Draft Hourly & Peak Forecast

November 21, 2024 presentation to DAWG

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Updated Inputs

- Additional historical years used to estimate models
  - Draft forecast considered 2016-2023, excluding 2020
  - Previous forecast used 2020-2022
- Revised PV generation profiles used to construct historical consumption
  - Lower consumption estimated during PV generation hours
- New load management program events
  - Demand Side Grid Support Program (DSGS)
  - Emergency Load Reduction Program (ELRP)
- Out-of-market grid-connected storage systems (SCE only)

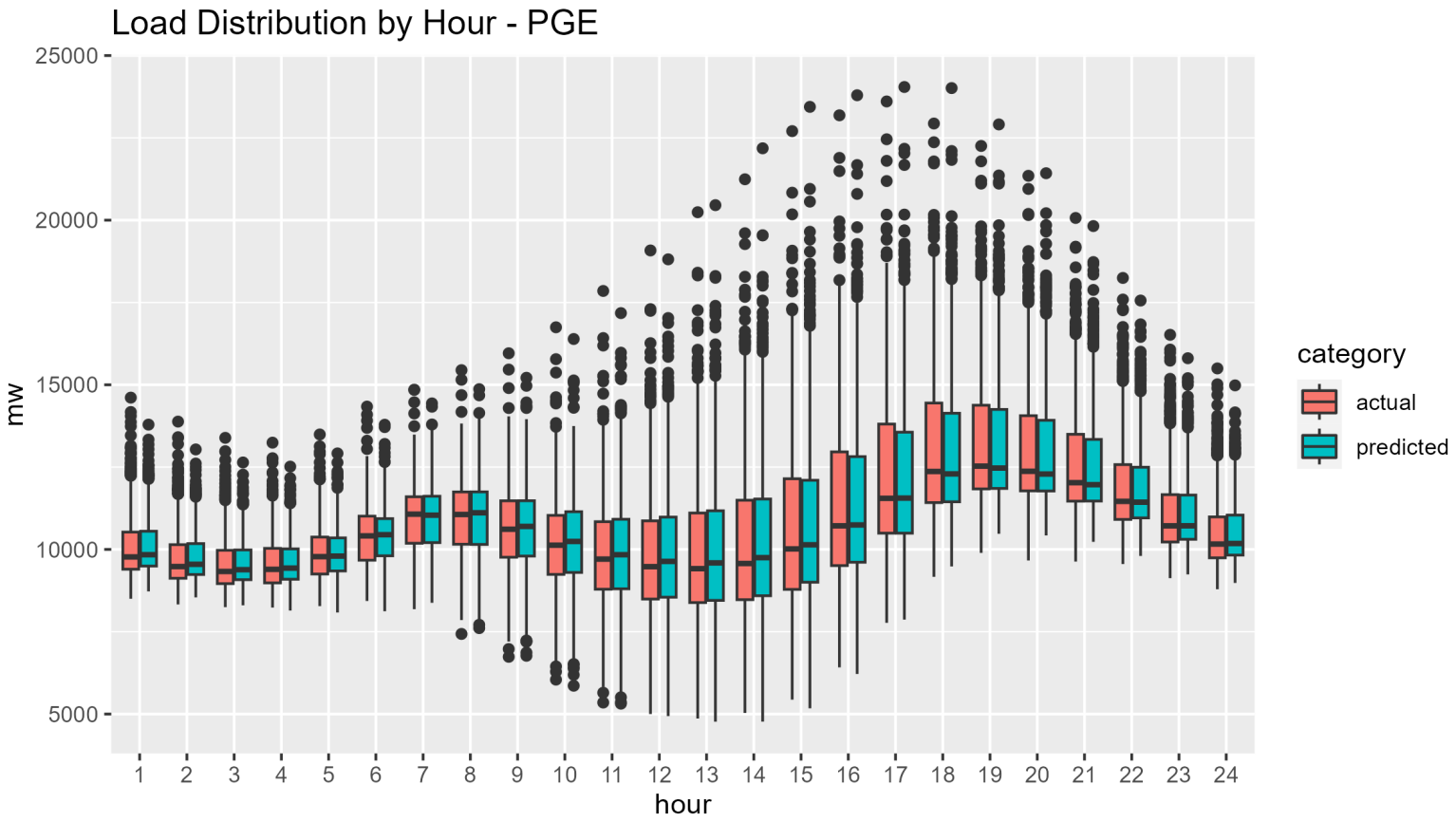
Hourly Model Changes

- Revised hourly model specification to reflect:
  - Changes in system load profile over time
  - Increasing temperature response
  - Year-to-year variation in load ratios due to weather
  - Expected levels in load in the first and second halves of each month (rather than monthly)
- Forecast calibrated to 2024 weather-normal annual peak estimate
  - Annual sales forecast adjusted to account for increased delta between EMS system loads and reported QFER sales

Load Modifiers

- Self-generation
  - Updated PV and storage forecasts
  - Forecast PV generation profiles reflect lower capacity factors
- Additional Achievable modifiers
  - Fuel Substitution
  - Transportation Electrification
- New load modifiers
  - New data center load
  - New carriers to be stationed at Naval Base Coronado (SDG&E)

Model Performance



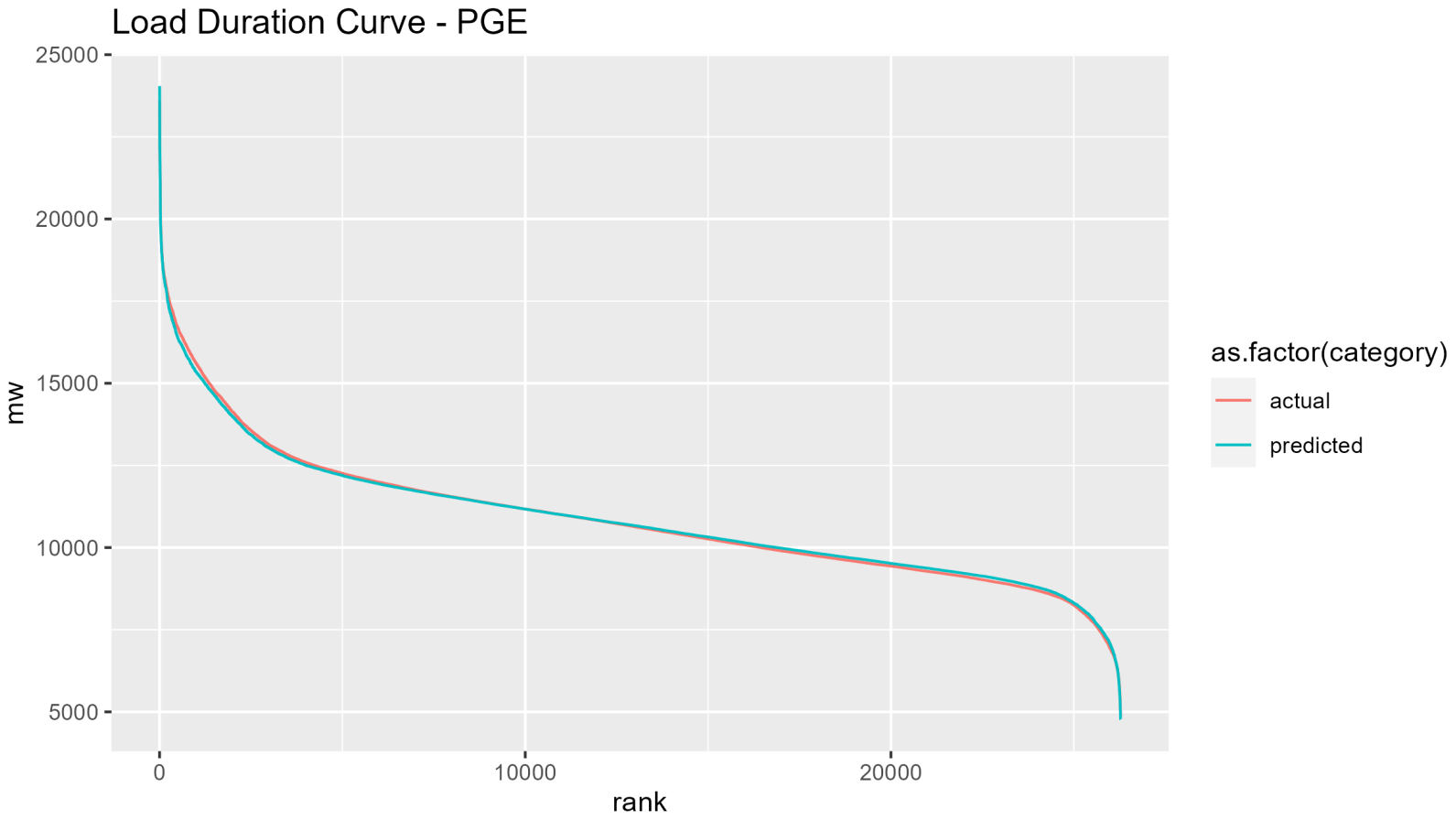
Source: CEC Staff

Compares the distribution of predicted and actual loads for each hour across three years (2021-2023)

Distributions are reasonably aligned

Similar comparisons for SCE and SDG&E TAC areas are included as appendix slides

Load Duration Curve



Source: CEC Staff

Duration curves for predicted and actual loads spanning the last three years (2021-2023) are well-aligned

1-in-2 duration curve is used to create the IEPR base consumption profile

Similar comparisons for SCE and SDG&E TAC areas are included as appendix slides

Assigning Loads to a Calendar

Background

- Need to map every hour of the forecast calendar to a load ranking
- Averages consumption profiles across weather-years
- Concept of day-type (ex: first Tuesday in March)

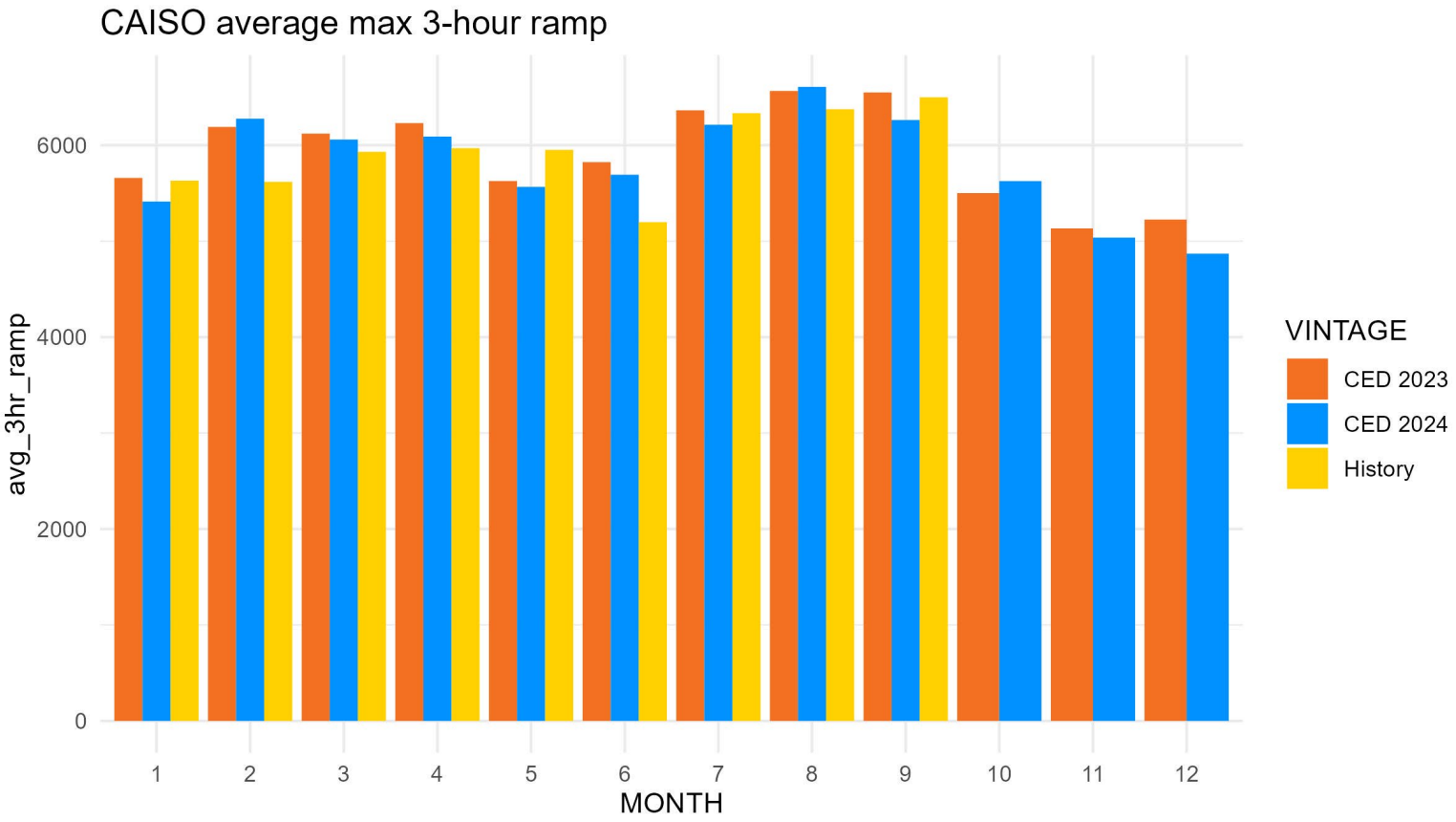
Method

1. Average ratios across consumption profiles by hour and day-type
2. Taking each month of each simulation, rank the days by peak consumption. Average ratios again but by month, rank, and hour
3. Assign profiles from (2) to ranks established in (1)

Updates to Load Assignment

- CED 2023 marked the first time simulated consumption profiles were used in place of counterfactual historical consumption
  - Allows the resulting “average” forecast profile to reflect present-day system behavior
  - Allows for a potential transition to using downscaled, localized climate projections in future IEPR cycles
- Updates for CED 2024
  - Truncated the number of historical weather patterns used (2012-2023 rather than 2000-2023)
  - Combined the 4th and 5th weeks of a month into a single day-type grouping

Maximum Three-hour Ramp

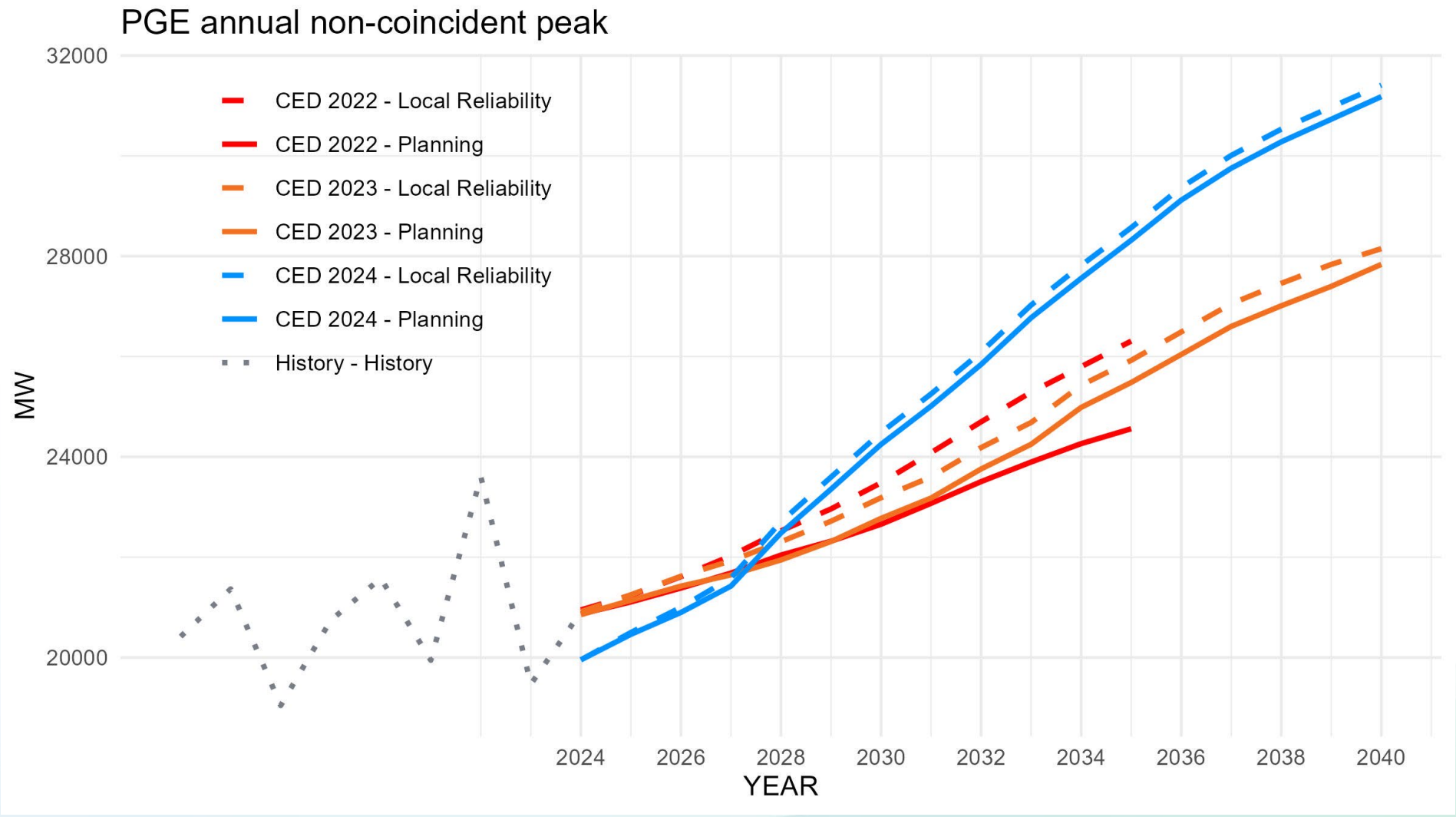


- Max system ramps are an input to CAISO's Flexible RA study
- Chart compares max three-hour ramp from two CED vintages (forecast year 2024) against actuals-to-date for 2024
- Forecast ramps are reasonably aligned with observed levels

Source: CEC Staff

Draft Peak Forecasts

PG&E Non-Coincident Peak

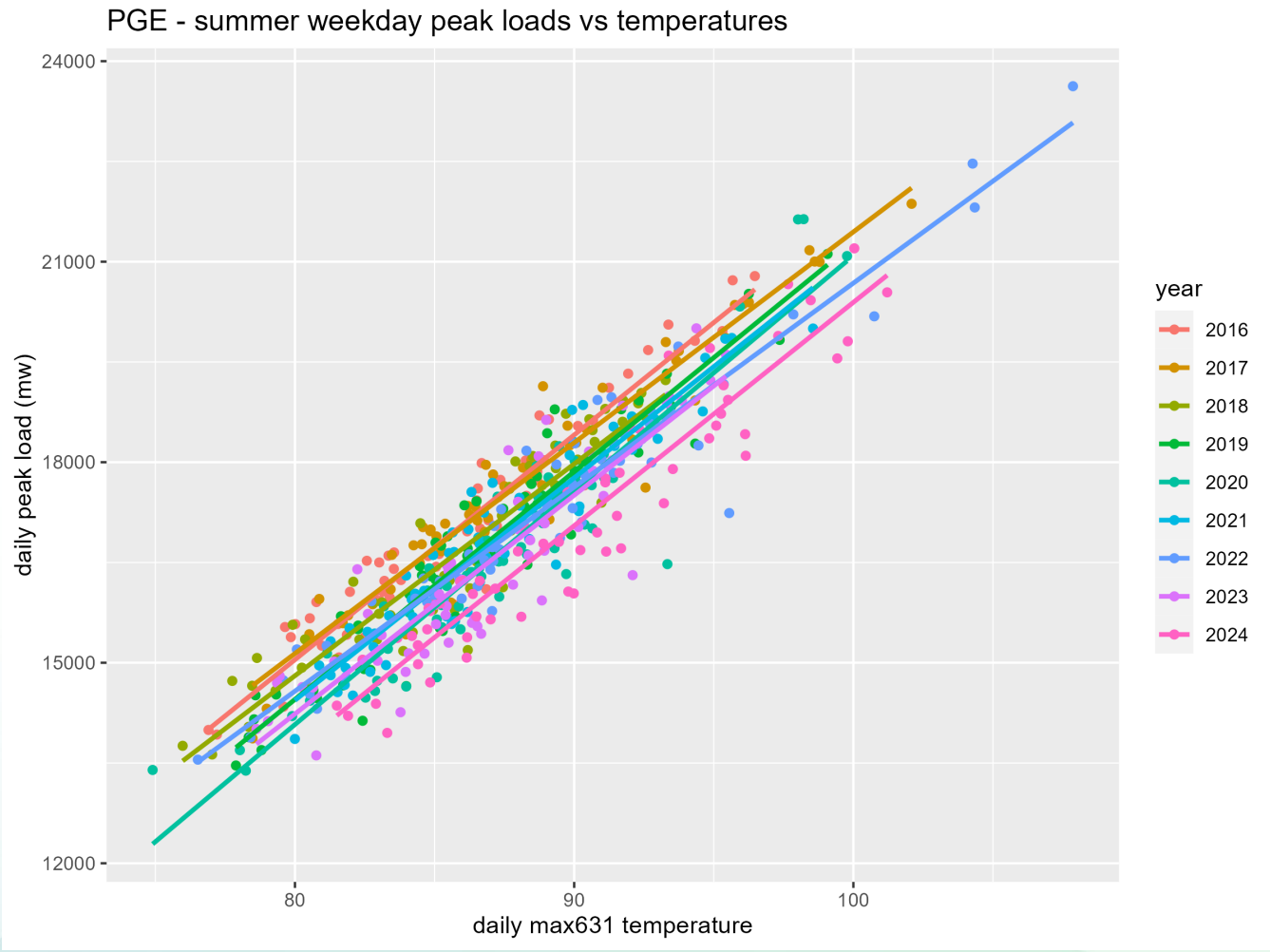


Year	Month	Hour	Peak	Coinc
2016	7	18	20,418	99.8%
2017	9	17	21,367	99.2%
2018	7	18	19,044	96.5%
2019	8	18	20,742	99.6%
2020	8	18	21,578	98.9%
2021	6	18	19,946	98.8%
2022	9	17	23,606	100.0%
2023	8	18	19,469	97.1%
2024	7	18	20,908	85.1%
2024	8	18	19,954	92.2%
2025	8	18	20,462	92.1%
2026	8	18	20,899	95.2%
2027	8	18	21,424	95.4%
2028	8	18	22,484	95.8%
2029	8	18	23,357	96.0%
2030	8	18	24,249	95.9%
2031	8	18	25,012	95.8%
2032	8	18	25,843	95.8%
2033	8	18	26,773	95.9%
2034	8	18	27,559	96.2%
2035	8	18	28,318	96.5%
2036	8	18	29,117	95.6%
2037	8	18	29,754	95.5%
2038	8	18	30,280	95.5%
2039	8	18	30,730	95.6%
2040	8	18	31,181	96.0%

Source: CEC Staff

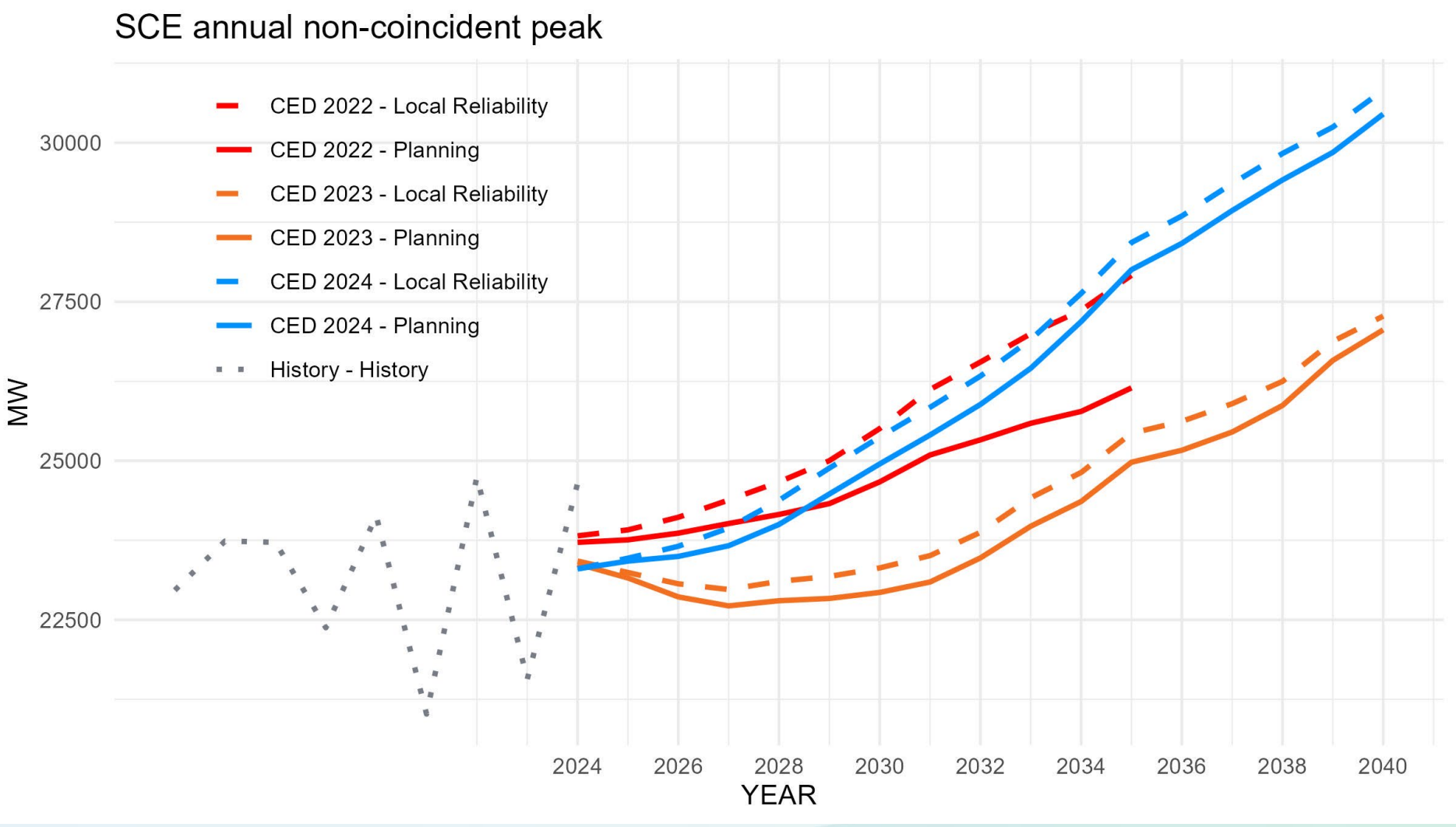
PG&E Weather-normal Peak

- PG&E summer daily peak load relative to temperature has been consistently declining since 2016
- This translates to a weather-normal peak estimate for 2024 which will appear low relative to recent historical peaks



Source: CEC Staff

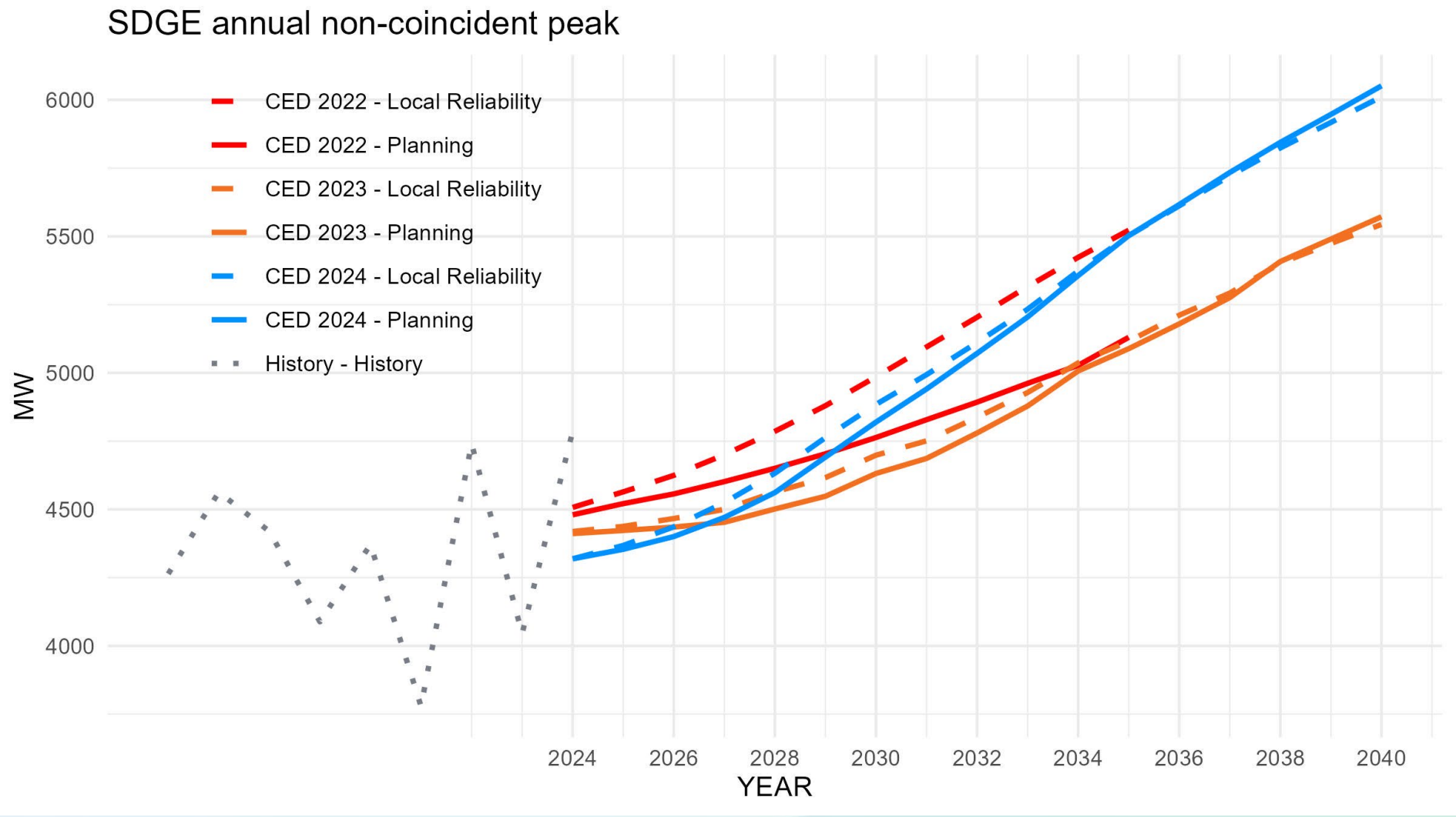
SCE Non-Coincident Peak



Year	Month	Hour	Peak	Coinc
2016	6	17	22,965	92.8%
2017	9	16	23,739	100.0%
2018	7	16	23,718	97.8%
2019	9	15	22,375	86.3%
2020	8	16	24,135	98.5%
2021	9	15	21,018	94.3%
2022	9	16	24,747	99.4%
2023	8	17	21,567	93.8%
2024	9	17	24,647	100.0%
2024	8	16	23,301	98.0%
2025	8	16	23,423	98.3%
2026	8	16	23,497	95.7%
2027	8	16	23,665	96.4%
2028	9	15	23,999	97.0%
2029	9	15	24,478	97.4%
2030	9	15	24,950	97.9%
2031	9	15	25,405	98.2%
2032	9	15	25,886	98.6%
2033	9	15	26,455	98.8%
2034	9	15	27,188	98.6%
2035	9	15	28,004	98.3%
2036	9	15	28,417	98.4%
2037	9	15	28,934	98.2%
2038	9	15	29,415	98.1%
2039	9	15	29,848	98.1%
2040	9	15	30,450	97.7%

Source: CEC Staff

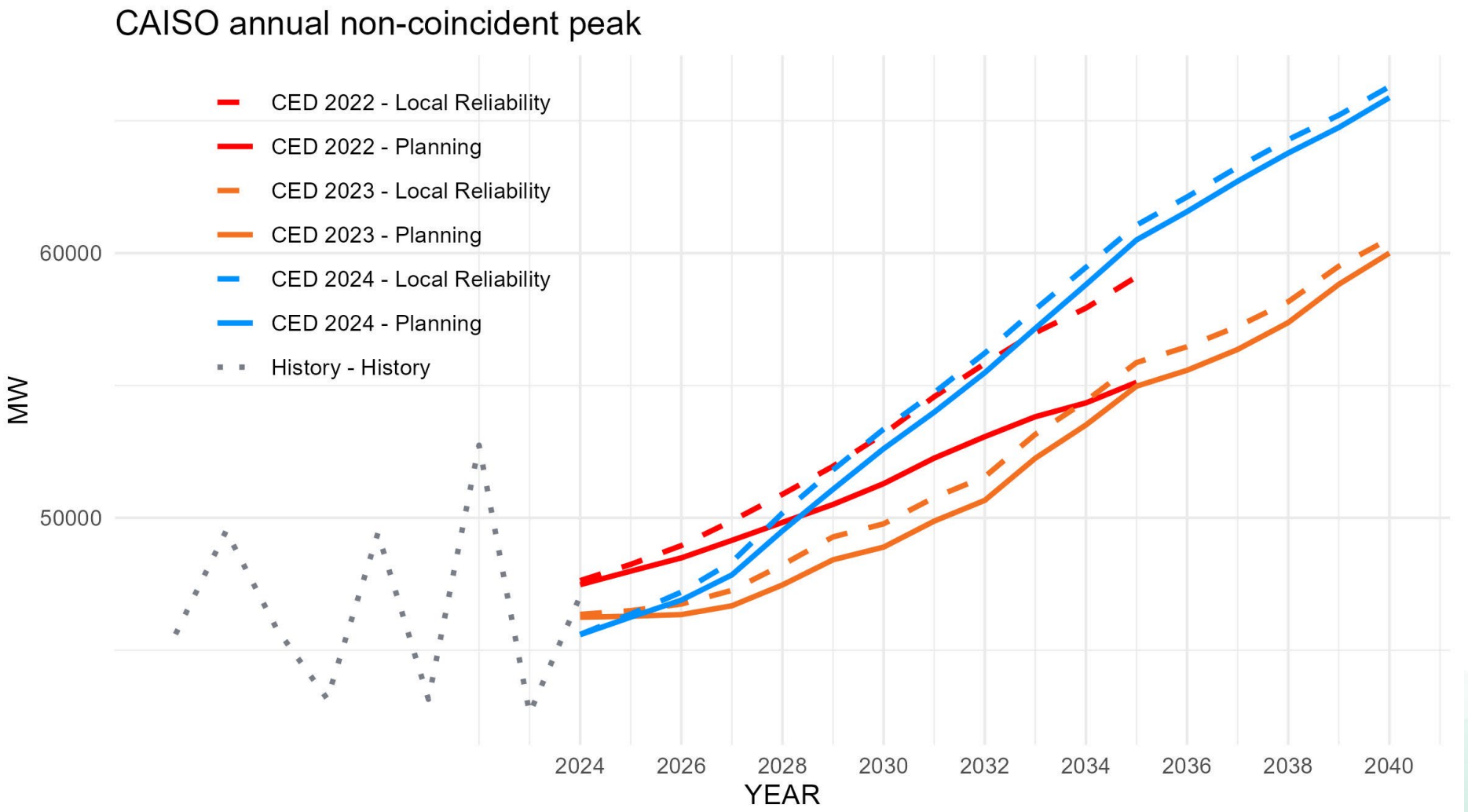
SDG&E Non-Coincident Peak



Year	Month	Hour	Peak	Coinc
2016	7	17	4,264	91.4%
2017	9	16	4,563	100.0%
2018	8	17	4,420	95.5%
2019	9	17	4,088	78.0%
2020	9	16	4,372	98.6%
2021	9	17	3,779	95.7%
2022	9	17	4,741	95.5%
2023	8	18	4,045	85.7%
2024	9	17	4,786	96.3%
2024	9	18	4,319	98.0%
2025	9	18	4,354	97.7%
2026	9	18	4,401	100.0%
2027	9	18	4,471	100.0%
2028	9	18	4,562	100.0%
2029	9	18	4,691	100.0%
2030	9	18	4,820	100.0%
2031	9	18	4,941	100.0%
2032	9	18	5,071	100.0%
2033	9	18	5,205	100.0%
2034	9	18	5,356	100.0%
2035	9	18	5,503	100.0%
2036	9	18	5,617	100.0%
2037	9	18	5,734	100.0%
2038	9	18	5,844	100.0%
2039	9	18	5,947	100.0%
2040	9	18	6,051	100.0%

Source: CEC Staff

CAISO Annual Peak



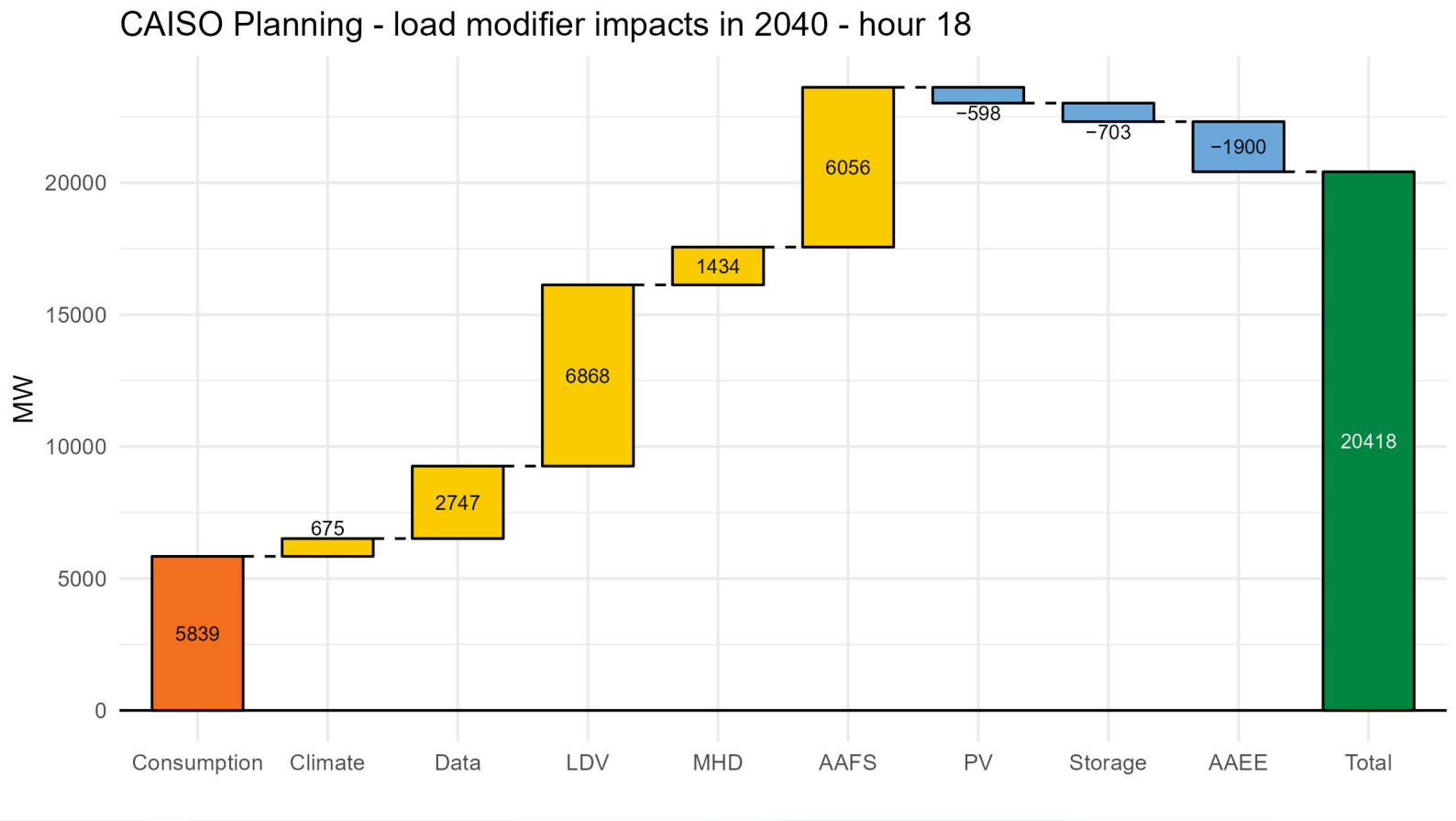
Year	Month	Hour	Peak	Coinc
2016	7	17	47,787	95.4%
2017	9	16	49,809	99.4%
2018	7	17	47,322	96.8%
2019	8	17	47,346	91.2%
2020	8	17	50,225	98.4%
2021	9	17	44,883	96.1%
2022	9	17	53,234	99.1%
2023	8	17	45,221	94.2%
2024	9	17	50,481	93.2%
2024	9	17	47,714	95.5%
2025	9	17	48,379	95.6%
2026	9	18	48,936	95.8%
2027	9	18	49,699	96.3%
2028	9	18	51,185	96.7%
2029	9	18	52,666	97.0%
2030	9	18	54,159	97.1%
2031	9	18	55,499	97.3%
2032	9	18	56,940	97.4%
2033	9	18	58,573	97.6%
2034	9	18	60,243	97.6%
2035	9	18	61,965	97.6%
2036	9	18	63,291	97.3%
2037	9	18	64,562	97.1%
2038	9	18	65,679	97.1%
2039	9	18	66,665	97.1%
2040	9	18	67,823	97.1%

Source: CEC Staff

Load Modifier Impacts on Peak

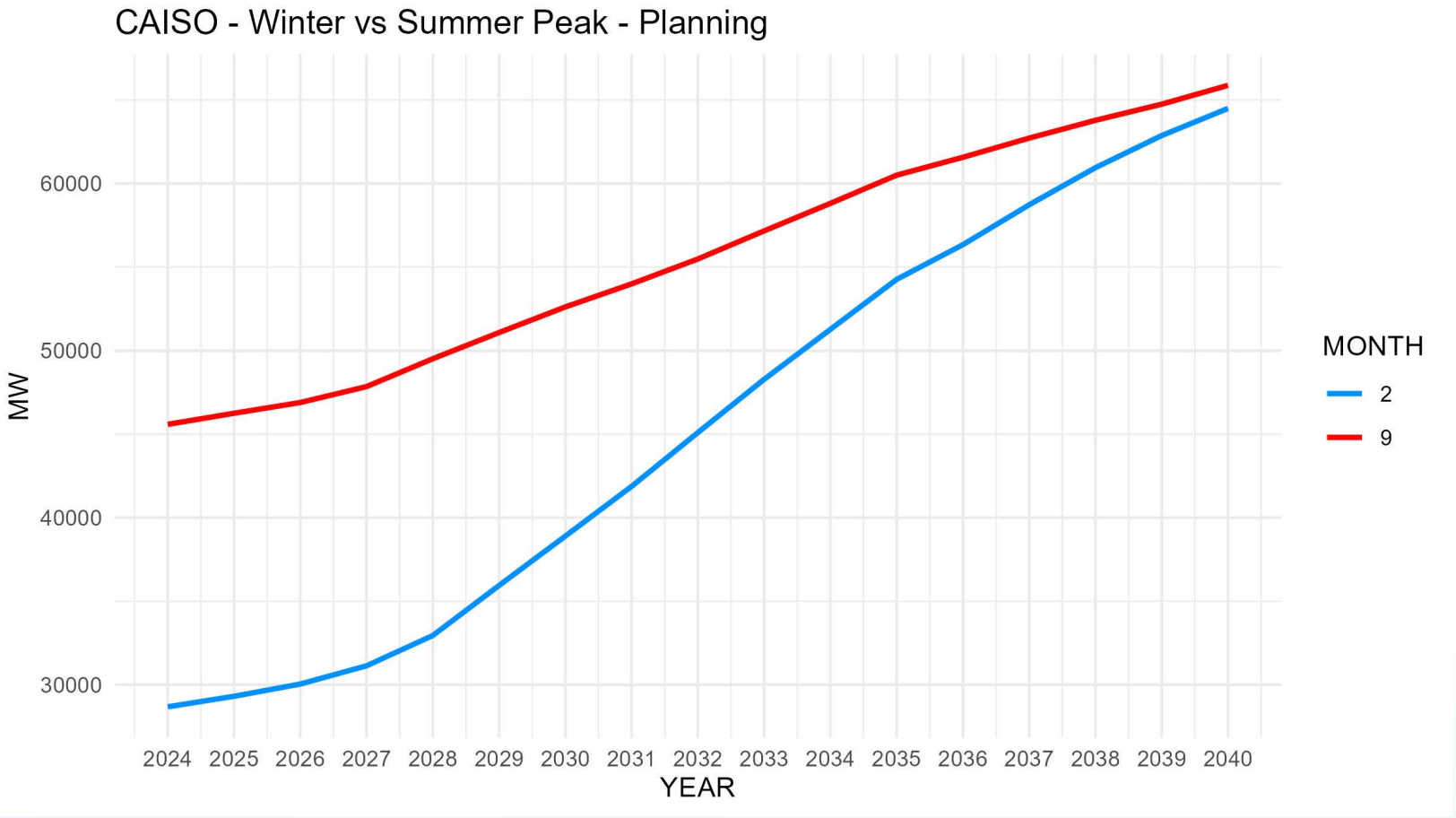
Shown here are the impacts of load modifiers in forecast year 2040 relative to 2024 during the CAISO peak hour.

Building and vehicle electrification represent the bulk of the total impact. Newly added data center projections make a significant contribution.



Source: CEC Staff

CAISO Winter Peak



Source: CEC Staff

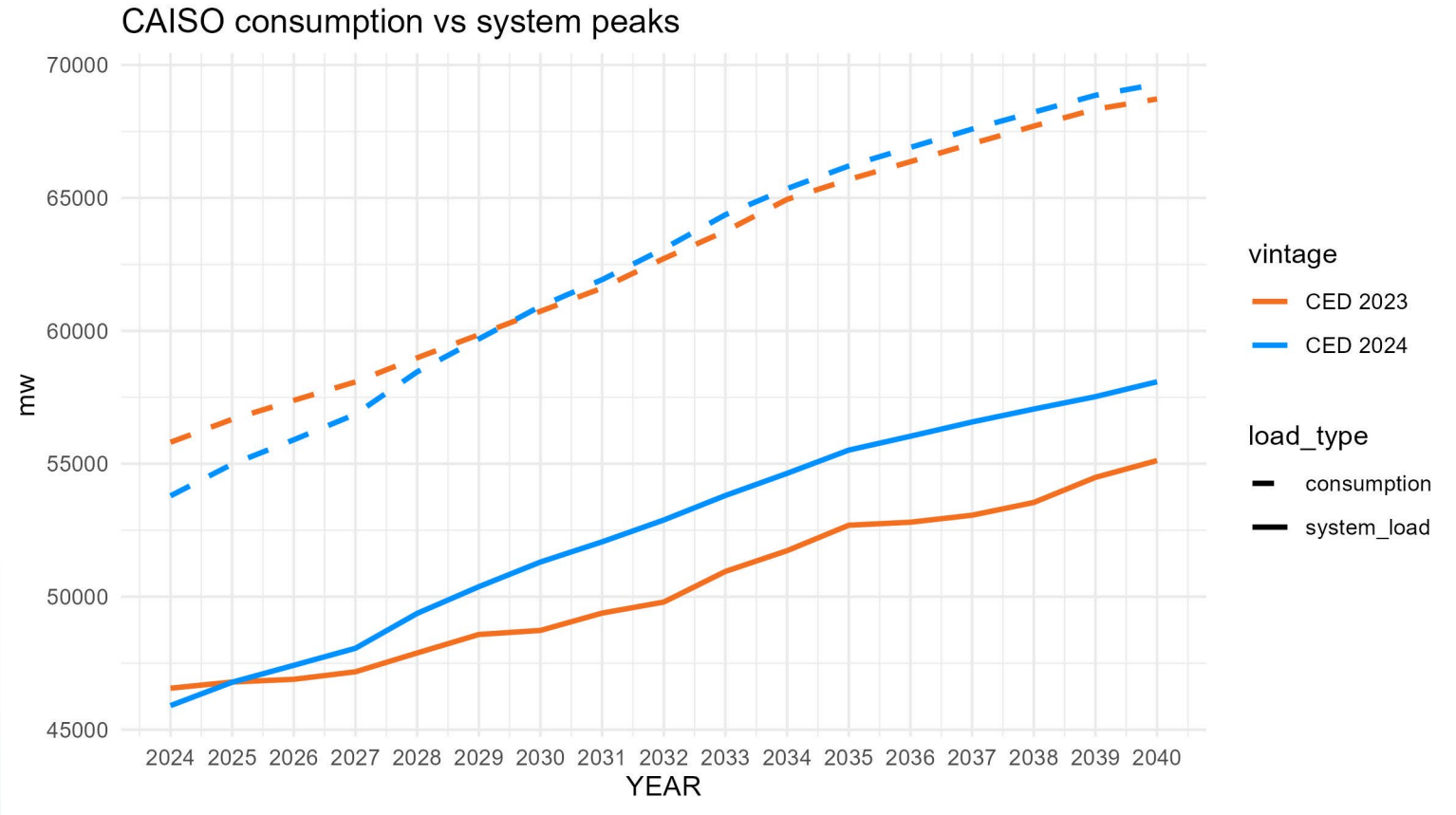
Additional achievable fuel substitution adds substantial heating load to winter morning hours.

Fuel substitution impacts surpass 23,000 MW by February 2024 causing winter peak loads to approach summer peak levels.

Consumption vs System Peak

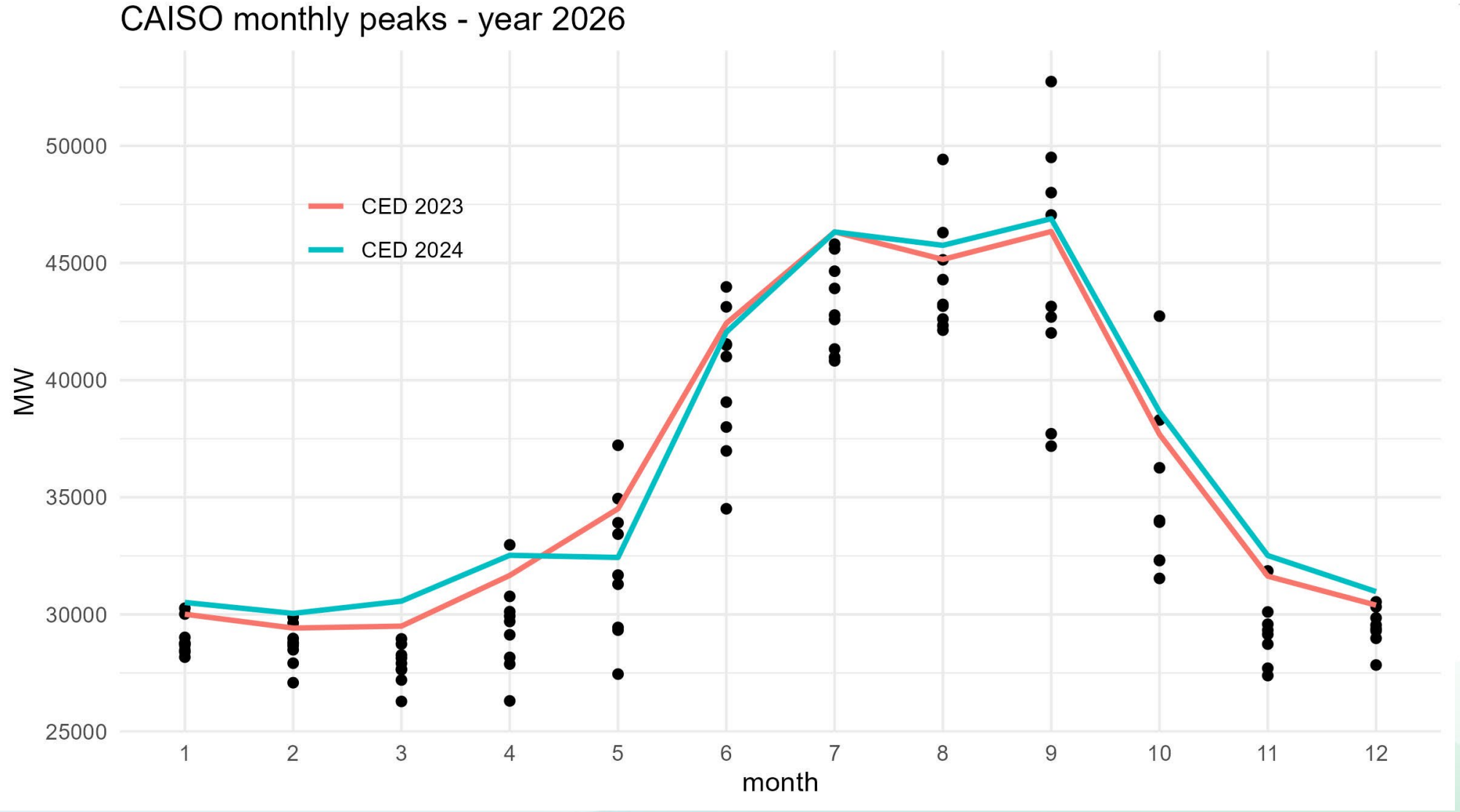
CPUC's modeling team expressed concern with the large delta between CED 2023 consumption and system peak forecasts

CED 2024 shows a smaller delta, primarily the result of reduced PV capacity factors



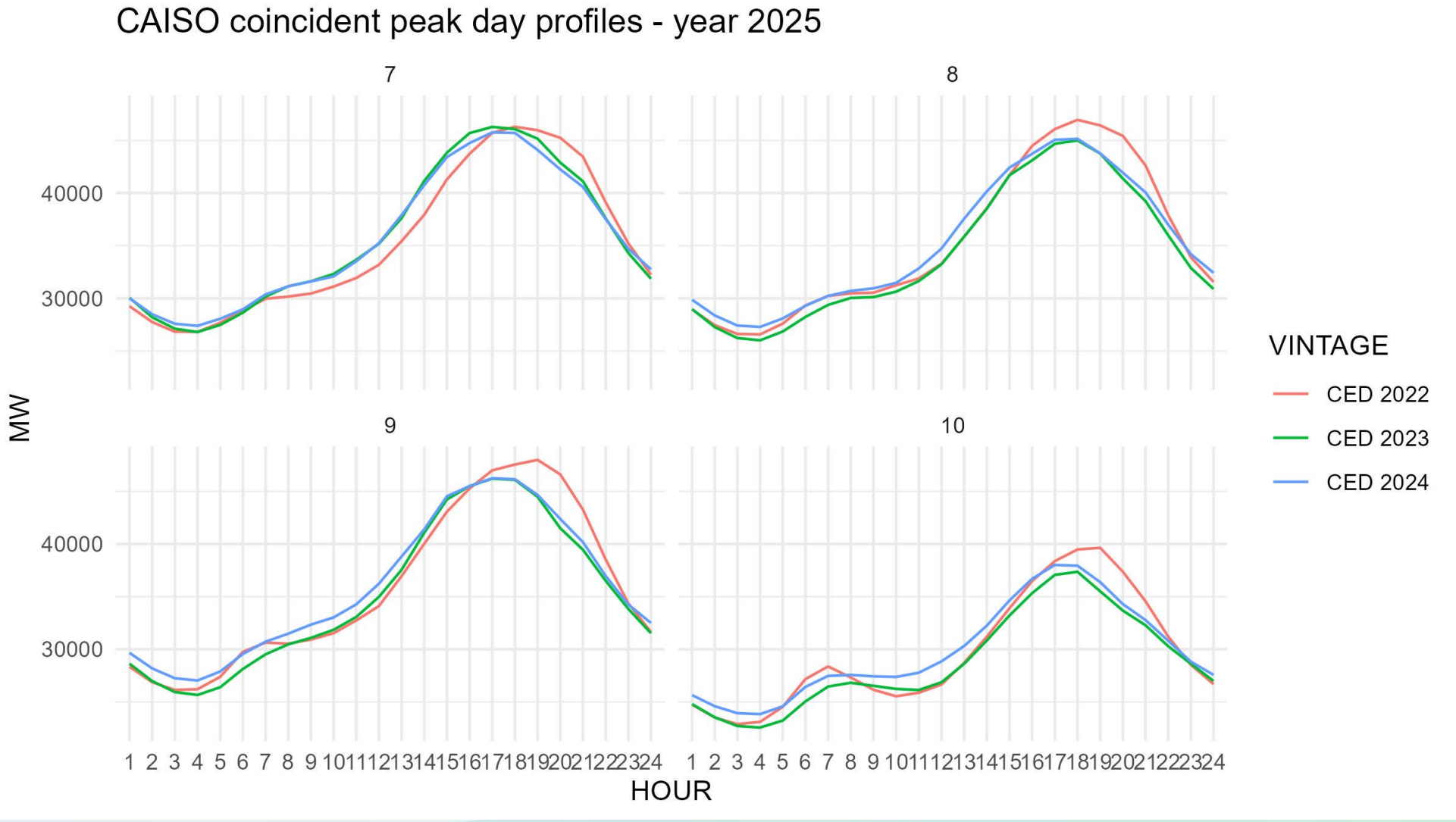
Source: CEC Staff

CAISO Monthly Peaks



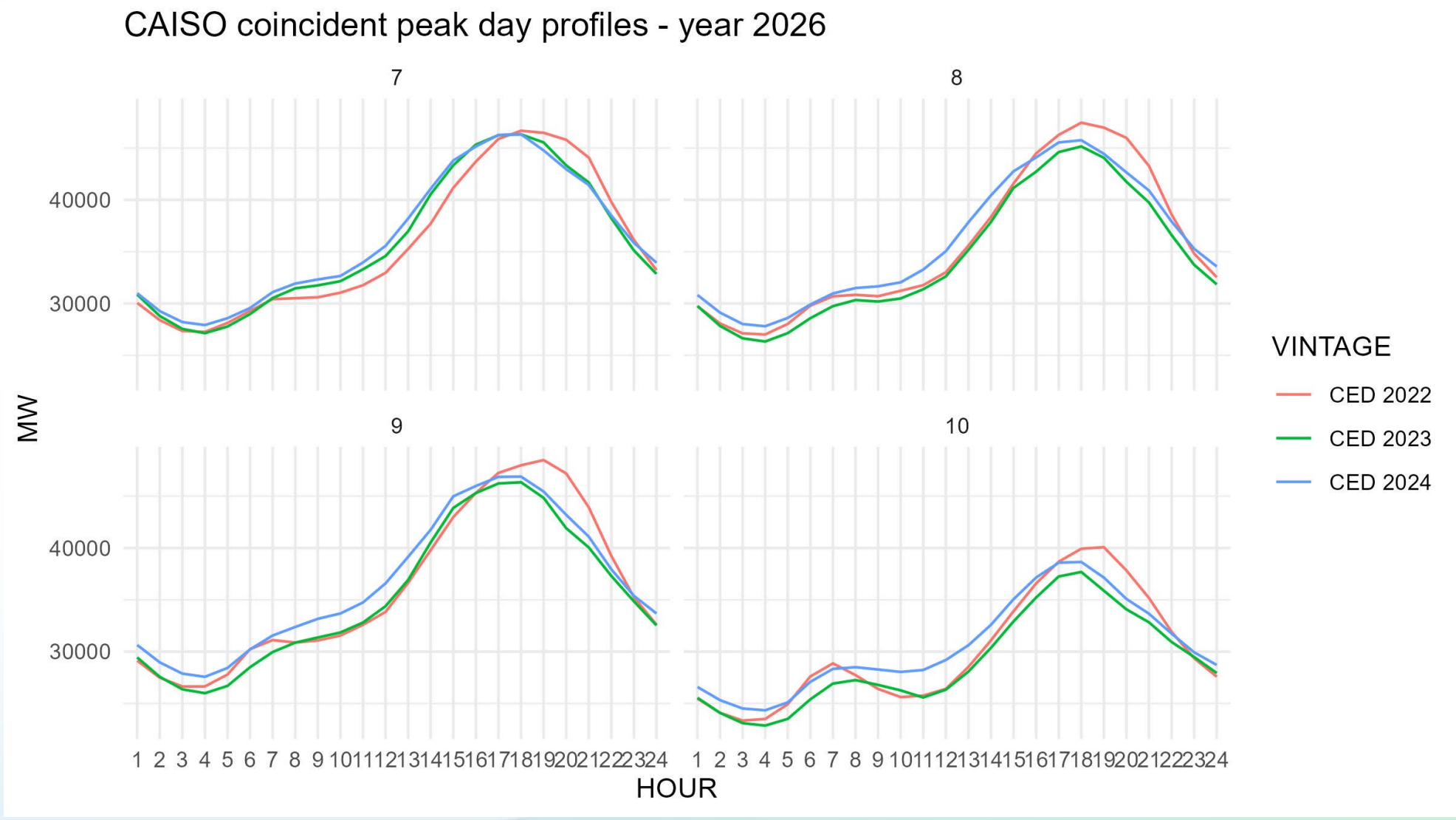
Source: CEC Staff

CAISO Peak Day Profiles - 2025



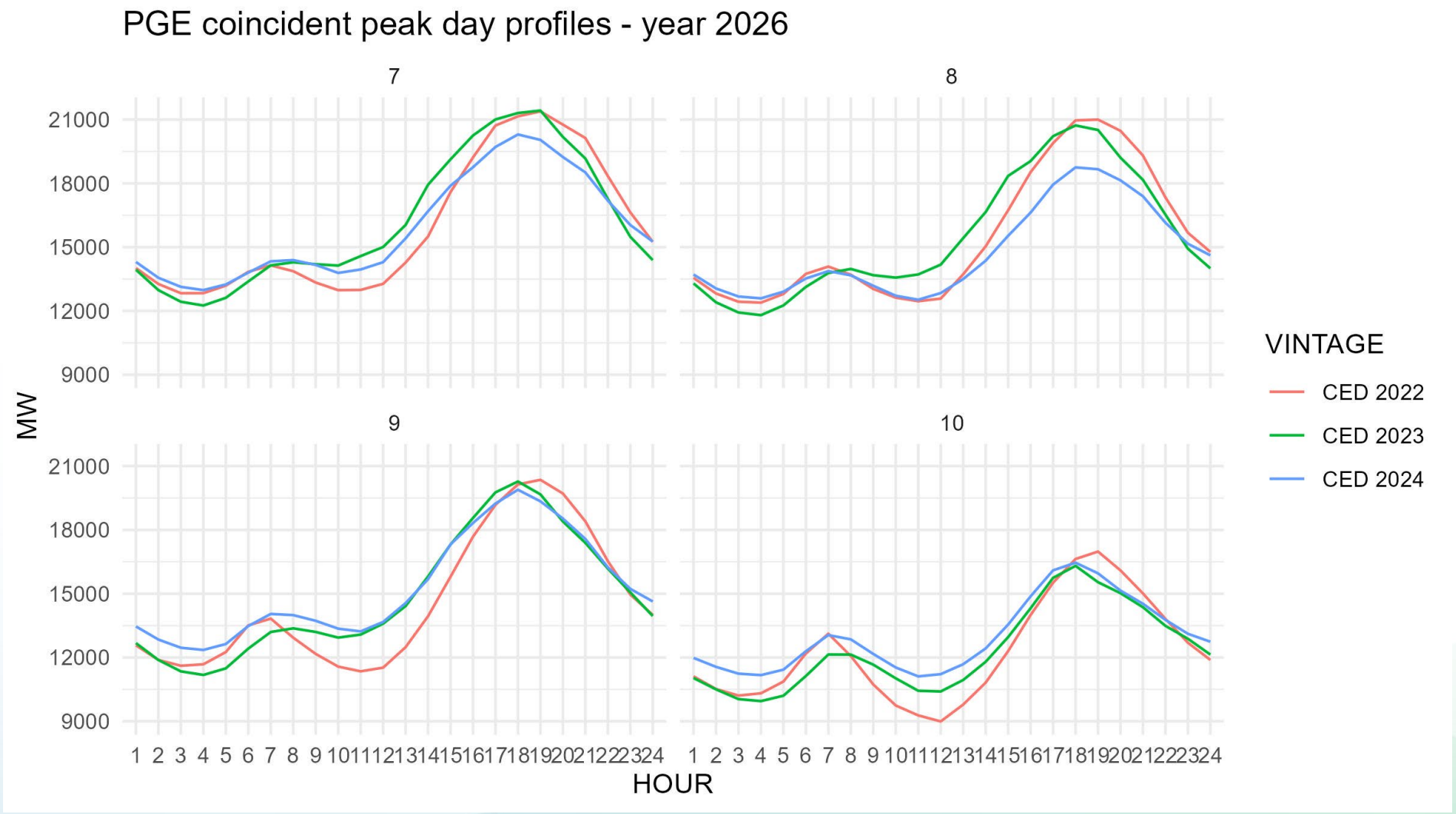
Source: CEC Staff

CAISO Peak Day Profiles - 2026



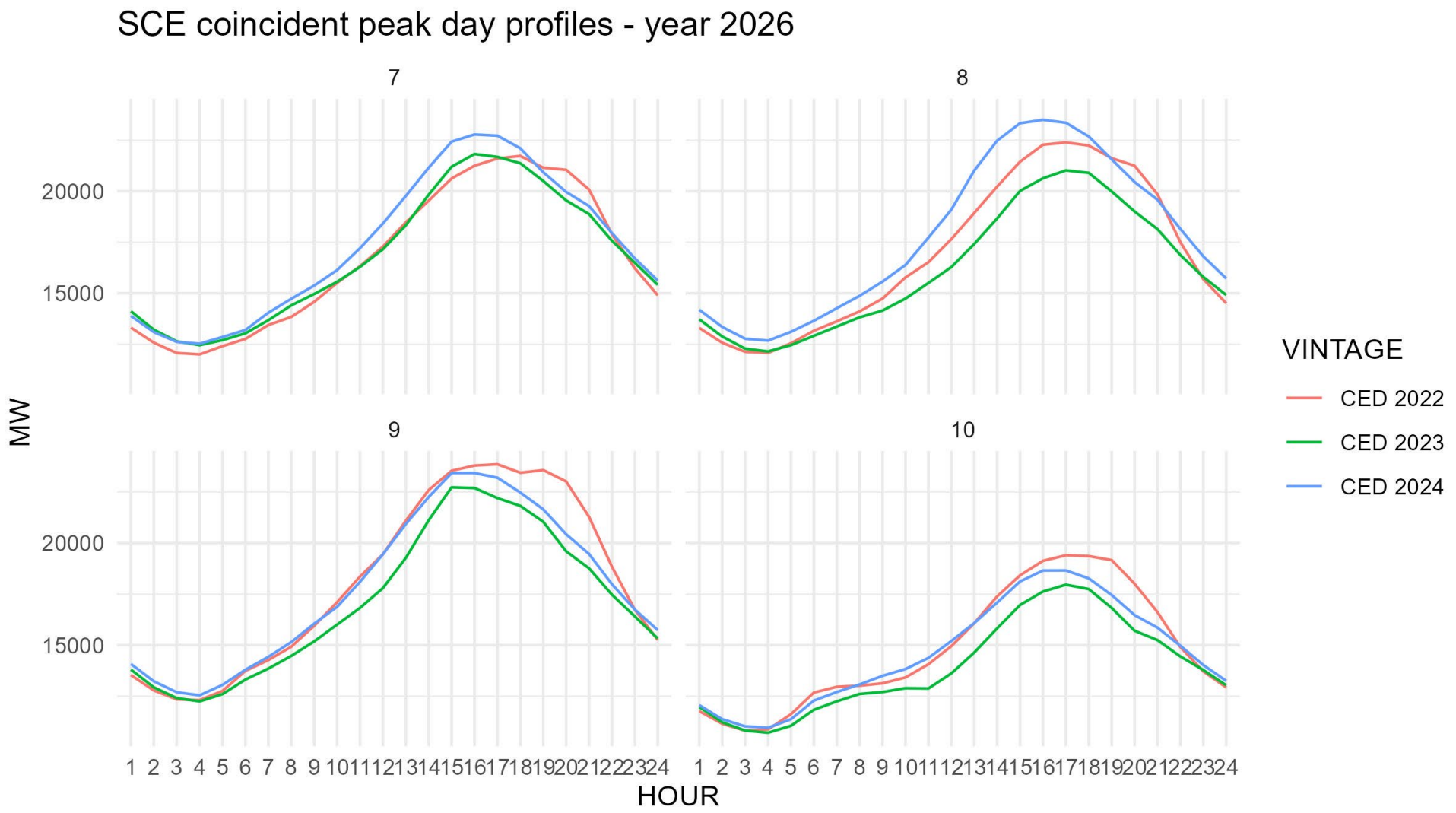
Source: CEC Staff

Monthly Coincident Peak Days PG&E - 2026



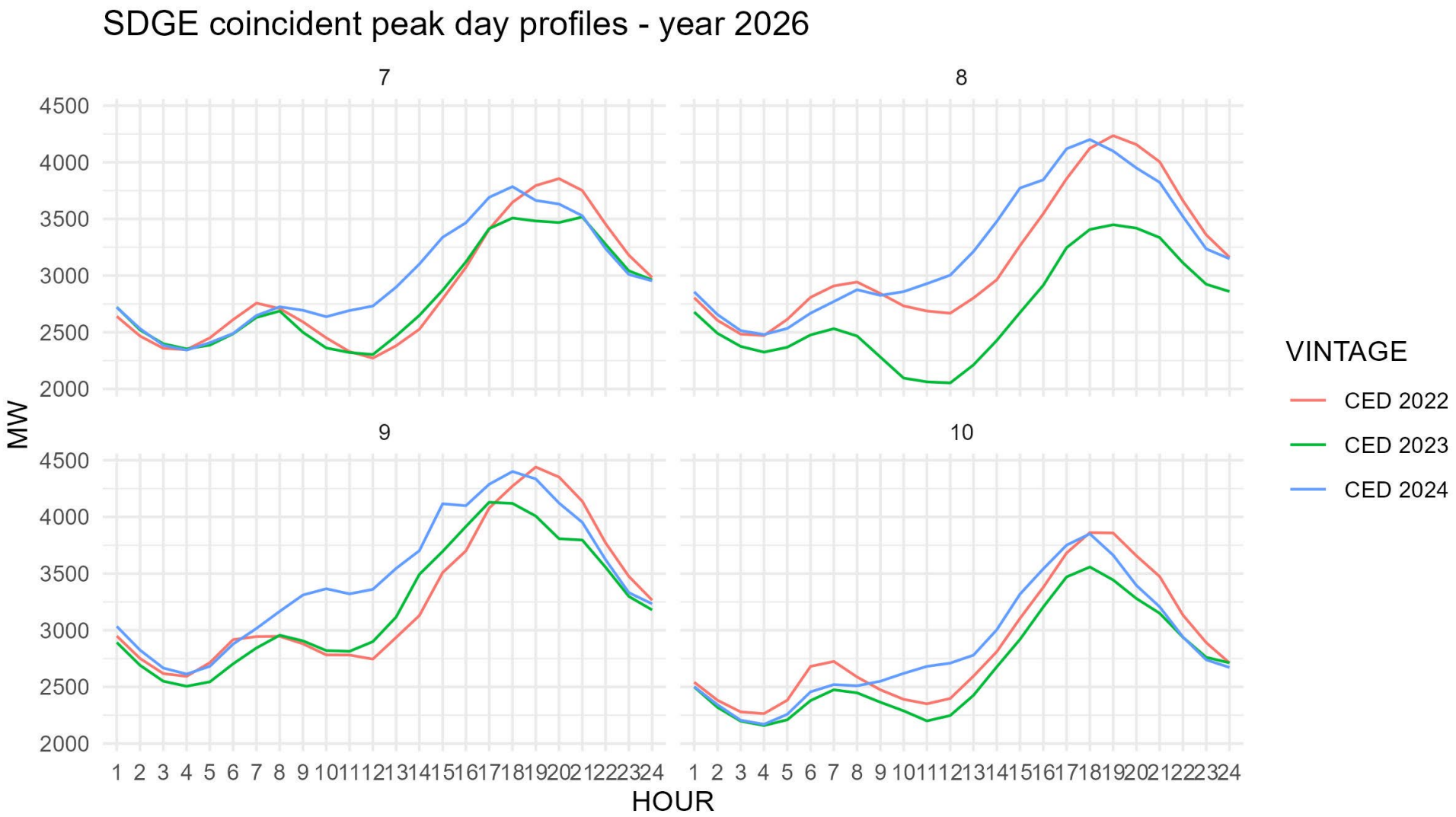
Source: CEC Staff

Monthly Coincident Peak Days SCE - 2026



Source: CEC Staff

Monthly Coincident Peak Days SDG&E - 2026



Source: CEC Staff

Appendix

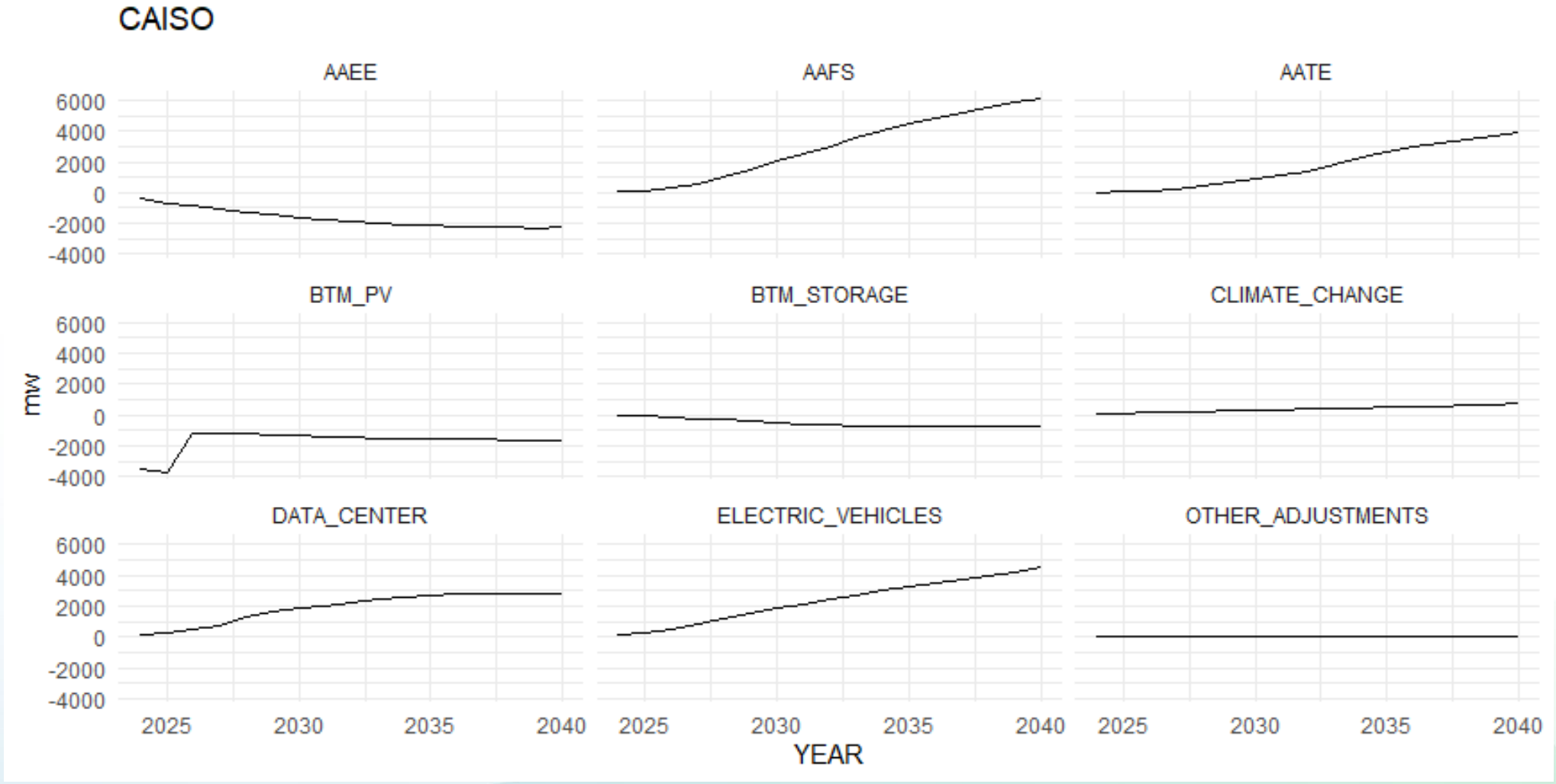
Annual Growth Rates

TAC	Scenario	CED 2023	CED 2024
CAISO	Local Reliability	1.7%	2.4%
PGE	Local Reliability	1.9%	2.9%
SCE	Local Reliability	1.0%	1.8%
SDGE	Local Reliability	1.4%	2.1%
CAISO	Planning	1.6%	2.3%
PGE	Planning	1.8%	2.8%
SCE	Planning	0.9%	1.7%
SDGE	Planning	1.5%	2.1%

Monthly Peak Loads

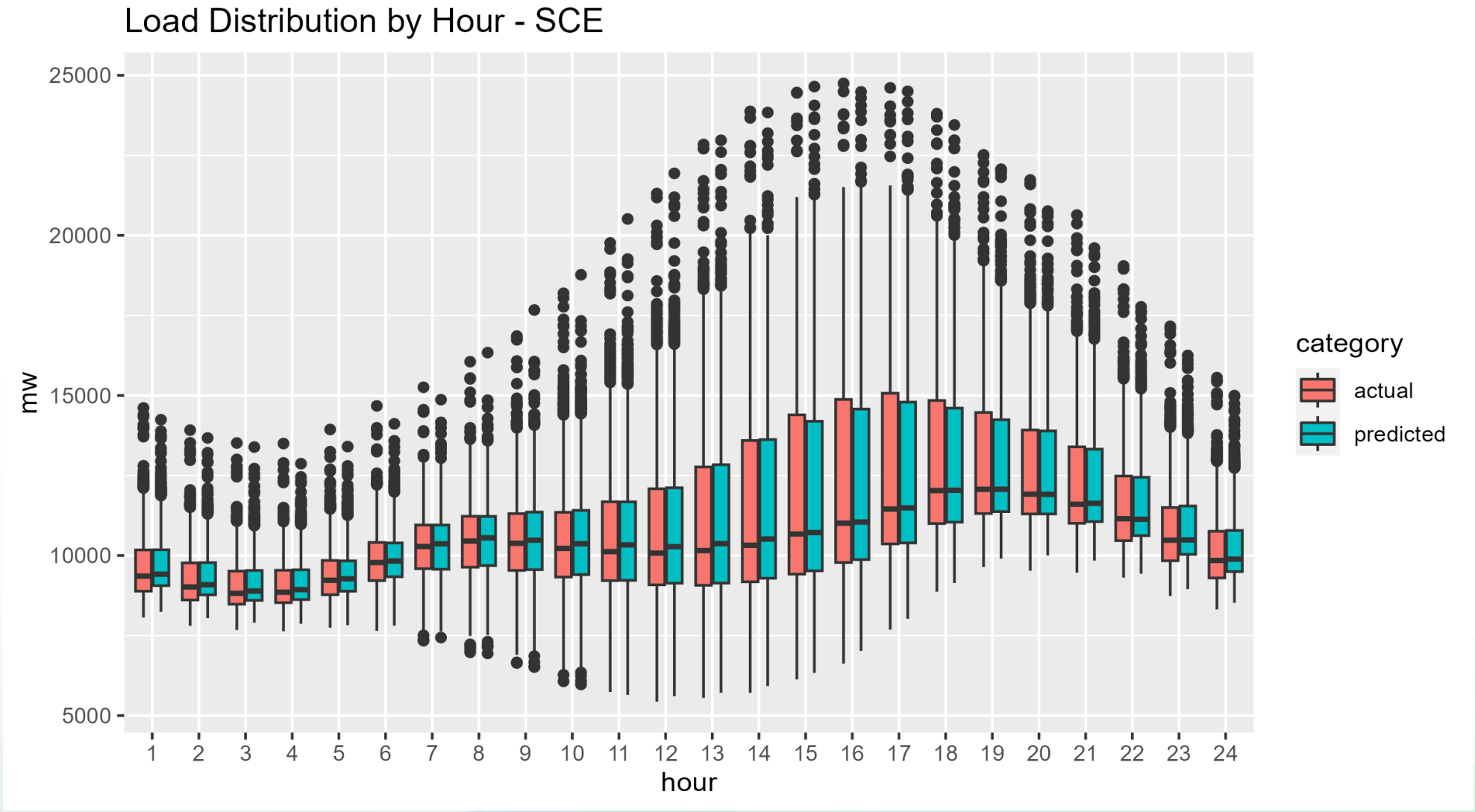
	CAISO			PGE			SCE			SDGE		
	CED 2023		CED 2024	CED 2023		CED 2024	CED 2023		CED 2024	CED 2023		CED 2024
Month	2025	2026	2026	2025	2026	2026	2025	2026	2026	2025	2026	2026
1	29,591	30,009	30,511	13,193	13,599	14,071	13,312	13,355	13,434	3,007	2,965	2,921
2	29,034	29,419	30,044	13,028	13,312	13,613	13,032	13,083	13,438	2,901	2,949	2,918
3	29,133	29,501	30,568	12,997	13,281	13,979	13,278	13,327	13,710	2,799	2,832	2,818
4	31,195	31,666	32,524	13,984	14,248	14,879	14,273	14,323	14,788	2,885	3,039	2,798
5	34,755	34,512	32,433	16,452	16,731	16,248	15,666	15,118	13,472	2,551	2,573	2,629
6	42,268	42,427	42,047	20,355	20,536	19,869	18,665	18,630	18,878	3,104	3,113	3,168
7	46,284	46,327	46,326	20,927	21,308	20,299	21,799	21,368	22,100	3,416	3,508	3,785
8	44,999	45,154	45,755	20,550	20,725	18,751	20,935	20,896	22,678	3,391	3,407	4,200
9	46,204	46,345	46,892	19,623	20,277	19,889	22,325	21,824	22,477	4,131	4,119	4,401
10	37,358	37,687	38,651	16,047	16,310	16,458	17,715	17,748	18,271	3,526	3,558	3,850
11	31,304	31,633	32,514	13,262	13,505	14,063	14,716	14,759	15,161	3,259	3,303	3,223
12	30,027	30,396	30,975	13,571	13,886	14,084	13,391	13,398	13,809	2,967	3,014	3,003

Load Modifier Peak Contribution



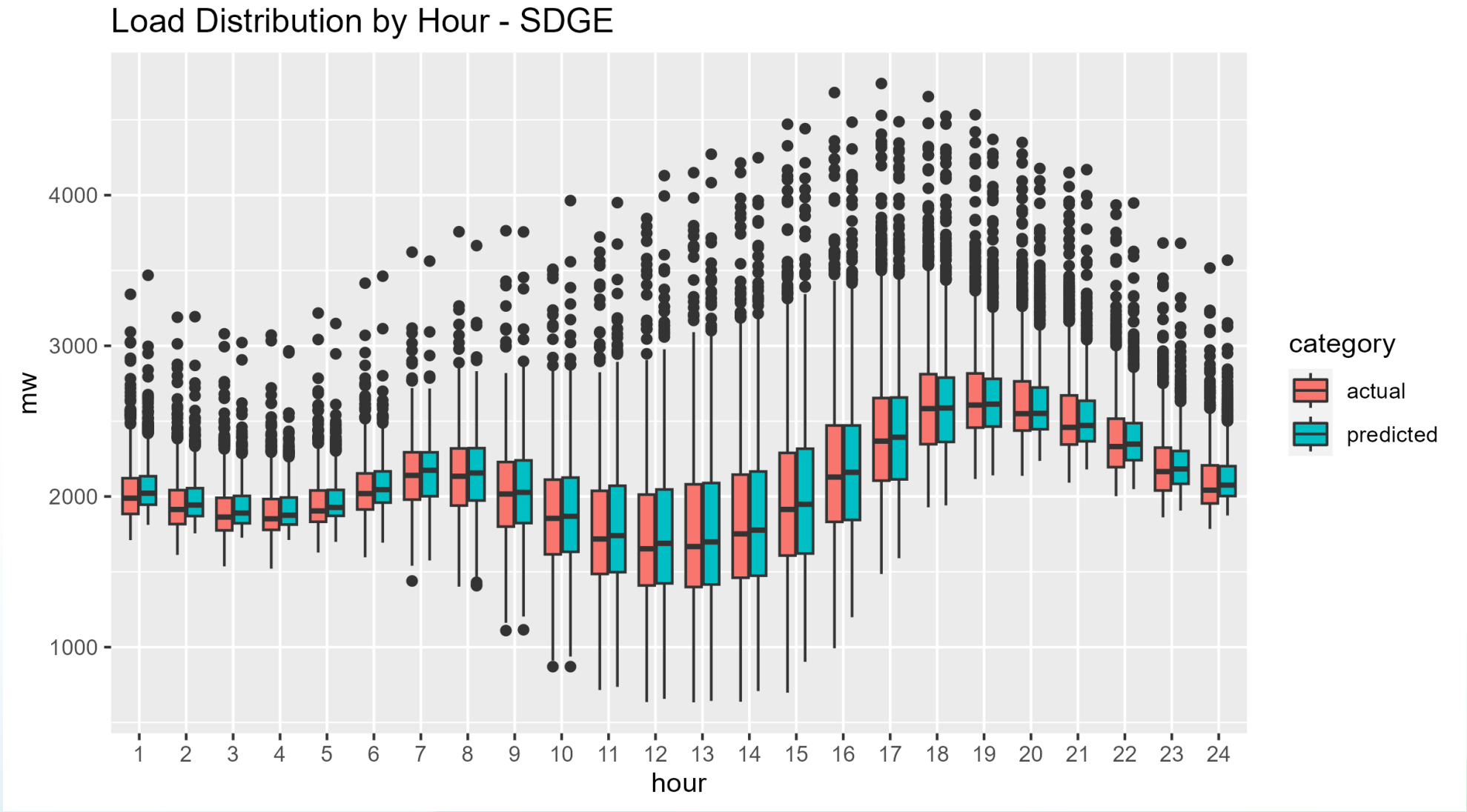
Source: CEC Staff

Hourly Load Distribution – SCE



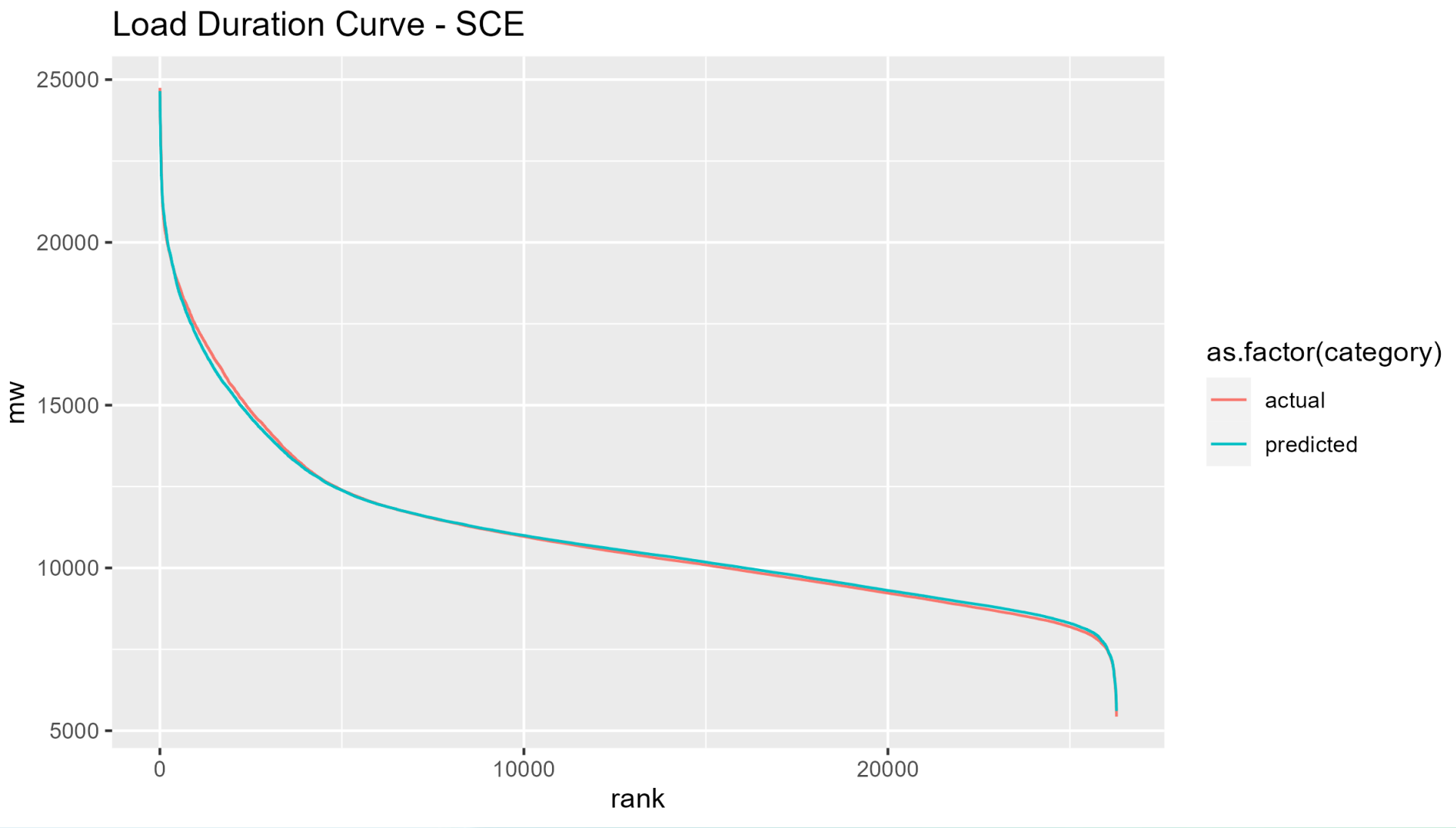
Source: CEC Staff

Hourly Load Distribution – SDG&E



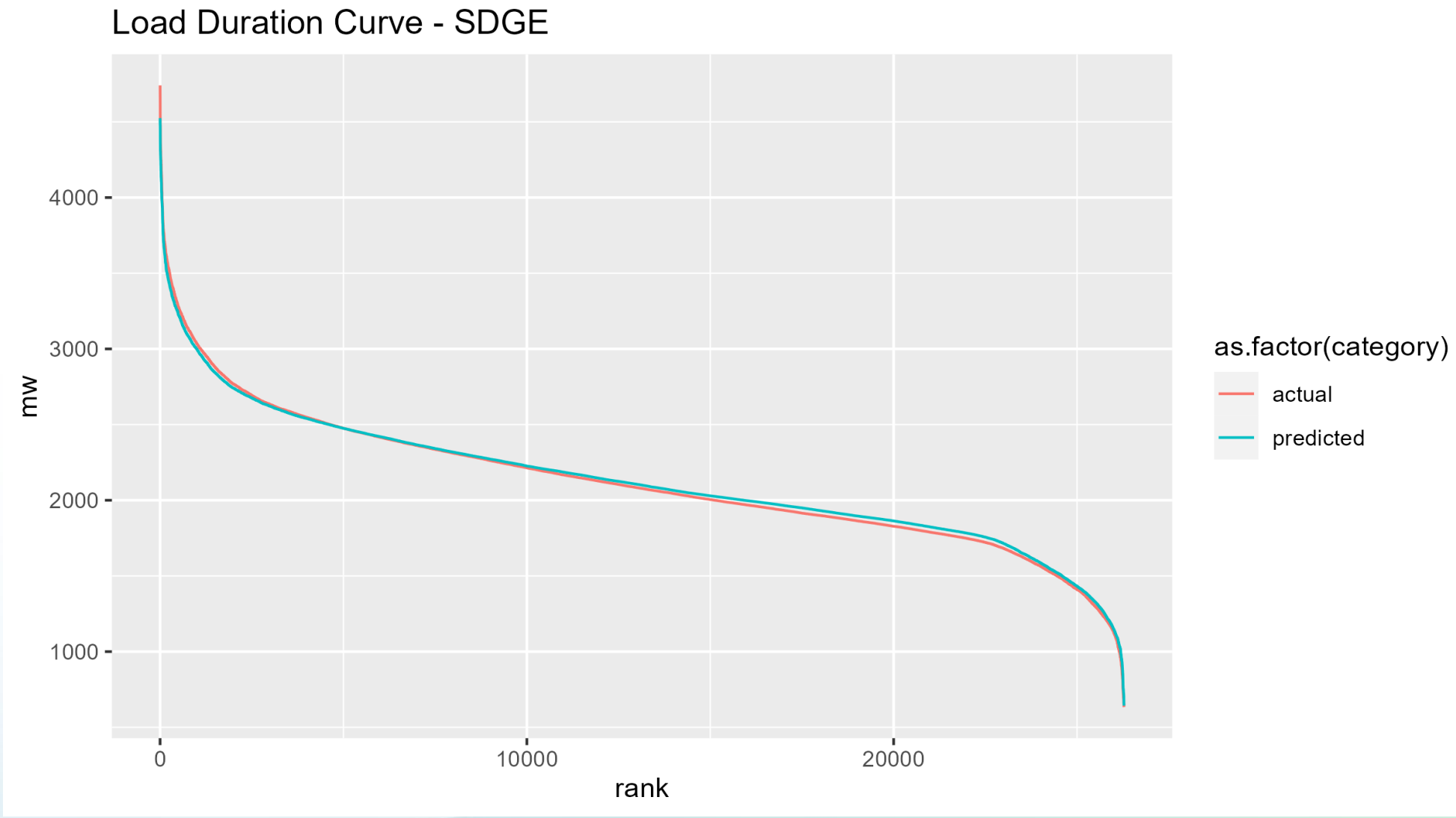
Source: CEC Staff

Load Duration Curve - SCE



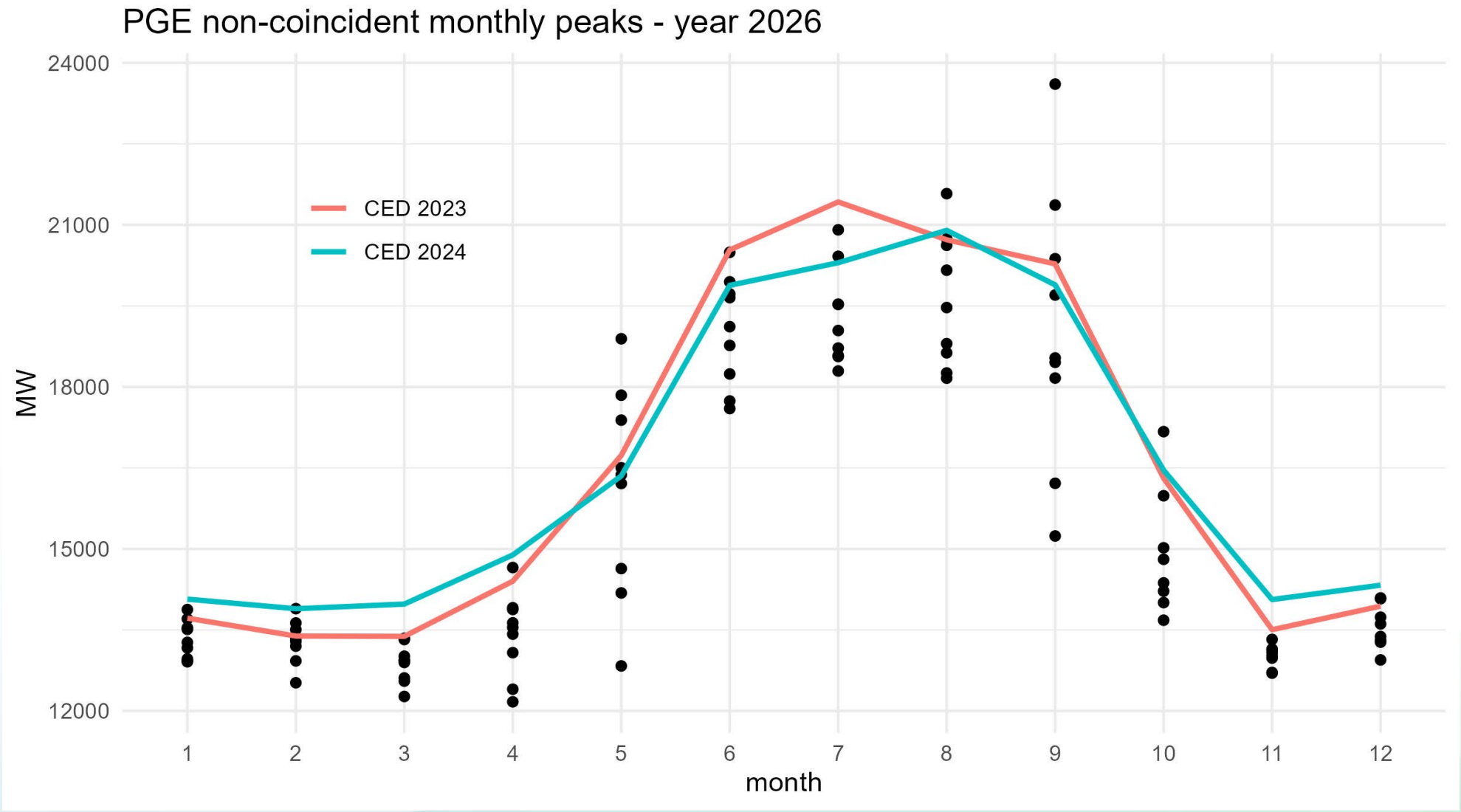
Source: CEC Staff

Load Duration Curve – SDG&E



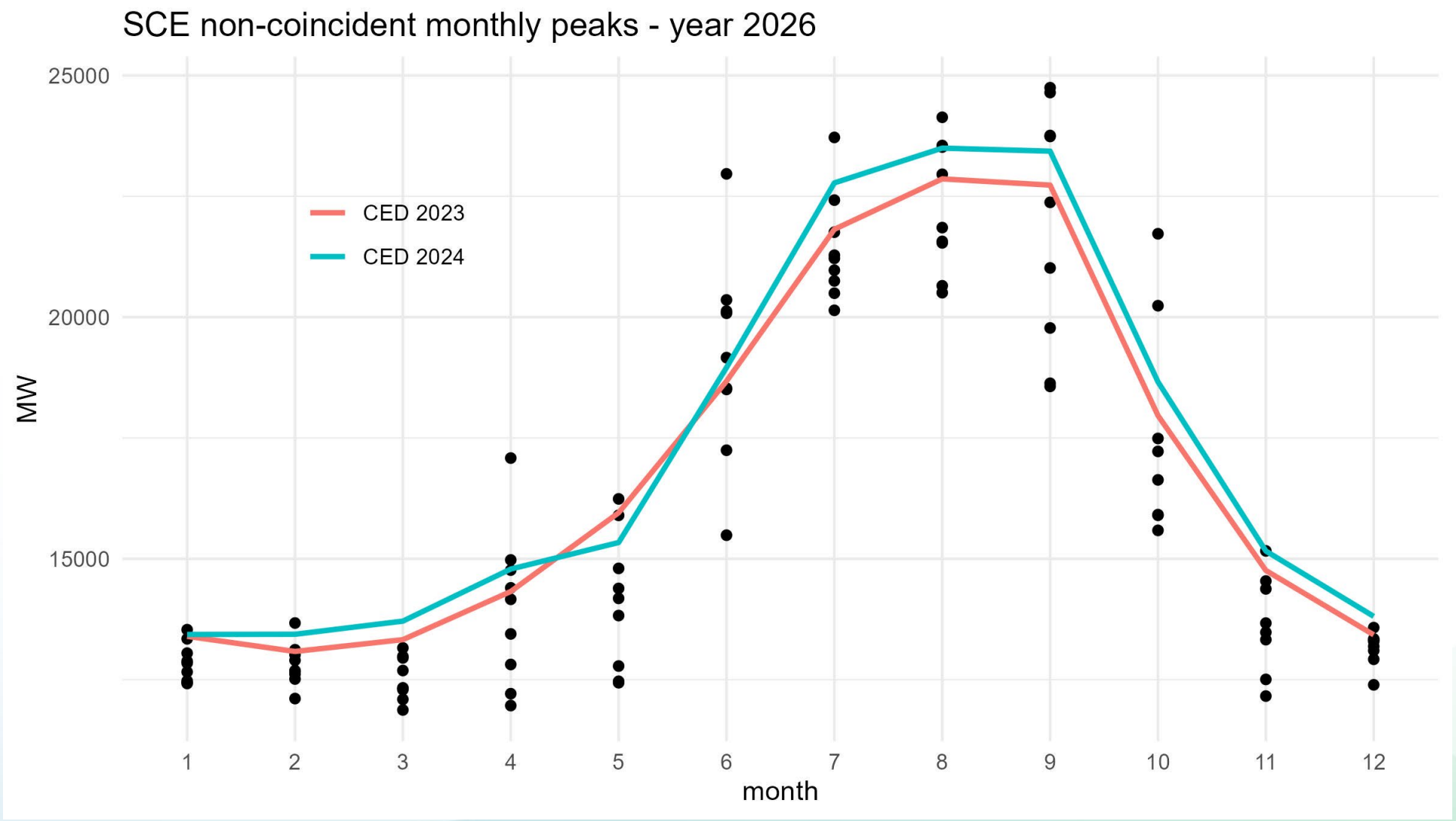
Source: CEC Staff

PG&E Monthly Peaks



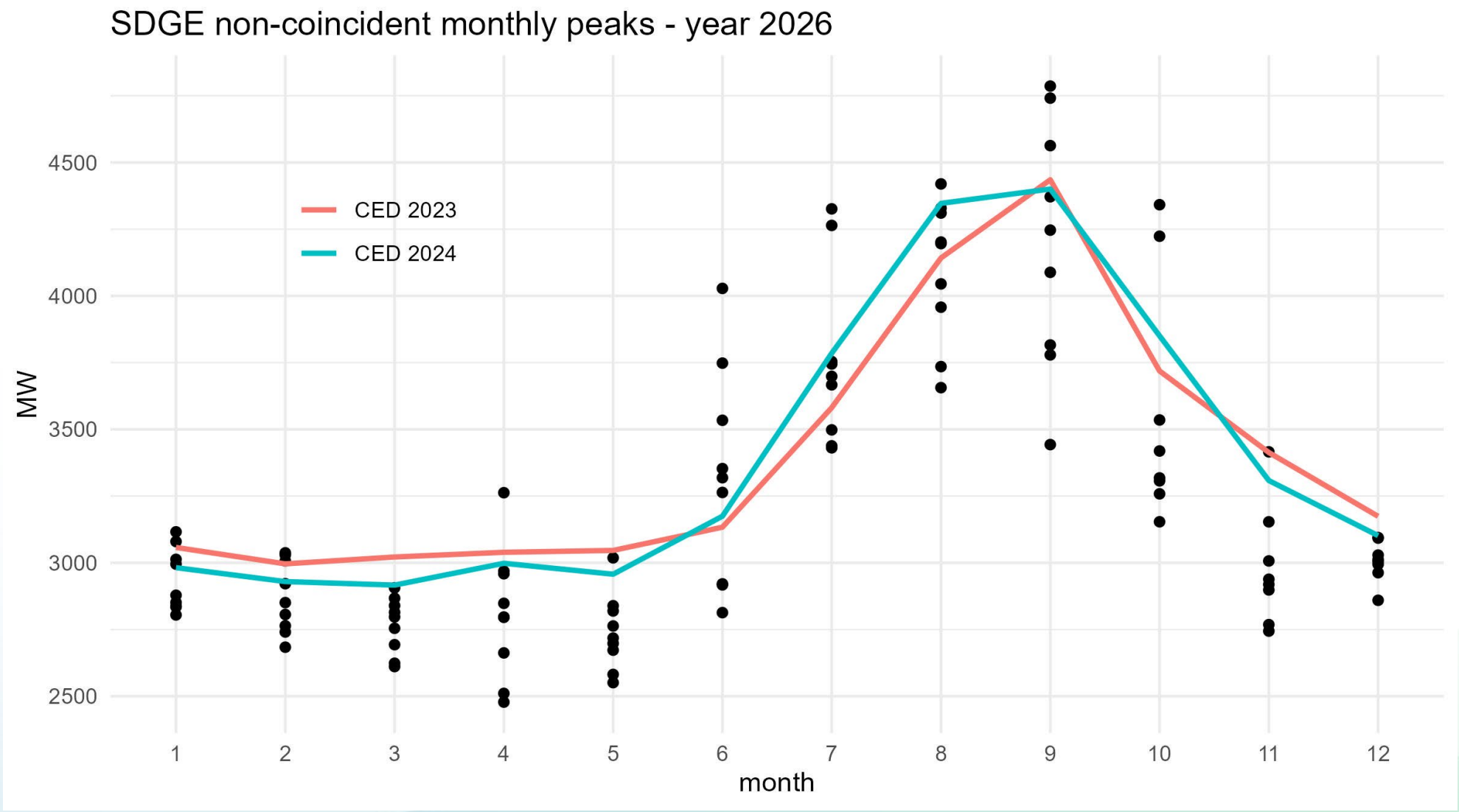
Source: CEC Staff

SCE Monthly Peaks



Source: CEC Staff

SDG&E Monthly Peaks



Source: CEC Staff