DOCKETED	
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Project Title:	Electricity and Natural Gas Demand Forecast
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Document Title:	Presentation - Peak Electricity Demand
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Peak Electricity Demand

California Energy Demand Forecast, 2021 - 2035

Nick Fugate, Energy Assessments

Use Cases

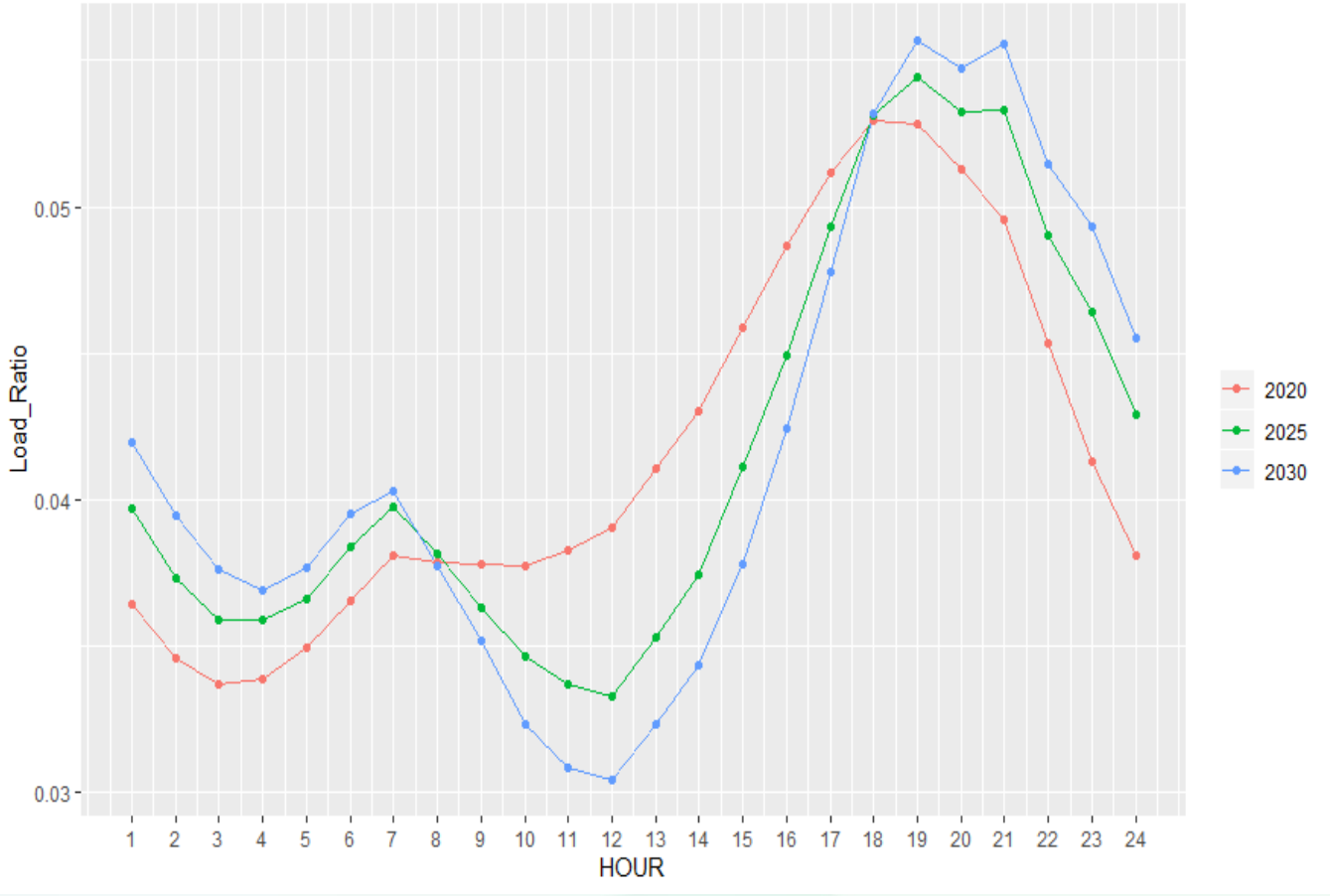
- Input to system and reliability modeling
- Monthly system peaks serve as a system-level benchmark for Resource Adequacy
- Detailed planning use cases outlined in Single Forecast Set agreement published in each IEPR

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

Hourly Load Model

Need for an Hourly Outlook

The Hourly Load Model (HLM) appropriately reflects the contribution of BTM PV and other load modifiers to peak demand as the system peak hour moves later in the day



HLM Approach

1. Estimate the ratio of “consumption” load in each hour to annual average hourly “consumption”
2. Apply estimated ratios to forecast of annual average hourly “consumption”
3. Adjust consumption load using hourly profiles for climate change impacts, EV charging, PV generation, BTM storage, residential TOU impacts, and AAEE
4. Calibrate to weather-normal base-year peak load

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Updating Historical Consumption

PV in HLM Model Estimation

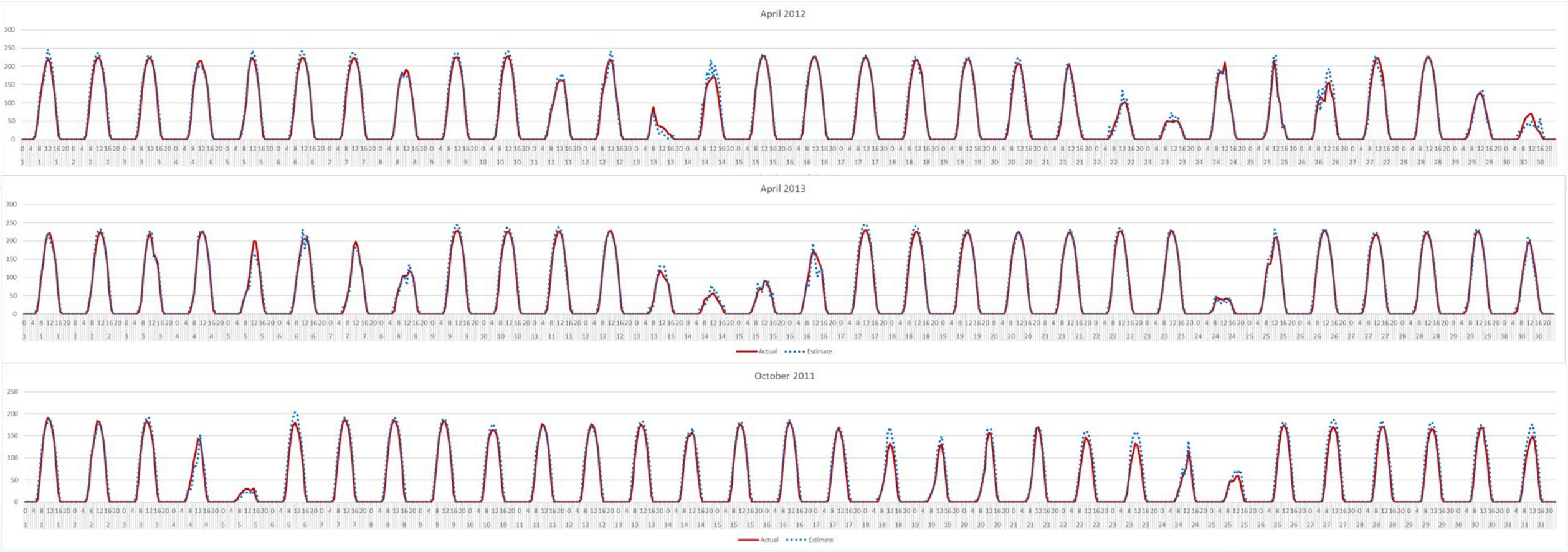
Consumption = System Load + Demand Response + PV

- System Load is recorded (CAISO)
- Demand Response impacts are estimated (IOUs)
- BTM PV generation was averaged over days and weeks
  - E3 metered generation study (2008-2012)
  - Does not always reflect historic generation

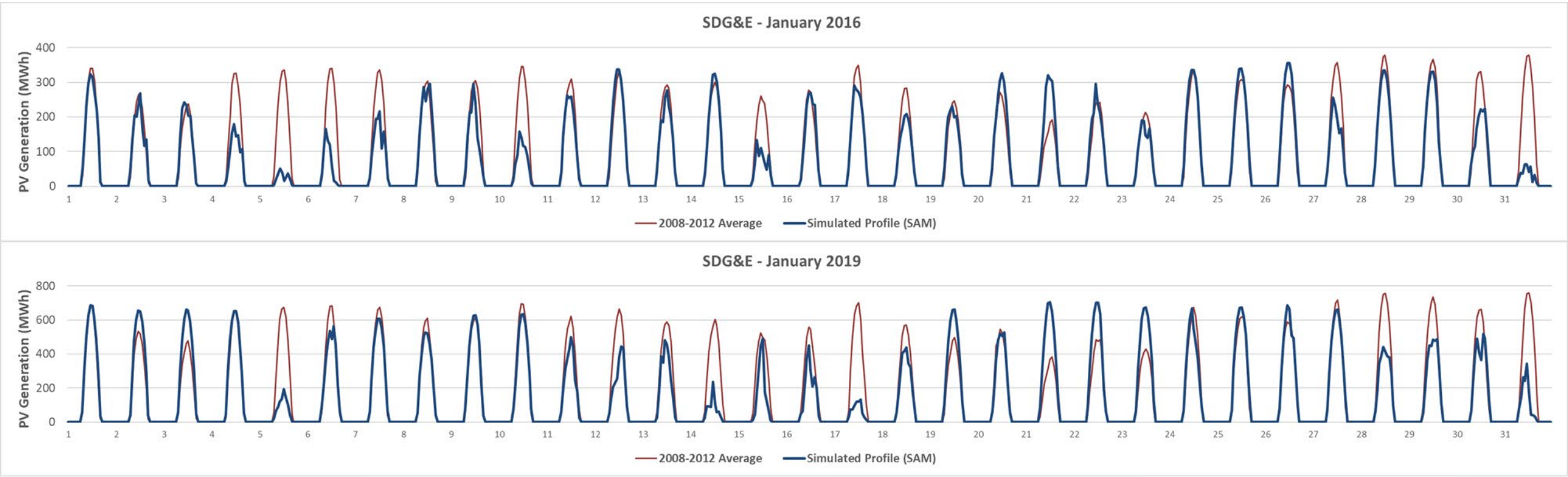
Simulating Historic PV Generation

- Simulated PV generation in the SDG&E planning area
  - NREL's System Advisor Model (SAM)
  - Interconnection data categorized by tilt, orientation, location
- Compared results against known PV generation data (CSI)
- Compared results against average HLM profiles

Simulation vs Actual



Simulation vs HLM Averages



Updating Consumption Estimates

- For CED 2021
  - Staff used historic generation profiles developed by Kevala Analytics (similar approach, benched to metered data)
- Beyond CED 2021
  - Expand staff simulations to all forecast zones
  - Acquire additional data for benchmarking
  - Explore other applications
    - Update average PV profiles and rank order of hourly loads (HLM)
    - Develop distributions of hourly load profiles for specific forecast years
    - Improve peak load normalization

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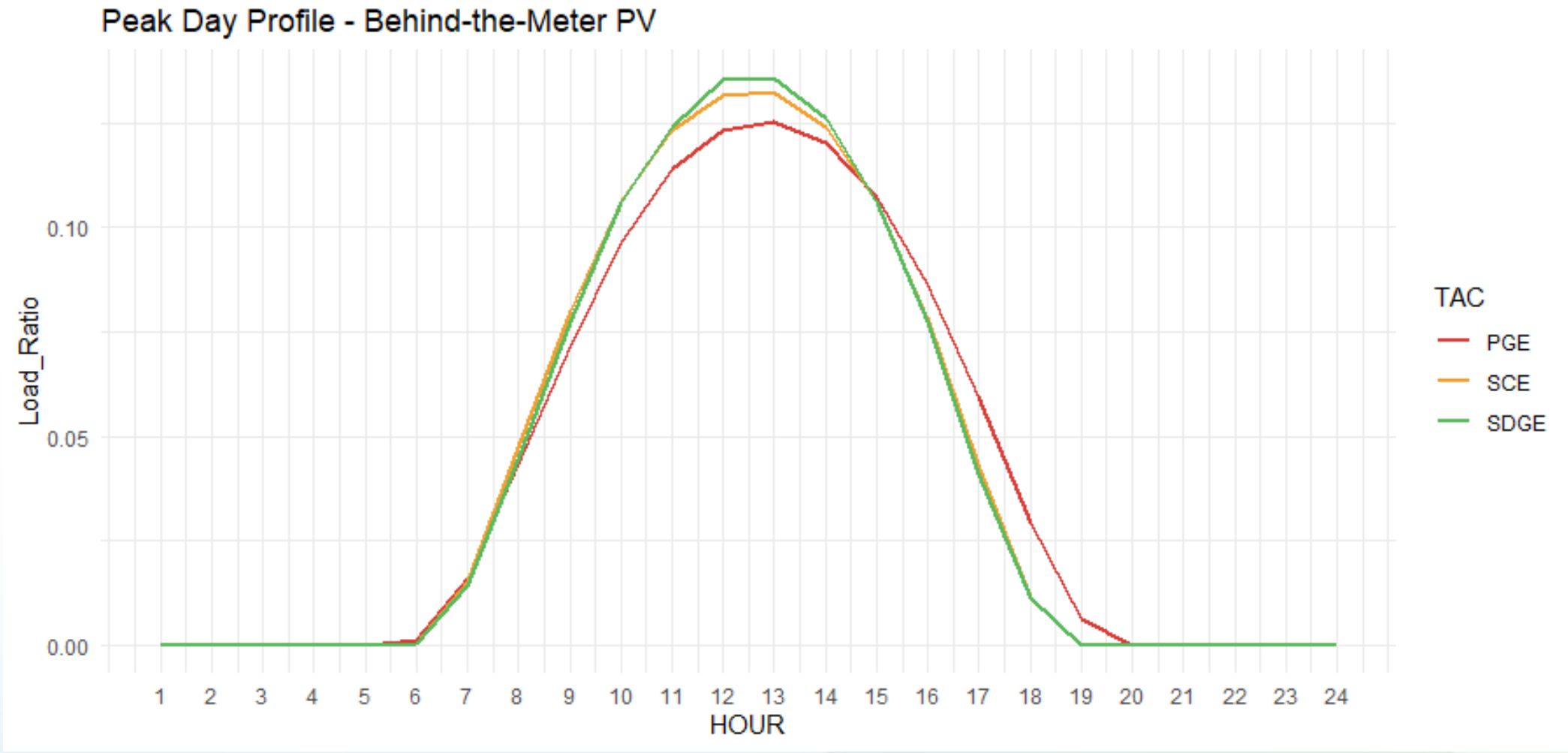
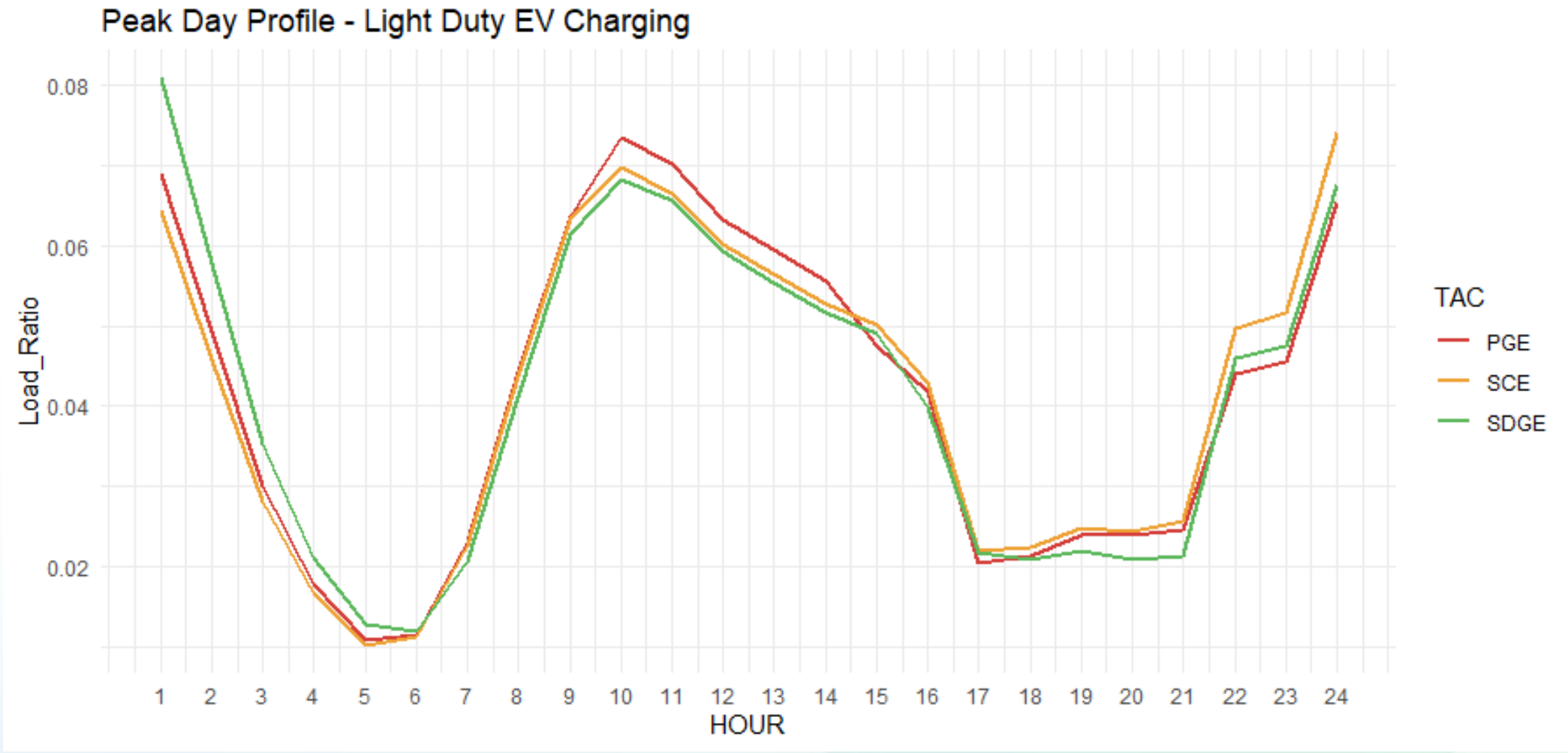
Load Modifiers

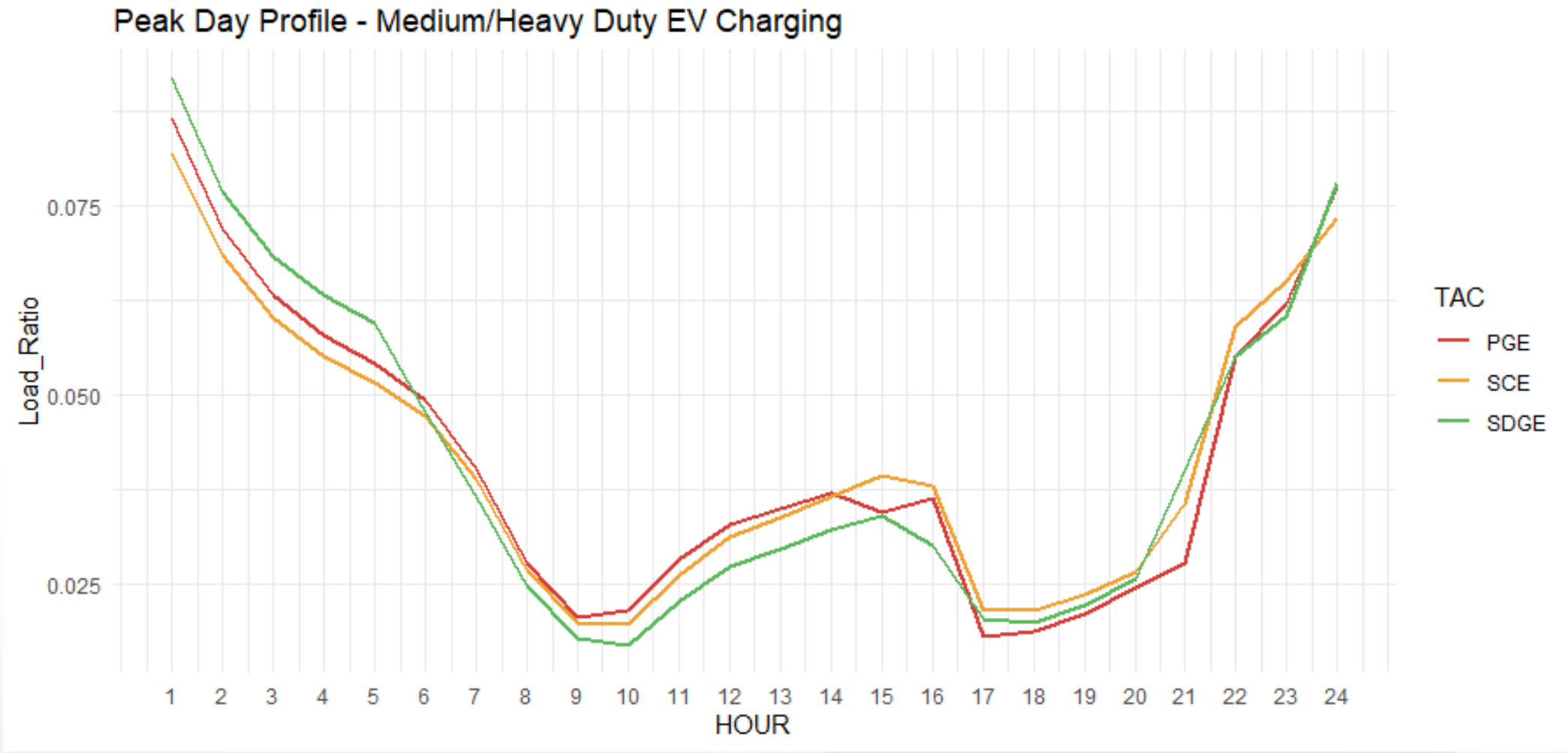
Behind-the-Meter PV



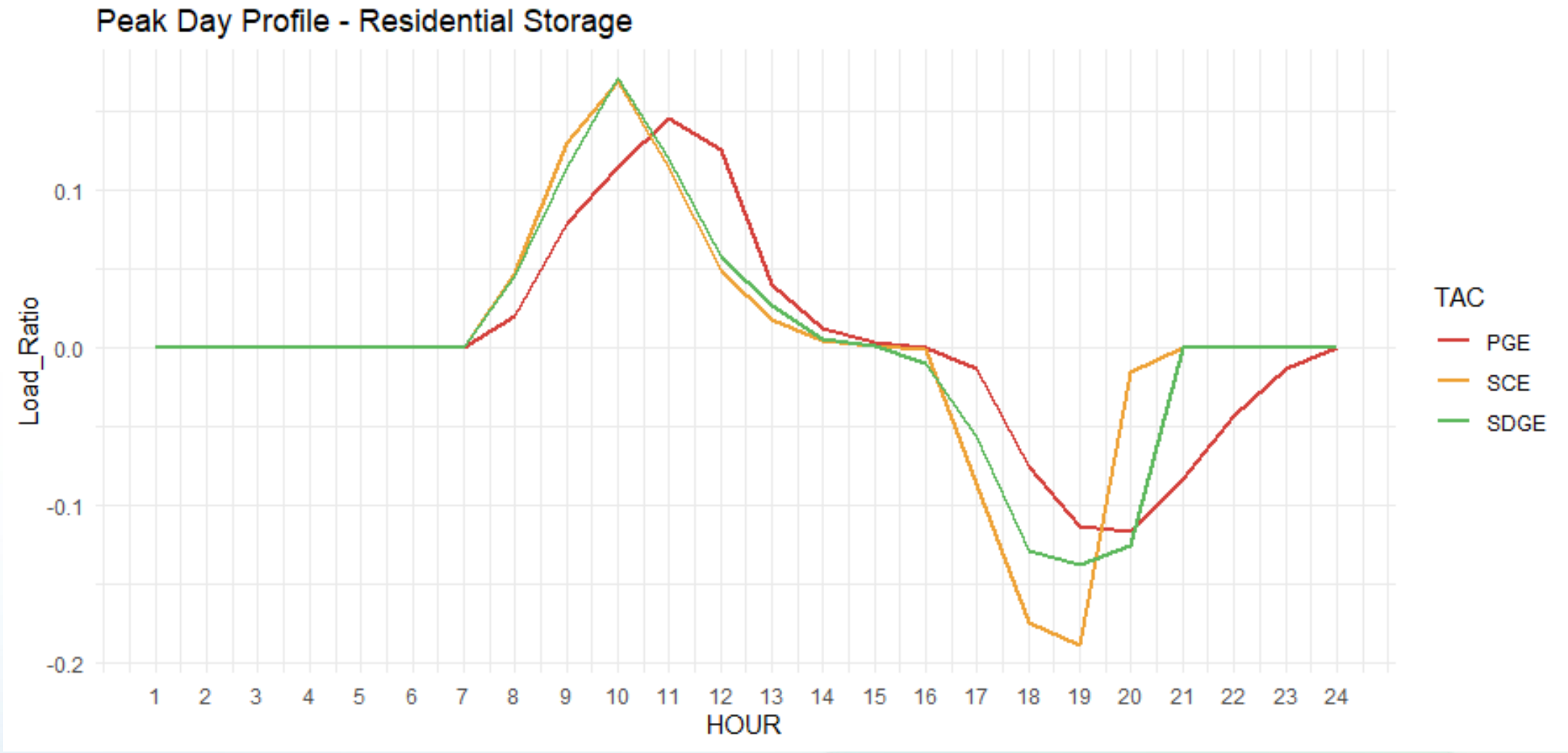
Light-Duty EV



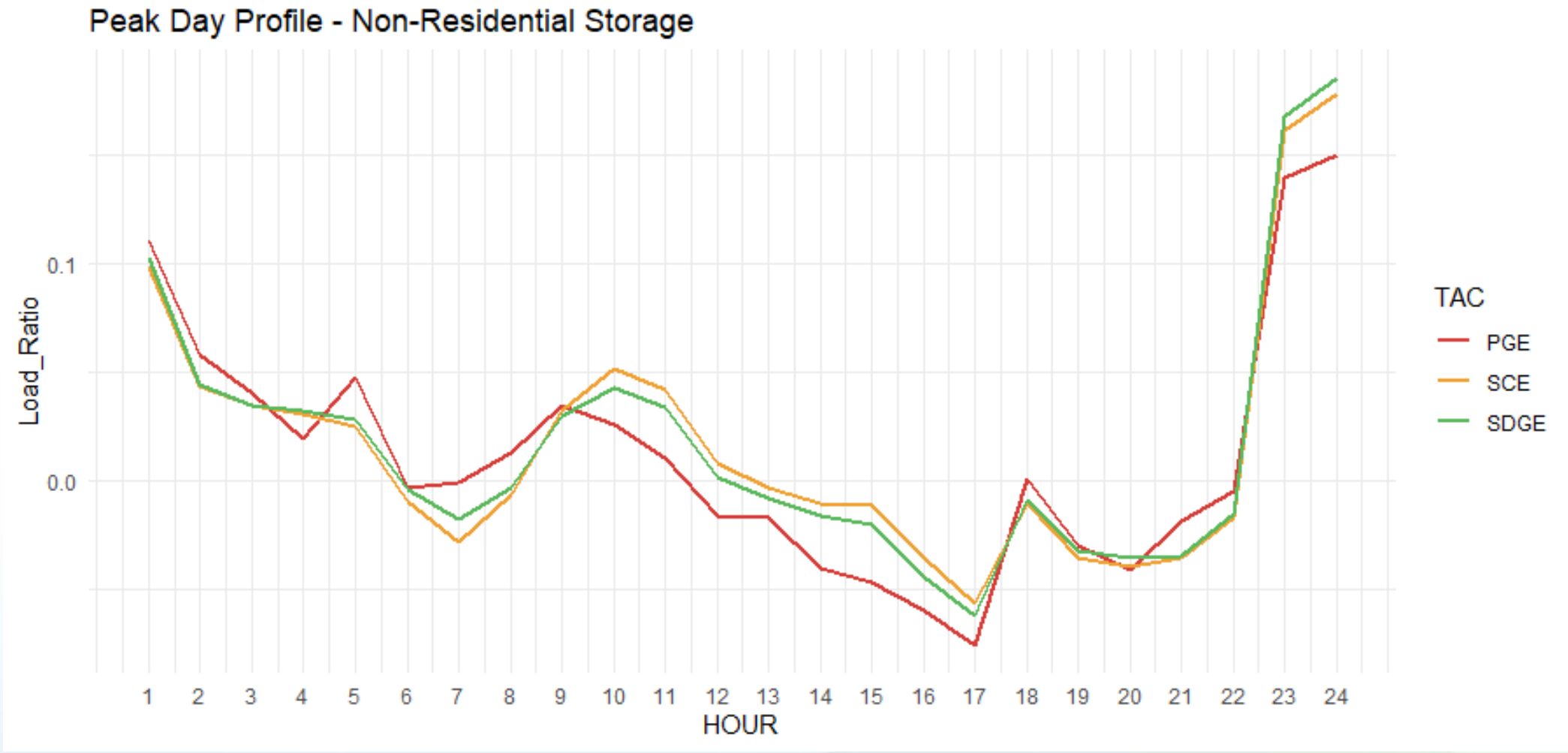
Medium/Heavy-Duty EV



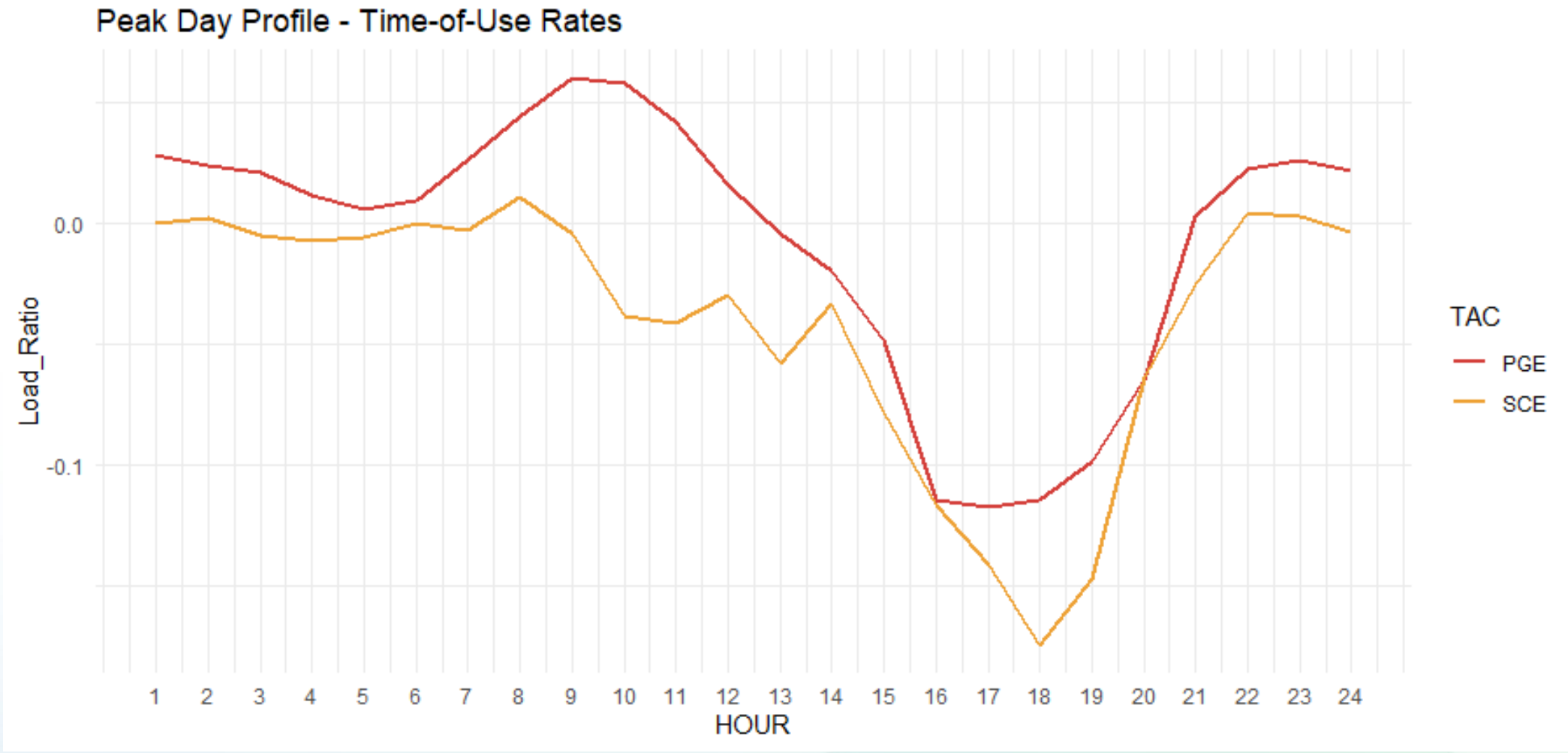
Residential Storage



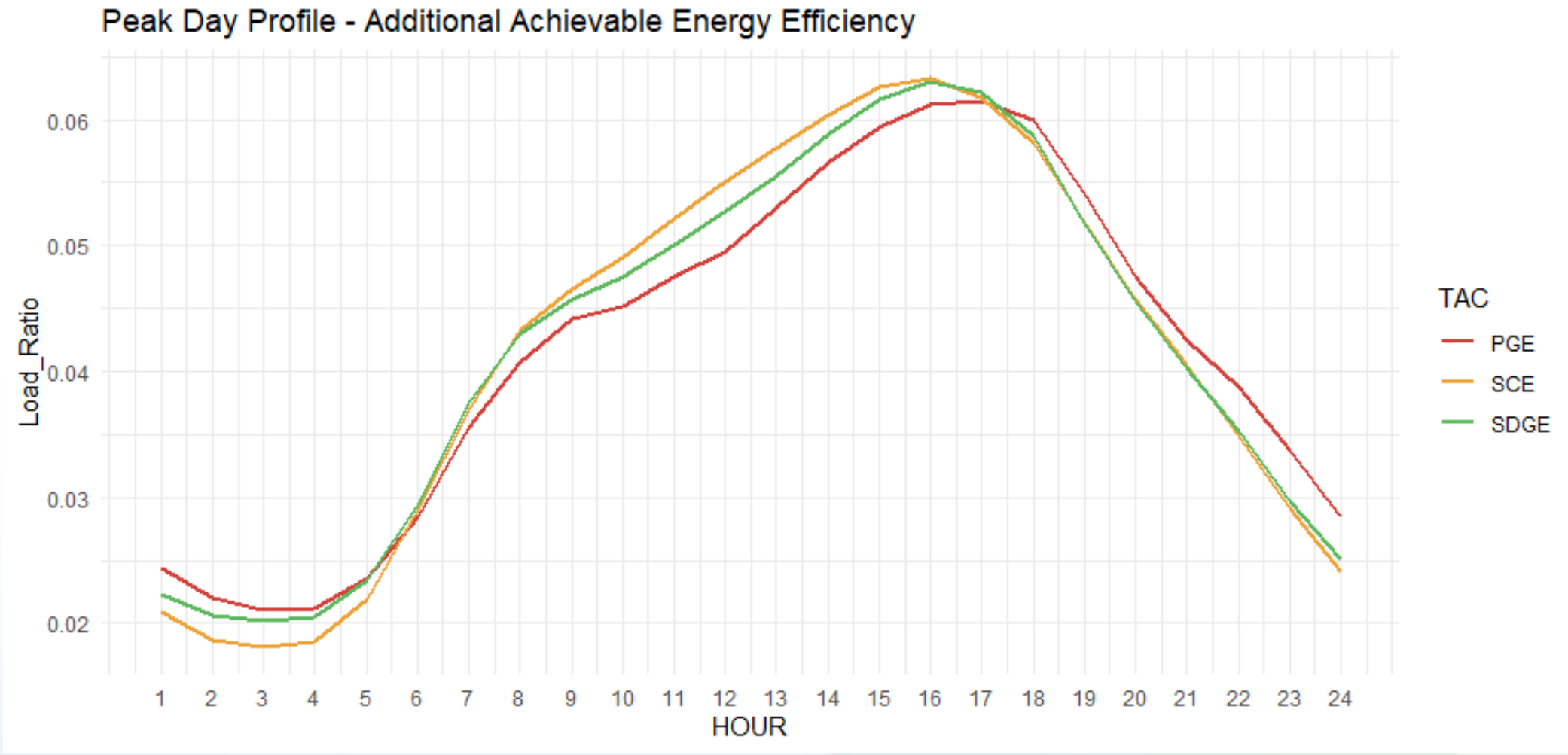
Non-Residential Storage



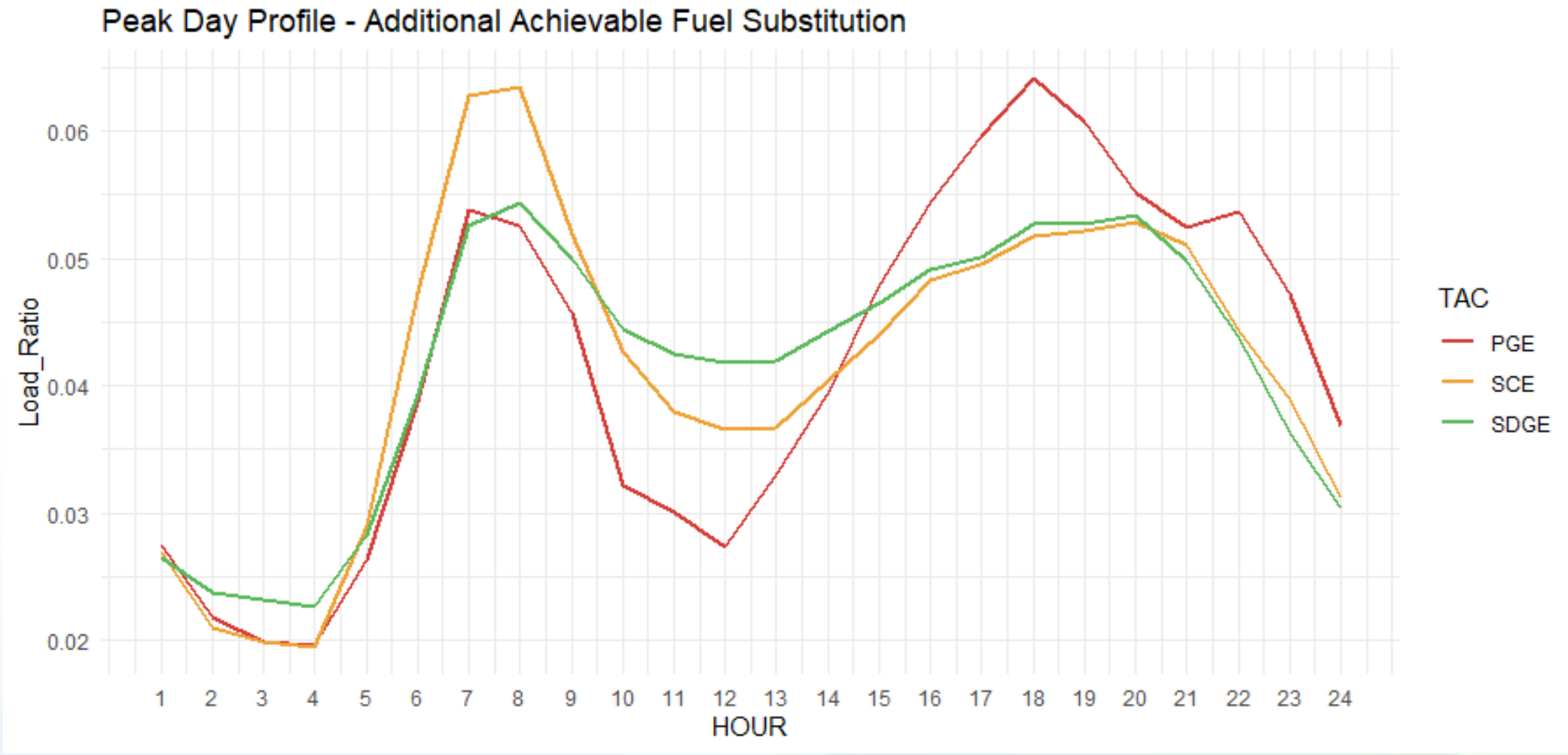
Time-of-Use Rates



Energy Efficiency

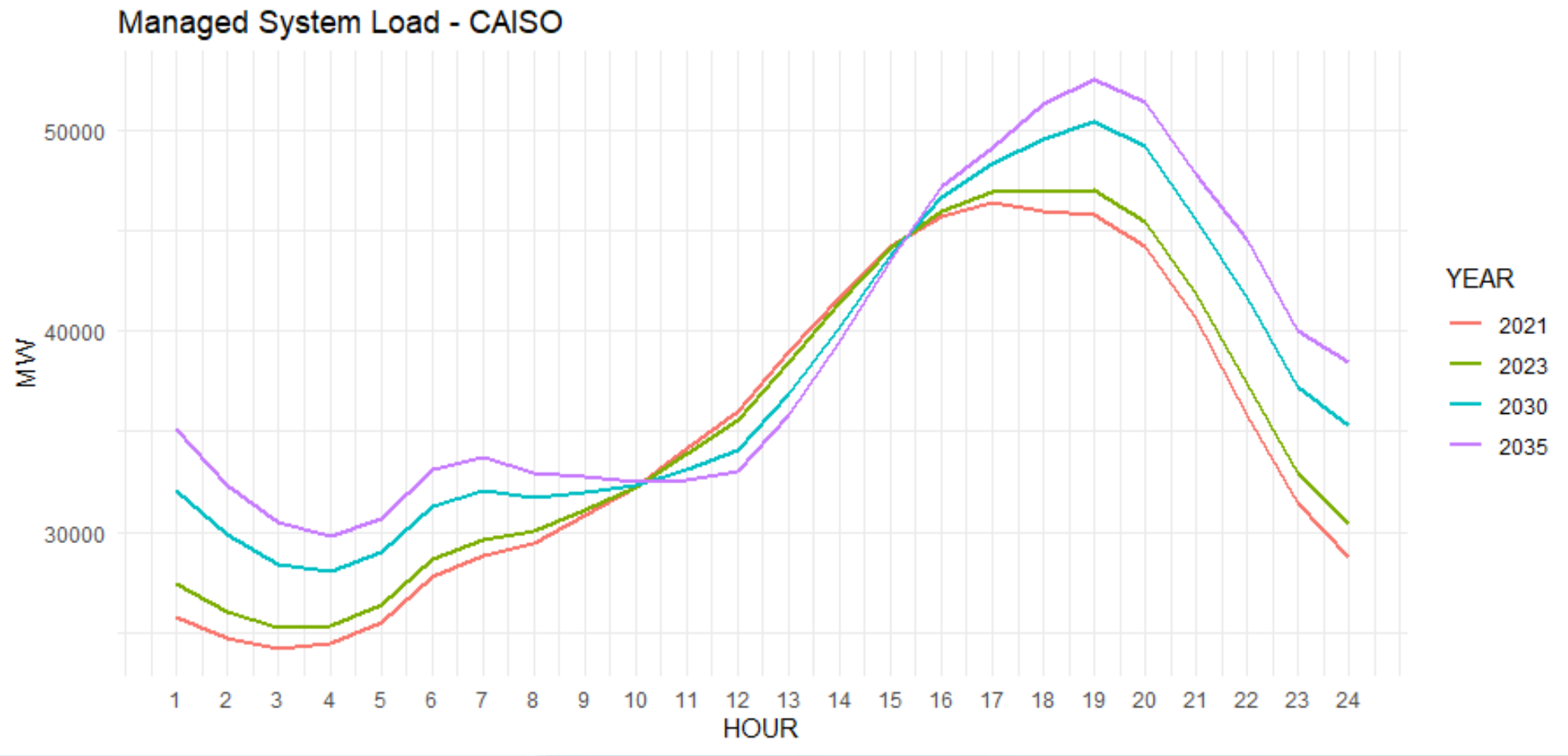


Fuel Substitution

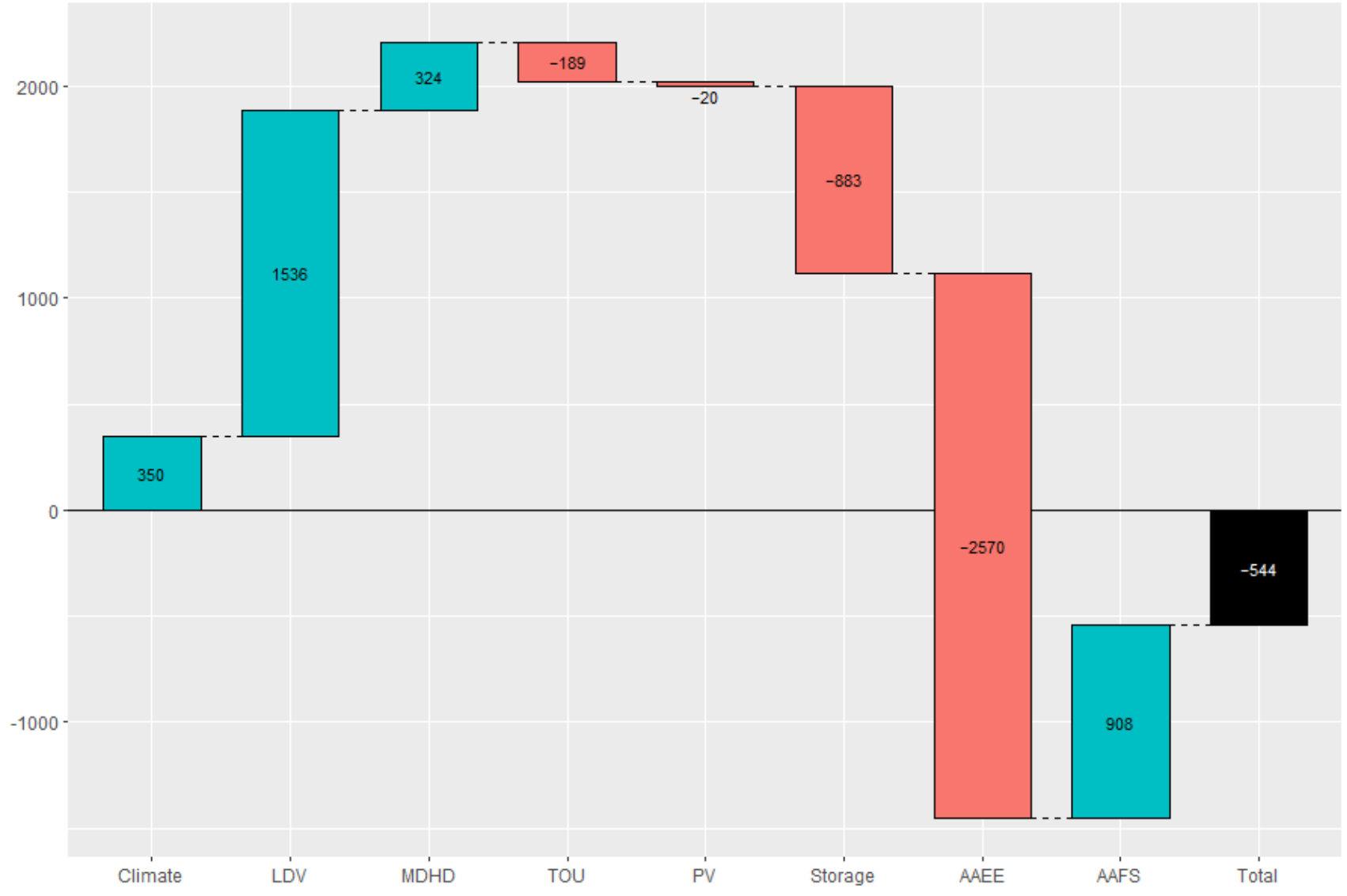


Impact on Peak Day Profile

CAISO peak hour shifts from hour 17 (PST) to hour 19 by 2023



Impact on Net Peak Hour



Incremental load modifiers added over the forecast period have the cumulative effect of reducing CAISO net load in 2035 by 544 MW.

Mid baseline

Mid AAEE (Scenario 3)

Mid AAFS (Scenario 3)

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Base Year Calibration

Weather Normalization Method

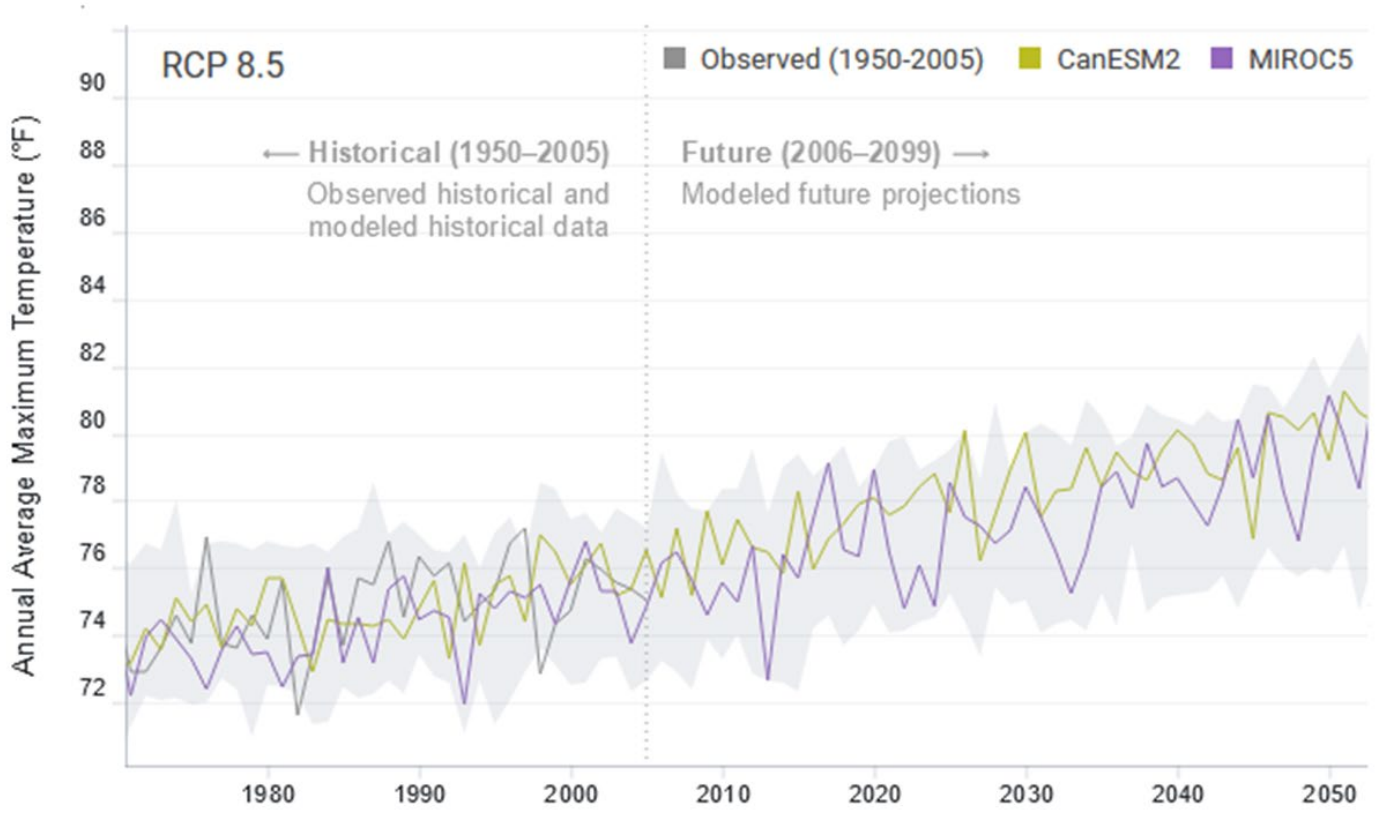
1. Data sources:
   - Hourly system loads by TAC (CAISO)
   - DR event impact estimates (IOUs / CAISO)
   - Hourly weather statistics
2. Estimate counter-factual daily peaks after adding DR impacts to recorded system load
3. Regress daily peaks against daily weather statistics and calendar effects using most recent three years of data
4. Use linear model to simulate daily peaks for historical weather years, including error term
5. Taking the maximum simulated value for each year, find the median

Additional Climate Considerations

Standard approach may underestimate normal 1-in-2 conditions

September 30 DAWG—staff proposed a modified approach, sampling recent years more frequently

Cal-Adapt Analytics Engine aimed at informing “weather-normal” estimates



Graphic: https://cal-adapt.org/

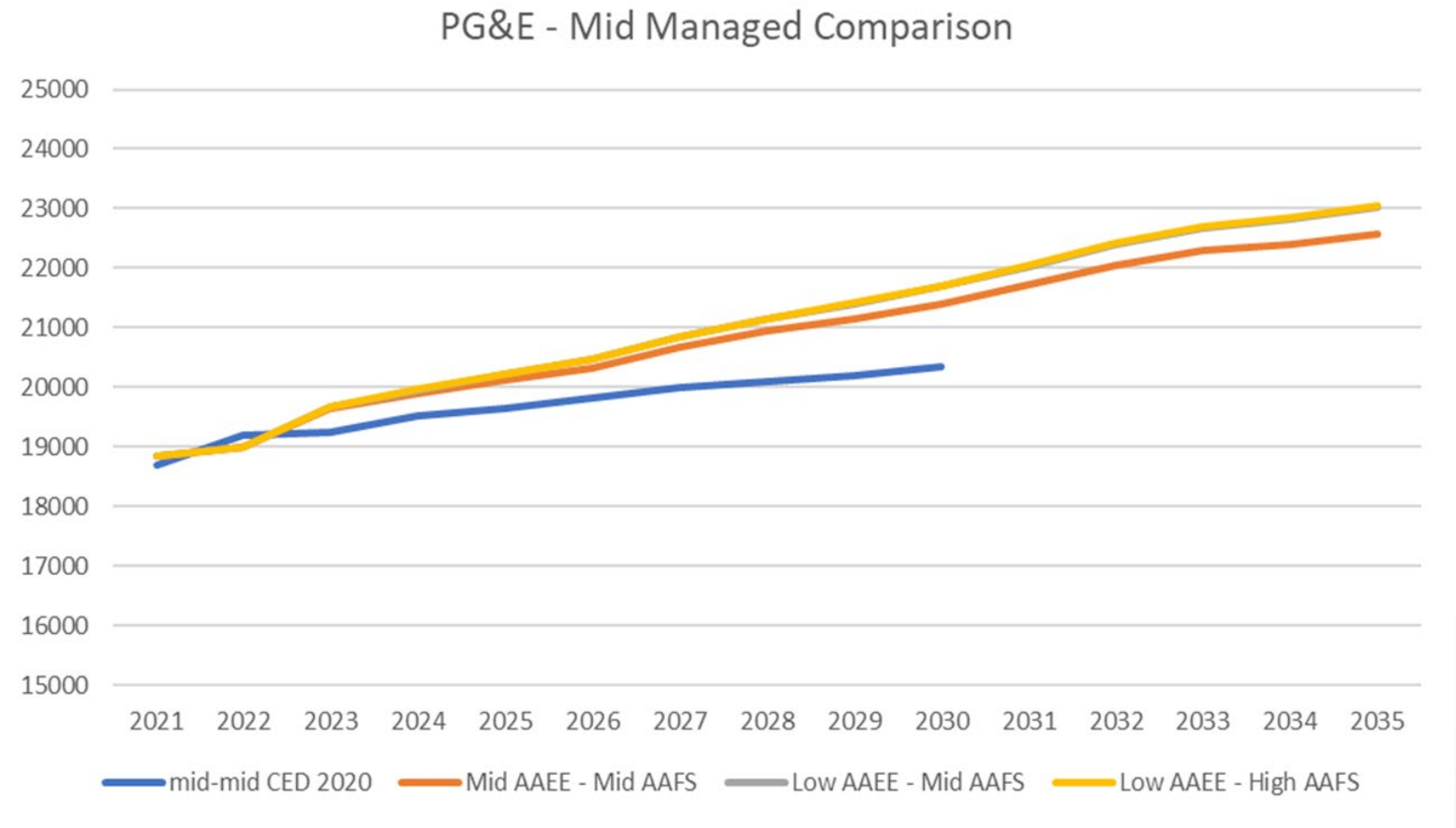
2021 Weather Normal Peaks

Planning Area	CED 2019	CED 2020	CED 2021	CED 2021*
PGE	20,779	20,370	20,826	20,794
SCE	23,623	23,364	23,713	23,820
SDGE	4,194	4,173	4,227	4,263
*Recent years given more weight during simulation				

Prior to weighting adjustment, CED 2021 weather-normal peaks are similar to CED 2019 vintage

Draft Managed Peak Forecasts

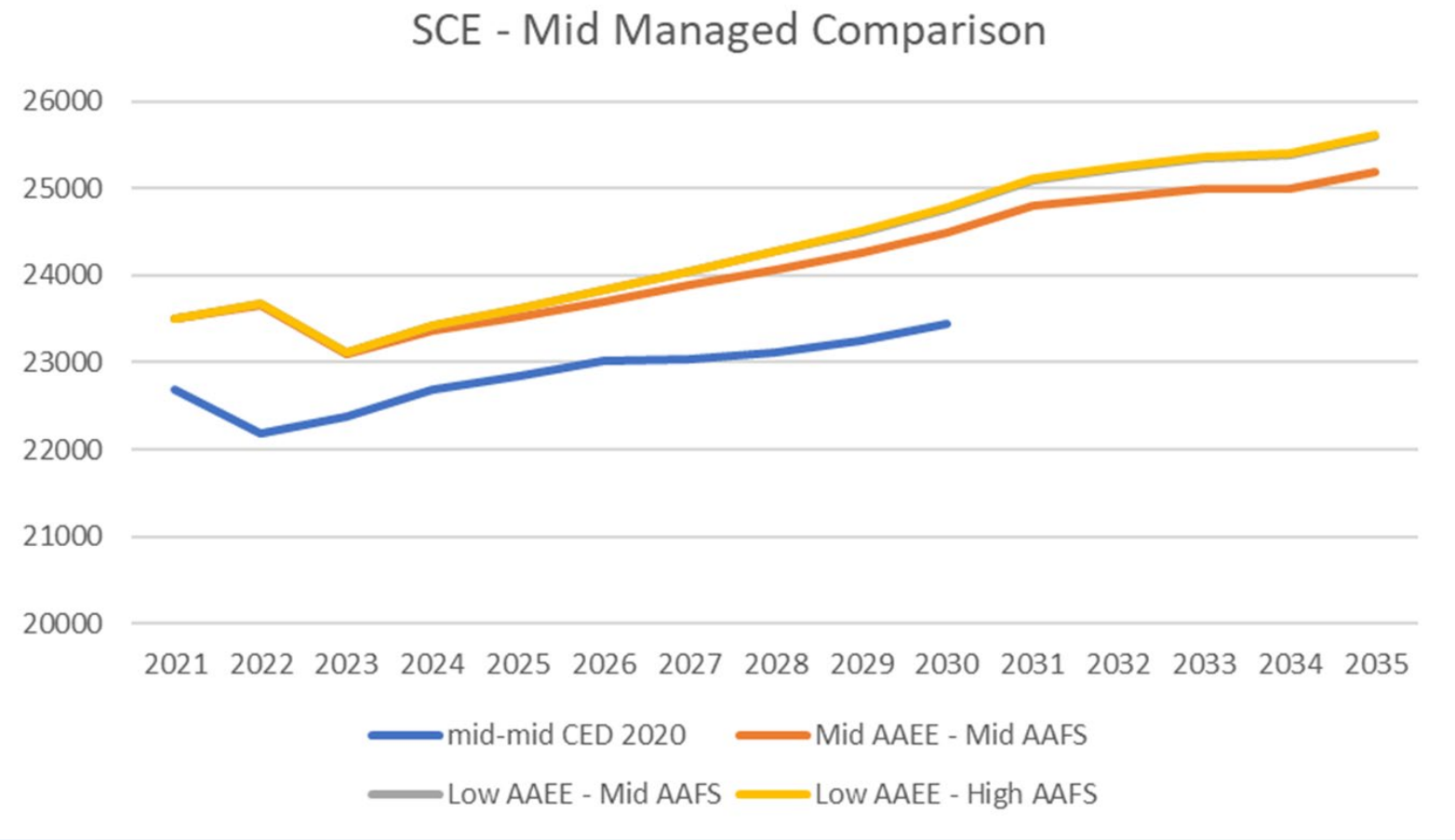
Coincident Peak Forecast – PG&E



Mid / Mid AAEE / Mid AAFS:

- 1.1 percent long-term annual growth
- 432 MW increase over CED 2020 by 2023
- Reaches 22,576 MW by 2035
- AAEE reduces peak load by 1136 MW
- AAFS adds 550 MW to peak load

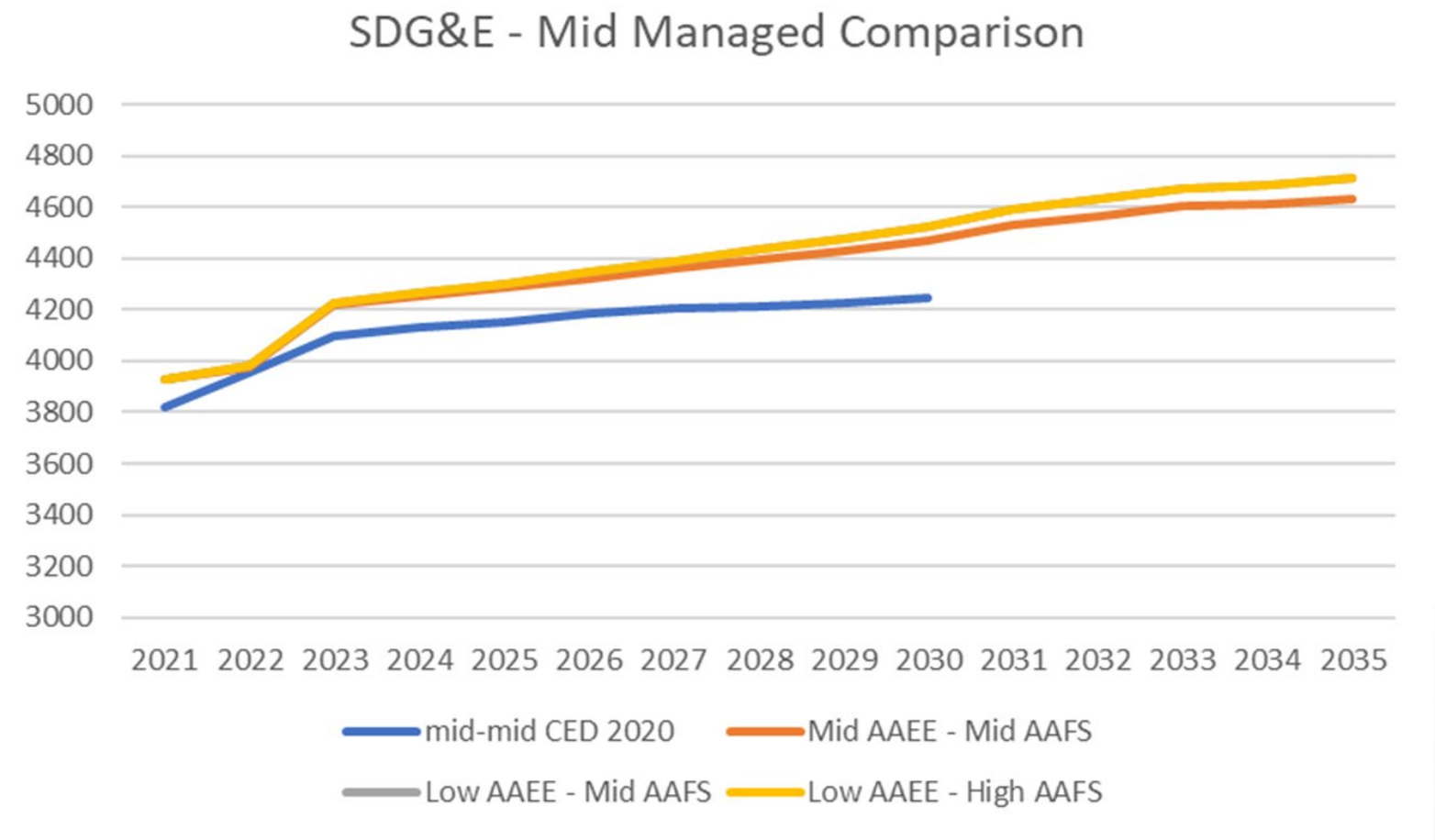
Coincident Peak Forecast – SCE



Mid / Mid AAEE / Mid AAFS:

- 0.7 percent long-term annual growth
- 712 MW increase over CED 2020 by 2023
- Reaches 25,188 MW by 2035
- AAEE reduces peak load by 1210 MW
- AAFS adds 234 MW to peak load

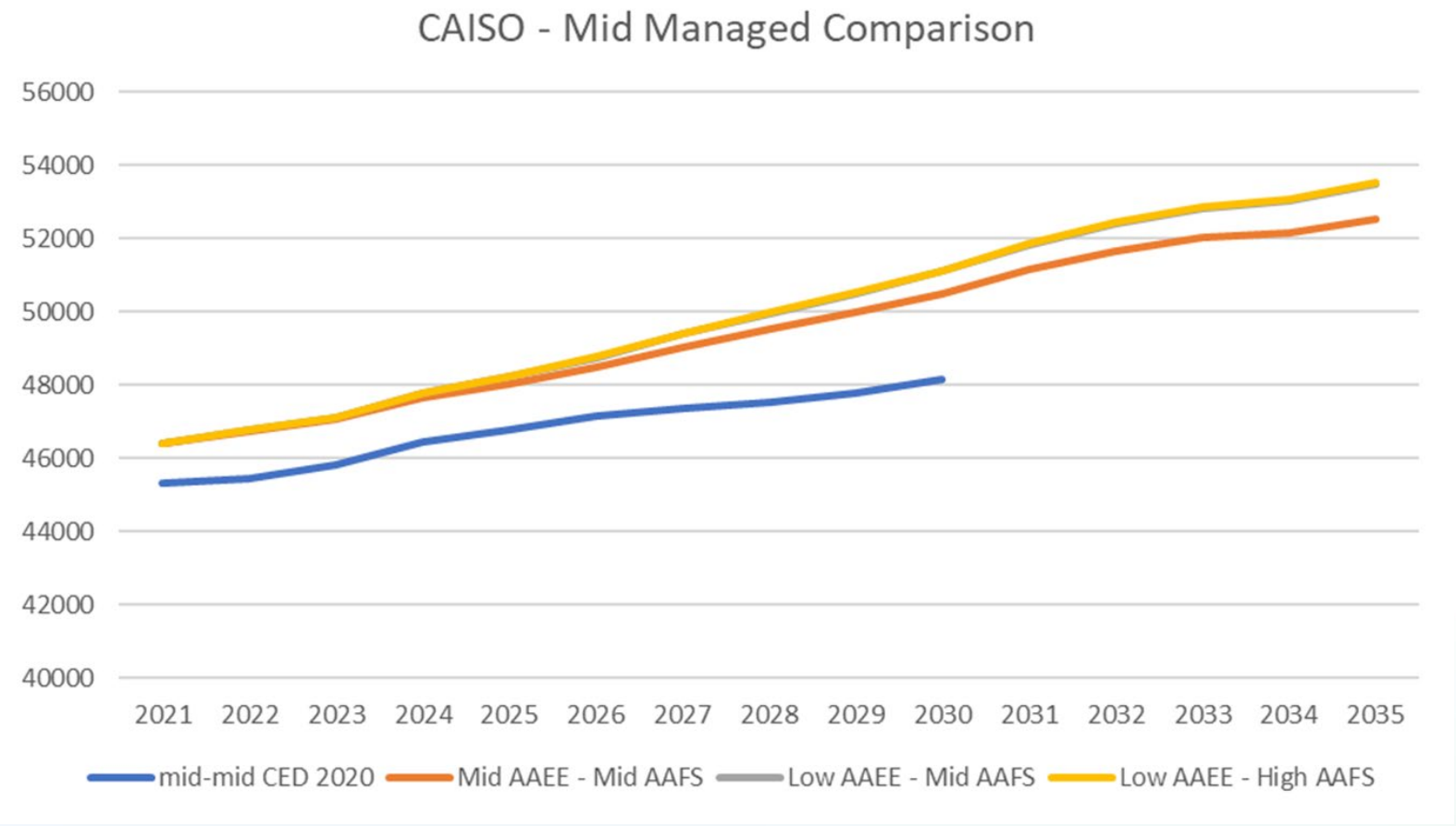
Coincident Peak Forecast – SDG&E



Mid / Mid AAEE / Mid AAFS:

- 1.1 percent long-term annual growth
- 120 MW increase over CED 2020 by 2023
- Reaches 4,634 MW by 2035
- AAEE reduces peak load by 223 MW
- AAFS adds 33 MW to peak load

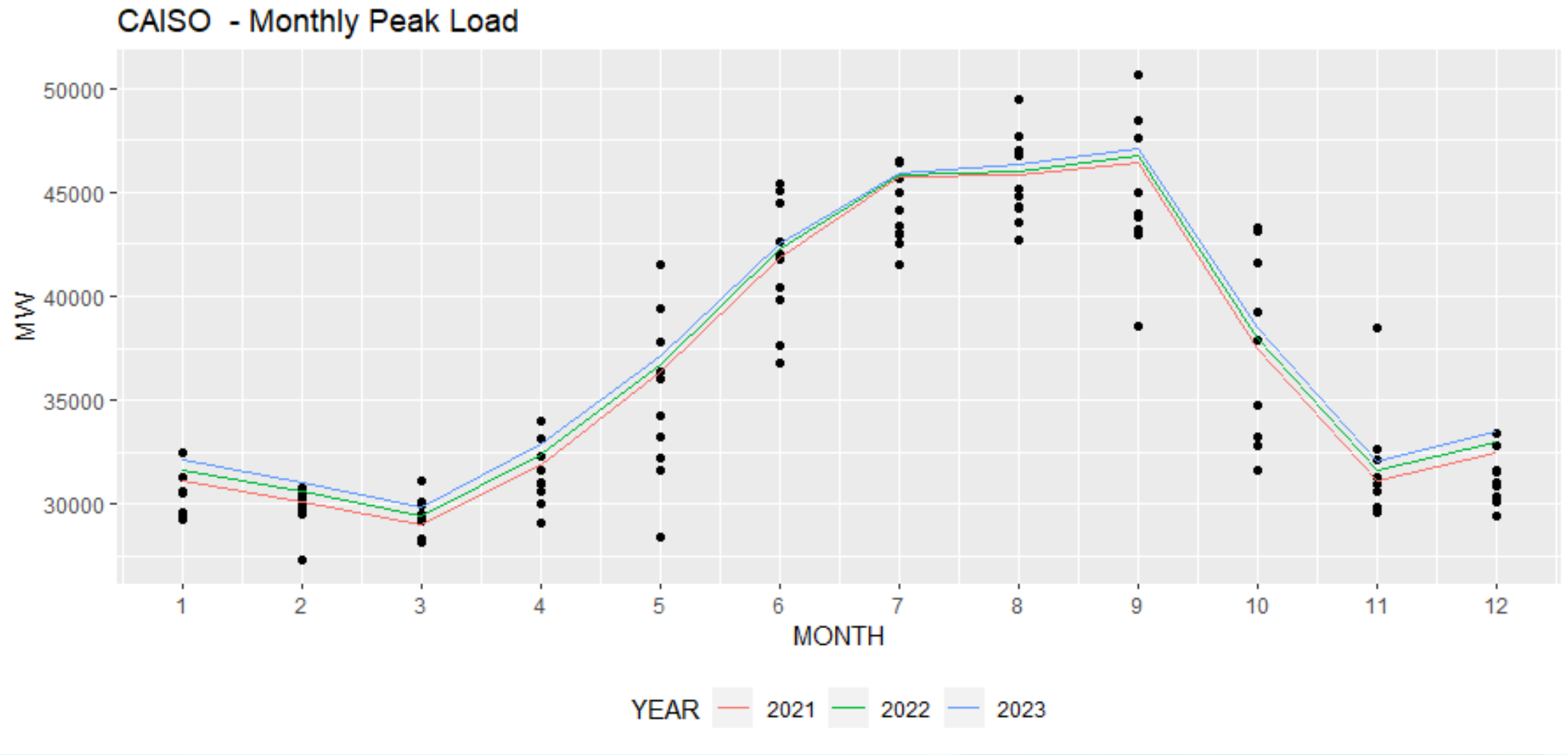
CAISO Peak Forecast



Mid / Mid AAEE / Mid AAFS:

- 1.1 percent long-term annual growth
- 430 MW increase over CED 2020 by 2023
- Reaches 22,576 MW by 2035
- Coincidence factor grows from 94.6% in 2021 to 97.7% by 2030

Forecast vs Historical Peaks



Next Steps

- Docket draft peak and hourly results
- Review peak forecast with IOUs / JASC
- Stakeholder comments due December 30
- Final forecast forms docketed (January)

January 26 Business Meeting – Proposed Adoption