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Methodology for Gas Demand Forecasting

Miguel Cerrutti, PhD
EAD / DAB
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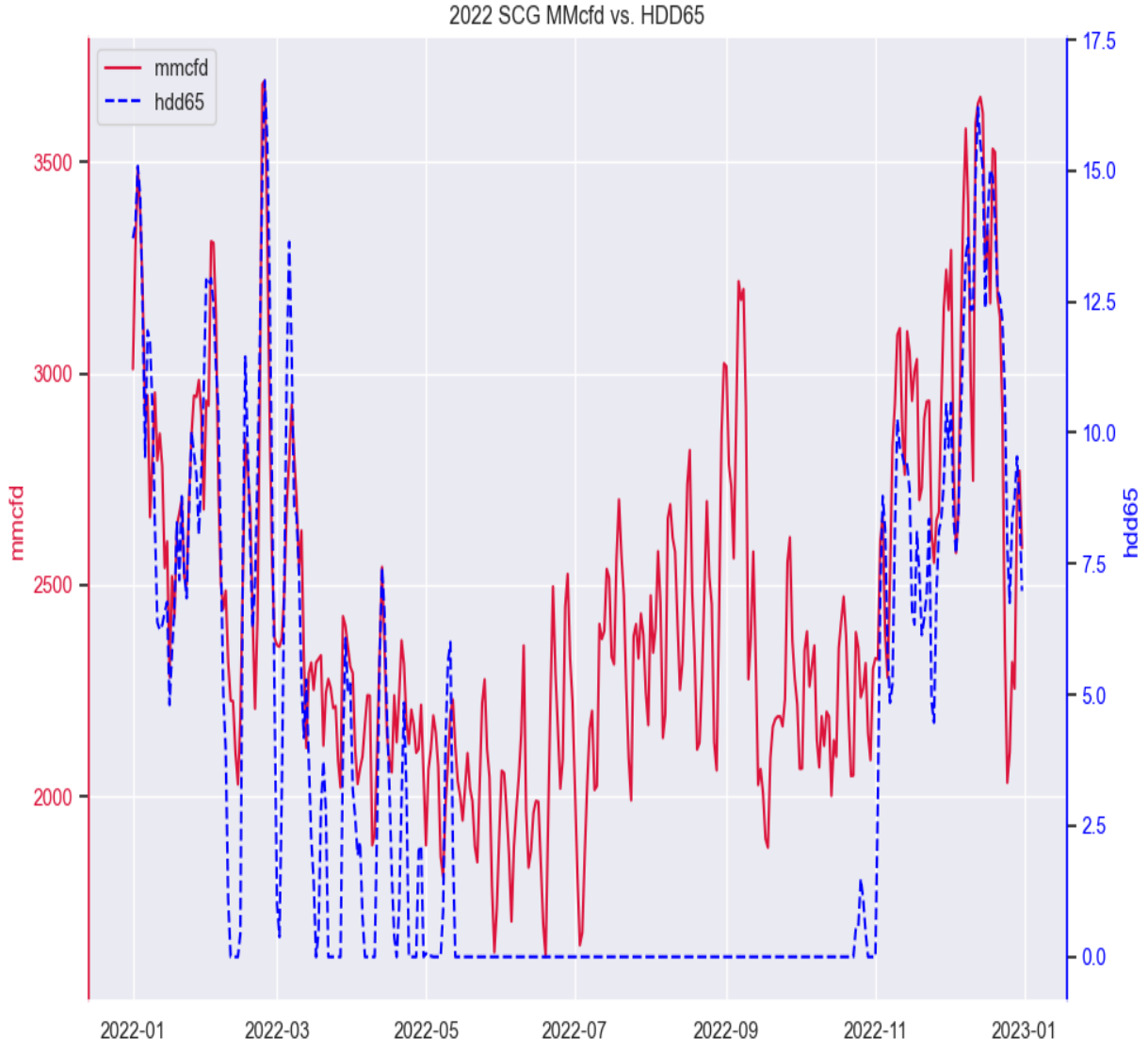
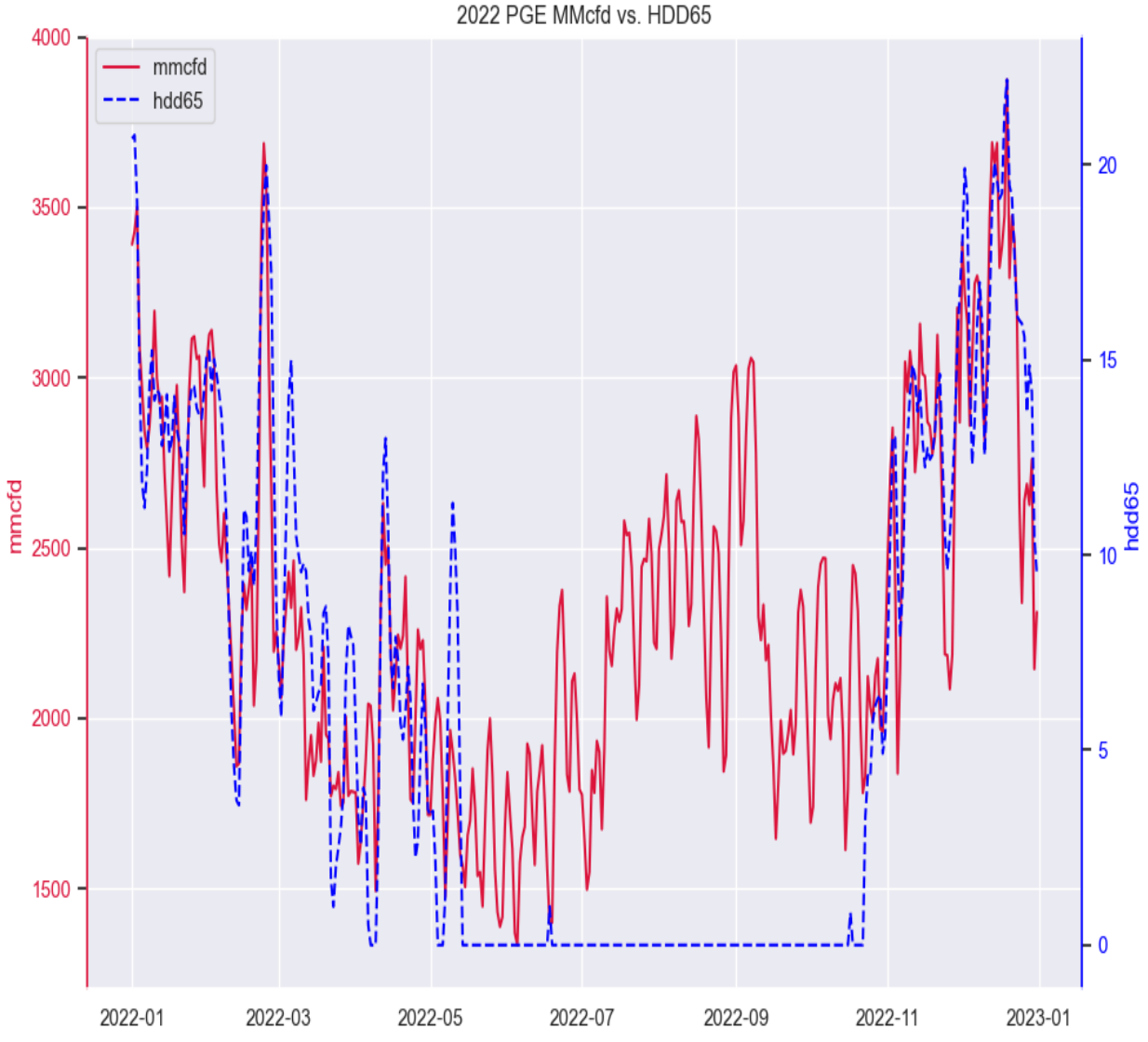
Winter reliability gas demand

- SoCalGas (SCG) and Pacific Gas & Electric (PG&E).
- Forecast peak-day and monthly average gas demands
  - Separate process from the IEPR forecast.
- Across customer classes and under climate change scenarios.
- January - March and October - December of 2024 – 2025.

SCG and PG&E Historical Daily Gas Demand (MMcfd) and Temperature (HDD65) for 2022





Source: CEC staff

Structured Approach

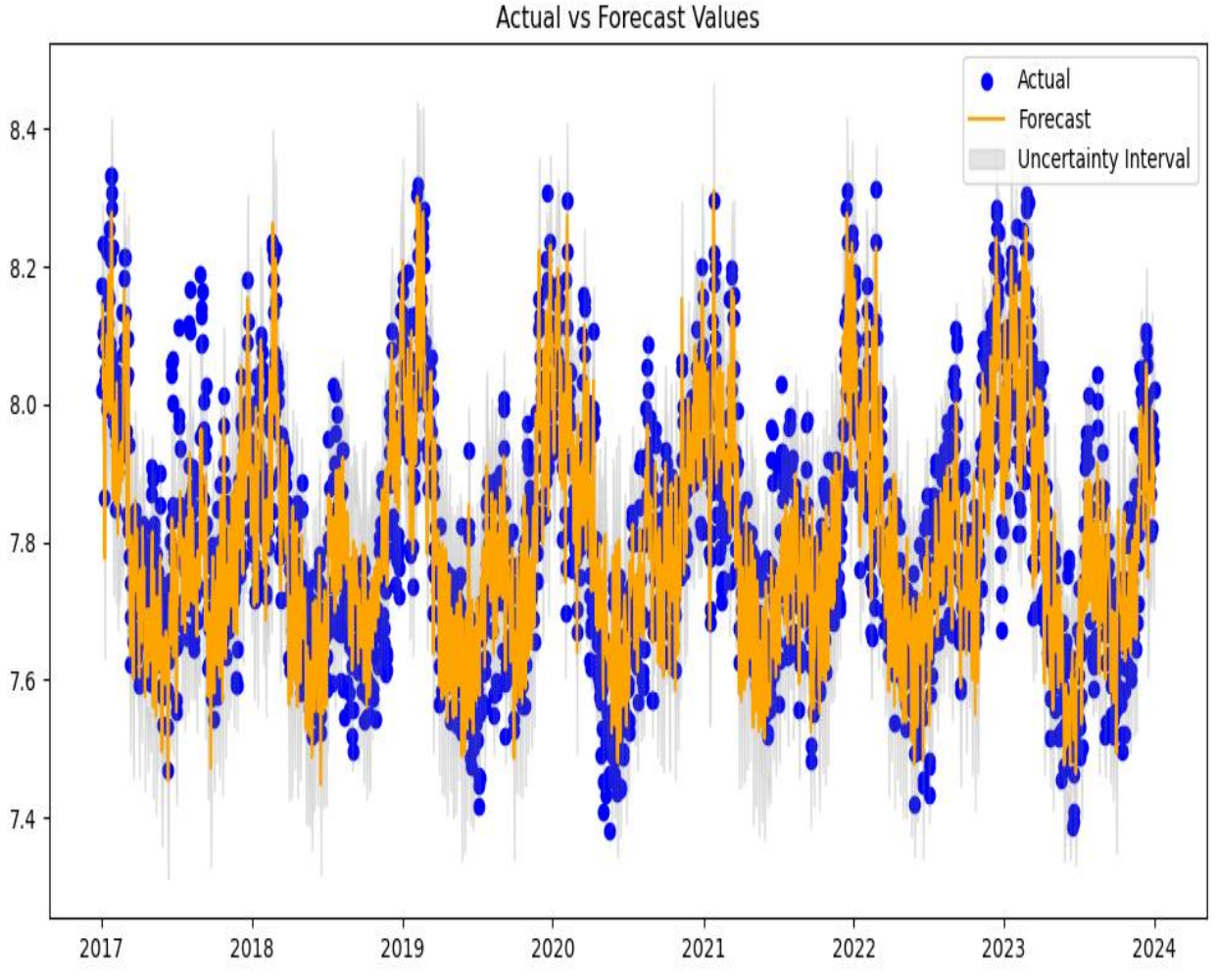
- Gathering and preparing datasets
  - historical daily gas demand and temperatures
  - climate change projections
- Identify and prepare calendar and temperature-derived regressor variables
- Setting, fitting, and analyzing Prophet additive time-series model
  - Seasonal effects, trends, special events, and external regressors
- Sean J. Taylor and Benjamin Letham. “Forecasting at Scale”. *American Statistician*, vol. 72, no. 1 (2018), pp. 37–45

Implementation Details

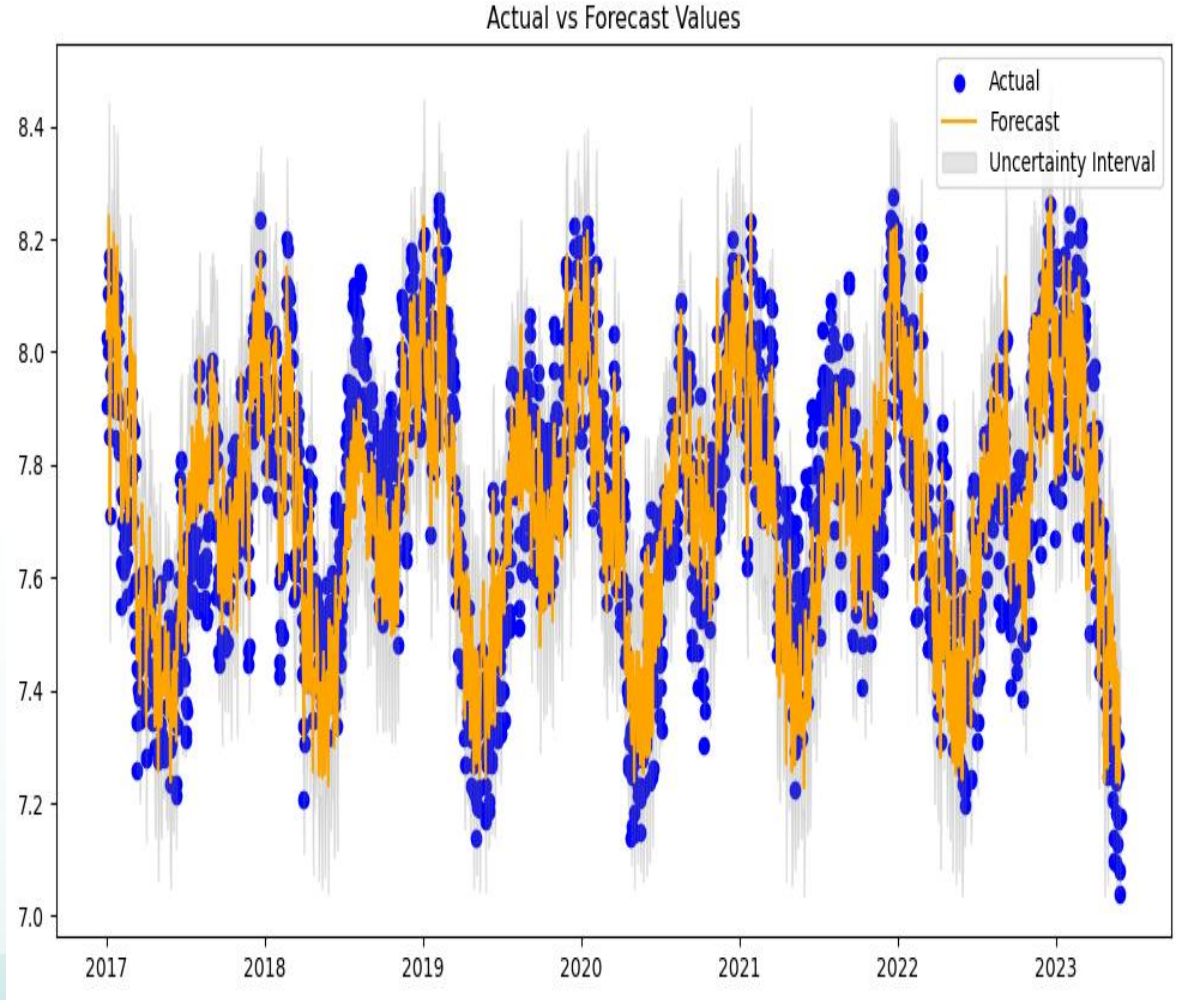
- Optimizing Prophet
  - Identifying significant variables
  - Hyperparameter tuning - seasonality & trend breakpoints
- Ex-post forecast
  - Train-test split
  - Fit on the training, evaluate on the testing - MAPE and cross-validation
- In-sample forecast – fit the ex-post best-performing model on the entire data
- Ex-ante forecast – from the in-sample model, generate peak-day and monthly average demand forecasts under climate change scenarios framed on probabilities
- Based on the chosen models and scenarios, develop forecasts for core and electric generation customer classes and reconcile them

SCG and PG&E Actual and Forecast with 95% confidence interval Daily Gas Demand (log MMcfd) for 2017 to 2023 (ds)

SCG

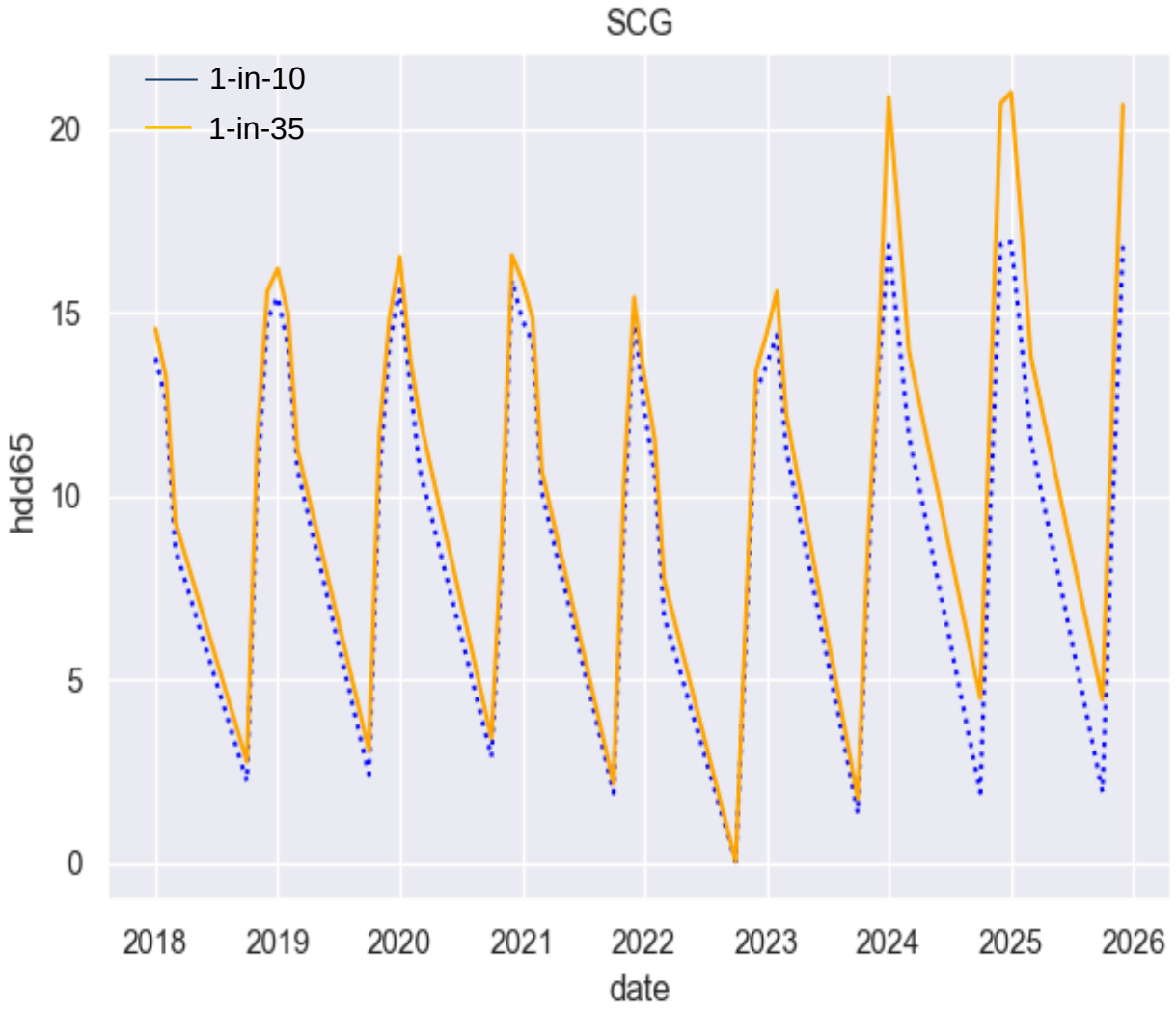


PG&E



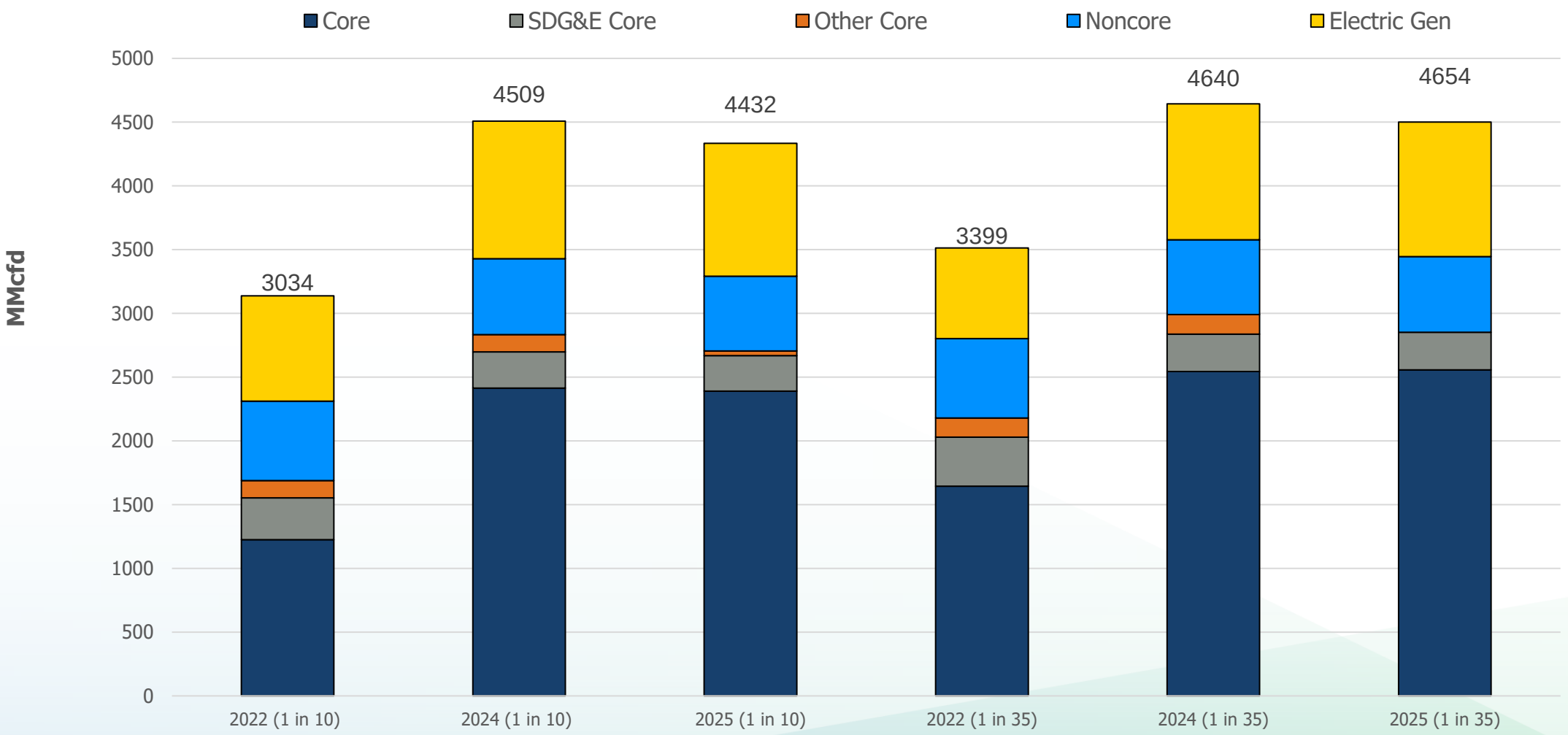
Source: CEC staff

SCG and PG&E HDD65 Historical Daily Probabilities for 2018 to 2024 and Climate Change Scenario Probabilities for 2024 and 2025



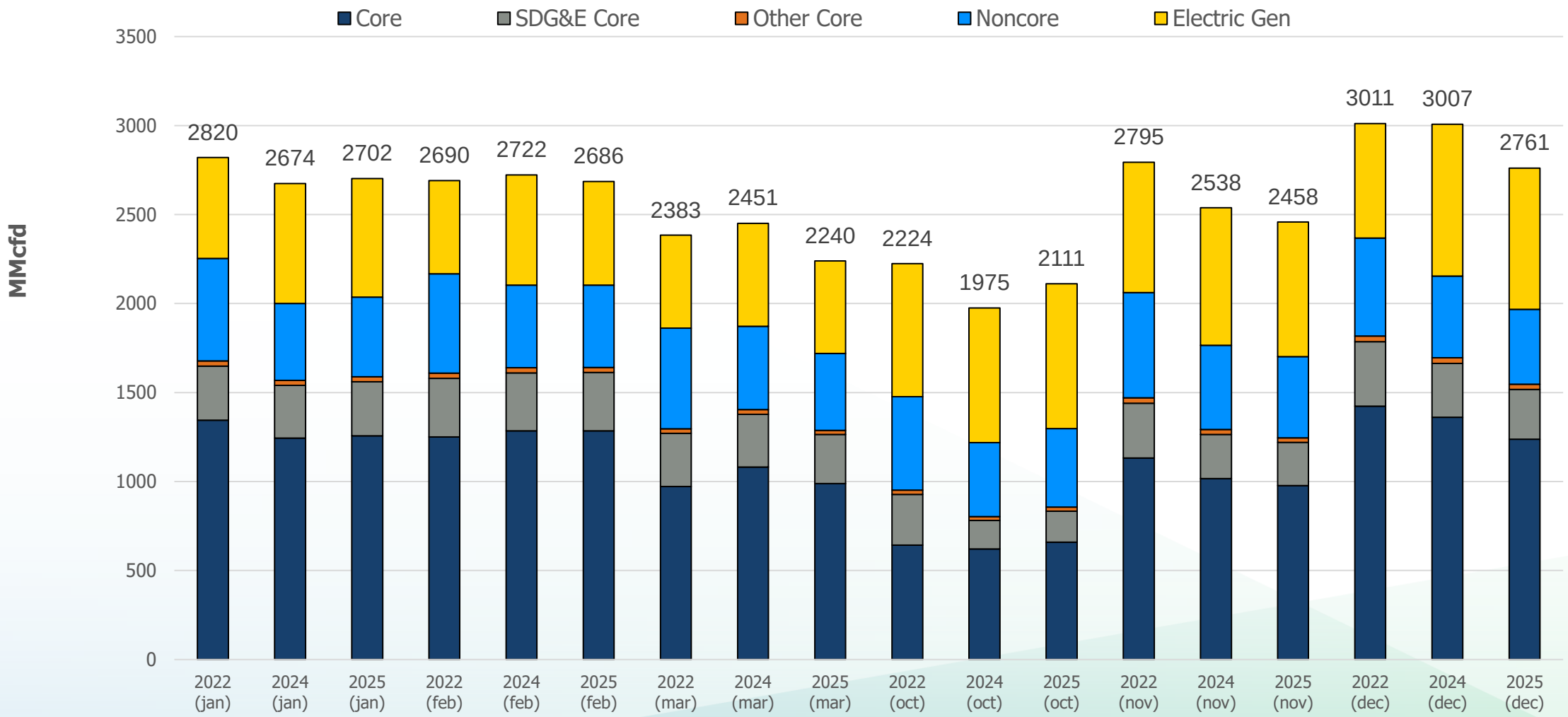
Source: CEC staff

Composition of SCG Gas Demand Peak-day Year Actual for 2022 and Forecast for 2024 to 2025



Source: CEC staff

Composition of SCG Gas Demand Monthly Average Actual for 2022 and Forecast for 2024 to 2025



Source: CEC staff

Contribution

- Probabilistic programming – express uncertainty
- Prophet algorithm
  - Capture shifts in the trends and seasonality
  - Robust to data gaps
  - Adapt to climate change impacts over time