	-
S11: Procurement, no Age Based Gas Ret.	3,581	948	-	-	-	-
S3: Gas in place of Procurement	3,781	1,632	44	1,894	2,534	855



S0: No Build

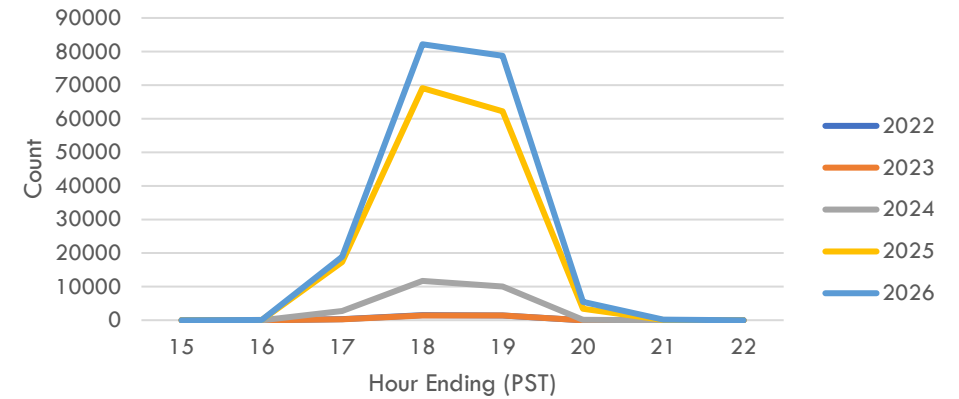
Total Samples: 10,400

Unserved Energy Event Magnitude

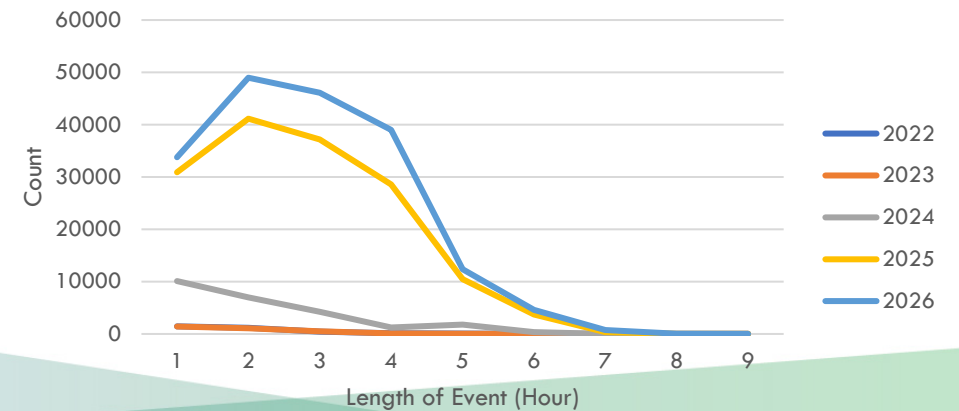


S0: No Build	2022	2023	2024	2025	2026	2026a
LOLE	0.311	0.303	2.369	14.639	17.839	N/A
1 in 10 Shortfall	2,372	2,391	6,711	11,540	12,022	N/A
1 in 20 Shortfall	3,215	3,246	7,893	12,525	12,968	N/A
1 in 100 Shortfall	4,817	4,774	10,351	14,065	14,662	N/A

Time of Day with Unserved Energy



Event Duration

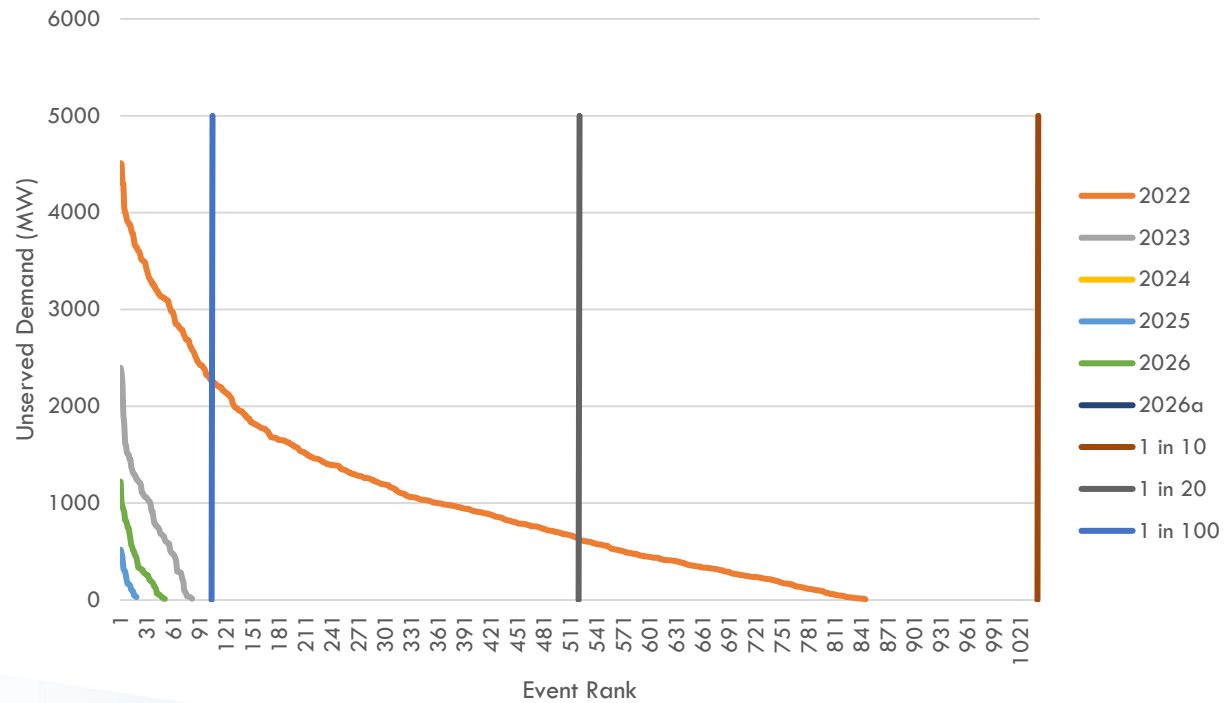




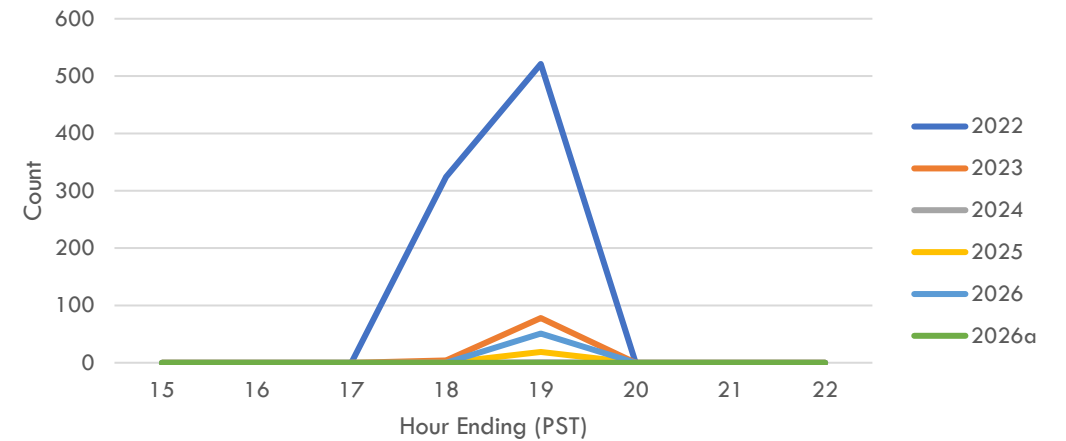
S1: PSP, and S2: PSP+

Total Samples: 10,400

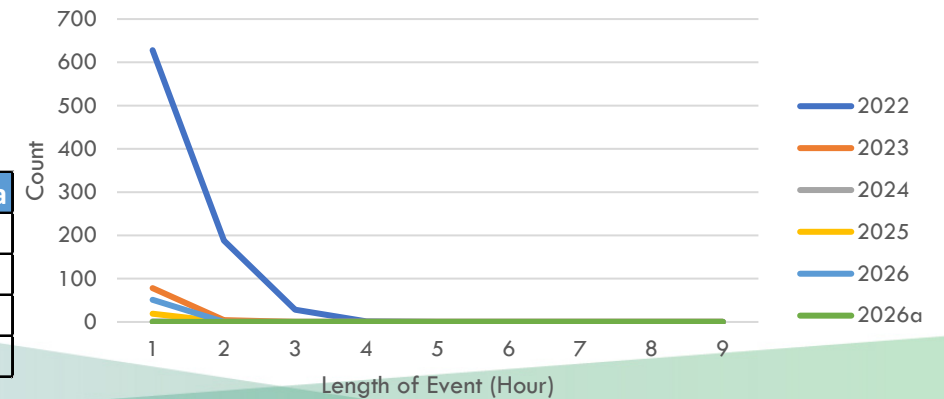
Unserved Energy Event Magnitude



Time of Day with Unserved Energy



Event Duration



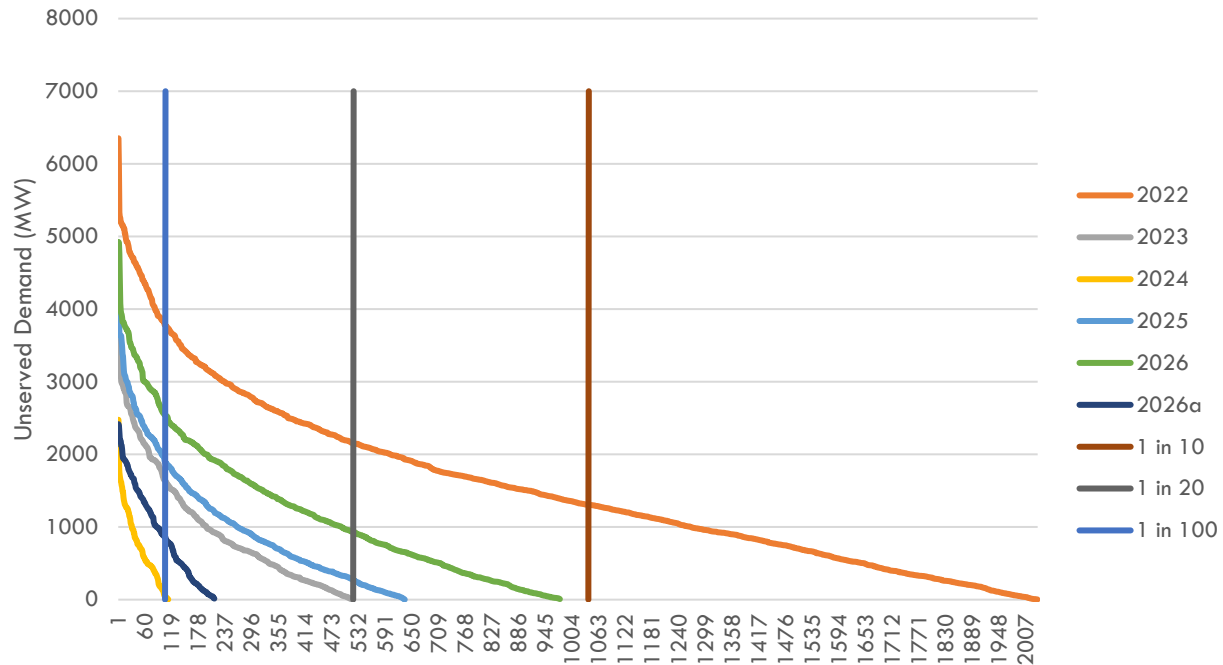
S1: PSP	2022	2023	2024	2025	2026	2026a
LOLE	0.081	0.008	0.000	0.002	0.005	-
1 in 10 Shortfall	-	-	-	-	-	-
1 in 20 Shortfall	620	-	-	-	-	-
1 in 100 Shortfall	2,256	-	-	-	-	-



S3: Gas in Place of Procurement, and S4: Gas in Place of Procurement+

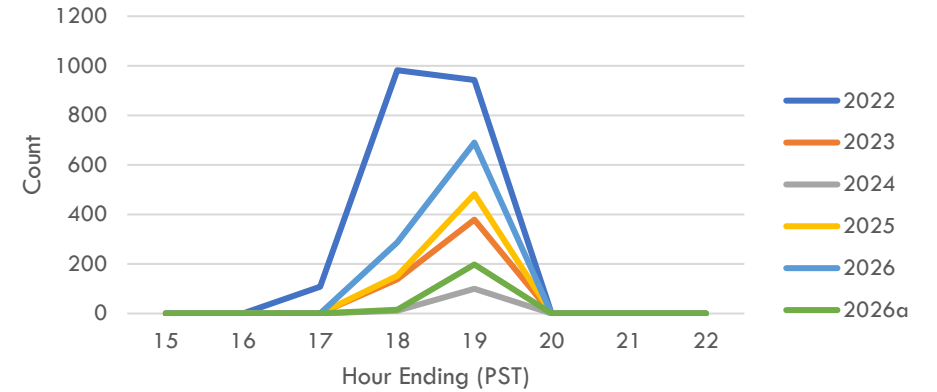
Total Samples: 10,400

Unserved Energy Event Magnitude

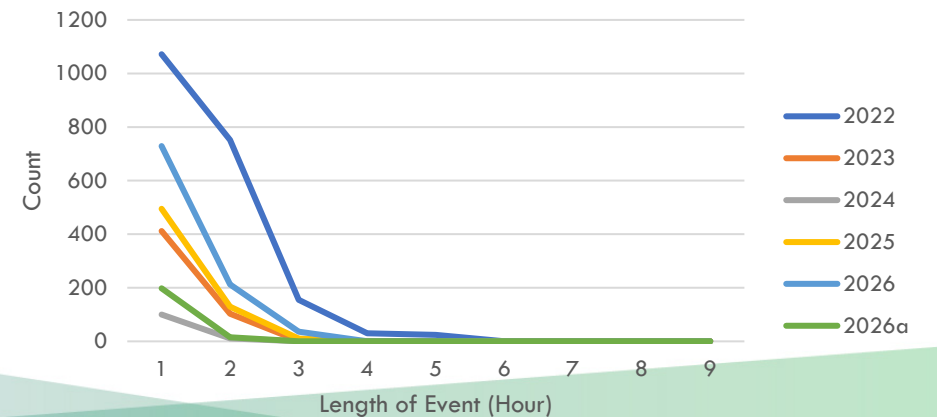


S3: Gas in place of Procurement	2022	2023	2024	2025	2026	2026a
LOLE	0.195	0.050	0.011	0.061	0.094	0.020
1 in 10 Shortfall	1,306	-	-	-	-	-
1 in 20 Shortfall	2,154	-	-	271	930	-
1 in 100 Shortfall	3,781	1,632	44	1,894	2,534	855

Time of Day with Unserved Energy



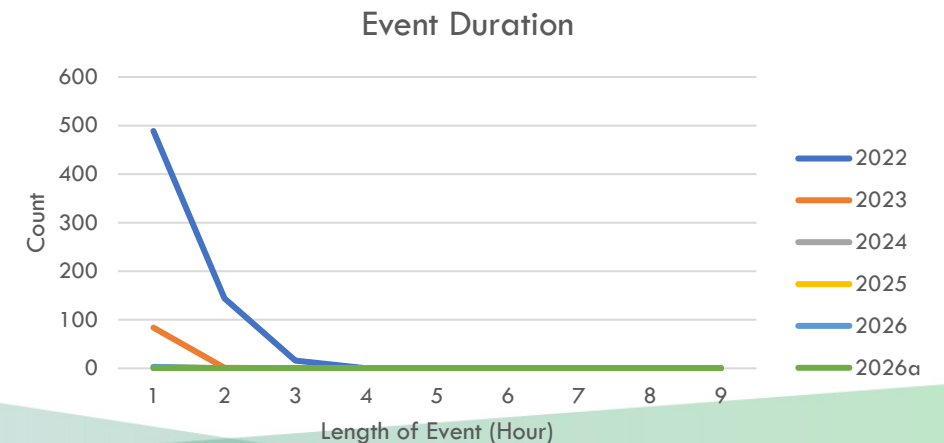
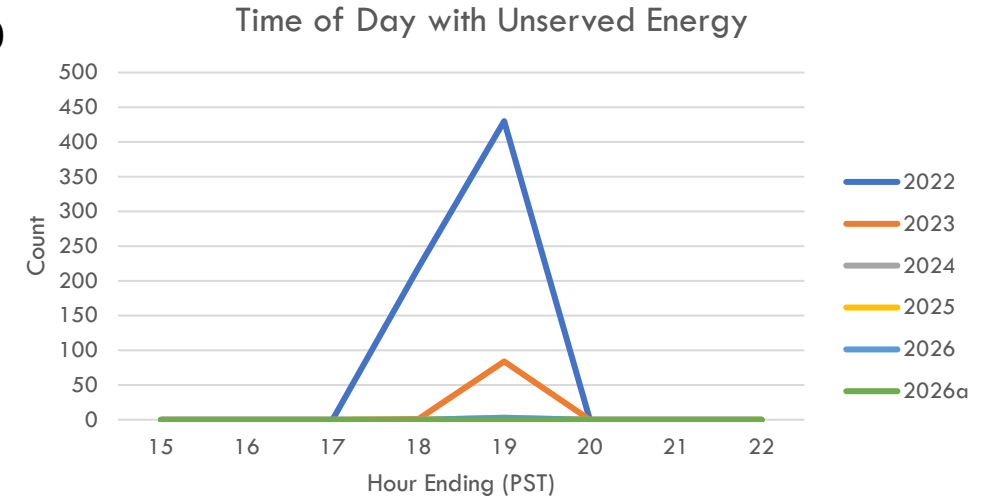
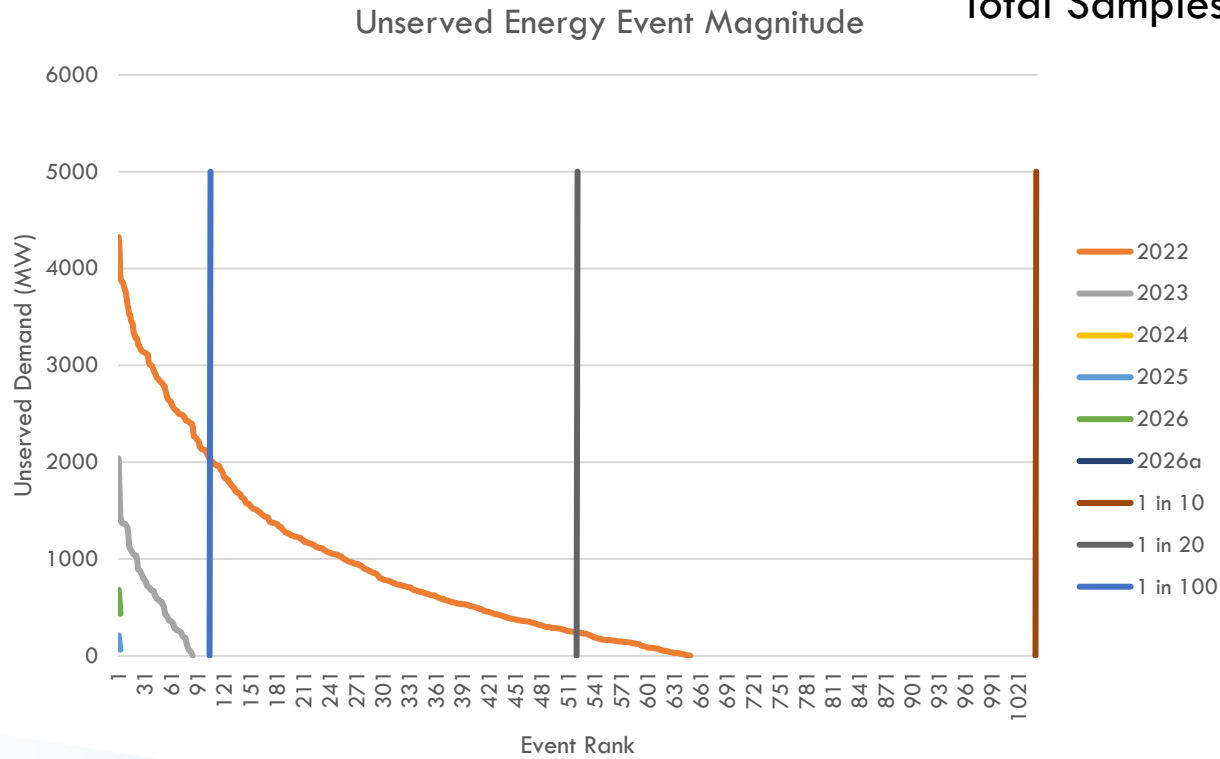
Event Duration





S5: PSP, No Age Based Gas Retirement, and S6: PSP+, No Age Based Gas Retirement

Total Samples: 10,400



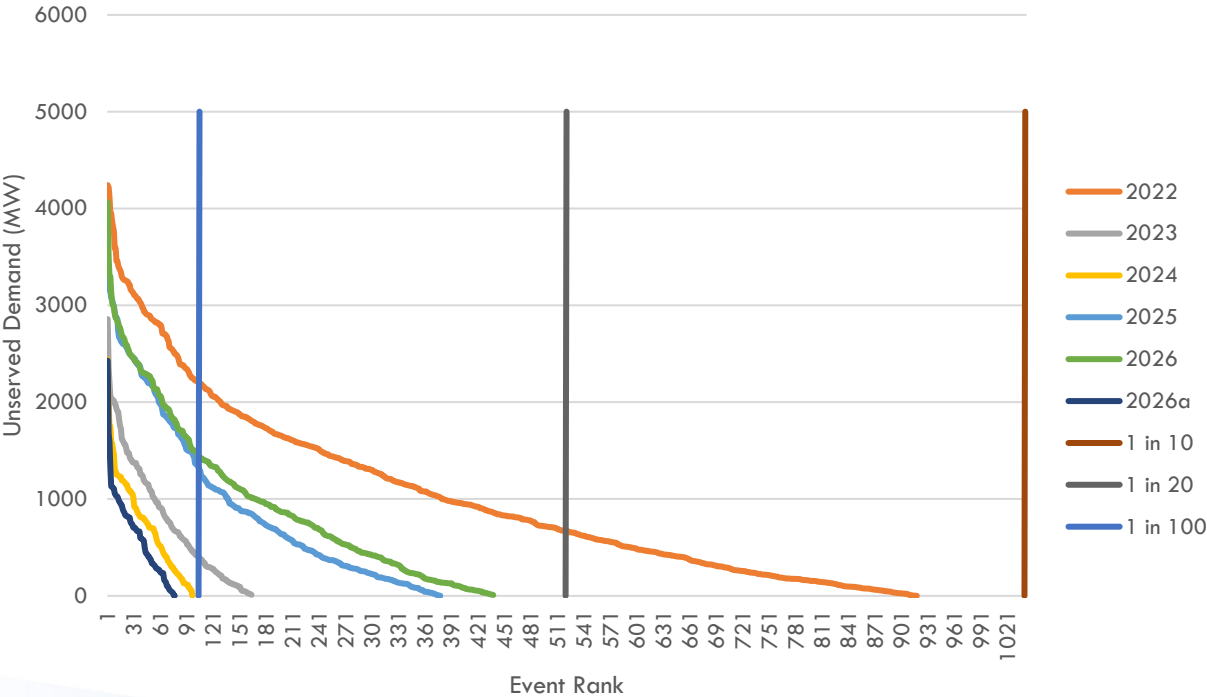
S5: PSP, no Age Based Gas Retirement	2022	2023	2024	2025	2026	2026a
LOLE	0.062	0.008	0.000	0.000	0.000	-
1 in 10 Shortfall	-	-	-	-	-	-
1 in 20 Shortfall	243	-	-	-	-	-
1 in 100 Shortfall	2,017	-	-	-	-	-



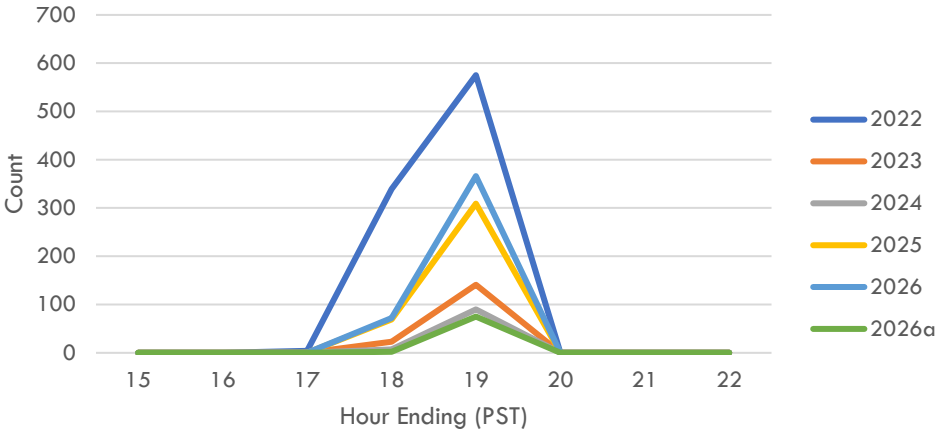
S7: Gas in Place of PSP, and S8: Gas in Place of PSP+

Unserved Energy Event Magnitude

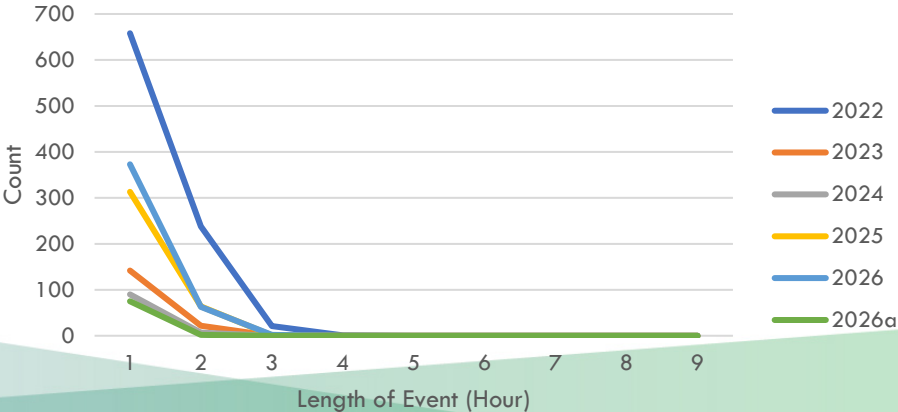
Total Samples: 10,400



Time of Day with Unserved Energy



Event Duration



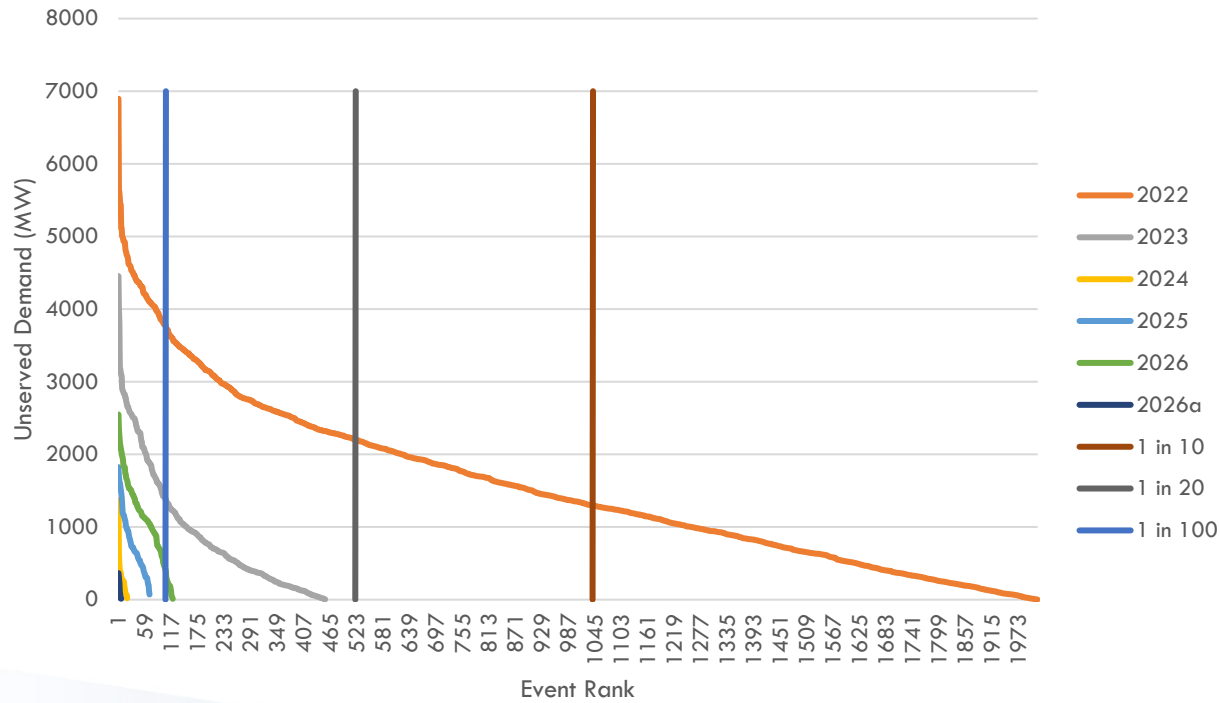
S7: Gas in place of PSP	2022	2023	2024	2025	2026	2026a
LOLE	0.088	0.016	0.009	0.036	0.042	0.007
1 in 10 Shortfall	-	-	-	-	-	-
1 in 20 Shortfall	669	-	-	-	-	-
1 in 100 Shortfall	2,193	394	-	1,302	1,428	-



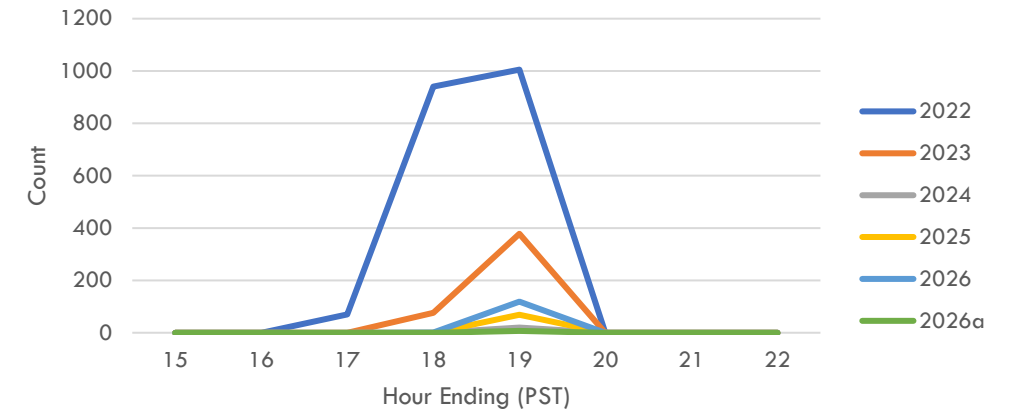
S9: Procurement, PSP Ratios, and S10: Procurement+, PSP Ratios

Total Samples: 10,400

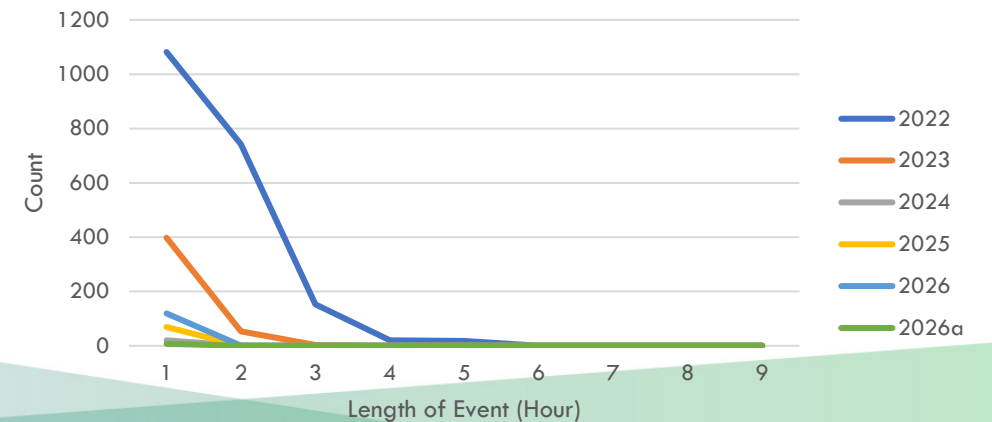
Unserved Energy Event Magnitude



Time of Day with Unserved Energy



Event Duration



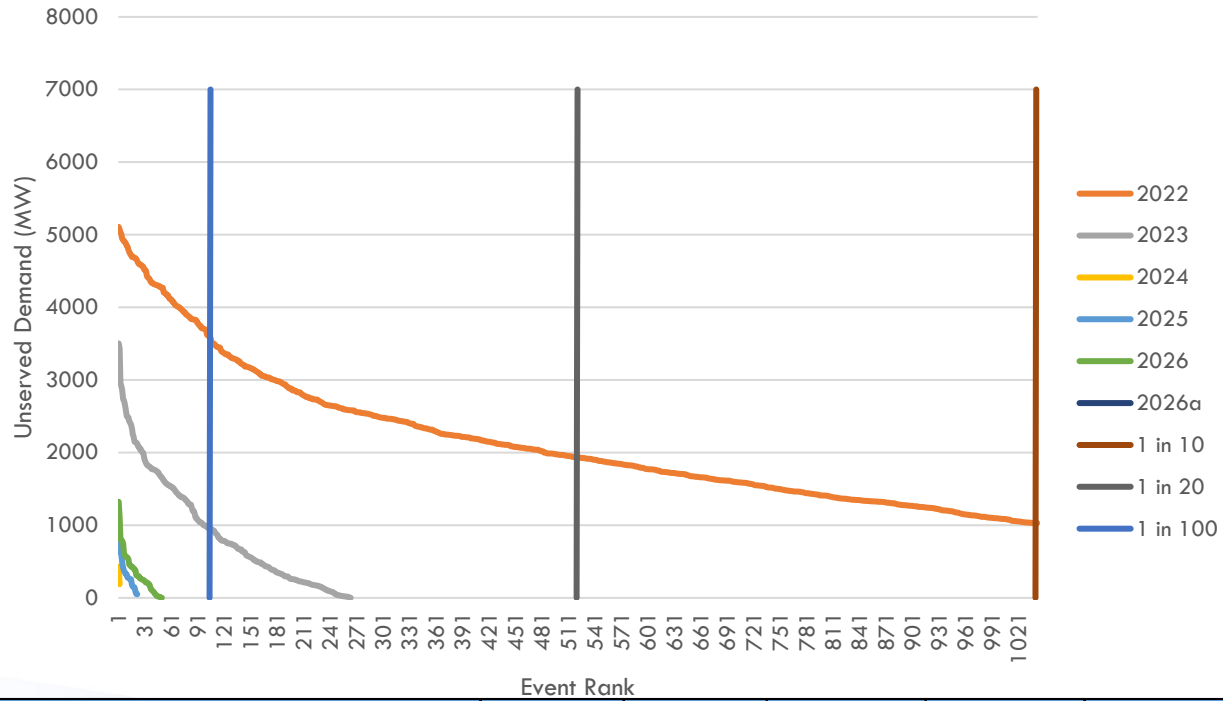
S9: Procurement, PSP Ratios	2022	2023	2024	2025	2026	2026a
LOLE	0.194	0.044	0.002	0.007	0.012	0.001
1 in 10 Shortfall	1,296	-	-	-	-	-
1 in 20 Shortfall	2,197	-	-	-	-	-
1 in 100 Shortfall	3,753	1,377	-	-	378	-



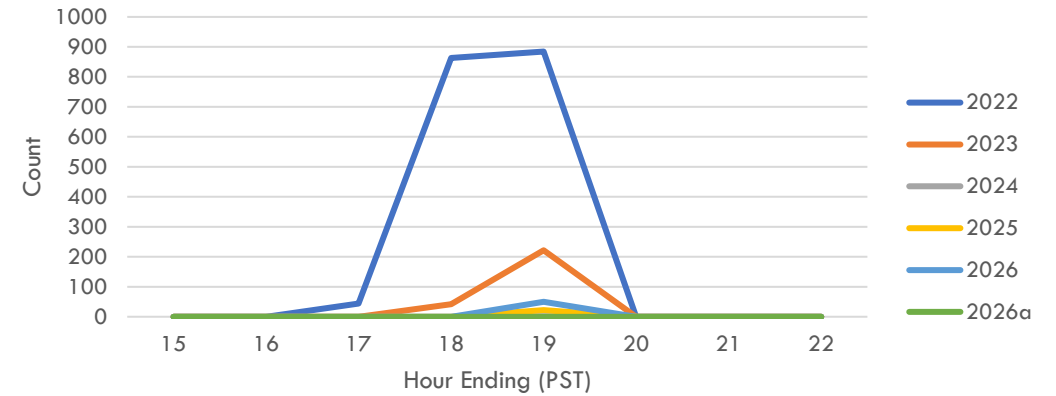
S11: Procurement, PSP Ratios, No Age Based Gas Ret, S12: Procurement+, PSP Ratios, No Age Based Gas Ret

Total Samples: 10,400

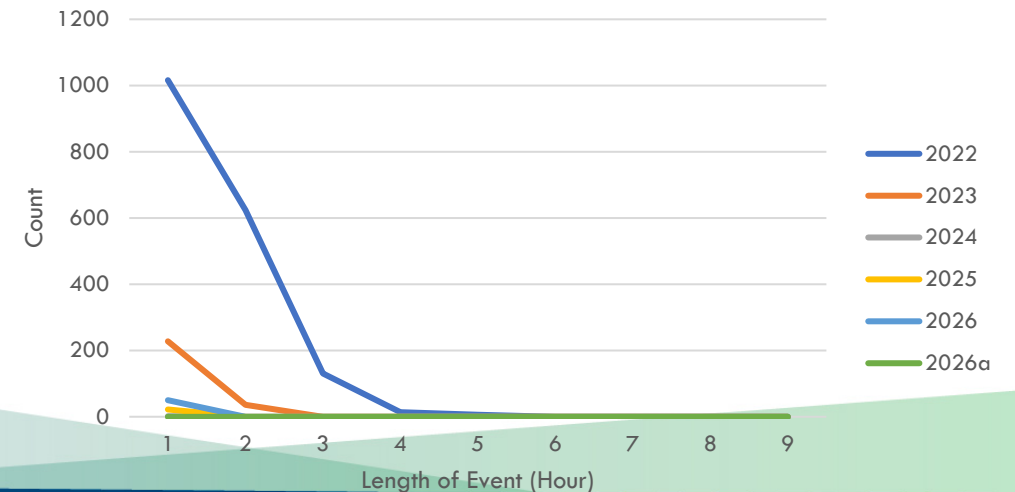
Unserved Energy Event Magnitude



Time of Day with Unserved Energy



Event Duration



S11: Procurement, no Age Based Gas Ret.	2022	2023	2024	2025	2026	2026a
LOLE	0.172	0.025	0.000	0.002	0.005	-
1 in 10 Shortfall	1,029	-	-	-	-	-
1 in 20 Shortfall	1,933	-	-	-	-	-
1 in 100 Shortfall	3,581	948	-	-	-	-