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Peak Electricity Demand

Update to the California Energy Demand Forecast, 2021 - 2035

Nick Fugate, Energy Assessments

Use cases

- Input to system and reliability modeling
- Monthly system peaks serve as a system-level benchmark for Resource Adequacy
- Detailed planning use cases outlined in Single Forecast Set agreement published in each IEPR

For IOU TAC areas, peak loads are derived from hourly load modeling

Hourly Load Model

HLM approach

1. Apply base load profile to annual “consumption” forecast
2. Adjust hourly consumption using profiles for:
   - Climate change impacts
   - Electric vehicle charging
   - Behind-the-meter PV generation and storage
   - “Additional Achievable” efficiency and electrification
3. Calibrate to weather-normal base-year peak load

What has changed

- New forecast framework
- Updated annual consumption forecast
- Updated AAFS scenario
- Transportation updates:
  - Revised electric vehicle forecast
  - New modifier – Additional Achievable Transportation Electrification (AATE)
  - EV charging profiles adjusted for TOU rates
- Annual peak forecast benchmarked to 2022

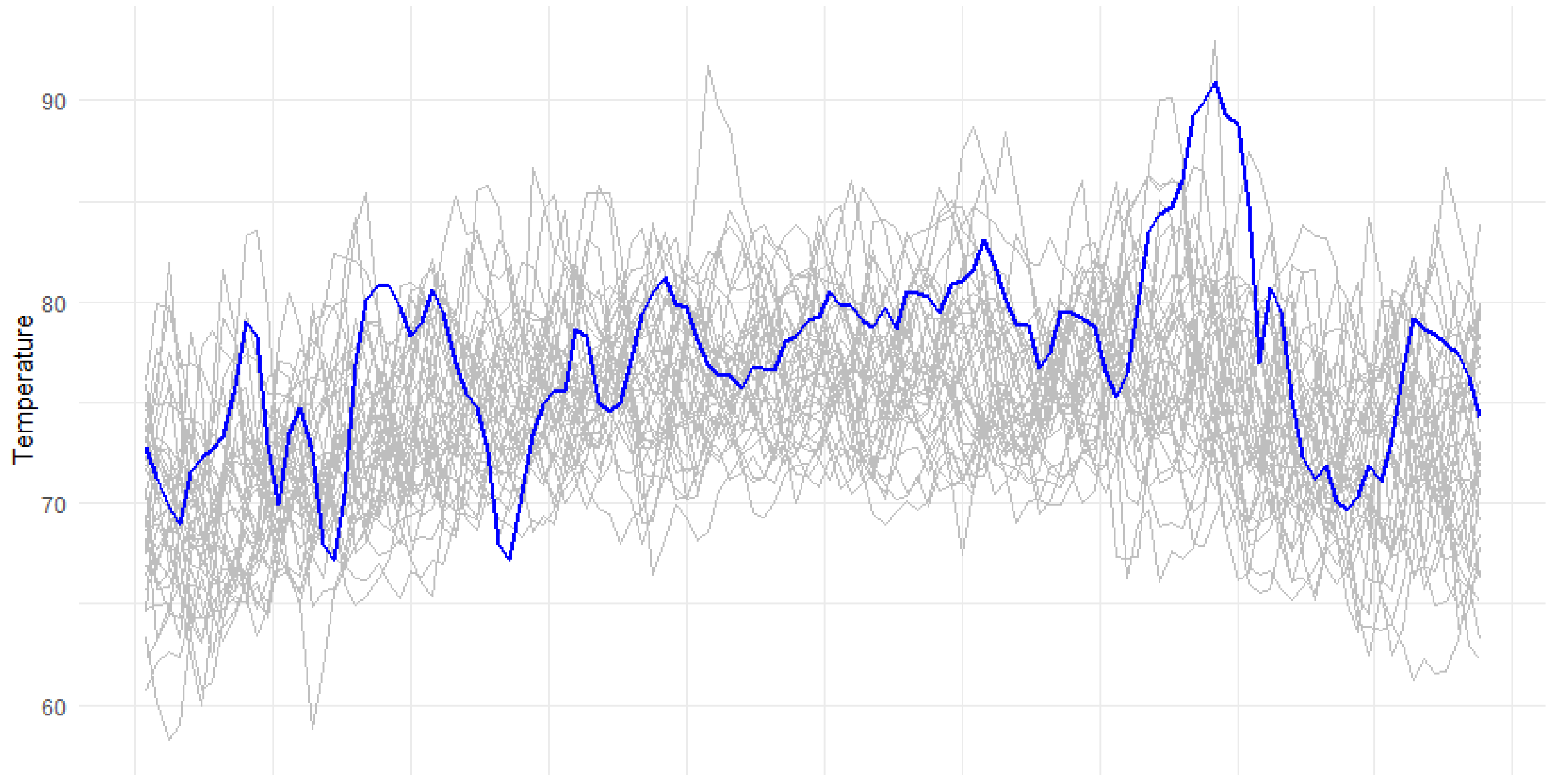
Weather-Normal Base Year

Record Peak Load in 2022

On September 6, 2022 CAISO set a record peak load of 52,061 MW

Comparing average temperatures across CAISO, this heat event ranked third in the last 30 years

Staff analysis characterizes the peak temperature as a 1-year-in-27 event **based on a 30-year weather history**

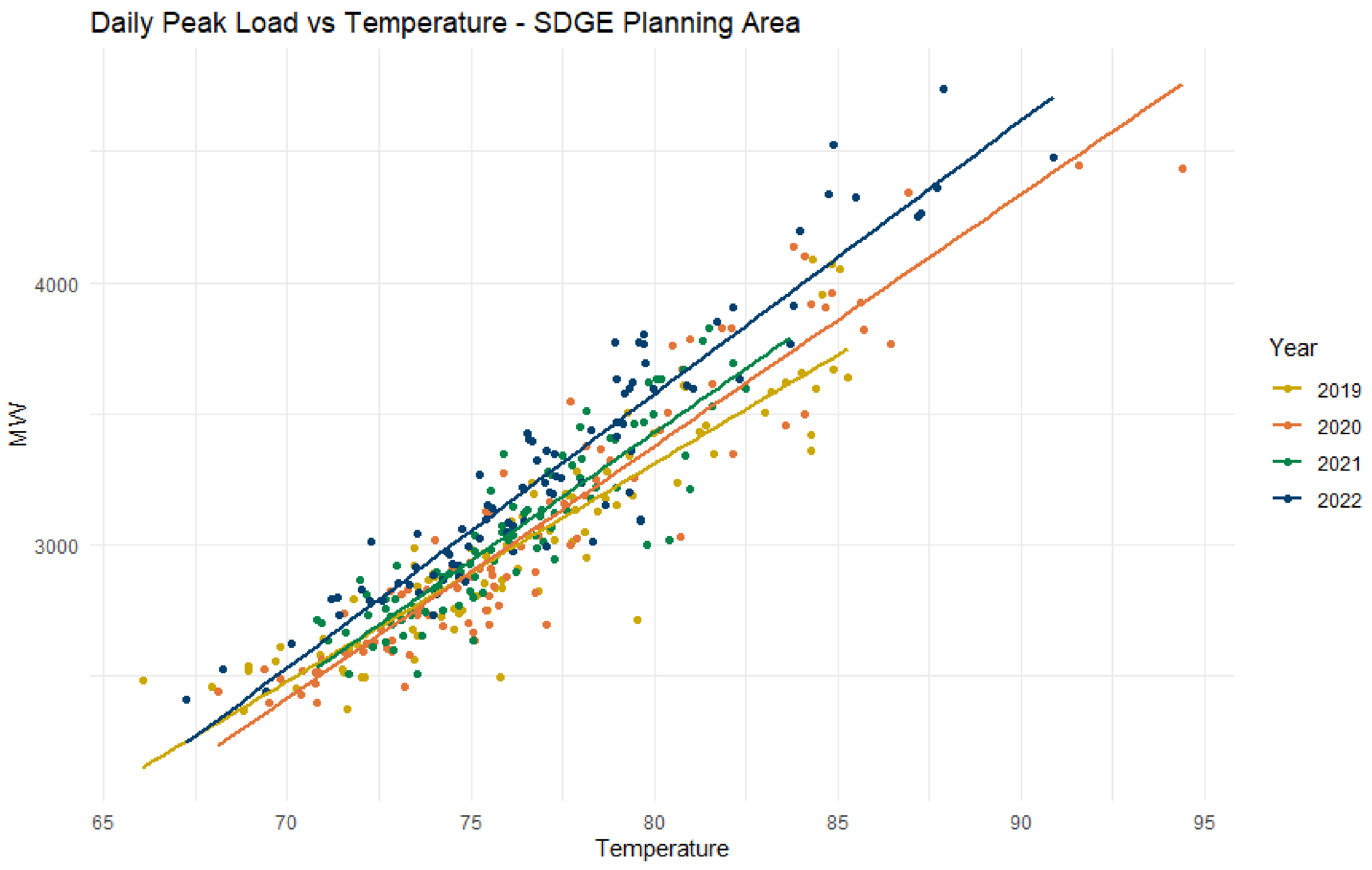


Creating a Base Year Estimate

Daily peak load is highly correlated with temperature

The 1-in-2 peak forecast starts from a counterfactual estimate of peak load

Considers recently observed load-temperature relationship under historically “normal” peak load conditions

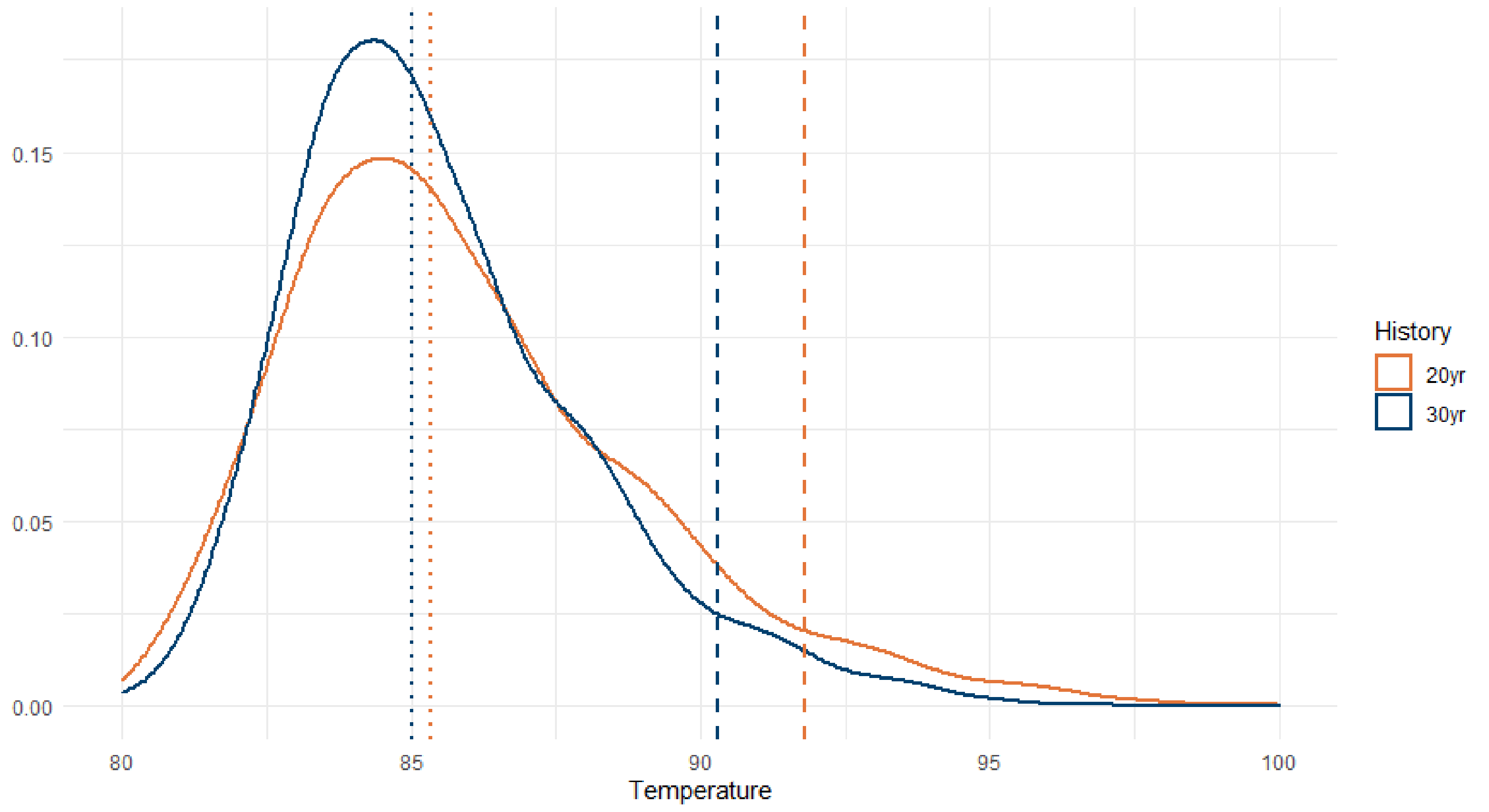


Climate Considerations

Recent years are characterized by generally higher temperatures

Truncating the historical record has a greater impact on extremes than on median values

Staff found the September 6 temperature to be a 1-in-14 event **based on a 20-year weather history**



Normalization Method

1. Data sources:
   - Hourly system loads by TAC (CAISO)
   - DR event impact estimates (IOUs / CAISO)
   - Hourly weather statistics
2. Estimate counter-factual daily peaks after adding demand response program and other load reduction impacts to recorded system load
3. Regress daily peaks against daily weather statistics and calendar effects using most recent three years of data
4. Simulate daily peaks drawing from 30 historical weather patterns, selecting recent years more frequently
5. Taking the maximum simulated value for each year, find the median

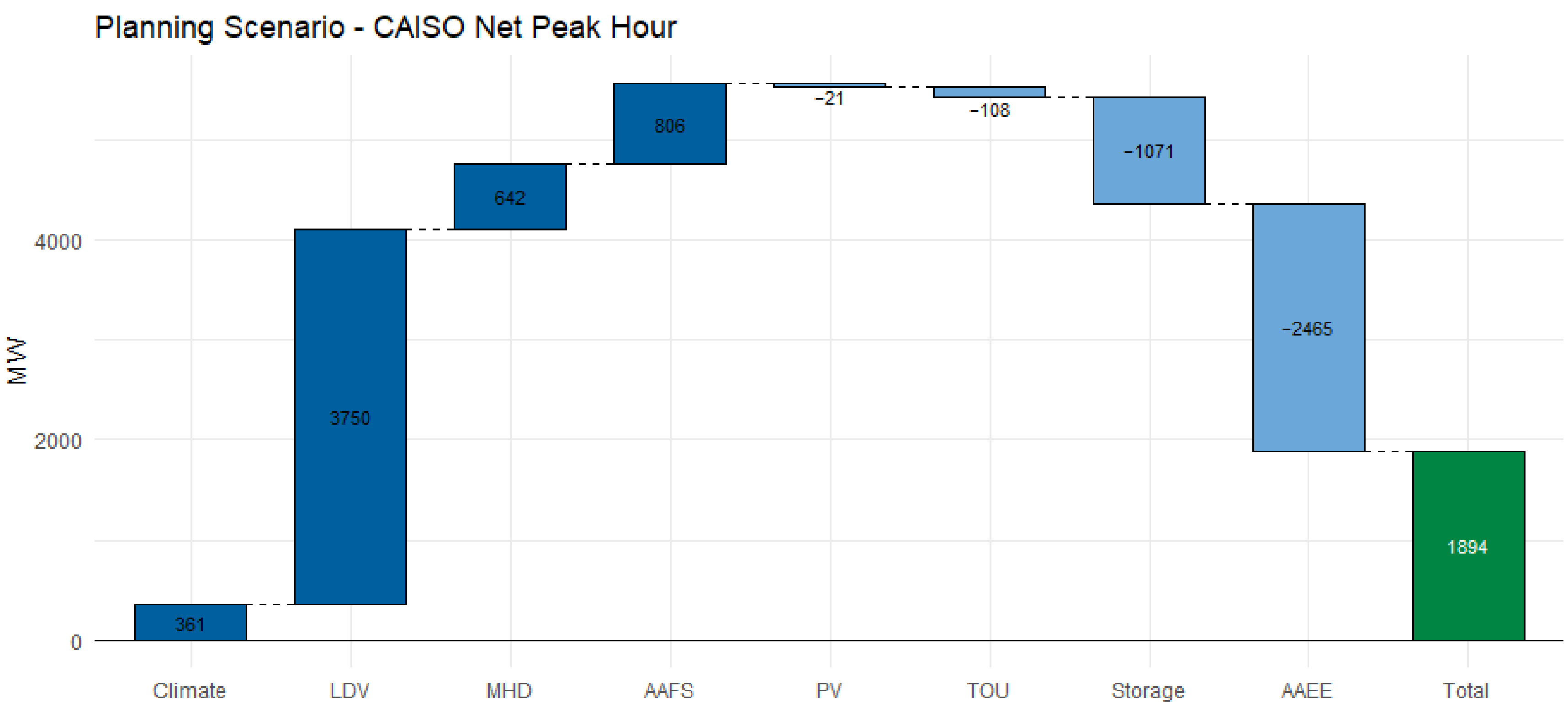
2022 Weather Normal Peaks

Planning Area	Recorded Peak	Counterfactual Peak*	Weather-Normal Peak	CED 2021 WN Peak	% Change
PGE	22,379	23,621	20,585	20,794	-1.0%
SCE	24,659	24,975	23,597	23,820	-0.9%
SDGE	4,652	4,741	4,385	4,263	2.9%

*Accounts for demand response events and voluntary load reduction

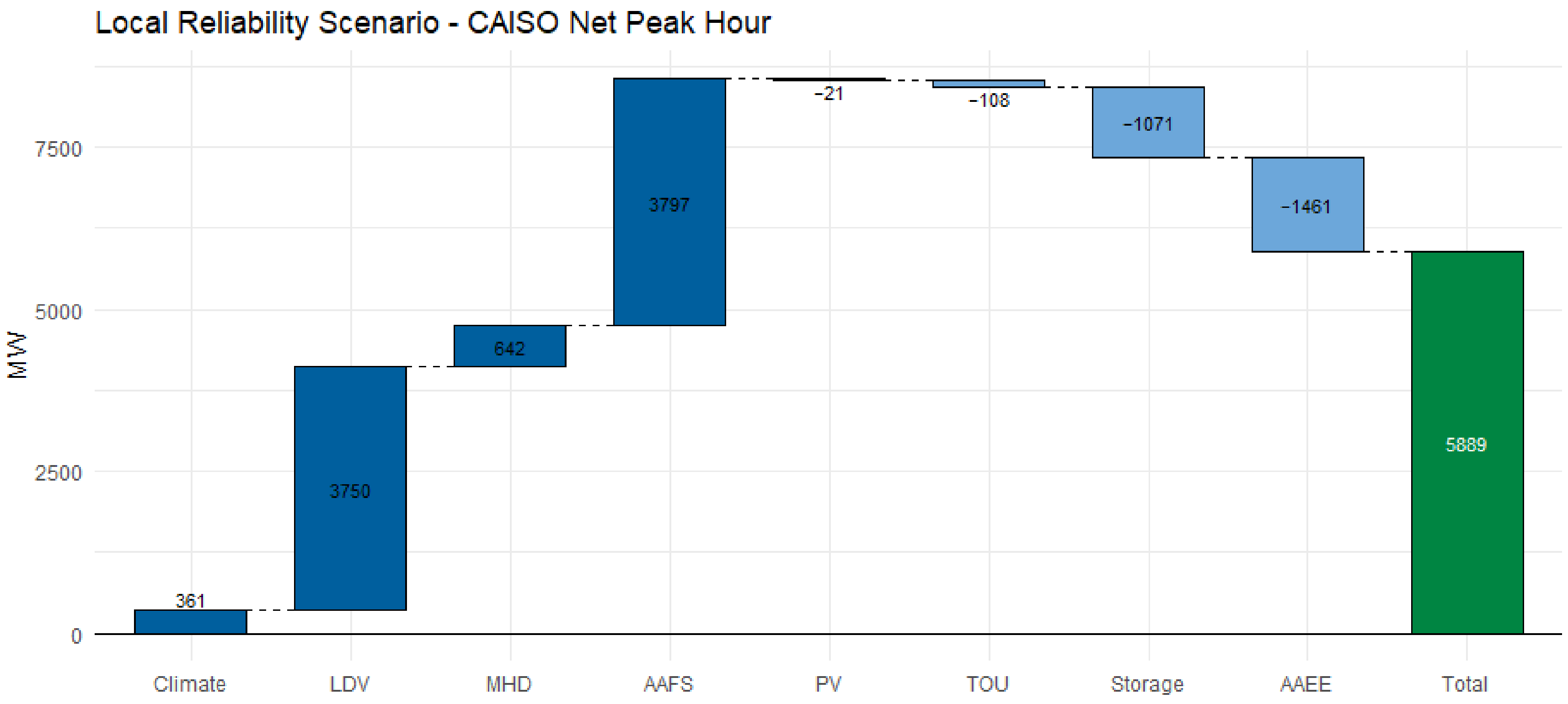
Load Modifiers

Impact on Peak Hour



Incremental load modifiers added over the forecast period have the cumulative effect of increasing CAISO peak load in 2035 by 1,894 MW

Impact on Peak Hour (Reliability)



For Local Reliability, the increased AAFS and reduced AAEE combine to add an additional 3,995 MW to the CAISO peak over the Planning Scenario level

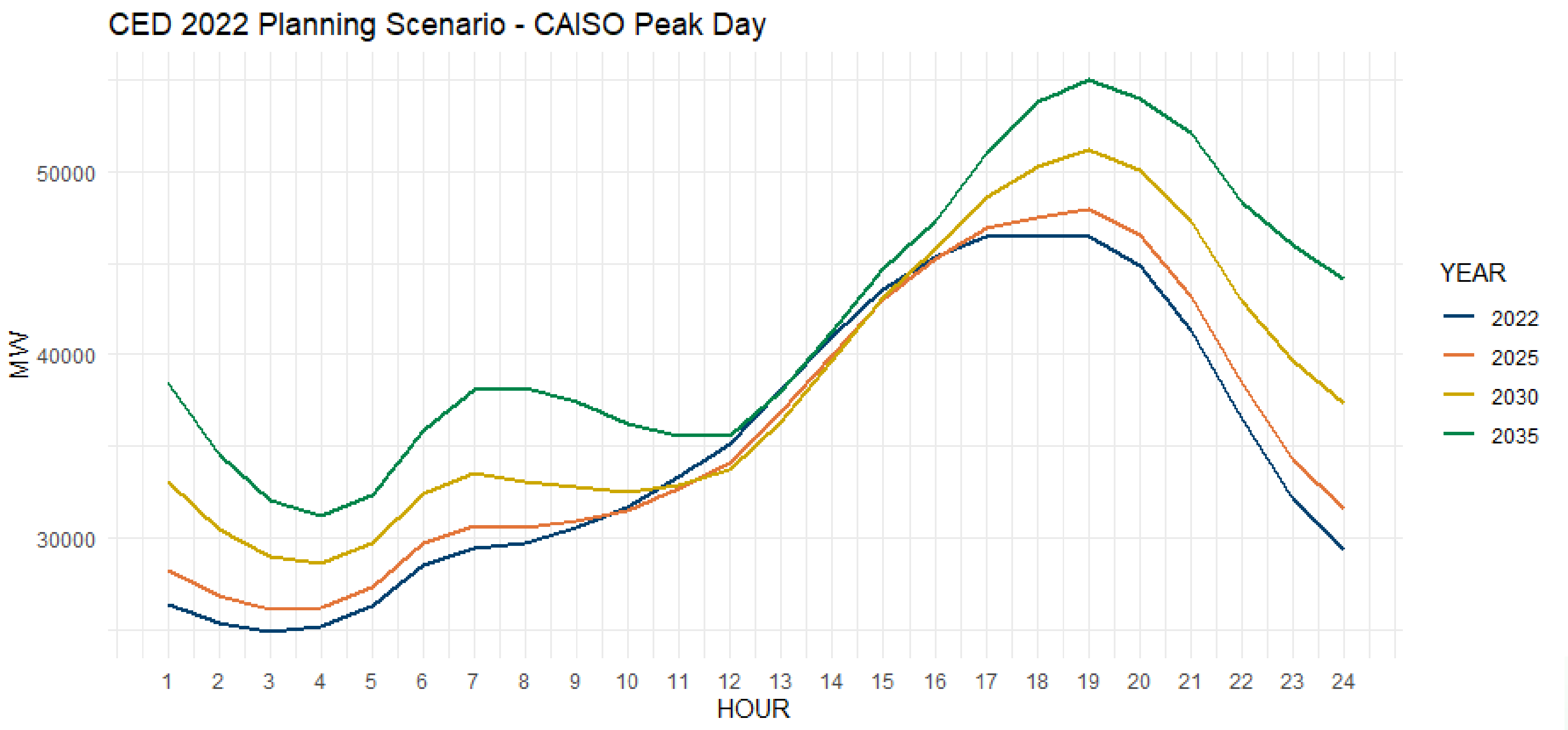
Other modifier impacts are unchanged

CAISO Peak Day

BTM PV slows mid-day load growth

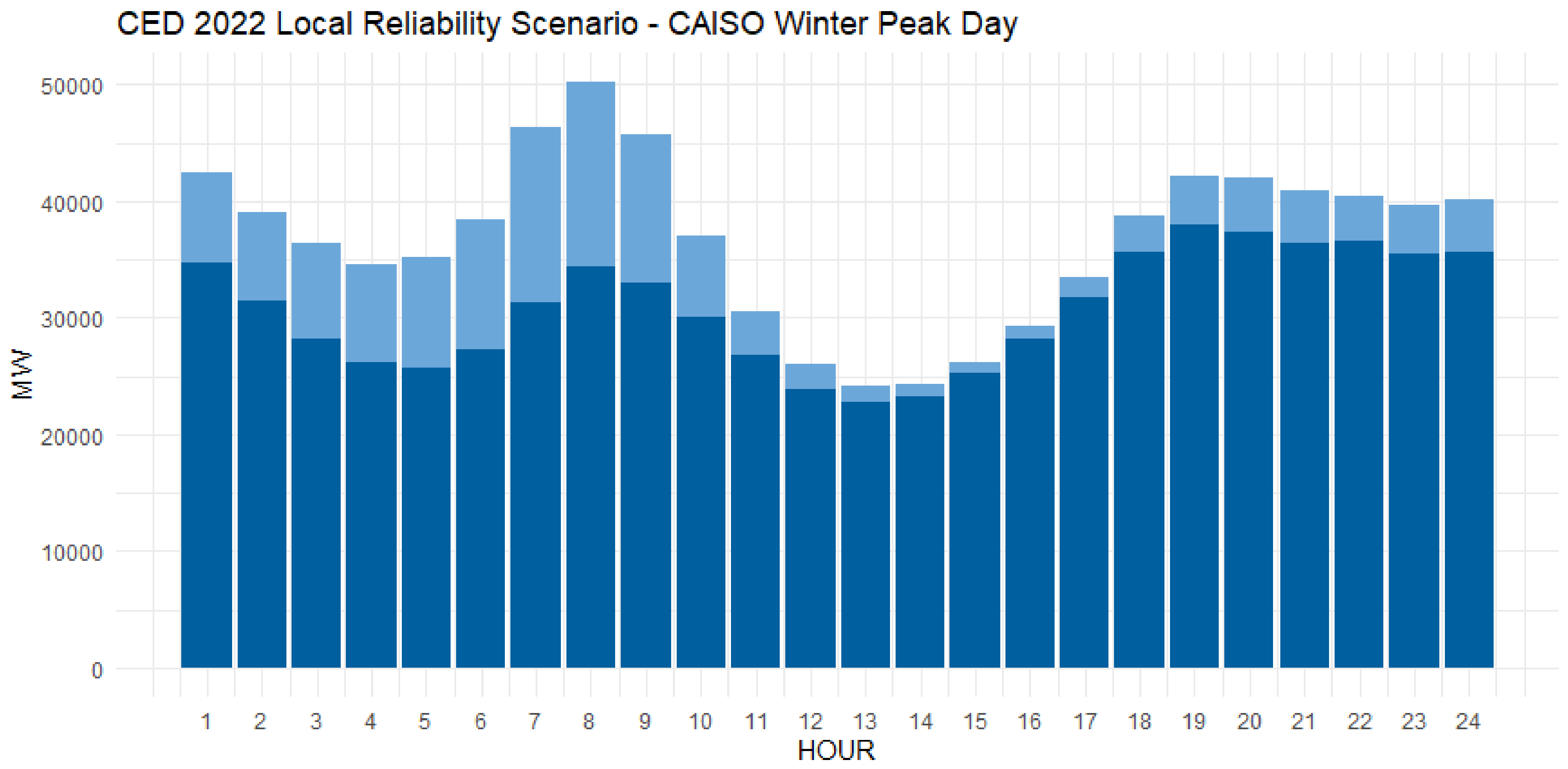
EV charging drives growth in late evening and early morning hours

Initially flat CAISO peak period shifts to pronounced peak at hour 19



CAISO Winter Peak (Reliability)

By 2035, fuel substitution impacts (light blue) put winter morning peaks on par with summer in the Local Reliability scenario

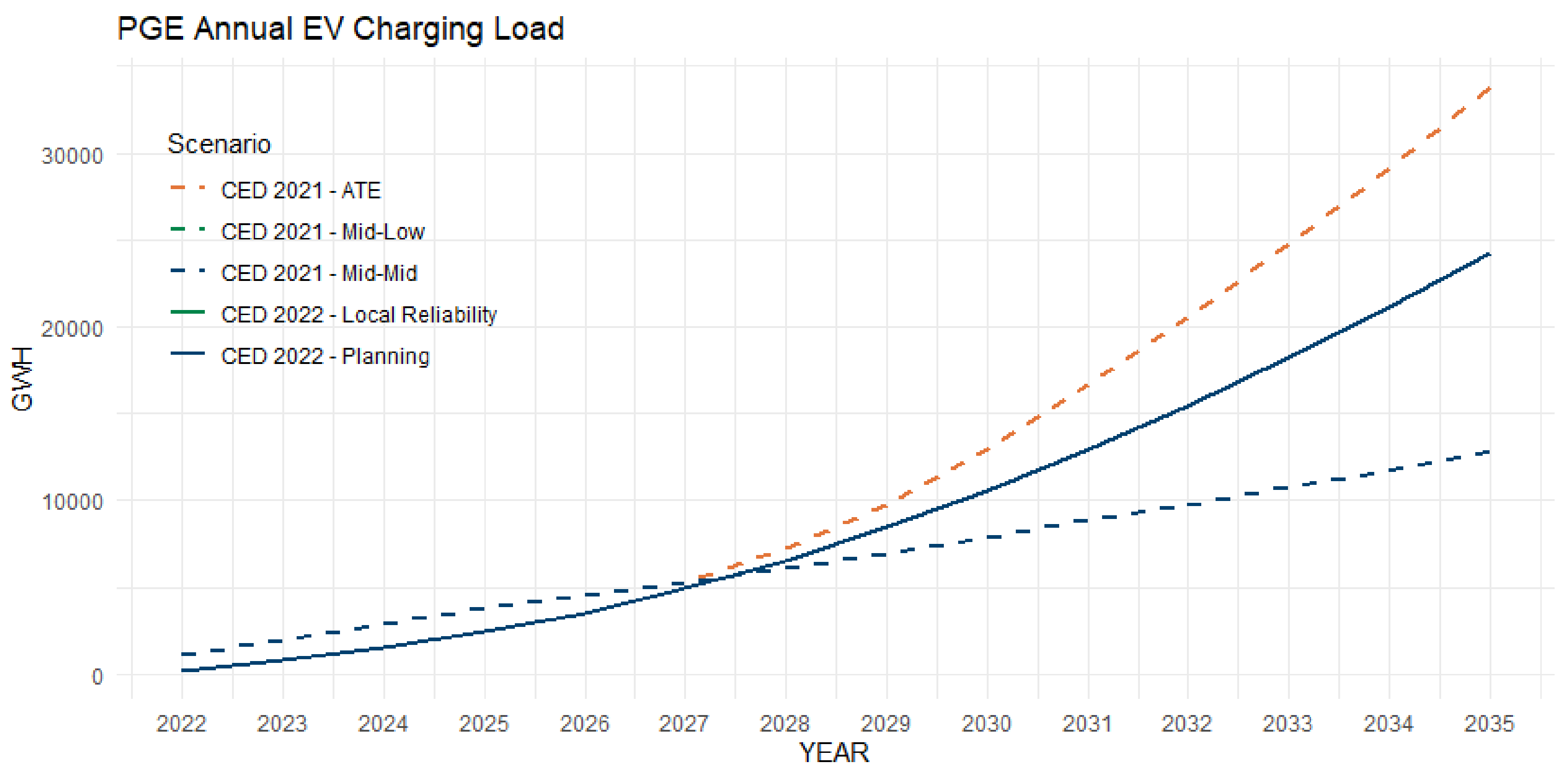


Annual EV Charging

Annual charging load decreased relative to CED 2021 - ATE

<u>Accounts for:</u>

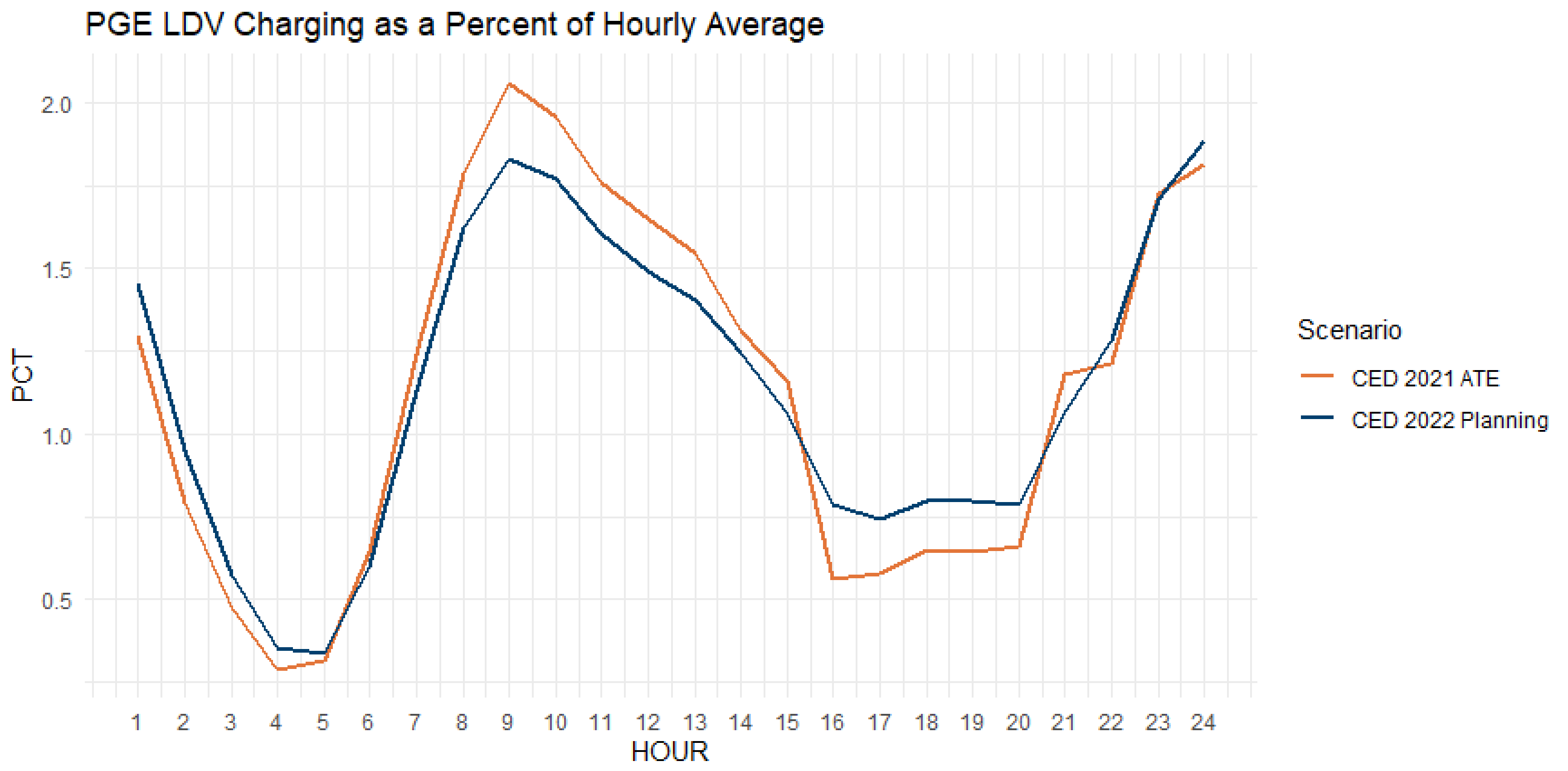
- Increased fuel economy
- Reduced VMT forecast
- Lower per vehicle consumption



EV Charging Profile

Adjusted EV charging profiles assume more charging will happen during TOU peak window

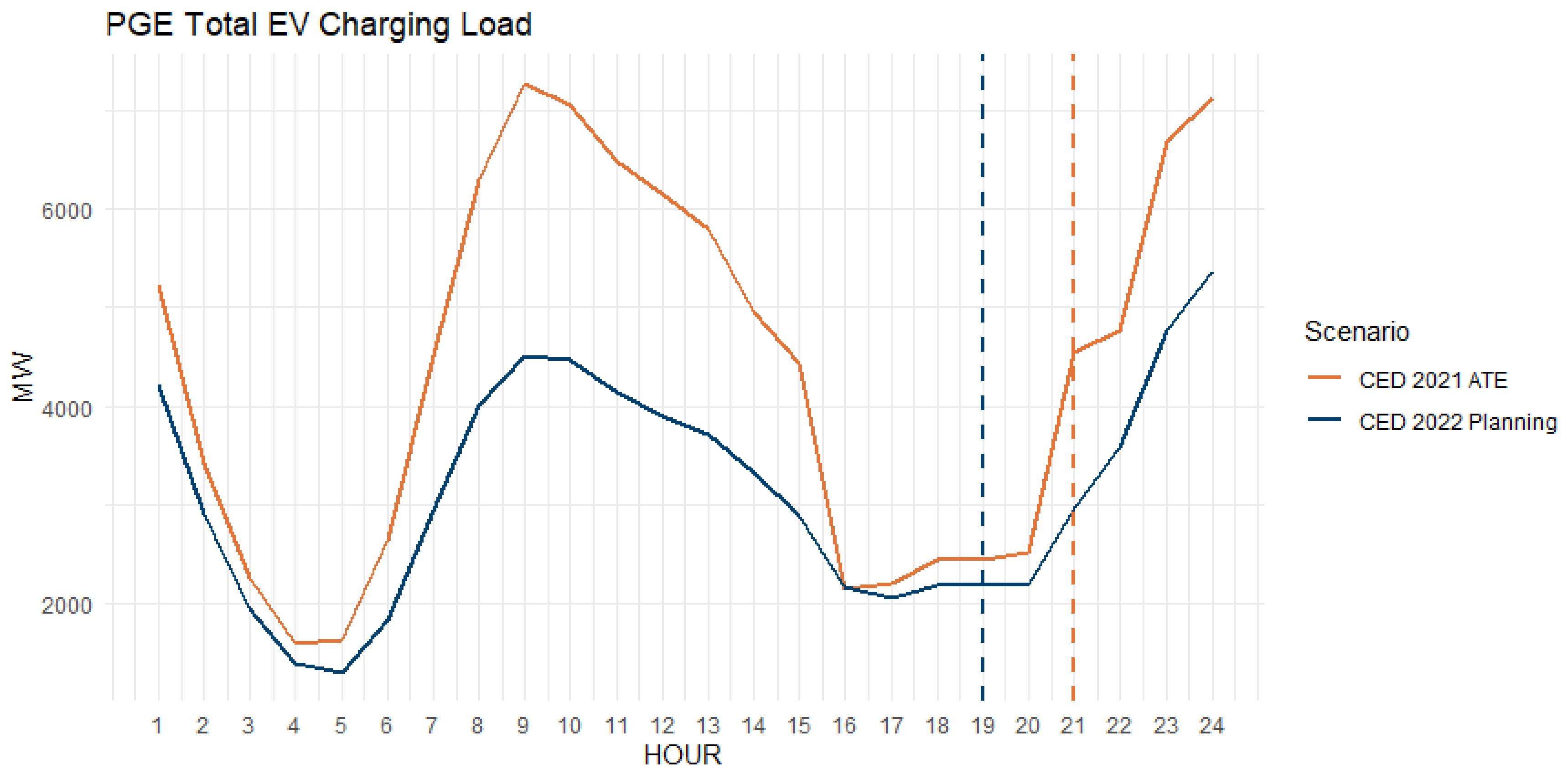
Accounts for smaller discrepancy between peak and off-peak rates



EV Charging – Peak Impact

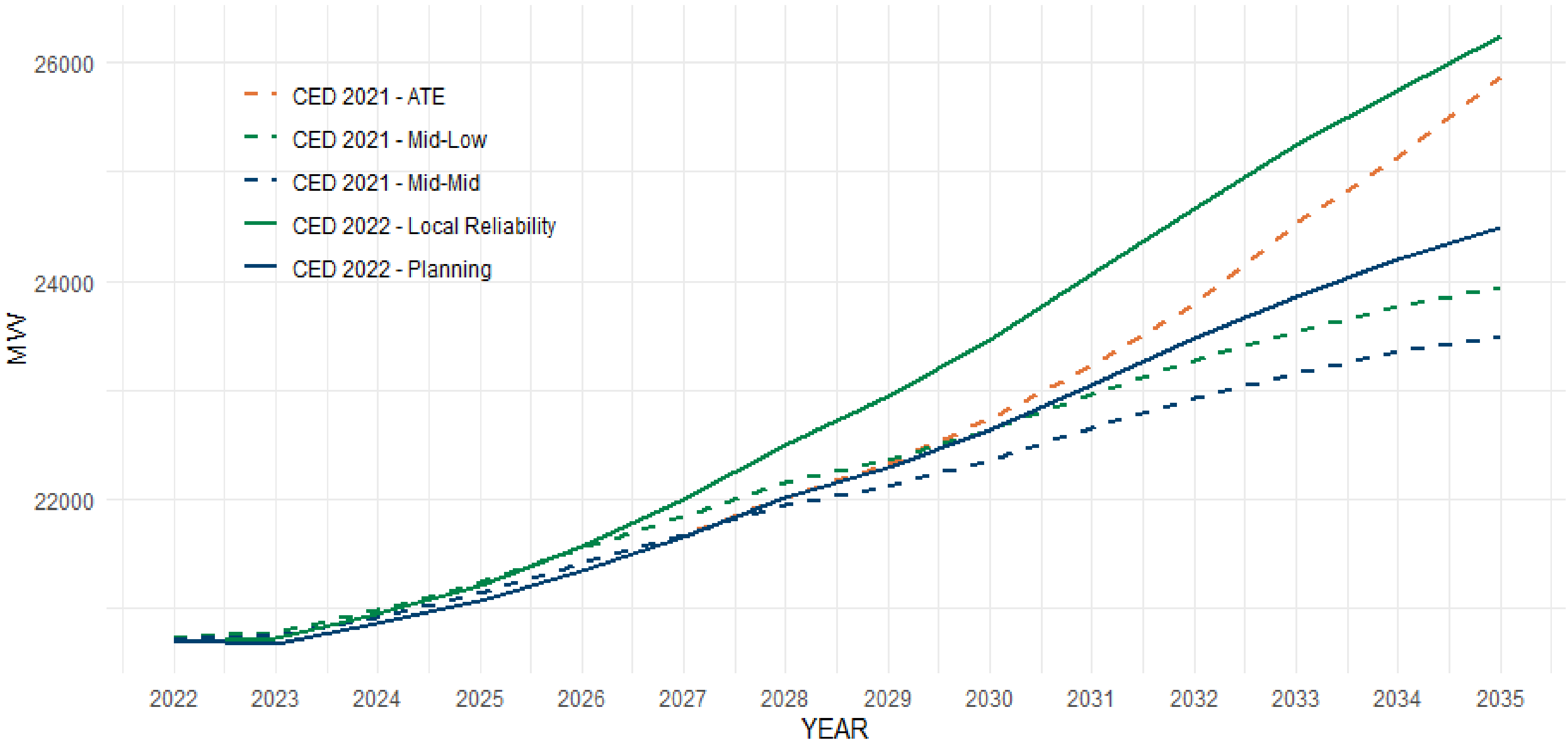
CED 2021 ATE scenario assumed significantly more charging would occur in hour 21

For the PG&E planning area, this was enough to shift the timing of the overall system peak from hour 19 to 21



Draft Managed Peak Forecasts

PG&E Non-Coincident Peak



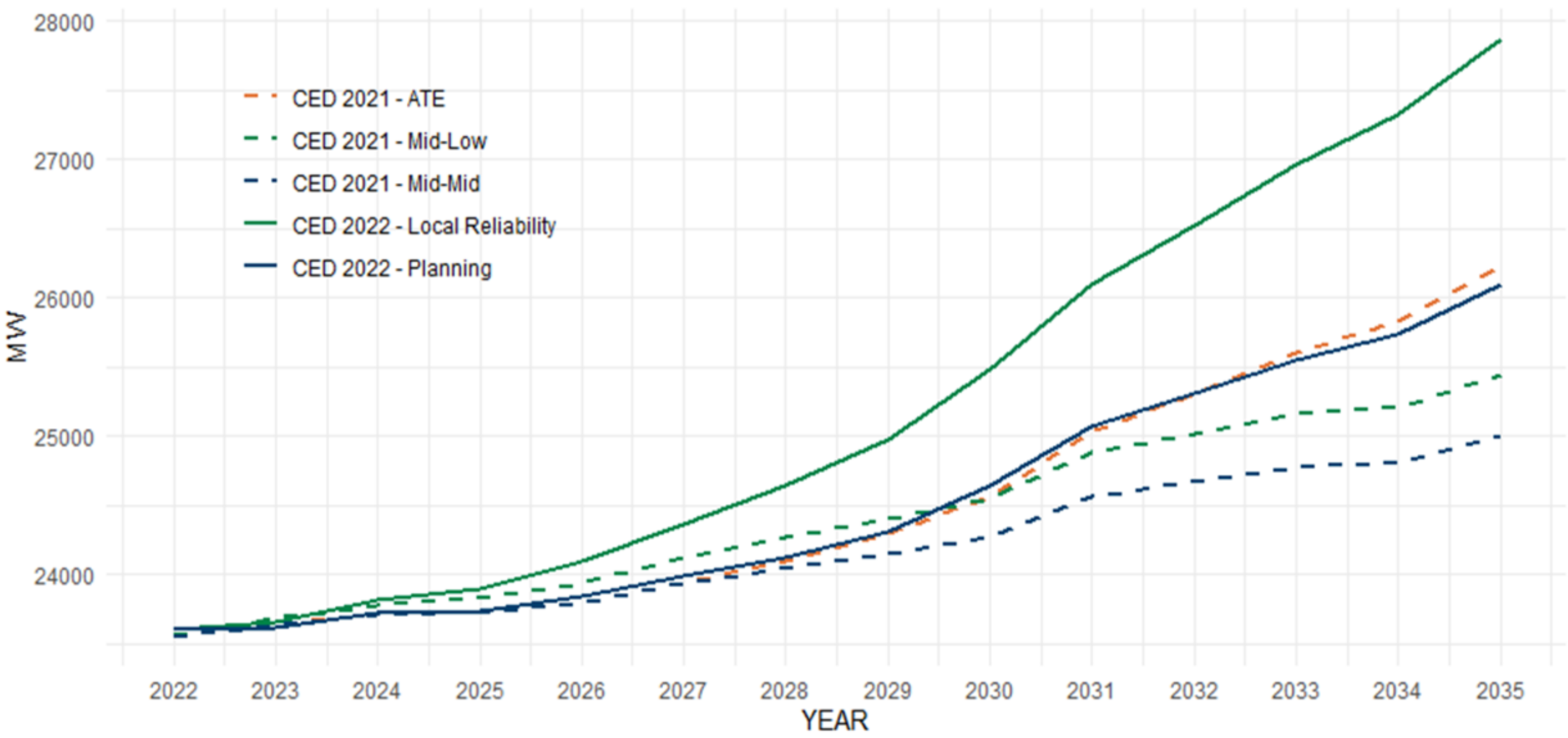
Planning Scenario:

- 1.3 percent long-term annual growth
- Reaches 24,491 MW by 2035
- -0.2% change over CED 2021 mid-mid in 2024

Reliability Scenario:

- 1.8 percent long-term annual growth
- Reaches 26,239 MW by 2035

SCE Non-Coincident Peak



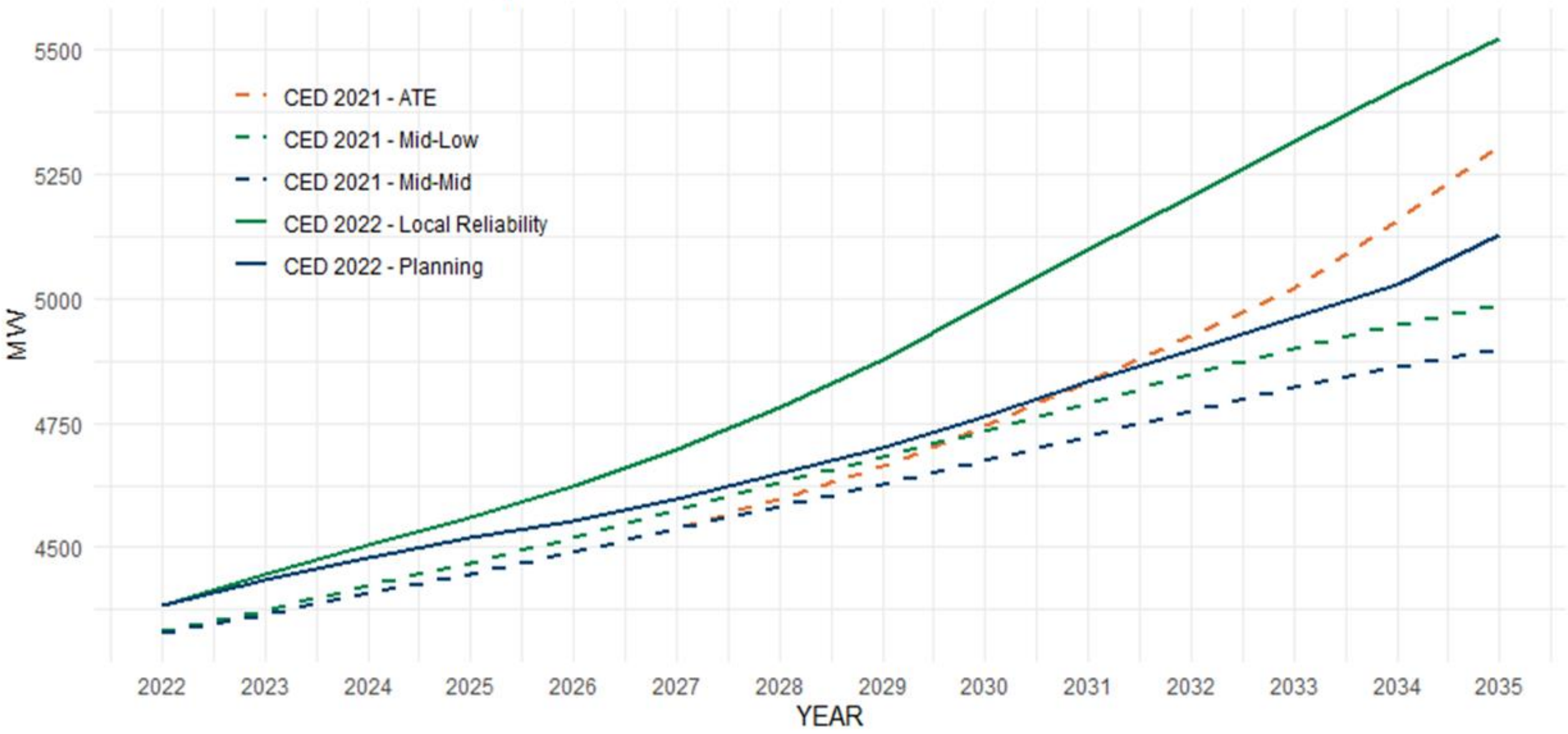
Planning Scenario:

- 0.8 percent long-term annual growth
- Reaches 26,094 MW by 2035
- 0.1% change over CED 2021 mid-mid in 2024

Reliability Scenario:

- 1.3 percent long-term annual growth
- Reaches 27,864 MW by 2035

SDGE Non-Coincident Peak



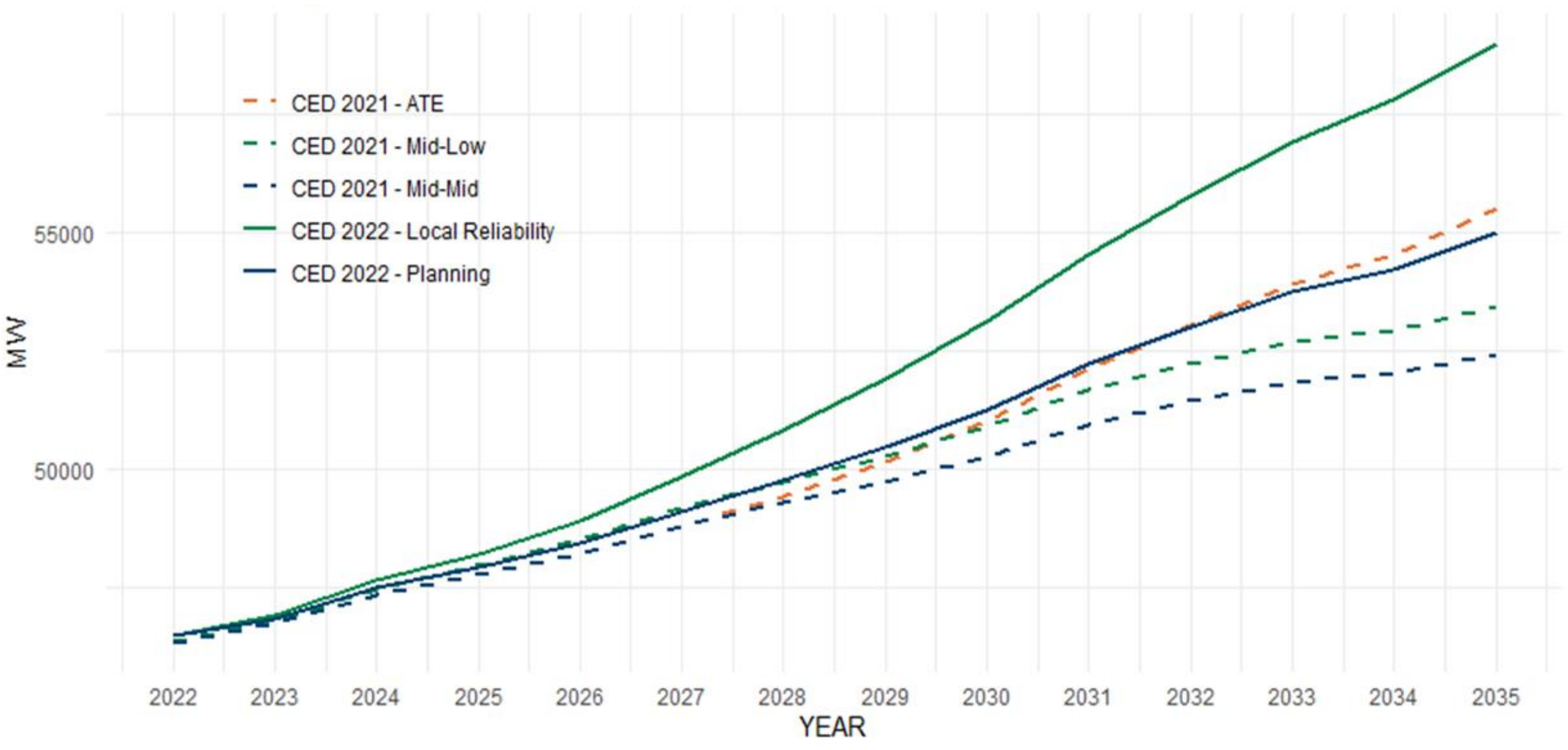
Planning Scenario:

- 1.2 percent long-term annual growth
- Reaches 5,128 MW by 2035
- 1.5% change over CED 2021 mid-mid in 2024

Reliability Scenario:

- 1.8 percent long-term annual growth
- Reaches 5,522 MW by 2035

CAISO System Peak



Planning Scenario:

- 1.3 percent long-term annual growth
- Reaches 54,997 MW by 2035
- 0.3% change over CED 2021 mid-mid in 2024

Reliability Scenario:

- 1.9 percent long-term annual growth
- Reaches 58,987 MW by 2035

Plans for IEPR 2023

PV generation data

- Reconstitute hourly consumption history
- Reassess PV generation profiles
- Explore weather normalization options

Climate modeling data

- Ongoing work with Eagle Rock Analytics
- Refresh climate change impact analysis
- Reassess normal and extreme weather

Finalizing the IEPR 2022 Update

Next steps:

- Staff will docket draft results
- Stakeholder comments due **December 30**
- Proposed adoption at **January 25** Business Meeting

Forecast forms and additional detail will be made available through the planning library