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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 Nonresidential, Agriculture and Water Pumping, Large Nonresidential, Street Lighting and Electric Vehicles.

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 additional achievable energy efficiency & standards impacts and self-served load (primarily from photovoltaic systems).

Small/medium 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 non-residential electric sales are adjusted to account for additional achievable energy efficiency & standards impacts and self-served load (from both solar and non-solar).

Agriculture and street lighting are forecasted as individual sectors based primarily on customer counts and recent energy usage trends.

Large non-residential customer groups such as military and manufacturing are forecasted individually based on recent energy usage trends.

System peak demand is modeled using historical hourly demand information (from noon to 10 P.M.) along with trends in heating, cooling and base load, heating degree days, cooling degree days, and cloud cover. Hourly demand estimates are adjusted for trends in demand response, self-served load from non-PV generation, PV and electric vehicles. This methodology was used to account for the recent trend of peak-shifting to later in the day.

The hourly forecast is based on the resulting control totals from the energy and peak forecast. Hourly loads provide an 8760 (8784 leap year) shape to the forecast period and incorporates hourly PV generation, electric vehicle consumption, demand response, and additional achievable energy efficiency.

Class energy consumption and system peak are further broken down into categories of private supply (self-served load), direct access and utility-procured energy (bundled service).

The energy forecast is disaggregated into bundled service and direct access service. The amount of direct access load reflects the California Public Utilities Commission's Decision (D.10-03-022) for limited reopening of Direct Access (DA) to nonresidential customers, in annual migration periods from 2010 through 2013. Since the last migration period ended in 2013, the forecast of total DA sales is tied to 3,562 GWH cap provided in the decision.

The economic assumptions are based on a blend of the latest available forecasts from Global Insight, Inc. (February 2017 Regional forecast for San Diego) and Moody's Economy.com (February 2017 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 of historical EV on-road registrations as provided by IHS/Polk data[1] and internal growth forecast estimates per Direct Testimony prepared for the SB 350 Transportation Electrification Application.[2] SDG&E uses three types of EV charging load shapes: time-of-use, non-time-of-use, and public charging profiles in order to create the kWh estimates for the hourly load forecast. The resulting load is aggregated to the annual totals.

[1] Proprietary IHS/Polk Data (Dec 2016).
[2] https://www.sdge.com/sites/default/files/regulatory/Direct%20Testimony%20Chapter%204%20-%20Residential%20Charging%20Program.pdf.

Private Supply Forecast

Non-PV Self-Served Load:

SDG&E witnessed rapid growth in non-PV self-served load from the early 1980s through the mid-2000s. Between 2005 and 2013, SDG&E saw little growth in non-PV customer generation capacity, and slow but steady growth in self-served load. A major structural shift has since occurred, and there has been 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 shape of the monthly 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. By the third quarter of 2016, SDG&E reached the Net Energy Metering (NEM) cap of 607 MW of installed capacity. Subsequently, SDG&E saw a decrease in the rate of solar adoption. SDG&E believes the California Energy Commission (CEC) has accurately accounted for these trends in solar installations in the 2016 California Energy Demand (CED) forecast. SDG&E applied the growth rates of the CEC's forecasted solar capacity to SDG&E's historical installed solar capacity to produce the PV capacity forecast. SDG&E has a representative sample of solar generation meters which are used to derive capacity factors and generation estimates. These generation estimates were used to develop annual energy sales and to estimate the impact of solar generation on system peak demand.

Form 6: Demand-Side Methodology

Both committed and uncommitted energy efficiencies and standards are incorporated in the forecasts produced by the models. Efficiencies and standards that represent improvements put into place in years prior to 2017 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 2016 were developed by analyzing and drawing from Southwestern United States regional efficiencies (provided by EIA to support the implementation of SAE modeling) and a 2015 energy efficiency potential study prepared by Navigant.

There are two types of Demand Response (DR) impacts, nondispatchable and dispatchable (delineated on Form 3.4). Nondispacthable program impacts are incorporated in the unmanaged demand forecast, dispatchable program impacts are not. The dispatchable program impacts will be passed onto the resource planners, who will incorporate them in the 2017 IEPR resource plan. The source of the values for both dispatchable and nondispatchable demand response programs is SDGE's Executive Summary of the demand response load impact reports filed with the CPUC, April 2017, in compliance with D-08-04-050.

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