Draft 2025 Flexible Capacity Needs and Availability Assessment Hours Technical Study for 2026 to 2028

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Reminders

- This call is being recorded for informational and convenience purposes only. Any related transcriptions should not be reprinted without ISO's permission.
- The meeting is structured to stimulate dialogue and engage different perspectives.
- Please keep comments professional and respectful.
- Please try to be brief and refrain from repeating what has already been said so that we can manage this time efficiently.

Instructions for raising your hand to ask a question

- Open the Participant and Chat panels from the bottom right.
- If you are connected to audio through your computer or used the “call me” option, select the raise hand icon located on the bottom of the participant panel.
  - **Note**: If you connected by phone outside of Webex, dial *3 to get into the question queue.
- Please remember to state your name and affiliation before making your comment.
- You may send your question via chat to all panelists.
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Objective

Discuss the assumptions, methodology, and draft results of the monthly flexible capacity requirement and Availability Assessment Hours Technical Study.

Specifically

Calculating monthly flexible capacity requirements for all LRAs within the ISO footprint for RA compliance year 2026 and advisory requirements for compliance years 2027 and 2028

Agenda / Overview

- Background
- Process review
  - Expected build out from all LSEs (CPUC jurisdictional and non-jurisdictional)
  - Load, wind and solar profiles
  - Calculate three-hour net load upward ramps
  - Add the larger of either the spinning reserve portion of contingency reserves or the most severe contingency
  - Calculate monthly Flexible Capacity requirement
- Overview of methodology used for system/local availability assessment hours
  - 2026 availability assessment hours
  - 2027-2028 draft availability assessment hours

Review of California's resource adequacy program

- The California Public Utilities Commission (CPUC) adopted a Resource Adequacy (RA) policy framework in 2004 in order to ensure the reliability of electric service in California
- The CPUC established RA obligations applicable to all:
  - Load Serving Entities (LSEs) within the CPUC's jurisdiction
  - Investor-owned utilities (IOUs),
  - Energy service providers (ESPs), and
  - Community choice aggregators (CCAs)
- The RA policy framework guides resource procurement and promotes infrastructure investment by requiring LSEs to procure capacity so that capacity is available to the CAISO when and where needed
- The CPUC's RA program now contains three distinct requirements:
  - System RA requirements (effective June 1, 2006),
  - Local RA requirements (effective January 1, 2007), and
  - Flexible RA requirements (effective January 1, 2015)

Each LSE Scheduling Coordinator shall make a year-ahead and month-ahead showing of flexible capacity for each month of the compliance year

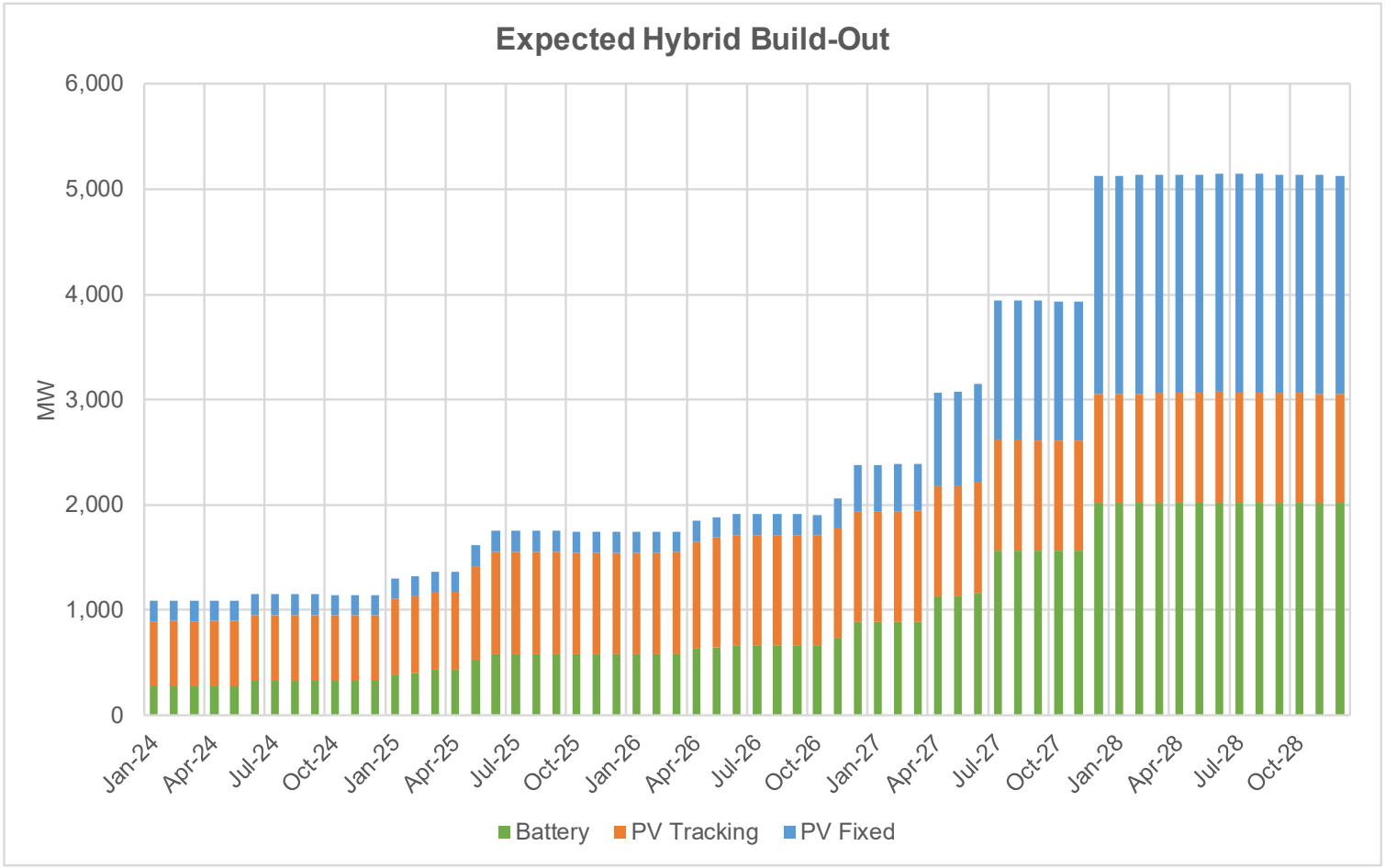
Resource Adequacy (RA)

- Ensure LSEs contract for adequate capacity to meet expected flexible capacity needs
- Year ahead: LSEs need to secure a minimum of 90% of the next years monthly needs
- Month ahead: LSEs need to secure adequate net qualified capacity to serve their peak load including a planning reserve margin and flexible capacity to address largest three-hour net load ramps plus contingency reserves
- All resources participating in the ISO markets under an RA contract will have an RA must-offer-obligation
- Required to submit economic bids into the ISO's real-time market consistent with the category of flexible capacity

The ISO used the following data to determine the flexible capacity needs

- CEC's IEPR demand forecast for 2026 through 2028
- LSE SCs updated renewable build-out for 2025 through 2029
- The Analysis of Flex Capacity Needs included:
  - Existing VERs capacity
  - Expected installed capacity by technology and expected operating date (e.g. Solar thermal, solar PV tracking, solar PV non-tracking, estimate of behind-the-meter solar PV, co-located and renewable components of hybrids) for all variable energy resources under contract
  - Operational date or expected on-line date
  - Dynamically scheduled resources located outside ISO's BAA

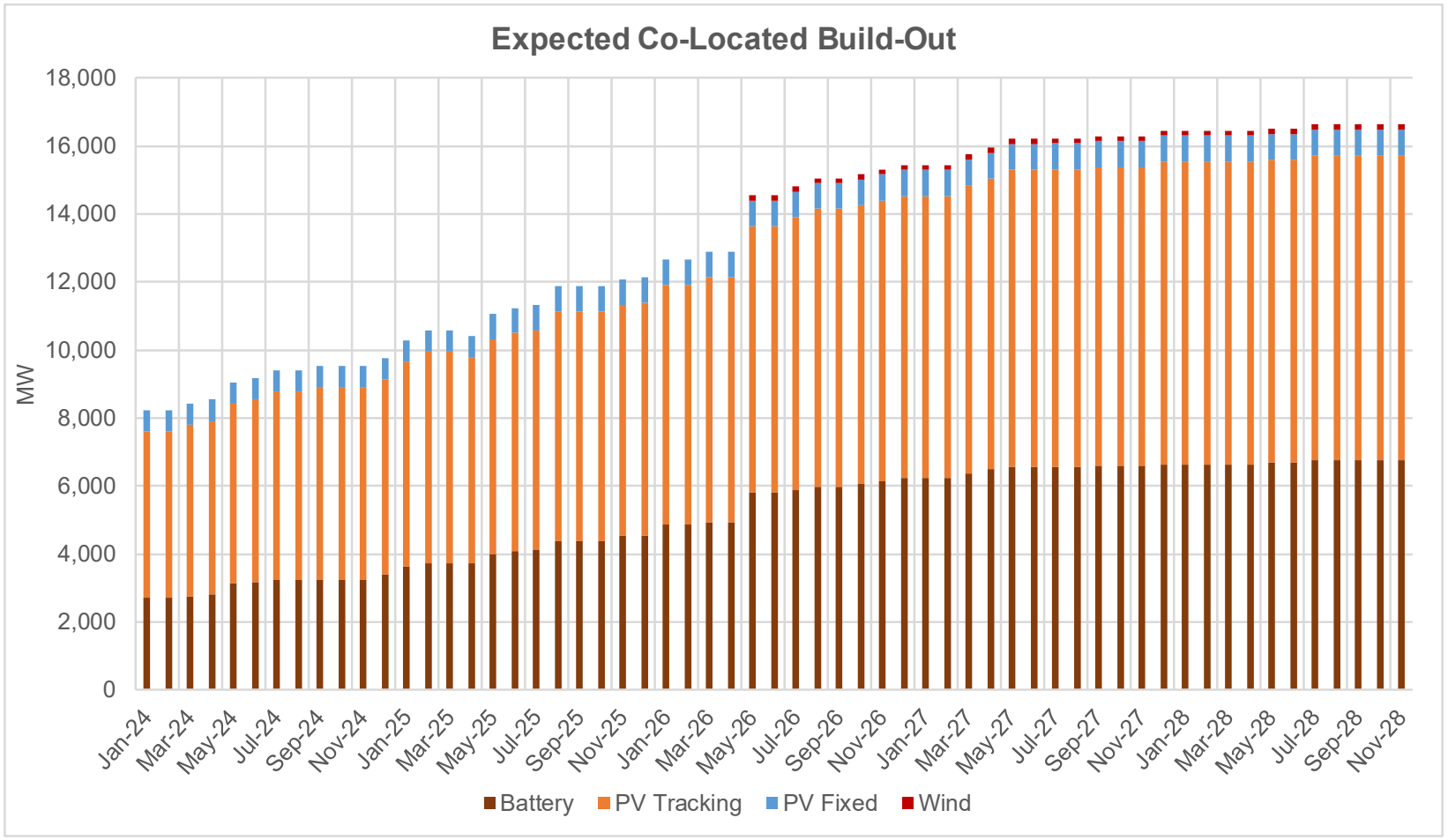
Expected hybrid renewable buildout through December 2028 based on LSE's submittal



Hybrid resources were included in the flexible needs assessment

For more details on hybrid and co-located resources, visit the stakeholder page: https://stakeholdercenter.caiso.com/StakeholderInitiatives/Hybrid-resources

Expected co-located renewable buildout through December 2028 based on LSE's submittal



Co-Located resources were included in the flexible needs assessment

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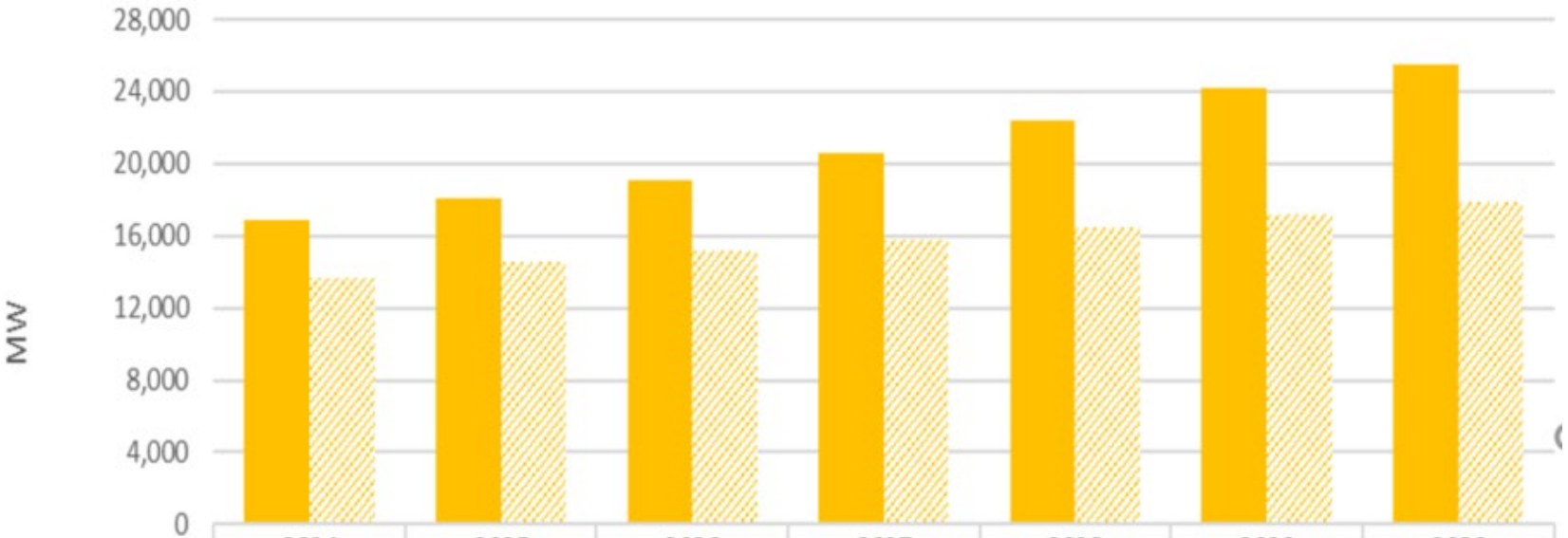
2025 LSE's submitted solar capacity and CEC's maximum monthly forecast production



	2024	2025	2026	2027	2028	2029	2030
LSE's Capacity	16,884	18,062	19,035	20,633	22,438	24,208	25,500
CEC's Forecast	13,666	14,567	15,180	15,806	16,474	17,173	17,911

Summary of LSEs submittal showing the expected capacity at the end of each year

Resource Type	Existing 2024	Expected 2025	Expected 2026
ISO Solar PV	12,516	12,646	12,901
ISO Solar Thermal	860	858	617
ISO Wind	5,064	4,987	5,970
Co-Located Resources (Wind)	0	0	148
Co-Located Resources (Solar)	6,289	7,628	9,213
Hybrid Resources (Wind)	0	0	0
Hybrid Resources (Solar)	818	818	1,488
Total Variable Energy Resource Capacity within the ISO	***25,547***	***26,936***	***30,337***
Cumulative Non ISO Wind/Solar Resources that's Dynamically Scheduled into the ISO	1,009	1,009	1,259
Total Internal and Dynamically Scheduled VERs in Flexible Capacity Needs Assessment	***26,556***	***27,945***	***31,596***
Incremental New VERs Additions Each Year (Included in Flexible Capacity Needs Assessment)		***1,389***	***3,651***
Maximum Expected BTM Solar PV Production in the CEC's Forecast		14,433	14,931
Cumulative behind-the-meter Solar PV Capacity reported by LSEs	16,884	18,062	19,305

The ISO is comparing the data submitted by the LSEs below to data in the interconnection que and current capacity to ensure alignment. The ISO may perform additional outreach to LSEs based on the data submitted to ensure all resources are being included.

The ISO flexibility capacity assessment is based on current LSEs' RPS build-out data

- Uses the most current data available for renewable build-out obtained from all LSE SCs
  - The SC for each *LSE* in the CAISO BAA [to identify] each *wind and solar resource*… that is owned, in whole or in part, by the LSE, or under contractual commitment to the LSE or the Load-following MSS LSE, for all or a portion of its capacity
- For new renewable installation, scale 2024 actual production data based on the expected installed capacity in subsequent years
- Generate net-load profiles for 2026 through 2028
  - Generate load profiles for 2026 through 2028
  - Generate solar profiles for 2026 through 2028
  - Generate wind profiles for 2026 through 2028

The ISO will use the CEC's 1-in-2 IEPR forecast to develop the monthly flexible capacity

- CEC IEPR Load Forecast
  - https://efiling.energy.ca.gov/GetDocument.aspx?tn=262289&DocumentContentId=98796
  - Title of File: CED 2024 Hourly Forecast - CAISO - Planning_Scenario - correction 32025
  - CEC Demand Forecast does not contain battery charging load for market and in front of the meter battery resources.
    - CAISO will be using Managed Net Load within the spreadsheet

```
BASELINE_CONSUMPTION = UNADJUSTED_CONSUMPTION +
                       PUMPING +
                       CLIMATE_CHANGE +
                       LIGHT_EV +
                       MEDIUM_HEAVY_EV +
                       DATA_CENTER +
                       OTHER_ADJUSTMENTS

BASELINE_NET_LOAD = BASELINE_CONSUMPTION +
                    BTM_PV +
                    BTM_STORAGE_RES +
                    BTM_STORAGE_NONRES

MANAGED_NET_LOAD = BASELINE_NET_LOAD +
                   AAEE +
                   AAFS +
                   AATE_LDV +
                   AATE_MHD
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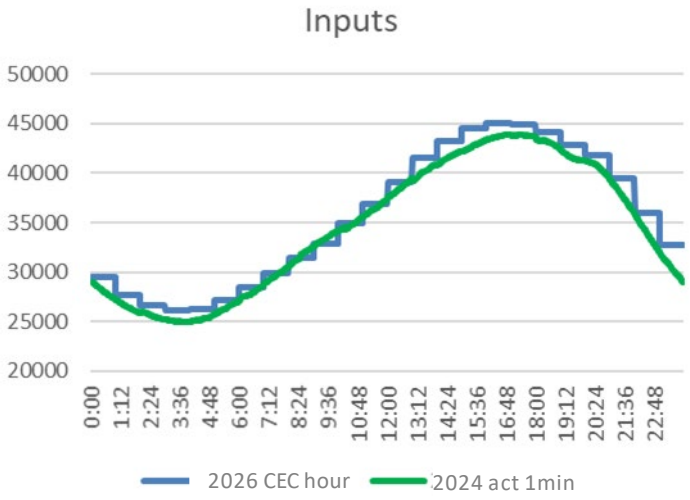
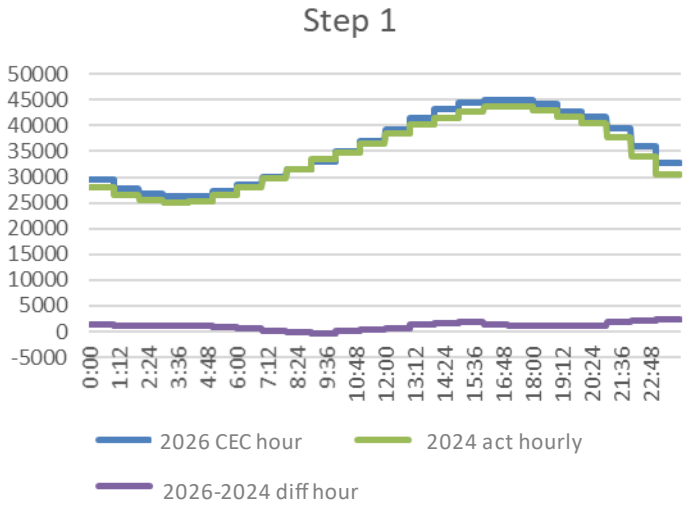
Building expected 1-minute load profile requires actual 2024 hourly and 1-minute data and CEC's hourly forecast

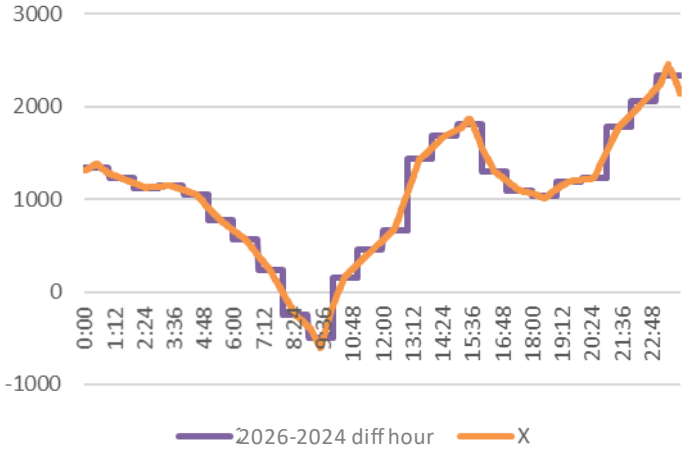
Using the 2026 CEC hourly forecast and the 2024 1-minute actuals, we will create the estimated 2026 1-minute forecast

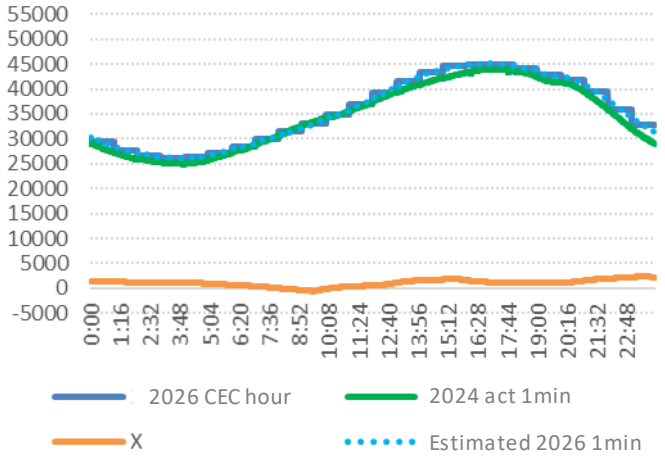




Take the hourly average of the 1-minute data and find the difference between the hourly 2024 actuals and 2026 forecast

Smooth the hourly 2026-2024 difference from Step 1 to a 1-minute granularity





Add the 1-minute data from Step 1 to the 2024 1-minute actuals to get a smoothed 2026 forecast

C

CAIS

Hourly load forecast to one-minute load forecast

- Used 2024 actual one-minute load data to build one-minute load profiles for subsequent years
- Scaled the hourly CEC load forecast value of each hour into one-minute forecast data using a smoothing equation looking at the differences between the forecasted year and the 2023 one-minute actuals.

2026 Load One-Minute Forecast

- **2026 $L_{CECfcst\_1\text{-}min}$ = 2024 $L_{Act\_1\text{-}min}$ + X**
  - **Where X = Interpolated 1-min profile from the difference**

    (2026 $L_{CECfcst\_hourly}$ - 2024 L_{actual_hourly})

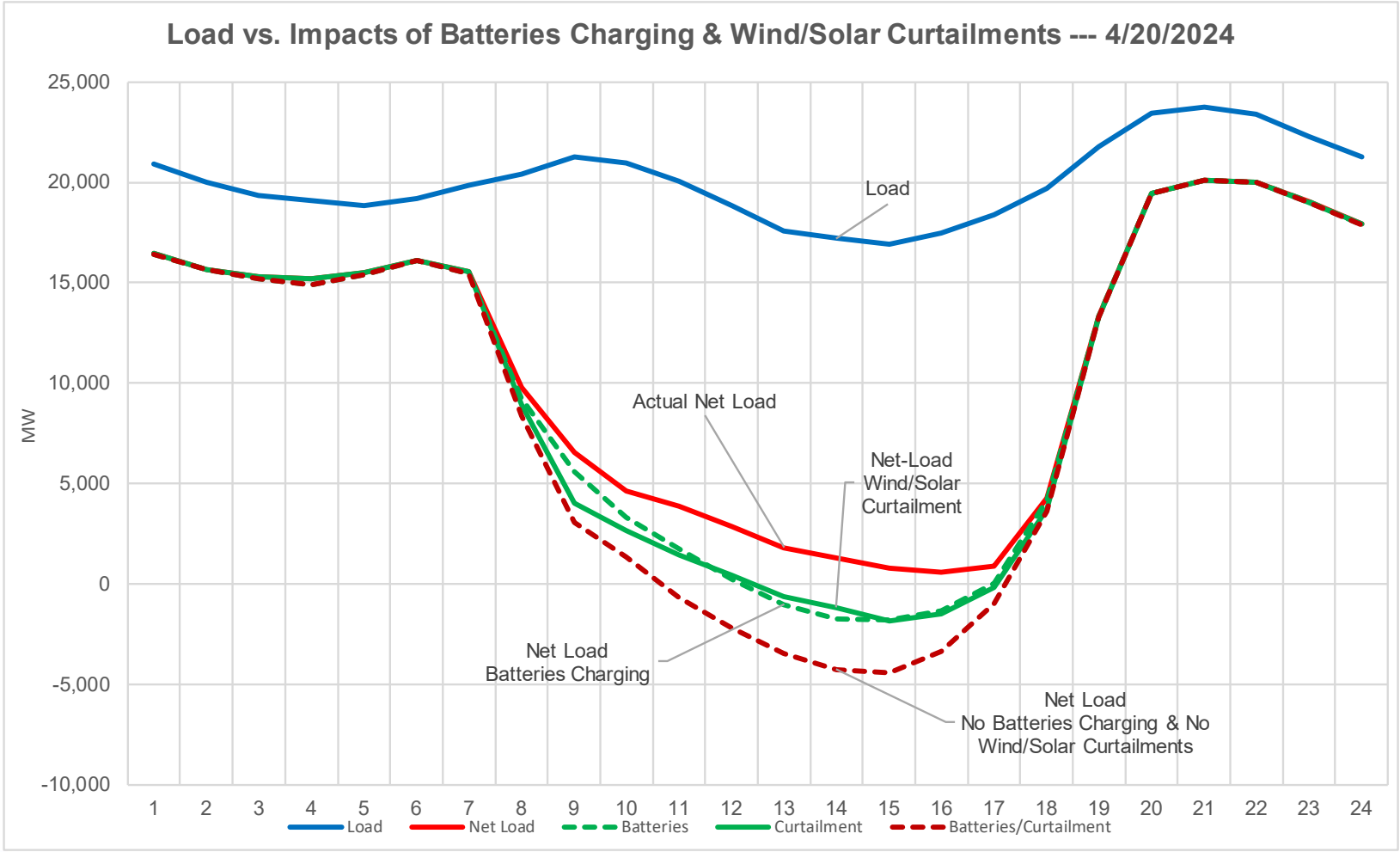
2027 Load One-Minute Forecast

- **2026 $L_{CECfcst\_1\text{-}min}$ = 2024 $L_{Act\_1\text{-}min}$ + X**
  - **Where X = Interpolated 1-min profile from the difference**

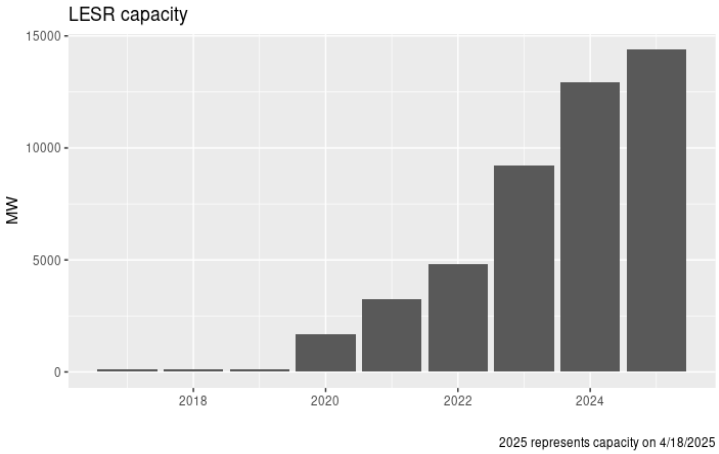
    (2026 $L_{CECfcst\_hourly}$ - 2024 L_{actual_hourly})

*See slide 8 for more graphs showing steps to calculate

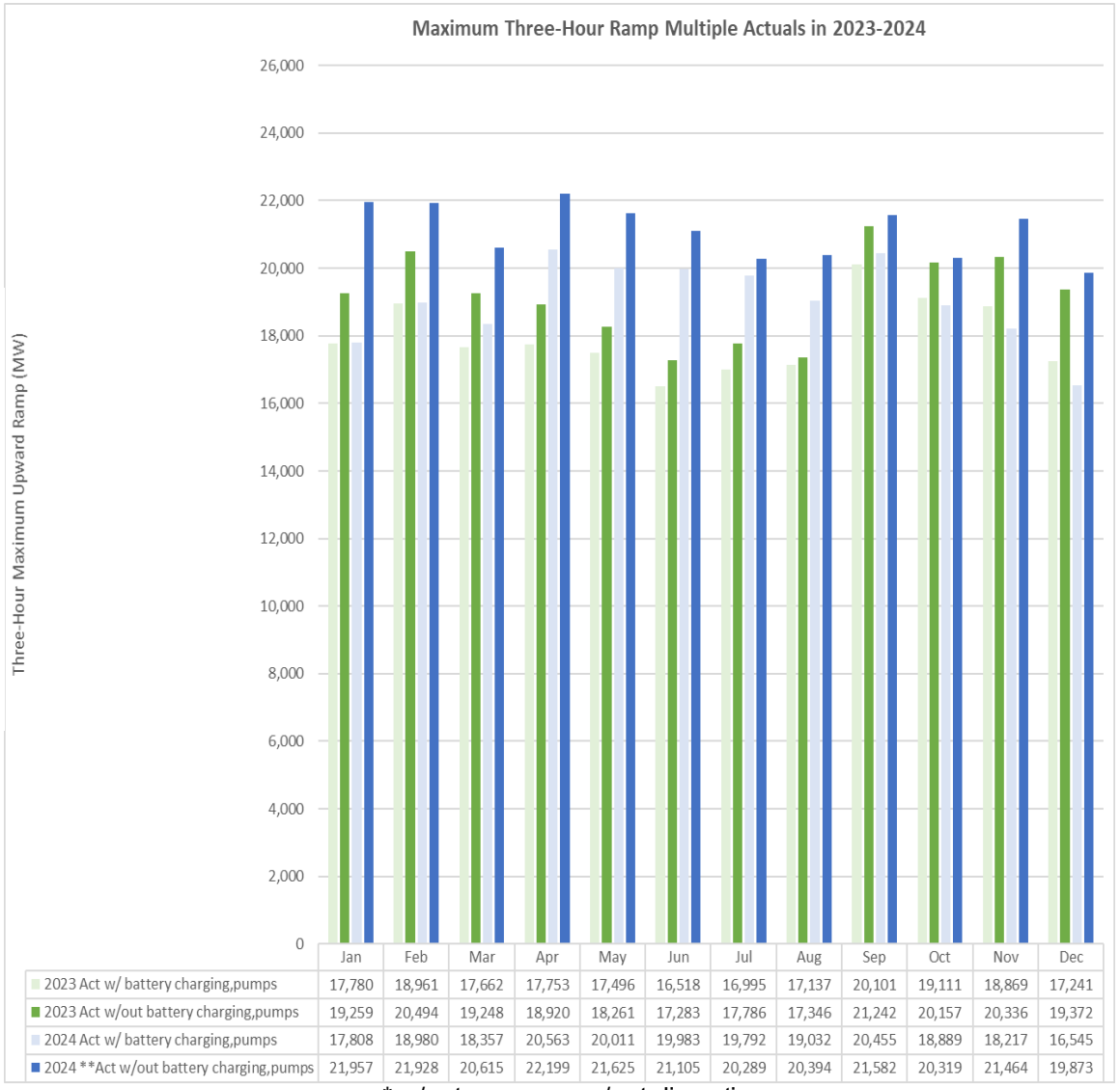
Maximum net-load 3-hour upward ramp in 2024 with and without curtailments and battery resource charging



Over the last 5 years, battery charging has impacted 3 hour net load actual ramps



Depending on the season batteries can modify the actual ramp by GWs, and this spread is increasing



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2023 Act w/ battery charging,pumps	17,780	18,961	17,662	17,753	17,496	16,518	16,995	17,137	20,101	19,111	18,869	17,241
2023 Act w/out battery charging,pumps	19,259	20,494	19,248	18,920	18,261	17,283	17,786	17,346	21,242	20,157	20,336	19,372
2024 Act w/ battery charging,pumps	17,808	18,980	18,357	20,563	20,011	19,983	19,792	19,032	20,455	18,889	18,217	16,545
2024 **Act w/out battery charging,pumps	21,957	21,928	20,615	22,199	21,625	21,105	20,289	20,394	21,582	20,319	21,464	19,873

* w/out pumps = w/out discretionary pumps

Battery resources receive Effective Flexible Capacity (EFC) accreditation for Charge and Discharge Range

2025 Annual EFC by Fuel

FUEL_TYPE	#Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GAS	182	23,985	23,994	23,991	23,941	23,894	23,817	23,784	23,776	23,810	23,910	23,962	23,986
HYBD	26	988	988	988	990	1,002	1,124	1,190	1,056	1,113	989	988	988
LESR	**130**	**17,654**	**17,654**	**17,654**	**17,654**	**17,654**	**17,654**	**17,654**	**17,654**	**17,654**	**17,654**	**17,654**	**17,654**
OTHR	35	1,349	1,349	1,349	1,348	1,348	1,349	1,349	1,349	1,349	1,349	1,349	1,349
WATR	111	5,064	5,065	5,009	5,292	5,557	5,678	5,884	5,832	5,646	5,304	5,136	5,212
TOTAL	484	49,039	49,049	48,991	49,225	49,456	49,622	49,861	49,666	49,572	49,205	49,088	49,188

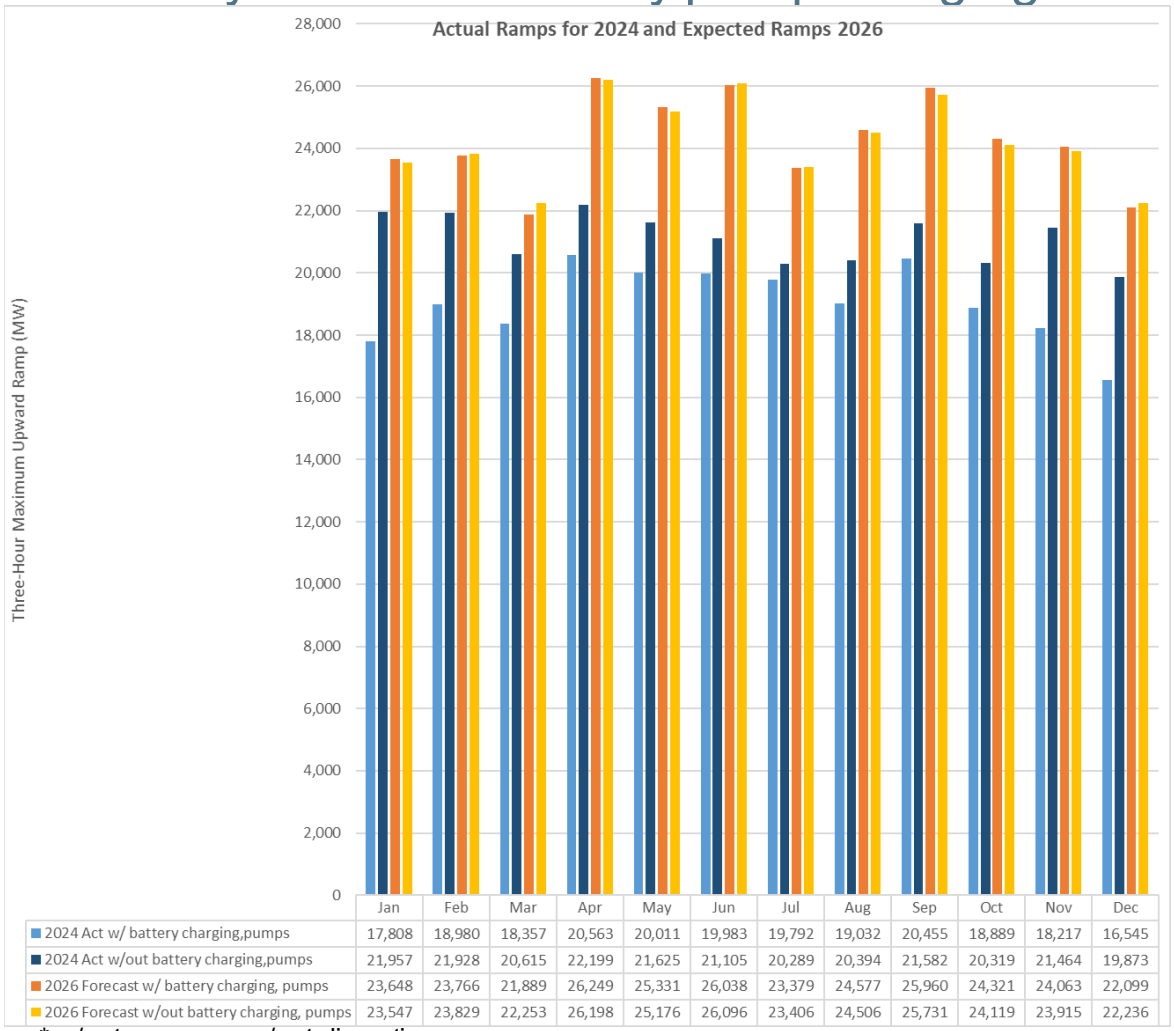
Battery EFC Tariff Language

(d) **Energy Storage Resource.** The Effective Flexible Capacity value for an energy storage resource will be determined as follows –

(1) for an energy storage resource that provides Flexible RA Capacity but not Regulation Energy Management, the Effective Flexible Capacity value will be the MW output range the resource can provide over three hours of charge/discharge while constantly ramping.

(2) for an energy storage resource that provides Flexible RA Capacity and Regulation Energy Management, the Effective Flexible Capacity value will be the resource's 15-minute energy output capability.

2025 draft study utilized different 2024 load actual information, excluding battery and discretionary pump charging to further align with CEC IEPR



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2024 Act w/ battery charging,pumps	17,808	18,980	18,357	20,563	20,011	19,983	19,792	19,032	20,455	18,889	18,217	16,545
2024 Act w/out battery charging,pumps	21,957	21,928	20,615	22,199	21,625	21,105	20,289	20,394	21,582	20,319	21,464	19,873
2026 Forecast w/ battery charging, pumps	23,648	23,766	21,889	26,249	25,331	26,038	23,379	24,577	25,960	24,321	24,063	22,099
2026 Forecast w/out battery charging, pumps	23,547	23,829	22,253	26,198	25,176	26,096	23,406	24,506	25,731	24,119	23,915	22,236

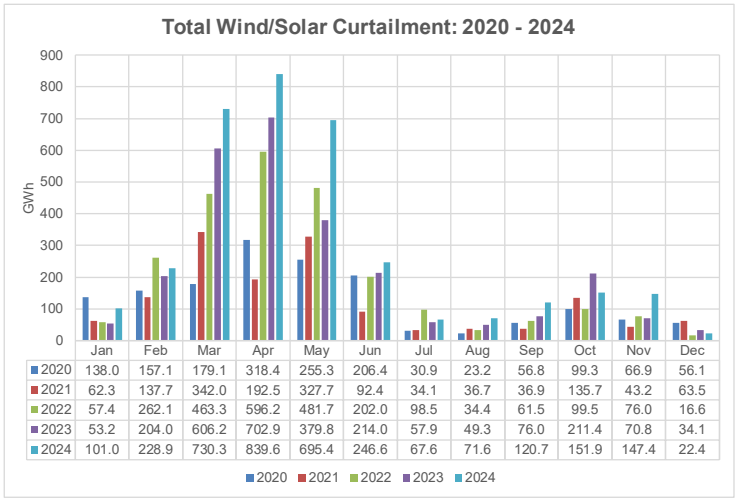
* w/out pumps = w/out discretionary pumps

Actuals (blue) can diverge substantially due to charging behavior and vary seasonally

The 2025 draft study results modified the load actual information to exclude battery and discretionary pump charging to further align with CEC IEPR forecast.

Minimal impacts to the requirement were observed from the input change.

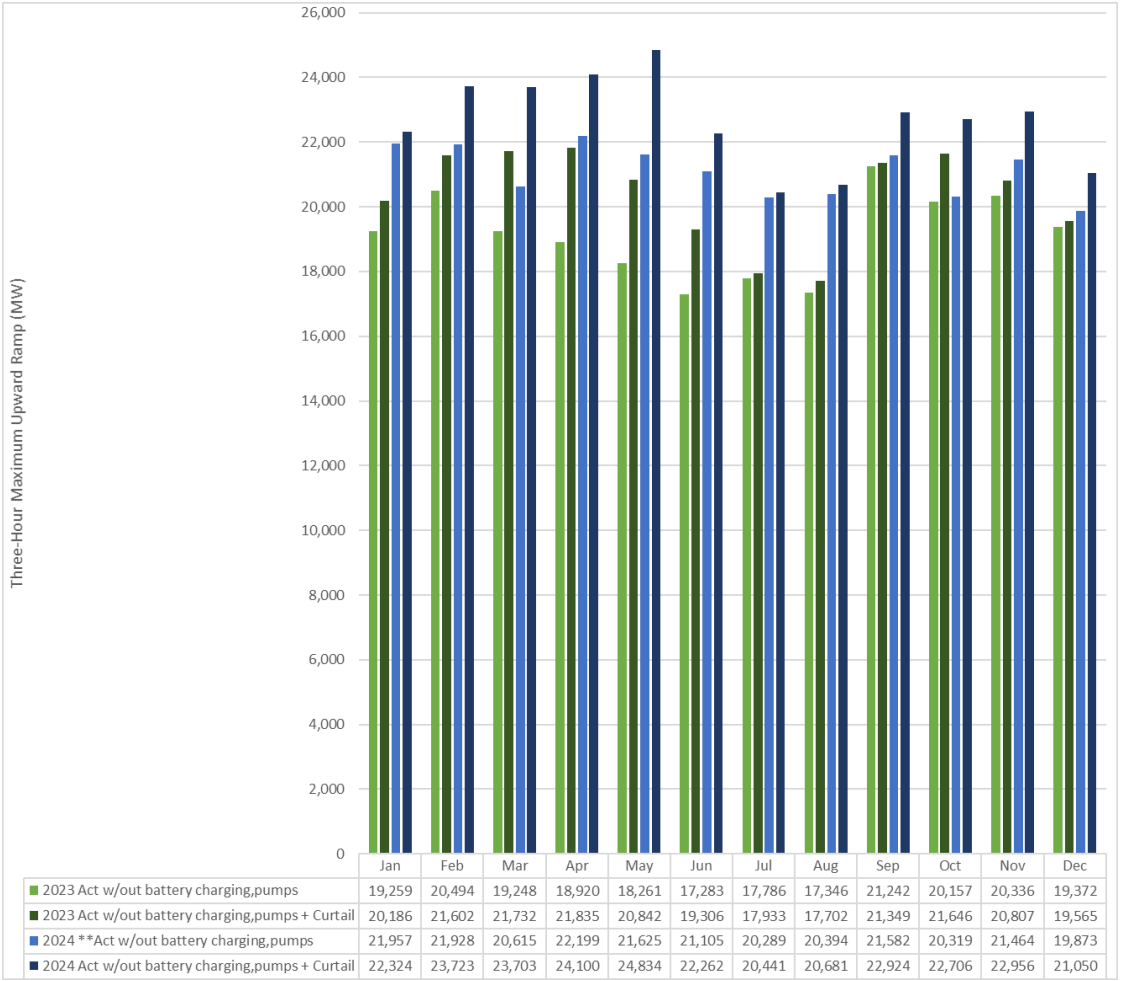
Similarly to battery charging; renewable curtailments continue to impact actual 3 hour net load ramps



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	138.0	157.1	179.1	318.4	255.3	206.4	30.9	23.2	56.8	99.3	66.9	56.1
2021	62.3	137.7	342.0	192.5	327.7	92.4	34.1	36.7	36.9	135.7	43.2	63.5
2022	57.4	262.1	463.3	596.2	481.7	202.0	98.5	34.4	61.5	99.5	76.0	16.6
2023	53.2	204.0	606.2	702.9	379.8	214.0	57.9	49.3	76.0	211.4	70.8	34.1
2024	101.0	228.9	730.3	839.6	695.4	246.6	67.6	71.6	120.7	151.9	147.4	22.4

No changes were made in the draft Flex RA study for treatment of curtailments in the requirement formulation of the 3 hour net load ramp.

CAISO expects further changes in 2026 for Flex RA year 2027 and welcomes stakeholder feedback.



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2023 Act w/out battery charging,pumps + Curtail	20,186	21,602	21,732	21,835	20,842	19,306	17,933	17,702	21,349	21,646	20,807	19,565
2024 **Act w/out battery charging,pumps	21,957	21,928	20,615	22,199	21,625	21,105	20,289	20,394	21,582	20,319	21,464	19,873
2024 Act w/out battery charging,pumps + Curtail	22,324	23,723	23,703	24,100	24,834	22,262	20,441	20,681	22,924	22,706	22,956	21,050

* w/out pumps = w/out discretionary pumps

Net-load is a NERC accepted metric[1] for evaluating additional flexibility needs to accommodate VERs

- Net load is defined as load minus wind and solar power production
- Net load variability increases as more and more wind and solar resources are integrated into the system
- The monthly three-hour flexible capacity need equates to the largest upward change in net load when looking across a rolling three-hour evaluation window
- The ISO dispatches flexible resources (including renewable resources with energy bids) to meet net load

1 NERC Special Report
Flexibility Requirements and Metrics for Variable Generation: Implications for System Planning Studies, August 2010. https://www.nerc.com/files/IVGTF_Task_1_4_Final.pdf

The flexible capacity methodology is expected to provide the ISO with sufficient flexible capacity

Methodology

Flexible $Req_{MTHy} = Max[(3RR_{HRx})_{MTHy}] + Max(MSSC, 3.5\%*E(PL_{MTHy})) + \varepsilon$

Where:

$Max[(3RR_{HRx})_{MTHy}]$ = Largest three-hour contiguous ramp starting in hour x for month y

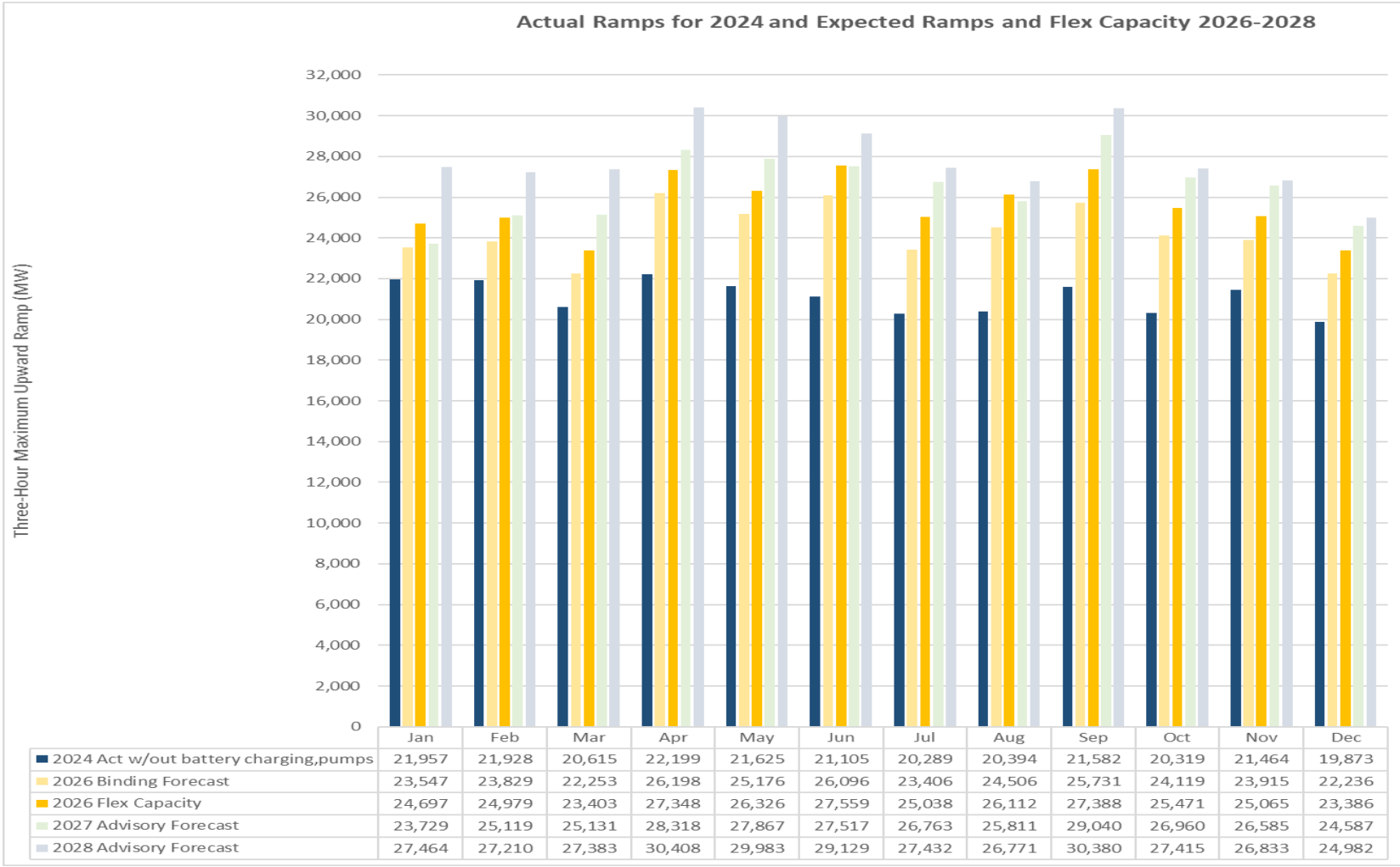
E(PL) = Expected peak load

MTH_y = Month $_y$

MSSC = Most Severe Single Contingency

ε = Annually adjustable error term to account for load forecast errors and variability. ε is currently set at zero

Monthly Three-Hour upward ramps and total flexible capacity requirements for 2026 and Expected Ramps



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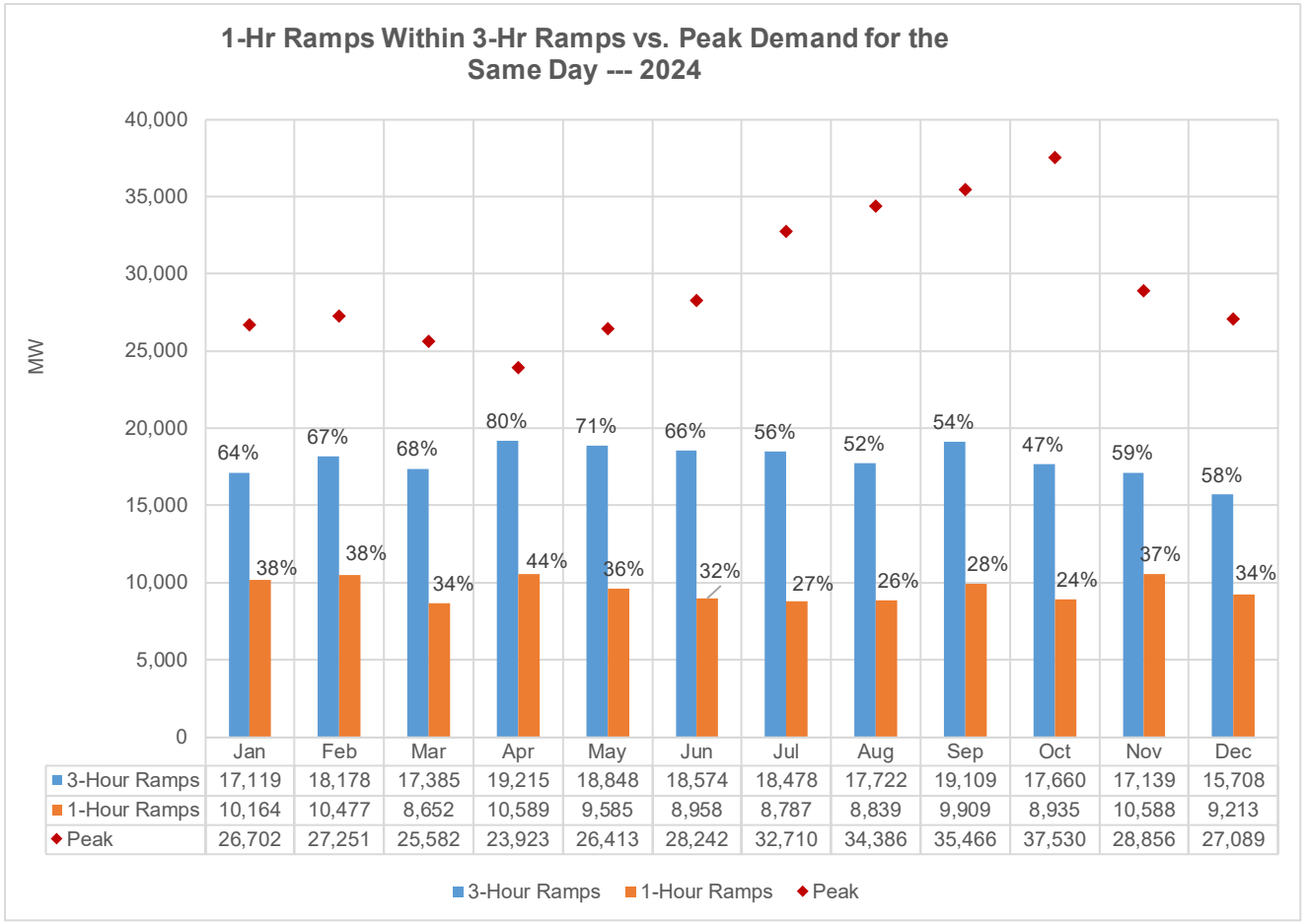
2024 Act w/out battery charging,pumps	21,957	21,928	20,615	22,199	21,625	21,105	20,289	20,394	21,582	20,319	21,464	19,873
2026 Binding Forecast	23,547	23,829	22,253	26,198	25,176	26,096	23,406	24,506	25,731	24,119	23,915	22,236
2026 Flex Capacity	24,697	24,979	23,403	27,348	26,326	27,559	25,038	26,112	27,388	25,471	25,065	23,386
2027 Advisory Forecast	23,729	25,119	25,131	28,318	27,867	27,517	26,763	25,811	29,040	26,960	26,585	24,587
2028 Advisory Forecast	27,464	27,210	27,383	30,408	29,983	29,129	27,432	26,771	30,380	27,415	26,833	24,982

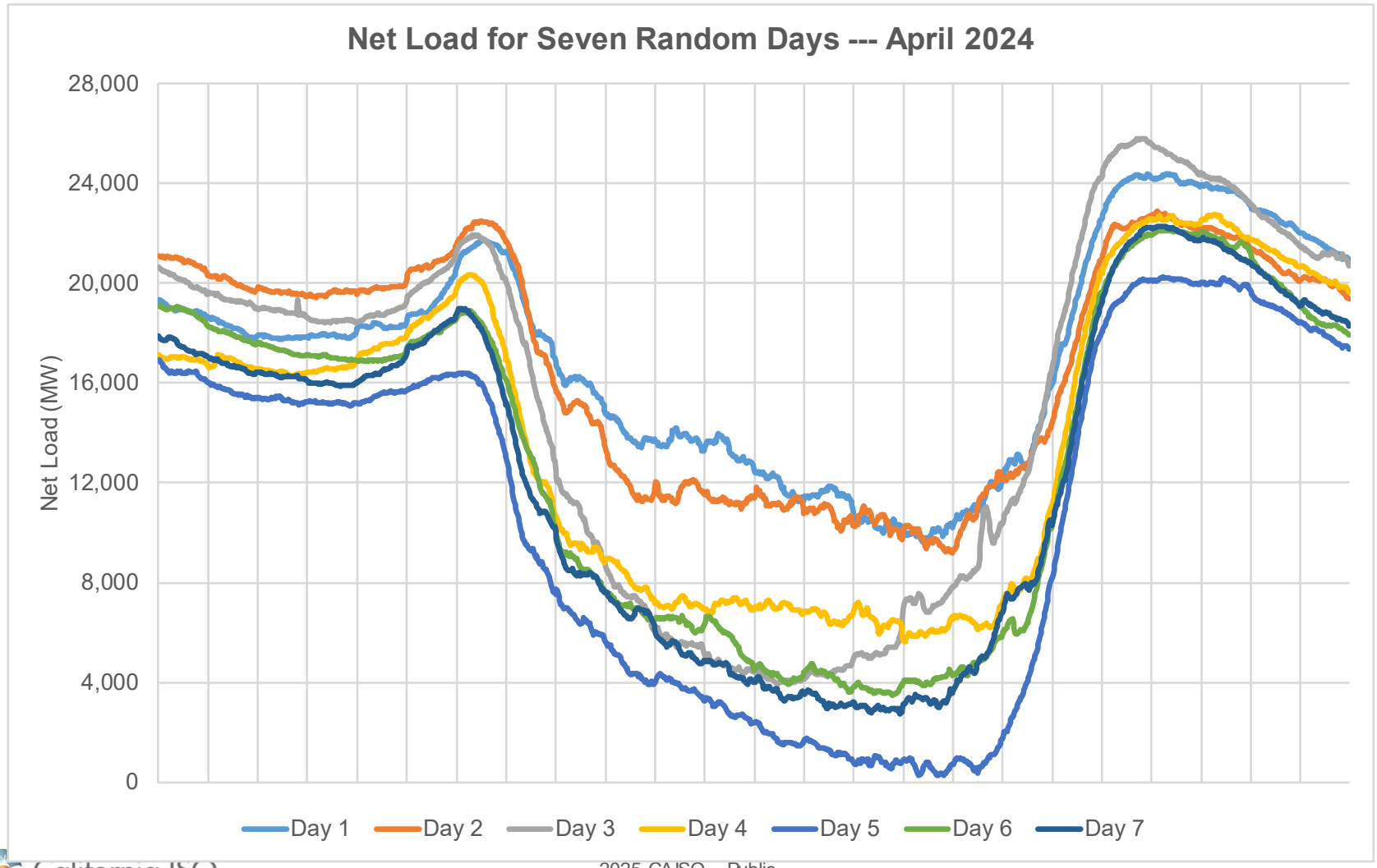
Maximum 3-Hour upward ramps are not evenly distributed each hour demonstrating the need for faster ramping capability

- Three hour-upward ramps have been steadily increasing over the years
- Ramps are not evenly distributed across three hours
- One hour upward ramp is now over 9,000 MW for several months

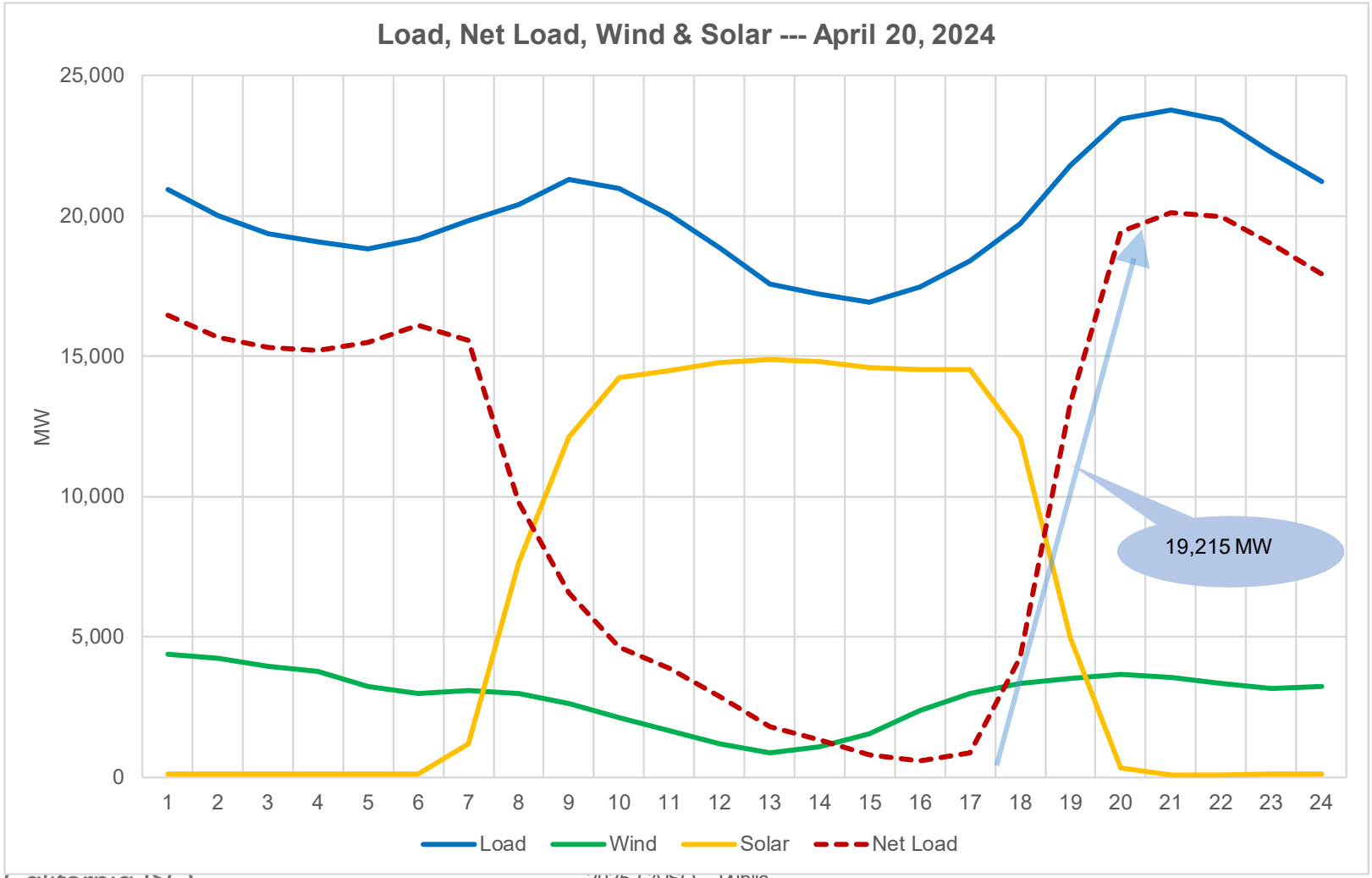


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3-Hour Ramps	17,119	18,178	17,385	19,215	18,848	18,574	18,478	17,722	19,109	17,660	17,139	15,708
1-Hour Ramps	10,164	10,477	8,652	10,589	9,585	8,958	8,787	8,839	9,909	8,935	10,588	9,213
Peak	26,702	27,251	25,582	23,923	26,413	28,242	32,710	34,386	35,466	37,530	28,856	27,089

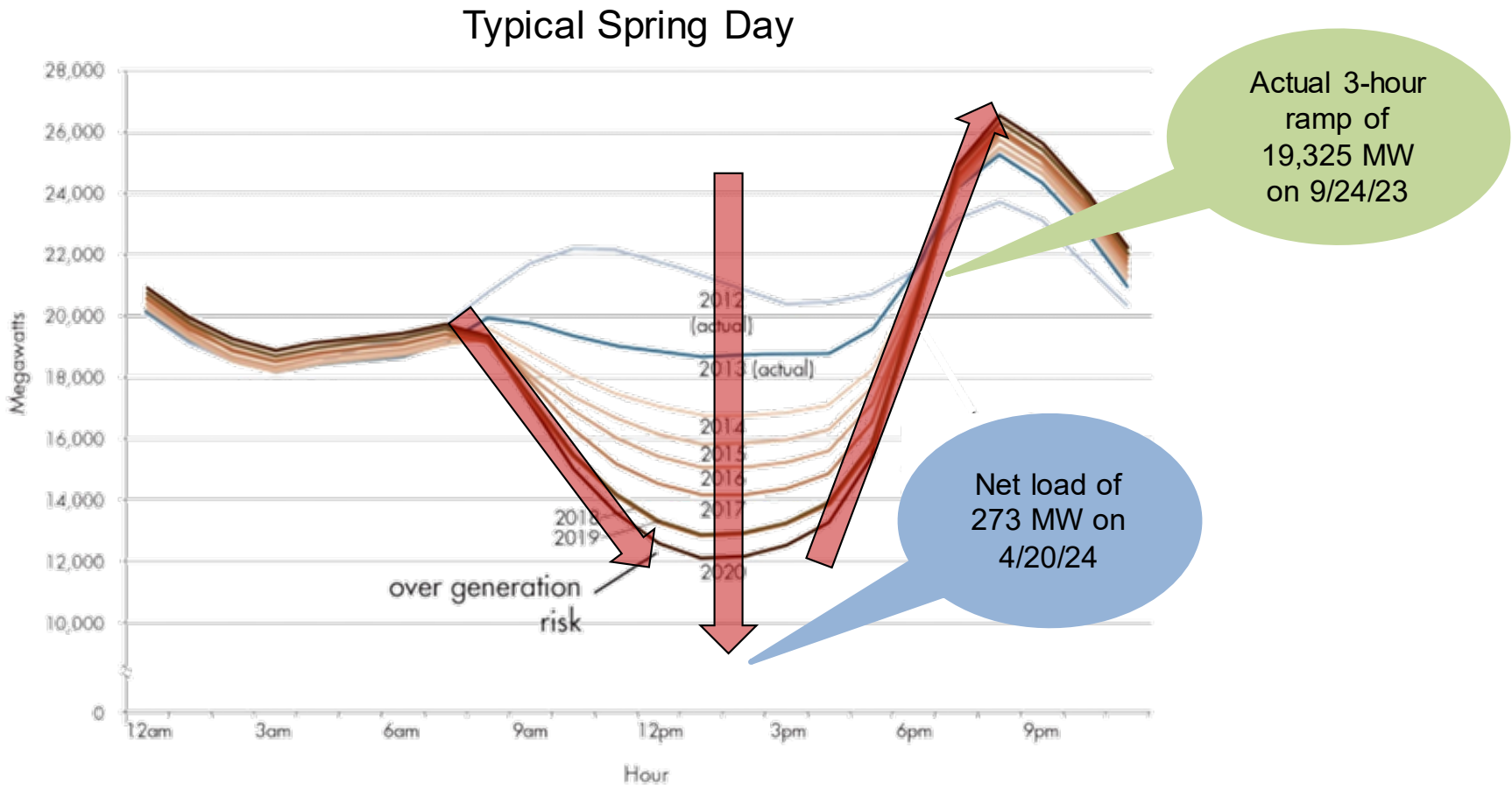
Example of actual net-load variability for seven random days in April 2024



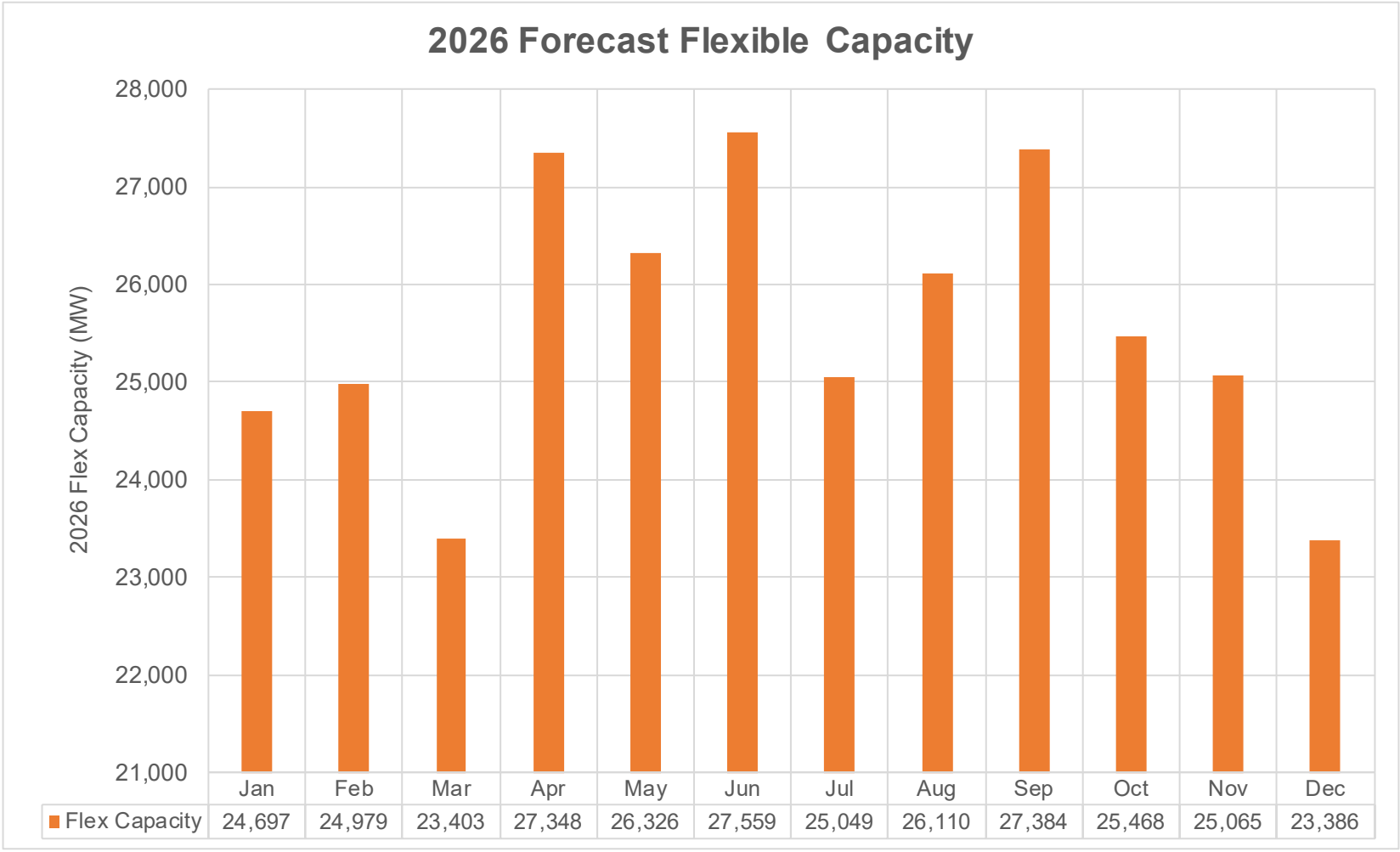
Maximum net-load 3-hour upward ramp in 2024 occurred on Saturday, April 20



The actual net load and 3-hour ramps are years ahead of the ISO's original estimate primarily due to under forecasting rooftop solar PV installation



ISO 2026 Monthly flexible capacity needs



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flex Capacity	24,697	24,979	23,403	27,348	26,326	27,559	25,049	26,110	27,384	25,468	25,065	23,386

NERC's BOG approved a new BAL standards to ensure BAs have the flexibility to meet their hourly energy needs as well as their daily peak capacity... effective 2026

Capacity Assessment versus Energy Reliability Assessment

	Capacity Assessment	Energy Reliability Assessment
Demand Representation	Uses forecasted load scenario(s) that represent a snapshot in time (e.g., 50:50 load, 90:10 load, peak hour load).	Uses time-series demand to incorporate the load changes throughout each day, hour, or year.
	Uses individual snapshots of fixed loads and operating reserves, typically peak demand.	Includes flexible load and net-load variability.
Supply Representation	Uses statistical representation of generator availability to calculate capacity contributions (e.g., UCAP[1], ELCC[2]) resulting in a single value that represents the outage potential at a single point in time.	Represents generator outages based on separate outage modes (e.g., equipment failure, fuel unavailability, network issues), each with a different probability of occurrence, impact, and duration.
Transmission Representation	The transmission model is likely to be similar for a capacity and energy reliability assessment. It is possible to use the exact same model for both types of analysis.	The added complexity of an energy reliability assessment may necessitate a different, potentially simpler, transmission model.
Risk and Reliability Evaluation	Evaluates reliability by simulating snapshots of BPS operation.	Evaluates time-series of BPS operation with fuel stock and other finite resources to be considered.
	Uses clearly defined industry standard capacity or reserve margins to determine the system's level of reliability in terms of magnitude of insufficient supply.	Measures energy-based metrics to evaluate magnitude, duration, and frequency of energy insufficiency over the study period. Though some are maturing, these metrics can be in their infancy and may not be well developed or standardized.

[1] UCAP: Unforced Capacity is a value that is assigned to a supply resource (e.g., generator) that represents the amount of power generation not subject to forced outages. UCAP is a function of EFORd, the equivalent demand forced outage rate, and ICAP, installed capacity.
[2] ELCC: Effective Load Carrying Capability is a representation of a supply resource's contribution to serving demand in reference to a theoretical resource that is not subject to outages

CAISO RA working group is evaluating potential changes to Flex RA process

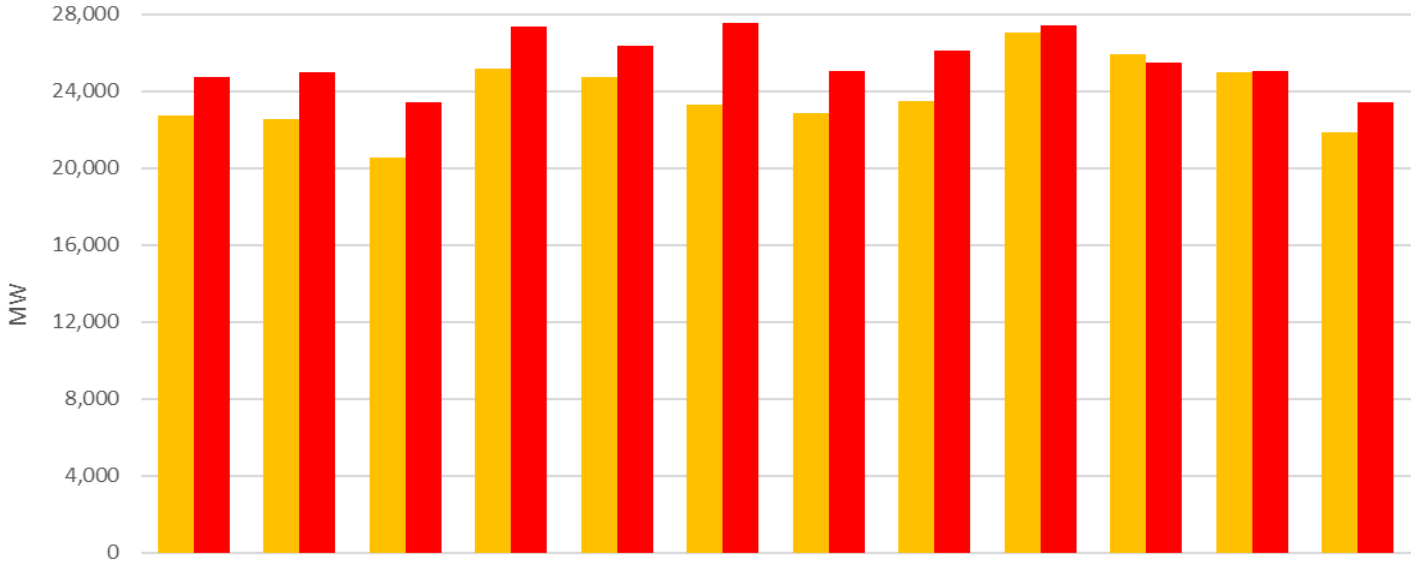
- RA working group was developed to review RA program health and make recommendations for changes within the RA program
  - Any changes will be through a stakeholder initiative
- As the resource fleet has evolved, the group will evaluate the overall need for Flex RA, including:
  - If the current process provides reliability benefits
  - Potential enhancements to the design
  - Where the process may need to be altered to obtain reliability objectives

California ISO

Preliminary Allocation Results

Hong Zhou
Lead Market Development Analyst, Short-Term Forecasting

Compare Forecasted monthly ISO system-wide flexible capacity needs*: 2025 vs 2026



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2025 Flexneed	22,704	22,568	20,533	25,191	24,740	23,317	22,869	23,469	27,010	25,920	24,987	21,880
2026 Flexneed	24,697	24,979	23,403	27,348	26,326	27,559	25,038	26,112	27,388	25,471	25,065	23,386

*Flexibility Requirement$_{MTHy}$= Max[(3RR$_{HRx}$)$_{MTHy}$] + Max(MSSC, 3.5%*E(PL$_{MTHy}$)) + ε

Components of the flexible capacity needs

Month	Load contribution 2026	Wind contribution 2026	Solar contribution 2026	Total percent 2026
January	30.09%	-0.96%	-68.95%	100%
February	33.69%	-1.52%	-64.79%	100%
March	32.41%	-0.55%	-67.04%	100%
April	33.31%	3.50%	-70.19%	100%
May	30.09%	1.18%	-71.09%	100%
June	23.60%	-2.14%	-74.26%	100%
July	14.60%	-1.22%	-84.18%	100%
August	22.40%	1.93%	-79.54%	100%
September	26.88%	1.62%	-74.74%	100%
October	25.44%	1.70%	-76.26%	100%
November	22.94%	-0.94%	-76.12%	100%
December	26.52%	1.97%	-75.45%	100%

Δ Load $-\Delta$ Wind $-\Delta$ Solar = 100

Flexible capacity categories allow a wide variety of resources to provide flexible capacity

- Category 1 (Base Flexibility): Operational needs determined by the magnitude of the largest three-hour secondary net load ramp
- Category 2 (Peak Flexibility): Operational need determined by the difference between 95 percent of the maximum three-hour net load ramp and the largest three-hour secondary net load ramp
- Category 3 (Super-Peak Flexibility): Operational need determined by five percent of the maximum three-hour net load ramp of the month

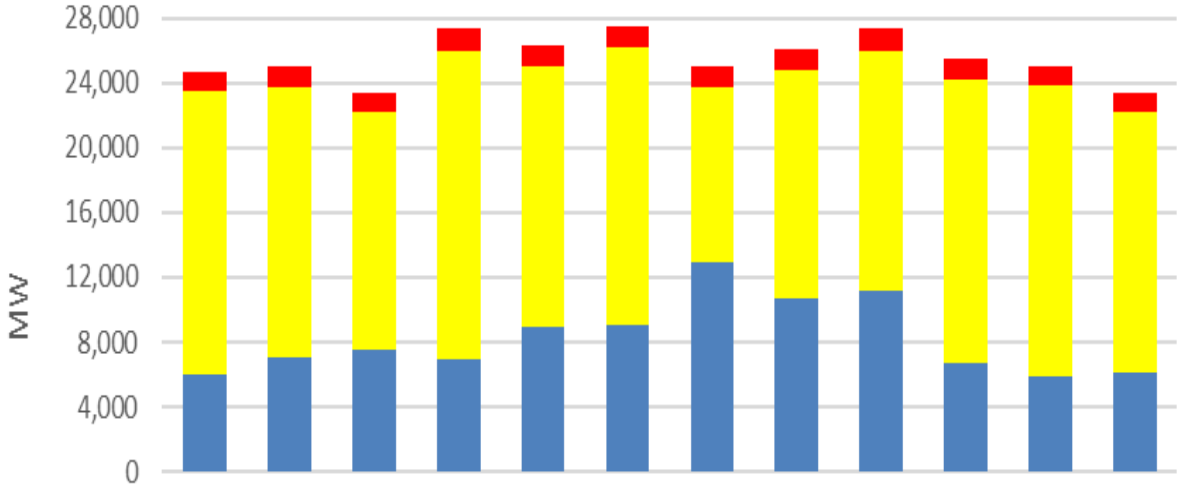
Seasonal breakout of flexible capacity needs

	Actual Contributions			Seasonal Contribution		
	Unadjusted			Adjusted		
Month	Base Flexibility	Peak Flexibility	Super-Peak Flexibility	Base Flexibility	Peak Flexibility	Super-Peak Flexibility
January	24%	71%	5%	27%	68%	5%
February	28%	67%	5%	27%	68%	5%
March	32%	63%	5%	27%	68%	5%
April	26%	69%	5%	27%	68%	5%
May	34%	61%	5%	40%	55%	5%
June	33%	62%	5%	40%	55%	5%
July	51%	44%	5%	40%	55%	5%
August	41%	54%	5%	40%	55%	5%
September	41%	54%	5%	40%	55%	5%
October	26%	69%	5%	27%	68%	5%
November	23%	72%	5%	27%	68%	5%
December	26%	69%	5%	27%	68%	5%

Peak Category (2) stays stable in 2026

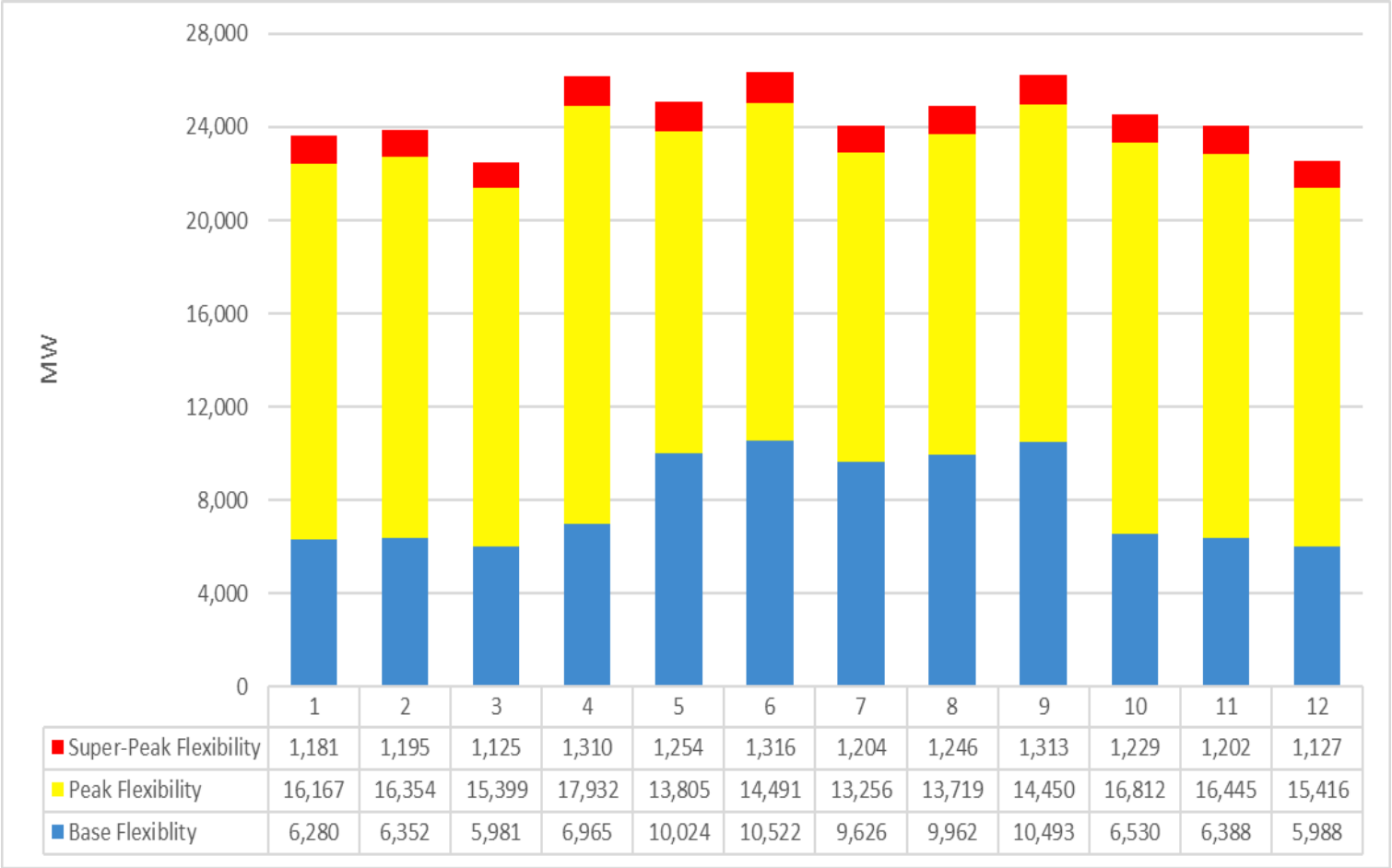
Month	2021	2022	2023	2024	2025	2026
January	57.30%	55.06%	62.74%	68.11%	66.43%	68.42%
February	57.30%	55.06%	62.74%	68.11%	66.43%	68.42%
March	57.30%	55.06%	62.74%	68.11%	66.43%	68.42%
April	57.30%	55.06%	62.74%	68.11%	66.43%	68.42%
May	45.62%	45.39%	49.28%	57.75%	54.29%	55.04%
June	45.62%	45.39%	49.28%	57.75%	54.29%	55.04%
July	45.62%	45.39%	49.28%	57.75%	54.29%	55.04%
August	45.62%	45.39%	49.28%	57.75%	54.29%	55.04%
September	45.62%	45.39%	49.28%	57.75%	54.29%	55.04%
October	57.30%	55.06%	62.74%	68.11%	66.43%	68.42%
November	57.30%	55.06%	62.74%	68.11%	66.43%	68.42%
December	57.30%	55.06%	62.74%	68.11%	66.43%	68.42%

Total flexible capacity needed in each category – seasonally adjusted



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Super-Peak Flexibility	1,235	1,249	1,170	1,367	1,316	1,378	1,252	1,306	1,369	1,274	1,253	1,169
Peak Flexibility	17,460	16,701	14,729	19,005	16,092	17,187	10,906	14,058	14,870	17,462	17,969	16,074
Base Flexibility	6,002	7,029	7,504	6,976	8,917	8,995	12,880	10,749	11,148	6,736	5,843	6,142

CPUC jurisdictional flexible capacity allocation - by flexible capacity category



	1	2	3	4	5	6	7	8	9	10	11	12
Super-Peak Flexibility	1,181	1,195	1,125	1,310	1,254	1,316	1,204	1,246	1,313	1,229	1,202	1,127
Peak Flexibility	16,167	16,354	15,399	17,932	13,805	14,491	13,256	13,719	14,450	16,812	16,445	15,416
Base Flexiblity	6,280	6,352	5,981	6,965	10,024	10,522	9,626	9,962	10,493	6,530	6,388	5,988

Start time of three-hour net load ramp to evaluate seasonal must offer obligations

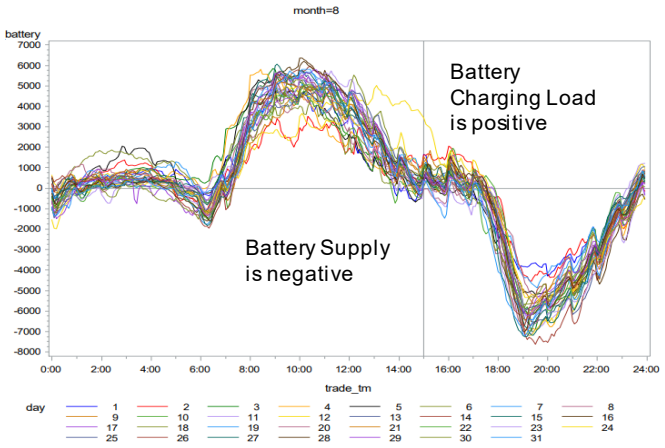
	Three Hour Net Load Ramp Start Hour (Hour Ending)				
Month	14:00	15:00	16:00	17:00	18:00
January	8	23			
February	1	26	1		
March		6	10	15	
April			1	29	
May				31	
June				28	2
July				31	
August			8	23	
September		1	27	2	
October		20	11		
November	17	13			
December	7	24			

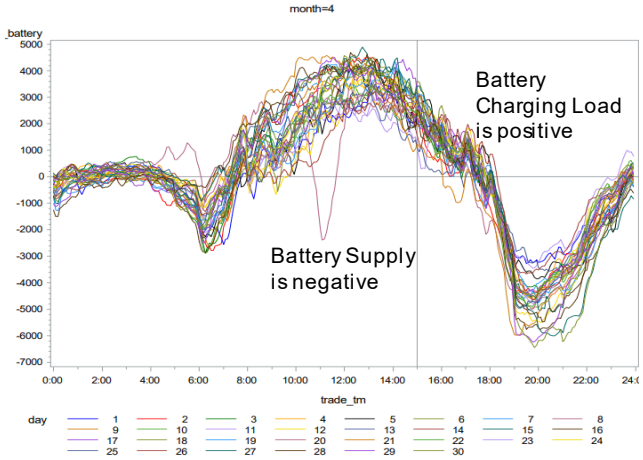
Seasonal must-offer obligations for peak and super-peak flexible capacity

- Recommended must-offer obligation hours in hour ending

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HE15-HE19	X	X								X	X	X
HE16-HE20			X	X					X			
HE17-HE21					X	X	X	X				

Battery Behavior in Flex Ramp hours





- For this year's allocation CAISO will not change the allocation formula to remove battery charging due to:
  - Needing further information from LRA's on Battery Resource mapping
- For most months outside spring season battery resources are typically in transition from charging to discharging
- Next year, the CAISO will work to gather further information to assess modifications needed to load components of allocation.

Review of preliminary assessment results

- Flexible Capacity need is largest in April, September, and October
- Flexible capacity makes up a greater percentage of resource adequacy needs during the off-peak months
  - Increase almost exclusively caused by three-hour ramp, not increase in peak load
- Peak category has stable weight this year
- The CEC IEPR hourly demand forecast, growth of behind-the-meter solar PV, and PV contributes to the larger flexible capacity requirements
- Using the ISO flexible capacity contribution calculation majority of three-hour net load ramps are attributable to CPUC jurisdictional LSEs
- The Peak and Super-Peak MOO hours for 2026 are list below (information below is in Hour Ending)
  - October through February: HE 15 – HE 19 (2:00 p.m. to 7:00 p.m.)
  - May through August: HE 17 – HE 21 (4:00 p.m. to 9:00 p.m.)
  - March, April, September : HE 16 – HE 20 (3:00 p.m. to 8:00 p.m.)
- For comparison, MOO for 2025 were
  - November through February: HE 15- HE 19 (2:00 p.m. to 7:00 p.m.)
  - March through August: HE 17 – HE 21 (4:00 p.m. to 9:00 p.m.)
  - September through October: HE 16- HE 20 (3:00 p.m. to 8:00 p.m.)

AVAILABILITY ASSESSMENT HOURS

Availability assessment hours: Background and purpose

- Concept originally developed as part of the ISO standard capacity product (SCP)
  - Maintained as part of Reliability Service Initiative – Phase 1 (i.e. RA Availability Incentive Mechanism, or RAAIM)
- Determine the hours of greatest need to maximize the effectiveness of the availability incentive structure
  - Resources are rewarded for availability during hours of greatest need
  - Hours determined annually by ISO and published in the BPM
    - See section 40.9 of the ISO Tariff

Methodology overview of system/local availability assessment hours

- Used CEC IEPR data accounting for DST shift
  - Hourly average load
    - By hour, by month
    - Years 2026-2028
  - Top 5% of load hours within each month using an hourly load distribution
- Actual demand tags do not contain battery charging load for market battery resources.

- For 2026, the ISO proposes the following AAH for a three season approach

  HE18-HE22 for winter: Jan – Feb, Nov – Dec
  HE18-HE22 for spring: Mar – May
  HE17-HE21 for summer: Jun – Oct

The ISO proposes Winter and Spring Season Alignment for AAH

2024 actual frequency of top 5% of load hours

Hour		8	15	16	17	18	19	20	21	22	23	Season
MONTH	Jan	4				9	13	7	4			Winter
	Feb					6	14	10	3			Winter
	Mar	1				2	6	15	13			Spring
	Apr	1					2	10	16	7		Spring
	May					1	4	11	13	7	1	Spring
	Jun		1	2	2	6	8	8	6	3		summer
	Jul			2	4	8	10	8	5			summer
	Aug			1	4	7	17	6	2			summer
	Sep		2	4	6	7	7	6	3	1		summer
	Oct		1	5	8	8	8	6	1			summer
	Nov					16	13	5	2			Winter
	Dec	1			2	10	10	9	4	1		Winter

2026 forecast frequency of top 5% of load hours

Hour		15	16	17	18	19	20	21	22	23	Season	Recommendation
MONTH	Jan				8	19	9	1			Winter	HE18-HE22
	Feb				1	18	14				Winter	HE18-HE22
	Mar					4	17	11	5		Spring	HE18-HE22
	Apr				2	4	8	13	7	2	Spring	HE18-HE22
	May					4	10	13	10		Spring	HE18-HE22
	Jun		2	3	5	7	8	6	4	1	summer	HE17-HE21
	Jul	1	3	4	8	8	7	4	2		summer	HE17-HE21
	Aug		2	6	9	12	6	2			summer	HE17-HE21
	Sep	2	4	5	7	7	5	4	2		summer	HE17-HE21
	Oct	1	3	4	7	9	7	4	2		summer	HE18-HE22
	Nov		2	4	14	11	4	1			Winter	HE18-HE22
	Dec				14	14	9				Winter	HE18-HE22

- Winter Months shift to HE 18-22
- Monitoring HE 8 values within top 5% of load hours

Looking further into top 10% of the hours to monitor HE 8, HE 17, and HE 22

2024 actual frequency of top 10% of load hours

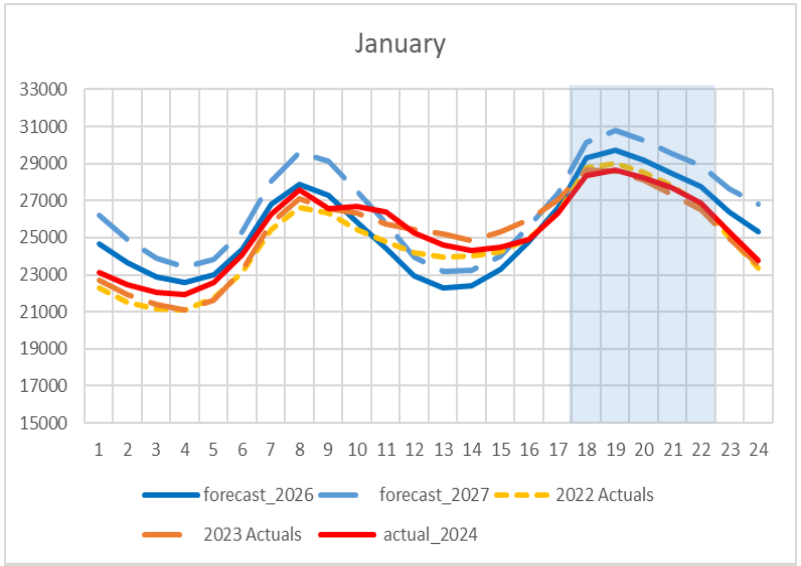
Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Jan																								
Feb								3	1	1							2	9	19	17	12	3		
Mar								5	1									4	9	24	22	9		
Apr								2	2	1									7	21	22	17		
May																		2	10	19	23	16	4	
Jun														1	2	2	6	11	13	14	12	10	1	
Jul															2	6	8	15	15	13	10	5		
Aug																4	6	18	21	19	4	2		
Sep	2	1	1	3	2	1	1	6	5	1	1	1	4	7	6	10	9	9	9	8	7	7	6	1
Oct	1	2	2		4	3	1	3	2	3	2	1	3	7	10	12	11	11	10	9	7	5	2	
Nov	8	1			1	7	1	3	2		3	1	2	1	2	1	8	18	19	16	8	2	1	3
Dec	3	1				2	4	9	4	3	1	2	3	2	2	3	5	17	16	12	9	5	4	4

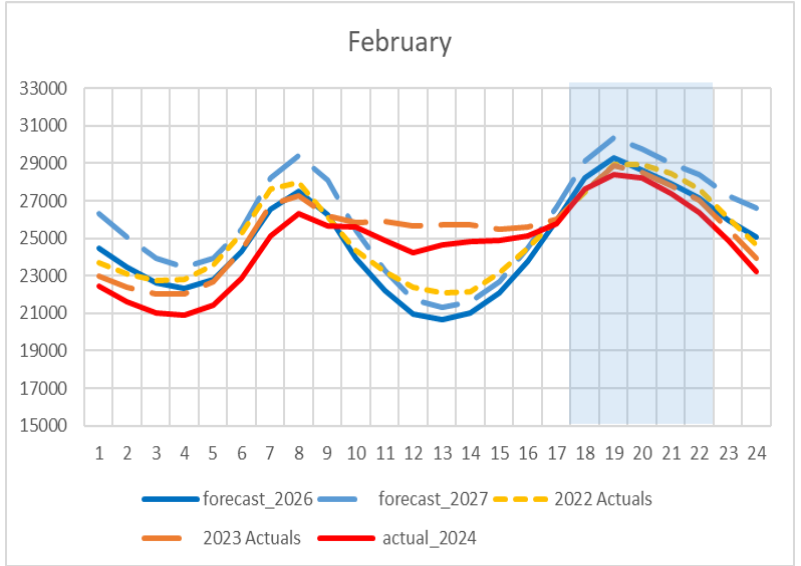
2026 forecast frequency of top 10% of load hours

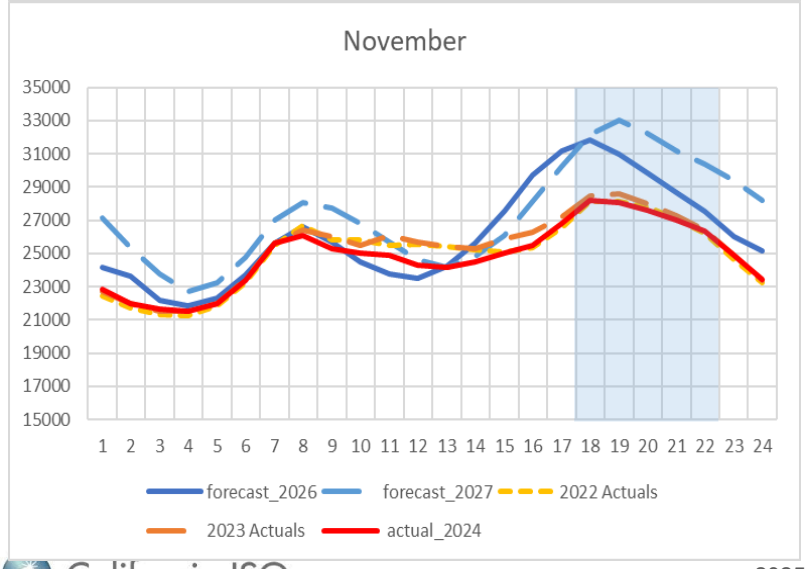
Hour	1	2	3	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Jan						3										19	22	19	10	1		
Feb						3										9	20	19	16			
Mar																	12	22	20	16	4	
Apr															1	2	5	18	22	18	5	1
May																3	10	17	20	20	4	
Jun													2	3	5	8	11	13	13	11	5	1
Jul												1	2	5	8	12	14	13	11	7	1	
Aug													1	6	11	16	16	14	8	2		
Sep	5	1	1	2	4	4	4	2	1	1		3	5	9	11	13	13	11	8	5	2	3
Oct	4	4	2		12	1		4		1	1	2	4	5	7	13	15	15	9	6	4	2
Nov	2	1		16			1	5		1			3	4	8	21	20	17	4		3	2
Dec	9			8	1				7				6		4	21	21	16	12	3	2	1

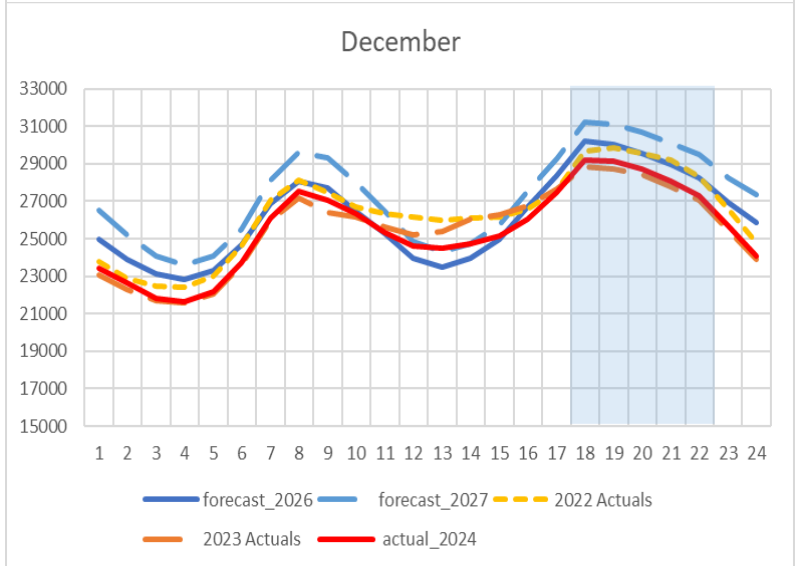
- During Fall and Early winter you observe more scattered top 10% of load.
- AAH currently is a 5 hour continuous time period; will need to monitor changes to this area due to duel peaking starting to be highlighted in results.

CEC IEPR forecast vs. actual in winter months

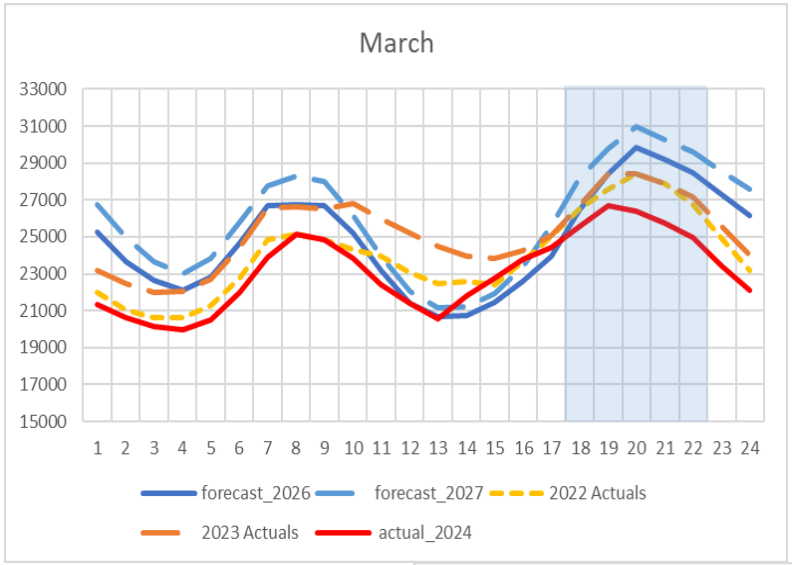


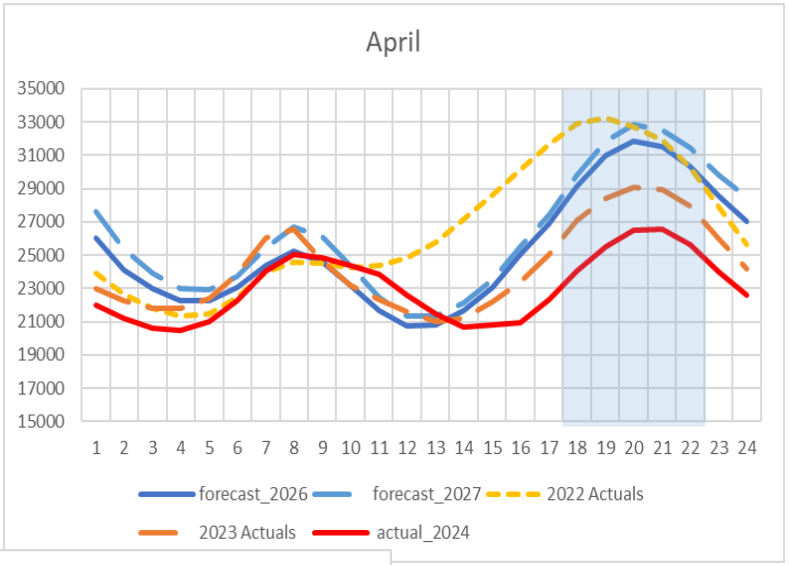


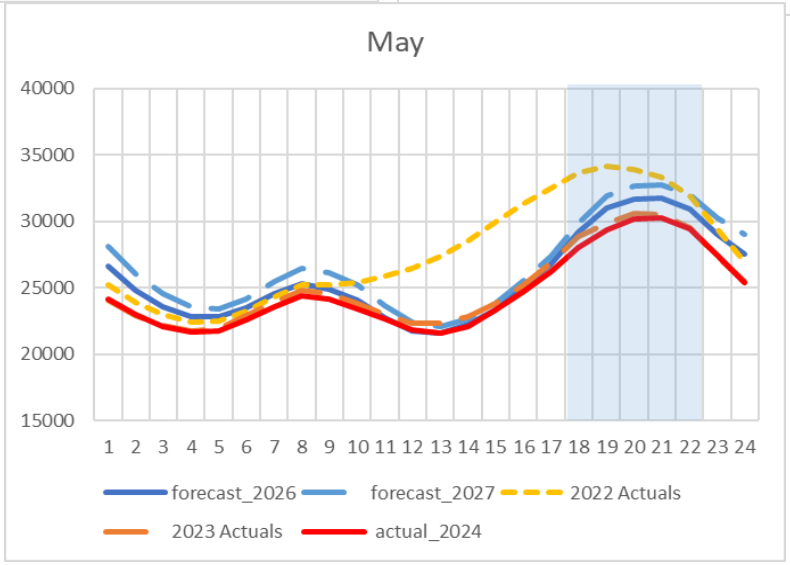




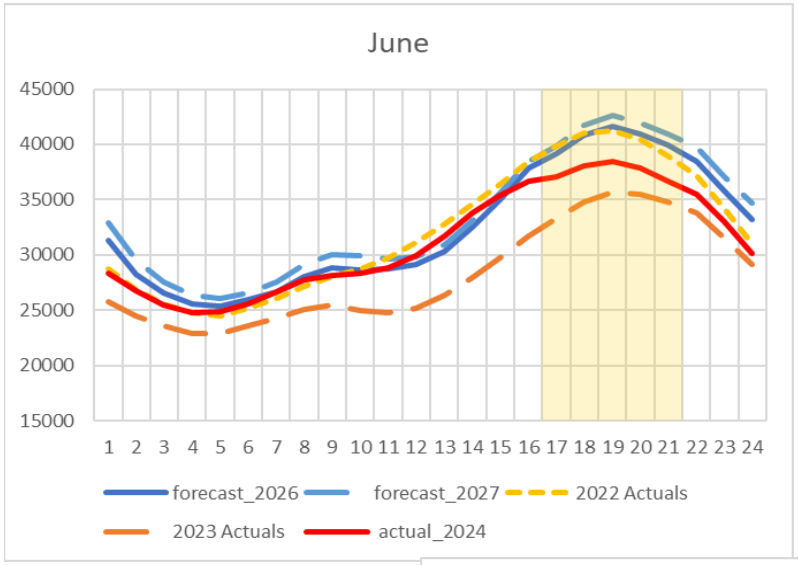
CEC IEPR forecast vs. actual in spring months

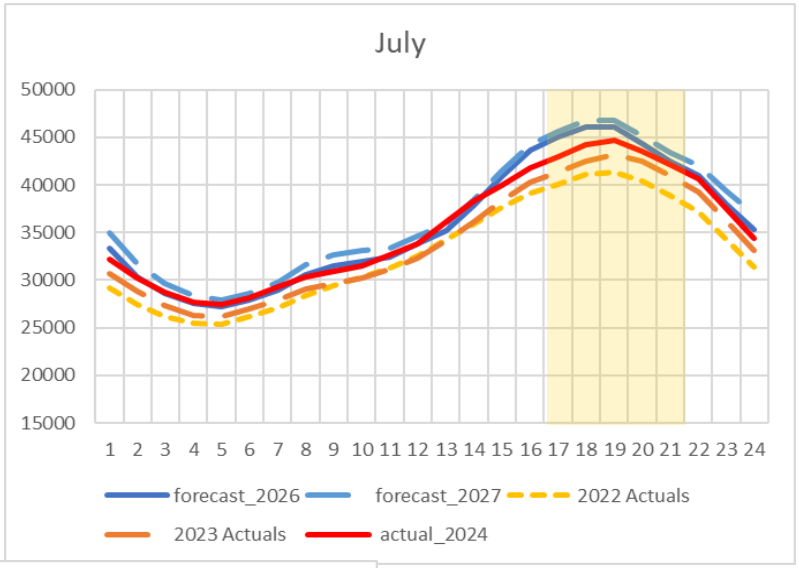


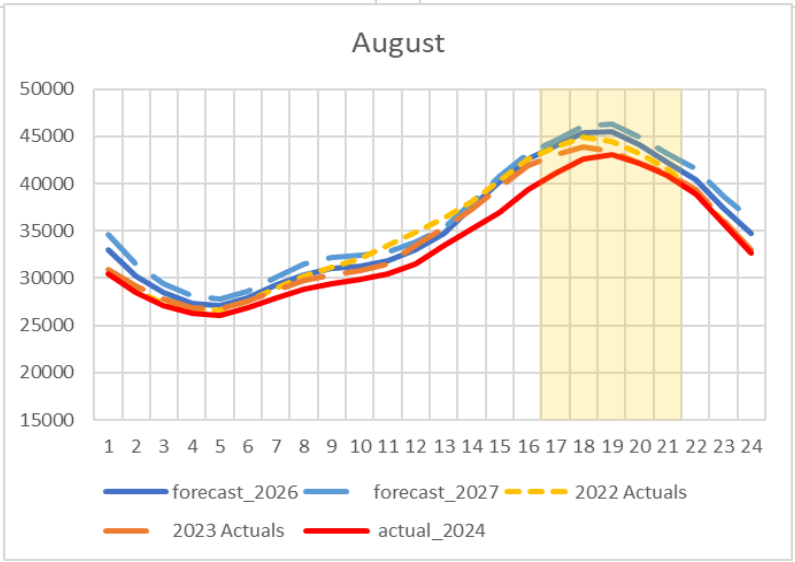




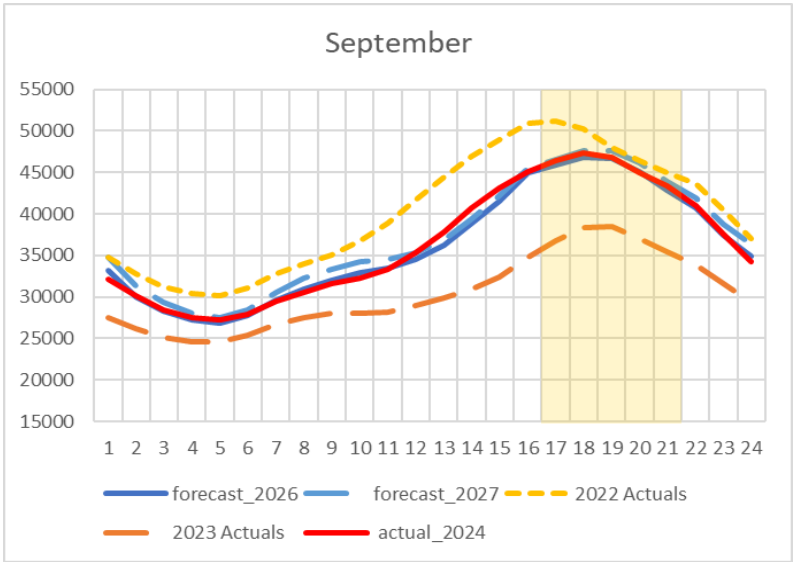
CEC IEPR forecast vs. actual in summer months

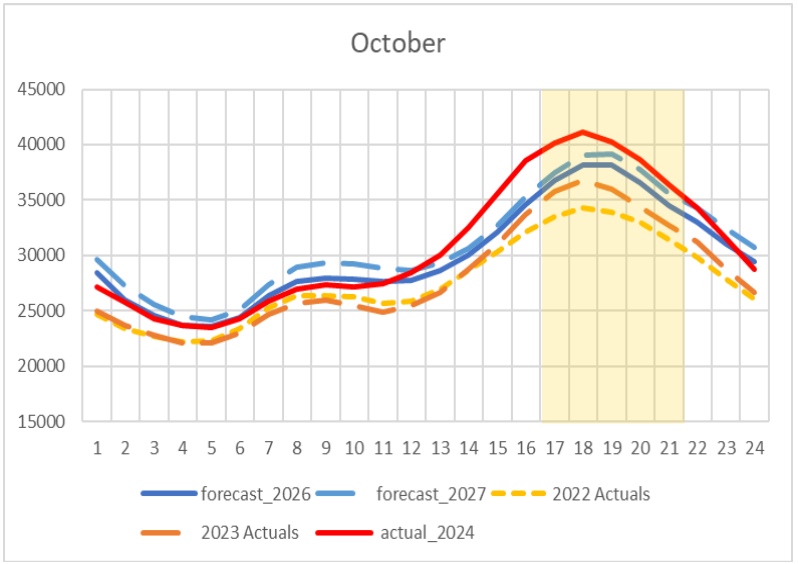






CEC IEPR forecast vs. actual in summer months





Availability assessment hours draft recommendation

Summer Season Draft Recommendation

June - October

Year	Start	End
2026 (Draft)	HE 17	HE 21

Winter and Spring Season Draft Recommendation

January – February, November – December, & March – May

Year	Start	End
2026 (Draft)	HE 18	HE 22

- Winter Months shift to HE 18-22

Availability assessment hours advisory recommendation

Summer Season Draft Recommendation

- June - October

Year	Start	End
2027 (Estimate)	HE 17	HE 21
2028 (Estimate)	HE 17	HE 21

Spring and Winter Season Draft Recommendation

- January – May, November December

Year	Start	End
2027 (Estimate)	HE 18	HE 22
2028 (Estimate)	HE 18	HE 22

- Estimates for 2027, 2028 include a shift of January, February, and December to HE18-22
- Continued monitoring on morning peak hours (HE8) during non summer months

Reliability Requirements; Section 7 – BPM Updates Needed

2026 System and Local Resource Adequacy Availability Assessment Hours
Analysis employed: Top 5% of load hours using average hourly load

Spring: March 1 – May 31
Availability Assessment Hours: 5pm – 10pm (HE18 – HE22)

Summer: June 1 - October 31
Availability Assessment Hours: 4pm – 9pm (HE17 – HE21)

Winter: January 1 – February 28, November 1 – December 31
Availability Assessment Hours: 5pm – 10pm (HE18– HE22)

2025 Flexible Resource Adequacy Availability Assessment Hours and must offer obligation hours

Flexible RA Capacity Type	Category Designation	Required Bidding Hours	Required Bidding Days
October – February			
Base Ramping	Category 1	5:00am to 10:00pm (HE6-HE22)	All days
Peak Ramping	Category 2	2:00pm to 7:00pm (HE15-HE19)	All days
Super-Peak Ramping	Category 3	2:00pm to 7:00pm (HE15-HE19)	Non-Holiday Weekdays*
May – August			
Base Ramping	Category 1	5:00am to 10:00pm (HE6-HE22)	All days
Peak Ramping	Category 2	4:00pm to 9:00pm (HE17-HE21)	All days
Super-Peak Ramping	Category 3	4:00pm to 9:00pm (HE17-HE21)	Non-Holiday Weekdays*
March, April, September			
Base Ramping	Category 1	5:00am to 10:00pm (HE6-HE22)	All days
Peak Ramping	Category 2	3:00pm to 8:00pm (HE16-HE20)	All days
Super-Peak Ramping	Category 3	3:00pm to 8:00pm (HE16-HE20)	Non-Holiday Weekdays*

Next steps

- Published Draft Flexible Capacity Needs Assessment and Draft AAH for 2025 on April 28, 2025

- Please submit comments by end of day May 5, 2025, through the link on the initiative page.

- Publish Final Flexible Capacity Needs Assessment and AAH for 2026 on May 16th, 2025

- Questions? Email ISOStakeholderAffairs@caiso.com

Questions

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This Week at the ISO – 04/28/25

Stakeholder Meetings

All public stakeholder meetings are also listed on the ISO calendar:

- Monday, April 28th – Draft 2026 Flexible Capacity Needs and Availability Assessment Hours Technical Study
  - 10:00am - 12:00pm PT (link)
- Tuesday, April 29th – Interconnection Customer User Group
  - 3:00pm - 4:00pm PT (register here to attend call)
- Tuesday, April 29th – Release User Group Forum
  - 10:00am - 11:00am PT (link)
- Thursday, May 1st – Congestion Revenue Rights Customer Partnership Group
  - 10:00am - 11:00am PT (link)
- Thursday, May 1st – Market Update
  - 10:15am - 11:00am PT (link)
- Friday, May 2nd – Market Surveillance Committee General Session
  - 10:30am - 3:00pm PT

Comment Submission Deadlines

- Tuesday, April 29th - 2024-2025 Transmission Planning Process
- Wednesday, April 30th - WEIM - Assistance Energy Transfer (AET) Extension
- Wednesday, April 30th- Participating transmission owner per unit costs - 2025
- Thursday, May 1st- Demand and Distributed Energy Market Integration
- Friday, May 2nd- Gas Resource Management Working Group

This Week at the ISO continued

Trainings

- Monday, April 28th – Refresher Training for Congestion Revenue Rights (CRR) System Upgrade Project for CRR Holders
  - 9:00am – 11:00am PT (link)
- Monday, April 28th – Refresher Training for Congestion Revenue Rights (CRR) System Upgrade Project for Allocations and Load Migration for LSEs
  - 1:00pm – 3:00pm PT (link)
- Tuesday, April 29th – Refresher Training for Congestion Revenue Rights (CRR) System Upgrade Project for Utility Distribution Company (UDC)
  - 9:00am – 10:00am PT (link)

Market Simulations

Please refer to our Release Schedule for the most recent updates of initiatives scheduled for MAP- and Production-stage market sims.

- Thursday, May 1st - Market Simulation Forum
  - 2:00pm - 3:00pm PT (link)
- Thursday, May 1st - DAME, EDAM, and EDAM CAISO Balancing Authority PR Market Simulation Meeting
  - 1:00pm - 2:00pm PT

Business Practice Manual (BPM) Updates

The status of all PRRs and updated BPMs in the BPM Library are published on the BPM Change Management Website.

Energy Matters blog provides timely insights into ISO grid and market operations as well as other industry-related news.

https://www.caiso.com/about/news/energy-matters-blog

Story | Operations

Taking steps to bend the cost curve while enhancing reliability

By Elliot Mainzer

04/24/2025

Story | Leadership

CEO Elliot Mainzer's recent Congressional testimony on grid reliability

By Elliot Mainzer

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Story | Inside the California ISO

FERC approves another key step toward independent governance of Western markets

By ISO Staff

04/03/2025

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APPENDIX

CAISO Forecast Utilizes CEC input forecast, which does not include charging behavior

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021 Act (45% increased bias)	14,781	17,259	17,012		14,831	13,573		13,374	14,596	14,969	14,531	14,256
2021 **Act w/out battery charging,pumps	14,809	18,264	17,452		15,707	13,904		13,656	15,278	15,772	15,776	15,446
2021 Binding Forecast	18,446	17,424	18,682	17,936	16,695	16,652	14,156	14,335	16,589	17,779	18,666	16,207
2022 Act (93% increased bias)	16,508	16,947	17,660	17,298	16,146	14,879	13,837	14,012	15,447	15,890	17,184	15,431
2022 **Act w/out battery charging,pumps	17,279	17,771	18,030	17,479	16,235	15,548	14,370	14,422	16,437	16,746	18,474	16,912
2022 Binding Forecast	17,990	18,294	18,212	18,377	18,911	15,863	15,085	15,382	15,429	18,400	18,150	18,669
2023 Act (54% increased bias)	17,780	18,961	17,662	17,753	17,496	16,518	16,995	17,137	20,101	19,111	18,869	17,241
2023 **Act w/out battery charging,pumps	19,259	20,494	19,248	18,920	18,261	17,283	17,786	17,346	21,242	20,157	20,336	19,372
2023 Binding Forecast	20,357	22,665	23,475	23,092	21,458	19,913	17,430	18,832	20,790	23,087	23,582	21,148
2024 Act (83% increased bias)	17,808	18,980	18,357	20,563	20,011	19,983	19,792	19,032	20,455	18,889	18,217	16,545
2024 **Act w/out battery charging,pumps	21,957	21,928	20,615	22,199	21,625	21,105	20,289	20,394	21,582	20,319	21,464	19,873
2024 Binding Forecast	24,680	24,981	25,465	24,701	24,161	24,102	20,347	21,716	23,324	23,395	24,151	21,988