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Form 4: Demand Forecast Methods and Models

Presented below is a summary of the methodology underlying the long-term forecast of electric energy for the San Diego Gas & Electric Company ("SDG&E") service territory.

SDG&E uses a combination of econometric and statistically adjusted end-use models ("SAE") to develop forecasts of electric customers, sales, system energy requirements and system peak demand. In general, the forecasting models integrate input assumptions regarding demographic and macroeconomic concepts, weather, energy prices, building and appliance standards and saturations, energy efficiency programs, and other factors affecting electricity consumption, such as new or changing technologies.

Electricity consumption is modeled in the following sectors and categories: Residential, Small/Medium/Large Commercial, Agriculture and Water Pumping, and Street Lighting.

The residential class is modeled as the product of per-customer-usage and the number of customers. Usage per customer is modeled using the residential SAE model and incorporates equipment efficiency and saturation trends along with billing days, real electric prices, weather, seasonal and real personal income to forecast energy sales. Residential sales are adjusted to account for energy efficiency & standards impacts, electric vehicle load, and self-served load (primarily from photovoltaic systems).

Small/Medium/Large non-residential electric sales are modeled as the product of per-customer-usage and the number of customers. Usage per customer is modeled using the commercial SAE model and incorporates equipment efficiency and saturation trends along with billing days, real electric prices, weather, seasonal and economic employment conditions to forecast energy sales. Small/Medium/Large commercial sales are adjusted to account for energy

efficiency & standards impacts, electric vehicle load, and self-served load (from both solar and non-solar).

Agriculture is forecasted as an individual sector based primarily on customer counts and recent energy usage trends. An econometric model was used to forecast the agriculture class on a usage per customer basis using an estimation period of 2014 through 2020. The model was fitted using monthly binary variables and historical rain data. Photovoltaic was included for the estimation of agriculture consumption and was later subtracted off forecast to determine reported sales.

Street lighting is forecasted as an individual sector based primarily on customer counts and recent energy usage trends. A five-year average (2016-2020) usage per customer was applied to forecasted customers to come up with a lighting sales forecast.

The hourly forecast is based individual forecasts by sector for each city in SDG&E service territory and is calibrated to the resulting control totals from the sector sales forecasts. Hourly loads provide an 8760 (8784 leap year) shape to the forecast period and incorporates hourly PV generation, charging and discharging battery storage, and electric vehicle charging

Class energy consumption and system peak are further broken down into categories of direct access (DA), community choice aggregation (CCA) and utility-procured energy (bundled service).

The energy forecast is disaggregated into bundled service, direct access service, and CCA service. The amount of direct access load in the forecast is limited to an authorized cap of 3,942 GWh, as per an

April 2019 CPUC draft decision (R.19-03-009) in a rulemaking proceeding to implement California Senate Bill 237 (SB 237).

The economic assumptions are based on a blend of the latest available forecasts from Global Insight, Inc. (January 2021 Regional forecast for San Diego) and Moody's Economy.com (January 2021 Regional Forecast for San Diego). Numerical values for key assumptions are presented in IEPR Form 2.1.

SDG&E uses various weather concepts in the sales forecast development process, including heating-degree days, cooling-degree days and relative humidity. The three weather stations that represent SDG&E's service area are Lindbergh Field, Marine Corps Air Station (MCAS) and El Cajon. Peak weather scenarios were developed from statistical analysis of historical weather data for the last 30 years.

Electric Vehicle Forecast:

The electric vehicle forecast is based off historical EV on-road registrations as provided by IHS/Polk data[1] and internal growth forecast estimates that considered the CEC's 2020 mid EV adoption scenario. SDG&E has transportation electrification projects in progress and planned for the future that will increase EV adoption in the forecast horizon. SDG&E used the CEC CEDU 2020 hourly forecast for SDG&E EV load as the basis for the EV charging profile. SDG&E adjusted the CEC's load shape to more accurately represent trends in charging behavior in SDG&E service territory. SDG&E also developed assumptions for daily EV consumption, charging sites (residential/public charging), and future car stock to obtain a forecast for EV charging load. The charging profile was applied to resulting load to develop an hourly EV load forecast.

[1] Proprietary IHS/Polk Data (Dec 2018).

Non-PV Self-Served Load:

SDG&E witnessed rapid growth in non-PV self-served load from the early 1980s through the mid-2000s. From 2007 to 2013, SDG&E saw relatively constant non-PV self-served load. A structural shift occurred in 2014, and there was a significant decrease in non-PV installed capacity within the SDG&E service territory, as well as a noticeable decrease in self-served load. The forecast anticipates that no major non-PV projects will be added to the system within the forecast period and has therefore determined that non-PV self-served load will see no growth over the next 10 years. A three-year historical average was used to develop the non-PV self-served load forecast.

PV Self-Served Load:

Over the past 10 years, SDG&E has experienced exponentially increasing solar installation, with year-over-year growth reaching as high as 50 percent. SDG&E believes the California Energy Commission (CEC) has accurately accounted for this trend in its mid-scenario PV forecast. SDG&E has adopted the CEC CEDU 2020 mid-scenario for the 2021 IEPR installed PV capacity forecast. SDG&E has a representative sample of solar generation meters which are used to derive hourly capacity factors. These historical capacity factors were used to create an average shape and applied to the CEC mid-scenario PV forecast to obtain estimates of PV generation.

Battery Storage:

Battery storage is still in its early stages of adoption in SDG&E service territory. SDG&E has relied on Bloomberg's 2021 Long-Term Energy Storage Outlook to obtain a basis

for installed capacity projections and made the following adjustments: Bloomberg forecasted statewide installed capacity of battery storage out to 2050. SDG&E determined its allocation of statewide installed capacity by applying the percentage of statewide peak load attributed to SDG&E. SDG&E applied the incremental growth from the resulting allocation to its most recent history to obtain the forecast for installed battery storage capacity. SDG&E used a battery storage charge/discharge profile that was derived from the CEC CEDU 2020 hourly forecast for SDG&E service territory. This profile was applied to the installed capacity forecast to obtain an hourly battery storage forecast.

Demand-Side Methodology

Committed and uncommitted energy efficiencies and standards are incorporated into the inputs of the sector forecast models. Efficiencies and standards are reflected in model parameters such as residential unit-energy-consumption (UEC) and commercial energy-use-intensities (EUI). Efficiencies and standards included in the models for years subsequent to 2020 were developed by analyzing the Energy Efficiency Potential and Goals Study 2019 and Beyond as prepared for the CPUC[2] and by incorporating efficiencies from standards, behavioral programs, equipment, and naturally occurring market adoption (NOMAD) and end-of-use decay for measures.