DOCKETED	
Docket Number:	24-IEPR-03
Project Title:	Electricity Demand Forecast
TN #:	264126
Document Title:	Pasadena Water and Power Form 4
Description:	PWP 2025 Demand Forms - Form 4 - Demand Forecast Methods and Models
Filer:	Allison Mao
Organization:	City of Pasadena
Submitter Role:	Public Agency
Submission Date:	6/9/2025 11:35:29 AM
Docketed Date:	6/9/2025

Form 4 Demand Forecast Methods and Models

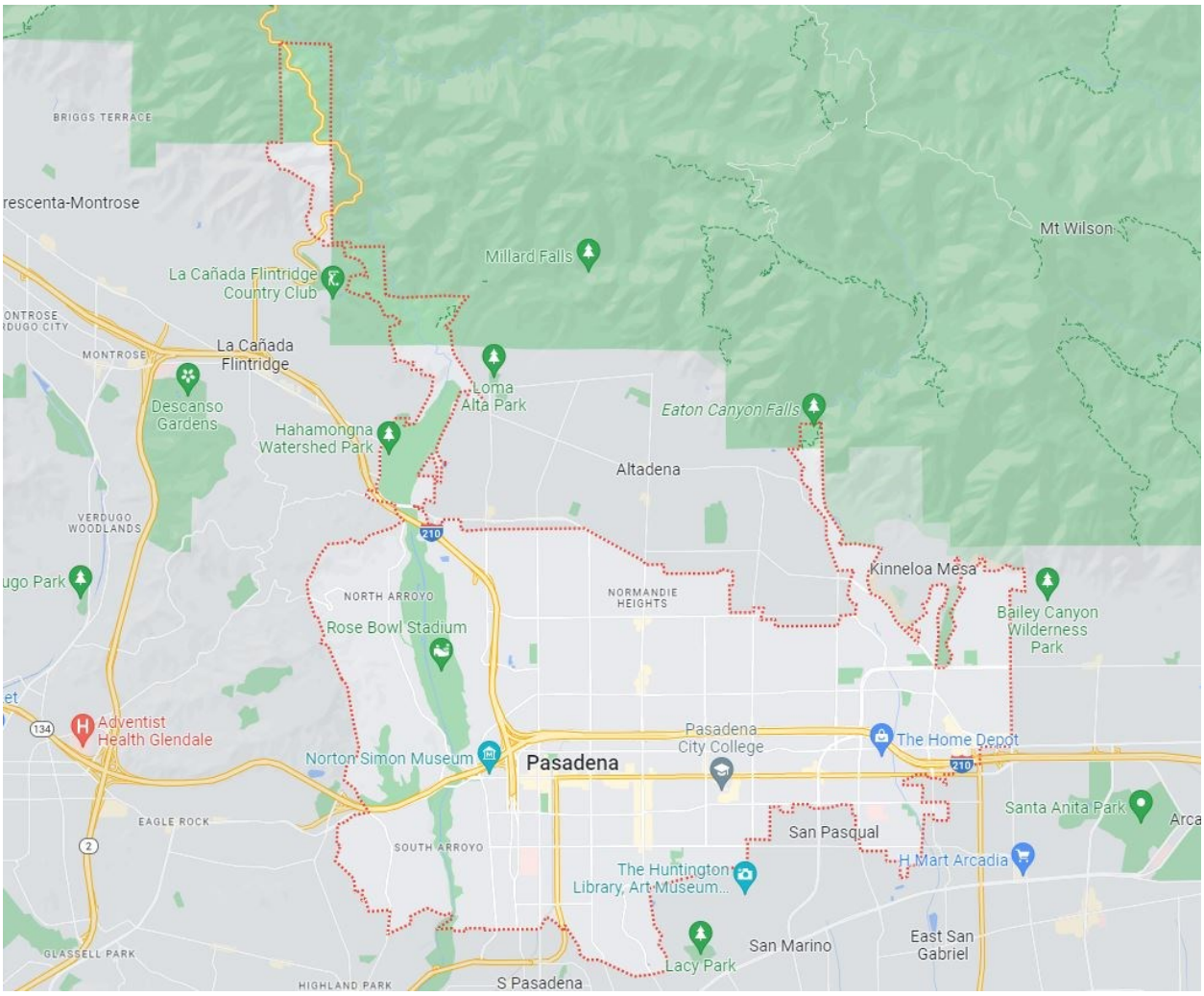
Background

The City of Pasadena Water and Power Department, also referred to as Pasadena Water and Power ("PWP"), is pleased to provide descriptions of the demand forecast methods, models, and data used to develop its peak demand, total system load, and retail sales forecast.

Demand Forecast Methods and Models Area

The demand forecast was developed for its service territory of the City of Pasadena, California. The City of Pasadena is located in Los Angeles County, California.

Figure 1: Map of Pasadena



Customer Class Definitions for Demand Forecast

PWP provides electricity to more than 65,000 customers. The demand forecast references four customer class types including residential, commercial/industrial, City accounts and other. The customer classes are segmented into the categories listed on Table 1: Pasadena Water and Power Customer Type and Rate

Classifications, as defined by the City of Pasadena Municipal Code, per Chapter 13.04 – Power Rates and Regulations.

Table 1: Pasadena Water and Power Customer Type and Rate Classification

Customer Type	Description	Per Municipal Code
Residential	Single family and multi-family residential dwellings	- Single Family applies to separately metered single-family dwellings and to individual family accommodations. - Multi-Family applies to separately metered multi-family dwellings, including properties permitted as "live-work" space when used for residential purposes, and to individual family dwellings in multi-family dwellings. Multi-family dwellings are apartments, condominiums, or town houses with at least four meters at the same physical location.
Commercial/Industrial	Small commercial, medium commercial – secondary and primary, large commercial – secondary and primary, hospitals, institutions, non-profits, etc.	- Small Commercial applies to single-phase and 3-phase general service, including lighting and incidental small power, through a single meter. Applies to service below 30 kW demand. - Medium Commercial – Secondary applies to 3-phase general service, including power and lighting, measured with demand meter. Applies to service at 30 kW demand or greater, but less than 300 kW demand. Any customer served under this schedule whose monthly maximum demand has registered less than 30 kW or greater than 300 kW for twelve consecutive months is no longer eligible for service under this Schedule M-1 and must take service under another applicable rate schedule. This schedule is subject to meter availability. Applies to services metered and delivered at voltages less than 17 kV. - Medium Commercial – Primary applies to 3-phase general service, including power and lighting, measured with demand meter. Applies to service at 30 kW demand or greater, but less than 300 kW demand. Any customer served under this schedule whose monthly maximum demand has registered less than 30 kW or greater than 300 kW for twelve consecutive months is no longer eligible for service under this Schedule M-2 and must take service under another applicable rate schedule. This schedule is subject to meter availability. Applies to services metered and delivered at voltages equal to or greater than 17 kV. - Large Commercial – Secondary applies to 3-phase general service, including power and lighting, measured with demand meter. Applies to service at 300 kW demand or greater. Any customer served under this schedule whose monthly maximum demand has registered less than 300 kW for twelve consecutive months is no longer eligible for service under this Schedule L-1 and must take service under another applicable rate schedule. This schedule is subject to meter availability. Applies to services metered and delivered at voltages less than 17 kV. - Large Commercial – Primary applies to 3-phase general service, including power and lighting, measured with demand meter. Applies to service at 300 kW demand or greater. Any customer served under this schedule whose monthly maximum demand has registered less than 300 kW for twelve consecutive months is no longer eligible for service under this Schedule L-1 and must take service under another applicable rate schedule. This schedule is subject to meter availability. Applies to services metered and delivered at voltages equal to or greater than 17 kV.
City Accounts	All City accounts, including, but not limited to, parking garages (includes transportation electrification charging and garage lighting), streetlights, department building energy usage, libraries, etc.	- Applies to outdoor street, highway and area lights and traffic signals, whether publicly or privately owned, where the poles, electrolier standards and lighting equipment are owned by the customer. For such lights as are burned from 30 minutes after sunset to 30 minutes before sunrise, 4140 hours of service per year will be used for cost calculation purpose.
Misc./Other	Adjustments made (overall) by PWP Finance, to account for unbilled customers. The Other Customers are customers that are not described above. No data is available in the Municipal Code	

Method for Forecasting Electricity Demand Components

A load forecast is the starting point in determining total energy, renewable energy, clean energy, and capacity requirements and aims to predict energy consumption and peak load demand. The load forecasting process takes into consideration historical factors of demand, such as weather and economic variables, as well as adjustments for customer changes, energy efficiency, demand-side management ("DSM"), and electric vehicle usage.

PWP has leveraged the California Energy Demand Forecast ("CED") that is a part of the California Energy Commission's Integrated Energy Policy Report ("IEPR") process for its forecast. The CED is an hourly forecast of electricity demand. PWP derived its load forecast from the CED Update 2022-2035 that is part of the 2022 Integrated Energy Policy Report Update.

The 2022 CED updated economic, demographic, and rate data from 2021 the CED, and refreshed the IEPR's methods for scenario design and modeling the growth of transportation electrification. The CED has hourly forecasts of electricity demand for four different entities: the three investor-owned utilities (Pacific Gas and Electric Company ("PG&E"), Southern California Edison ("SCE"), and San Diego Gas & Electric ("SDG&E") and the California Independent System Operator ("CAISO"). PWP is included in the CED as part of SCE's forecast. Therefore, as an initial forecast, PWP calculated its load as a proportional percentage of SCE's load in 2021 for its hourly CED forecast through 2035.

PWP's service territory does not mirror the load growth behavior of the larger SCE service territory. Adjustments were necessary to accurately reflect PWP's load and load growth expectations for the future due to the unique characteristics of PWP's service area. The forecast made modifications to the following:

- Additional Achievable Energy Efficiency ("AAEE")
- Additional Achievable Fuel Substitution ("AAFS")
- Distributed storage
- Distributed solar
- Time of use (TOU) rates
- Vehicle electrification
- Climate change

The impacts on the overall load forecast are summarized below:

Additional Achievable Energy Efficiency ("AAEE")

PWP has a variety of programs and services to help their customers save energy and water and programs to keep bills manageable. PWP's building code incorporates the California Green Building Standards Code (CALGreen). The City of Pasadena's building code is a "reach code" which goes beyond the state minimum requirements set forth in Title 24 and contains specific regulations for energy efficiency and water conservation.

In 2021, PWP participated in and funded the California Municipal Utilities Association (CMUA) study by GDS Associates, Inc. to study how much energy efficiency PWP could cost-effectively support in its territory. This study became the foundation for PWP's energy efficiency goals that were later adopted by

Pasadena's City Council in May 2021. PWP's energy efficiency goal is to achieve 11,720 MWh per year in savings and 1.8 MW per year in demand reduction for Fiscal Years 2022 through 2031. For the load forecast, AAEE is likely to occur, but may not materialize based on customer behavior.

Additional Achievable Fuel Substitution ("AAFS")

Additional Achievable Fuel Substitution ("AAFS") estimates the impacts of building electrification and fuel substitution on electricity demand. Fuel substitution refers to the replacement of fossil or renewable gas with electricity. PWP incorporated the load forecast allocation of AAFS from the CED with no adjustments. AAFS estimated a 2% increase of CAISO metered load in the forecast.

Distributed Storage

In January 2025, PWP had 1.34 MW of distributed storage. The CED suggested 0.5 MW across the residential and non-residential sectors for PWP in 2023. To calibrate the starting point, PWP's existing penetration was added to the IEPR forecast.

It is likely that distributed storage will be paired with distributed solar in the future. PWP estimated storage adoption given its anticipated solar penetration, and then applied the rate of change embedded in the resulting penetration to its starting point. Overall, this method generated a larger distributed storage capacity than what the CED method estimated and produced an estimate more in line with PWP's expectations.

Distributed Solar

In January 2025, PWP had 29.98 MW of distributed solar. Assuming an average installation of 7 kW per residential rooftop and 58,720 residential customers, that equates to approximately 7% of PWP's households with solar. The CED attributed 52 MW of solar to PWP in 2023, which equates to 12% of PWP households with solar. PWP serves a dense urban area and is more space-constrained than SCE. PWP's load forecast projects that PWP will be at approximately 12% of households with solar by 2030.

Time of Use ("TOU") Rates

TOU Rates impact the CED load forecast. Advanced metering infrastructure ("AMI") is needed for TOU rates. As of 2025, PWP does not have AMI. PWP currently projects that AMI will be online and at full capacity by 2030. Therefore, PWP's forecast only included TOU impact in 2030 and beyond.

TOU rate will also be critical to support any significant expansion of distributed solar and storage resources.

Vehicle Electrification

PWP applied the 2027 CED EV forecast to Pasadena to reflect Pasadena's higher EV adoption. As of 2024, PWP had 10,920 electric-based vehicles registered across the eight zip codes and accounts for approximately 9.7% of all vehicles within its service territory. Assuming 3.18 MWh per vehicle per year (based on PWP's 2023 IRP assumptions), PWP's EV load is estimated to be higher than the CED forecast. Approximately 36% of light-duty vehicles in PWP's territory are expected to be electric in 2030 and 65% by 2045. No adjustments were made to the CED's medium/heavy-duty EV forecast. Overall, EV charging is projected to be at 14% and 28% of metered energy in 2030 and 2045, respectively.

Climate Change

Climate change could increase the overall load expectations. The CED forecast included potential load impacts associated with climate change. The CED looked at 30 years of history, emphasizing and attributing more importance to more recent years. Per the IEPR, baseline peak and energy forecasts were weather-normalized, and future years were adjusted for climate change. The effect of climate change is about 0.3% of annual metered energy.