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2023 IEPR
Form 4: Forecast: Methodology and Assumptions

Methodology:

Forecasters used MetrixND[1] to construct linear regression models for each rate class at every hour of the day (n = 240). These models quantify the relationship between energy demand per customer and various demand drivers, including: date characteristics (weekday v. weekend, holidays, daylight savings), weather (temperature, precipitation), and economic conditions (local unemployment, COVID transmission rates and generalized recovery trends). To improve interpretability, all hourly models for a given rate class have the same specification. Most models were trained on approx. the most recent 1-3 years of actual hourly demand data.

The forecast assumes normal weather patterns and no changes to the CPSF customer enrollment during the forecast period, except where noted differently in the assumptions section below. The forecast was adjusted to conform to annual growth expectations adopted from the California Energy Commission (CEC).

Key assumptions:

1. Demand Growth: Energy demand per customer increases annually as a result of economic growth and modifications such as increased building electrification, fuel switching, and expanded EV charging. Growth rates represent year-over-year changes in demand and were derived from the California Energy Commission's Energy Demand Forecast, 2021-2035[2] for CleanPowerSF. They apply equally to all rate classes:

Year	Growth Rate	Source
2023	0.50%	Internal estimate
2024	1.18%	CEC
2025	1.09%	CEC

[1] Software developed by Itron
[2] Refer to the CED 2021 Mid Baseline Forecast – LSE and BA Tables Mid Demand Case

Year	Growth Rate	Source
2026	1.06%	CEC
2027	1.09%	CEC
2028	1.05%	CEC
2029	1.23%	CEC
2030	1.26%	CEC
2031	1.39%	CEC
2032	1.21%	CEC
2033	1.38%	CEC
2034	1.31%	CEC

2. Weather: Abnormal weather is expected to occur regularly and drive increases in peak energy demand. The forecast approximately replicates the single most extreme temperature and precipitation events for each calendar month that have occurred since 2021 and assumes they reoccur annually throughout the forecast period. These adjustments are assigned to the same dates as the actual historical events they are designed to replicate. Normal weather, based on historical averages and calculated by our weather data provider DTN, is expected to occur during all other days. These adjustments include:

Month	Temperature Event	Precipitation Event
Jan	3-day cold spell (1/2-1/4), 45 F avg/day	4-day storm (1/13-1/16), 1 in/day
Feb	6-day cold spell (2/21-2/26), 47 F avg/day	2-day storm (2/3-2/4), 0.6 in/day
Mar	4-day cold spell (3/14-3/17), 50 F avg/day	1-day storm (3/14), 1 in/day
Apr	1-day heat wave (4/6), 73 F avg/day	1-day storm (4/16), 0.5 in/day
May	3-day heat wave (5/8-5/10), 67 F avg/day	
Jun	1-day heat wave (6/21), 80 F avg/day	
Jul	3-day heat wave (7/4-7/6), 70 F avg/day	
Aug	2-day heat wave (8/27-8/28), 75 F avg/day	
Sep	5-day heat wave (9/4-9/8), 80 F avg/day	1-day storm (9/21), 0.2 in/day
Oct	3-day heat wave (10/1-10/3), 70 F avg/day	1-day storm (10/24), 3 in/day

Month	Temperature Event	Precipitation Event
Nov	2-day cold spell (11/29-11/30), 49 F avg/day	1-day storm (11/8), 1.1 in/day
Dec	3-day cold spell (12/1-12/3), 47 F avg/day	2-day storm (12/12-12/13), 1.5 in/day

3. New Enrollments - New customers will be enrolled in CleanPowerSF at several points in the future and are assumed to exhibit average energy demand patterns within their respective rate classes. These enrollments include[3]:

Rate Class	New Customers	Enrollment Date
RES	1,416	May 1, 2023
A1	204	May 1, 2023
A10	14	May 1, 2023
E19S	26	January 1, 2024
E19P	9	January 1, 2024
E20S	8	January 1, 2024
E20P	4	January 1, 2024

4. Loss Fractions- The forecasts report loads at the customer interconnection point and assume the following losses by rate class:

Rate Class	Distribution Loss %	Transmission Loss %
A1	4.5%	2%
A10	4.4%	2%
A6	4.5%	2%
AG	4.5%	2%
E19P	0%	2%
E19S	4.5%	2%
E20P	0%	2%

[3] 85 new enrollees that do not fall into these rate classes (i.e. listed as "Other") were assigned to the "RES" rate class.

Rate Class	Distribution Loss %	Transmission Loss %
E20S	4.5%	2%
LS	4.5%	2%
RES	4.5%	2%

Demand Modifier Impacts

Solar PV

Solar PV Demand Modifier increments were based upon the following assumptions:

- Installations
  - Residential: assumed to increase by 5.5% annually
  - Stable/no increase for Commercial and Industrial
- Energy (MWh):
  - Residential = Installations/0.14157
  - Commercial = Installations/0.00930
  - Industrial – Installations/0.01095

Electric Vehicles

The Electric Vehicle (EV) demand modifier increment statistics were based upon an electrification study provided by the International Council On Clean Transportation (ICCT).[4] The study was conducted to predict San Francisco's changing EV charging-station infrastructure needs as the adoption of electric transportation begins to increase. As part of the study's scope, estimates were given for both the light-duty and medium/heavy-duty EV populations in San Francisco by 2025 and 2030. The SF EV population year-over-year increments were based upon these estimates. The base population number for 2022 was taken from actual data provide by the California Energy Commission (CEC)[5].

The ICCT study also assumed that total yearly energy consumption for light-duty EVs was 2.6 MWhs/vehicle/year and 117 MWhs/vehicle/year for medium/heavy-duty EVs. All load calculations are based on those estimates.

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[4] City charging infrastructure needs to reach 100% electric vehicles: The case of San Francisco - International Council on Clean Transportation (theicct.org) < https://theicct.org/publication/city-charging-infrastructure-needs-to-reach-100-electric-vehicles-the-case-of-san-francisco/>. Accessed July 3, 2023.
[5] Light-Duty Vehicle Population in California <https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/light-duty-vehicle>. Accessed July 3, 2023.