

DOCKETED	
Docket Number:	18-IRP-01
Project Title:	Integrated Resource Plan
TN #:	266465
Document Title:	Review of City of Palo Alto Utilities' 2023 Integrated Resource Plan
Description:	N/A
Filer:	Mikayla Roberts
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	10/10/2025 2:33:07 PM
Docketed Date:	10/10/2025



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California Energy Commission

STAFF REPORT

Review of City of Palo Alto Utilities' 2023 Integrated Resource Plan

October 2025 | CEC-200-2025-028

California Energy Commission

Bryan Neff

Primary Author

Elise Ersoy

Program and Project Supervisor

RELIABILITY & EMERGENCY UNIT

Liz Gill

Branch Manager

RELIABILITY ANALYSIS BRANCH

David Erne

Deputy Director

ENERGY ASSESSMENTS DIVISION

Aleecia Gutierrez

Director

ENERGY ASSESSMENTS DIVISION

Drew Bohan

Executive Director

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ACKNOWLEDGEMENTS

The California Energy Commission appreciate the contributions from the following staff:

California Energy Commission

Brian McCollough

Usman Muhammad

Cynthia Rogers

Brian Samuelson

Charles Smith

ABSTRACT

Senate Bill 350 (De León, Chapter 547, Statutes of 2015), established Public Utilities Code Section 9622, which requires the California Energy Commission to review the integrated resource plans of identified publicly owned utilities to ensure they meet various requirements specified in the law, including greenhouse gas emission reduction targets and renewable energy procurement requirements.

Integrated resource plans are long-term planning documents that outline how publicly owned utilities will meet demand reliably and cost effectively while achieving state policy goals and mandates. The City of Palo Alto Utilities submitted its *2023 Integrated Resource Plan* and supplemental information for review on April 30, 2024. The City of Palo Alto Utilities Integrated Resource Plan filing includes detailed technical analysis performed in partnership with a consultant and was developed with input from a public stakeholder process. This staff paper presents the results of the California Energy Commission staff review of the *City of Palo Alto Utilities' 2023 Integrated Resource Plan*.

Keywords: Publicly owned utility, integrated resource plan, City of Palo Alto Utilities, CPAU, demand, resources, portfolio, generation, transmission, distribution, Renewables Portfolio Standard, forecast, energy efficiency, transportation electrification, demand response, greenhouse gas, GHG, emissions, system reliability

Please use the following citation for this report:

Neff, Bryan. 2025. *Review of City of Palo Alto's 2023 Integrated Resource Plan*. California Energy Commission. Publication Number: CEC-200-2025-028.

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EXECUTIVE SUMMARY

Senate Bill 350 (De León, Chapter 547, Statutes of 2015) requires publicly owned utilities with an annual electrical demand exceeding 700 gigawatt-hours to adopt an integrated resource plan. Those plans must meet certain requirements, targets, and goals, including greenhouse gas emission reduction targets and renewable energy procurement requirements identified in Public Utilities Code (PUC) Section 9621. The California Energy Commission's *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines* require the utilities to file an integrated resource plan with data and supporting information sufficient to demonstrate that they meet these requirements and the targets and planning goals from 2018 to 2030. Under PUC Section 9622, the California Energy Commission must review the integrated resource plans for consistency with the requirements of PUC Section 9621.

The City of Palo Alto Utilities prepared and submitted its *2023 Integrated Resource Plan* to align with California's clean energy goals set by Senate Bill 100 (De León, Chapter 312, Statutes of 2018) and Senate Bill 1020 (Laird, Chapter 361, Statutes of 2022). The *2023 Integrated Resource Plan* documents the City of Palo Alto Utilities' planning analysis, modeling efforts, and resulting strategic plan for meeting the requirements of PUC Section 9621.

The City of Palo Alto Utilities' Integrated Resource Plan discusses the changing utility goals and regulatory environment. The utility presents its analyses and underlying assumptions used in developing a resource plan that reliably and affordably meets its customers' energy needs through 2030.

In reviewing the *City of Palo Alto Utilities' 2023 Integrated Resource Plan* and determining consistency with the requirements of PUC Section 9621, California Energy Commission staff relied on the four standardized reporting tables and narrative descriptions in the integrated resource plan filing, as well as analysis and verification of the materials submitted. Staff presents the following conclusions in accordance with the requirements:

- *Achieving Greenhouse Gas Emissions Targets and Renewables Portfolio Standard Requirements:* The utility plans to meet the greenhouse gas emission reduction requirements of PUC Section 9621(b)(1) and the renewable energy procurement requirement of PUC Section 9621(b)(2). The City of Palo Alto Utilities has no emitting resources, and all of its attributable greenhouse gas emissions come from short-term and spot market purchases. Despite its large hydroelectric resources not counting toward the Renewables Portfolio Standard Requirements, the City of Palo Alto Utilities has sufficient renewable contracts to meet the 2030 target of 60 percent.
- *Meeting Planning Goals:* The utility intends to meet planning goals related to retail rates, reliability, transmission and distribution systems, as set forth in PUC Section 9621(b)(3). Costs are projected to increase through 2045, primarily due to transmission and distribution system upgrade costs, increasing environmental regulations, and renewable integration costs. Retail energy sales are also projected to increase through 2045 due to building and transportation electrification, with increases in energy

efficiency and behind-the-meter solar installations anticipated to temper the increase. The utility is planning annual 5 percent rate increases between 2025 and 2028.

- *Considering Peak Needs:* The utility has considered the role of existing renewable generation, grid operational efficiencies, energy storage, and distributed resources (including energy efficiency) in helping ensure the utility's energy and reliability needs in the hours that encompass the peak hour as set forth in PUC Section 9621(c). The City of Palo Alto Utilities has sufficient capacity to meet its peak demand through 2030 with the addition of geothermal and solar resources.
- *Addressing Resource Procurement Types:* The utility addressed the procurement requirements for energy efficiency and demand response, energy storage, transportation electrification, portfolio diversification, and resource adequacy as set forth in PUC Section 9621(d). The City of Palo Alto Utilities has a suite of energy efficiency programs and anticipates some load growth from transportation and building electrification. The utility's infrastructure investments support these electrification efforts. The utility also retains its hydroelectric resources while adding geothermal and additional solar to its resource portfolio.

CHAPTER 1:

Demand Forecast and Procurement

Introduction

Senate Bill 350 (De León, Chapter 547, Statutes of 2015) requires publicly owned utilities (POU) with an annual electrical demand exceeding 700-gigawatt-hours (GWh) to develop integrated resource plans (IRPs).¹ IRPs are electricity system planning documents that describe how utilities plan to meet their energy and capacity resource needs while achieving policy goals and mandates, meeting physical and operational constraints, and fulfilling other priorities such as reducing impacts on customer rates. SB 350 requires the governing board of a POU to adopt an IRP and a process for updating it at least once every five years starting no later than January 1, 2019.²

Public Utilities Code (PUC) Section 9622 requires the California Energy Commission (CEC) to review POU IRPs to ensure they achieve PUC Section 9621 provisions.³ If the CEC determines an IRP is inconsistent with the requirements of PUC Section 9621, the CEC shall provide recommendations to correct the deficiencies. The CEC adopted the *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines (Guidelines)* to govern the submission and review of the POU's IRPs.⁴

This chapter outlines the CEC's review process and provides an overview of the City of Palo Alto Utilities (CPAU) and its IRP development process. In addition, the chapter addresses the *Guidelines* requirements that POU's provide a demand forecast and a procurement plan as part of its IRP. In compliance with SB 350, CPAU filed its initial IRP with the CEC in 2019, which was found consistent with SB 350 and the requirements of PUC Section 9621.

City of Palo Alto Utilities

The City of Palo Alto Utilities began in 1896 when it started supplying water for the City of Palo Alto. It has since expanded its ownership and operation of services to include wastewater, electric power, natural gas, and fiber optic. Its 26 square mile service territory in the South Bay Area serves a population of roughly 66,000, with 26,220 residential, 3,640 commercial, and 142 city electric customers. In 2023, CPAU had peak load of 178 megawatts (MW) and

1 PUC Section 9621.

2 PUC Article 16 (commencing with Section 399.11) of Chapter 2.3 of Part 1 of Division 1.

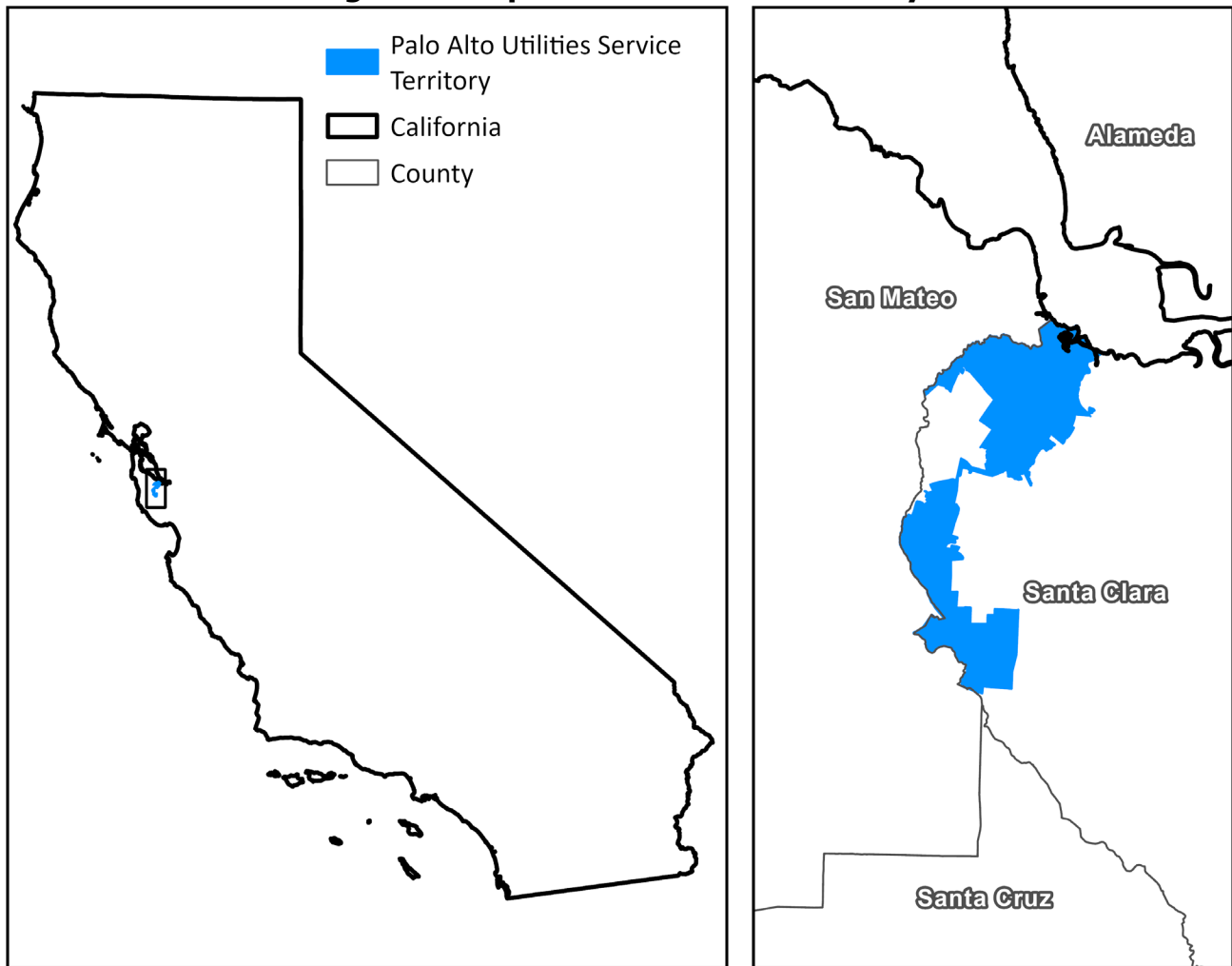
3 PUC Section 9622.

4 [Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines](https://www.energy.ca.gov/publications/2022/publicly-owned-utility-integrated-resource-plan-submission-and-review-guidelines),

<https://www.energy.ca.gov/publications/2022/publicly-owned-utility-integrated-resource-plan-submission-and-review-guidelines>.

provided roughly 853 gigawatt-hours (GWh) of energy. A map of CPAU's service territory is shown in **Figure 1**.

Figure 1: Map of CPAU Service Territory



Source: CEC

Since 2013, CPAU has provided 100 percent carbon neutral electricity, meaning it matches electricity demand with carbon free resources on an annual basis while accounting for the emissions associated with purchases and sales of grid electricity every hour of the year. CPAU depends on hydroelectric resources for the majority of its power through a combination of its contract with the Western Area Power Authority and its own hydro facility, Calaveras hydroelectric project. CPAU also contracts with solar, wind, and landfill gas resources to meet its needs. CPAU operates within the Northern California Power Agency's (NCPA) Metered Subsystem Aggregation Agreement with the California Independent System Operator (California ISO), which allows NCPA to balance CPAU's loads and resources as well as provide access to system resources and markets.

CPAU Planning Process

CPAU's 2023 IRP is a continuation of its long-term power planning, a process previously performed under its Long-term Electric Acquisition Plan in 2012 followed by its 2018 IRP. These efforts are guided by a set of objectives and strategies approved by the Palo Alto City Council. The current objectives and strategies place greater emphasis on managing uncertainty related to resource availability and costs, regulatory uncertainty, and the increased penetration of distributed energy resources (DERs), electric vehicles (EVs), and building electrification.

CPAU used economic analyses to assess various scenarios and sensitivities to arrive at its optimal resource plan. This resource planning process was performed in six steps:

1. Examine planning framework and risks
2. Assess needs
3. Consider resource options
4. Develop potential resource portfolios
5. Perform scenario and risk analysis
6. Identify a preferred plan

Energy and Peak Demand Forecast, Method, and Assumptions

The *Guidelines* (Chapter 2.E.1) identify the need for a forecast of energy and peak demand to determine whether a POU's IRP is consistent with the requirements of PUC Section 9621.⁵ The *Guidelines* also state that the POU must provide information on the method used in developing the demand forecast if a POU uses a forecast other than the CEC's adopted demand forecast.⁶ The demand forecast and supporting information provided present an adequate representation of future energy and peak demand that meets the *Guidelines* requirements.

CPAU staff based its electricity demand forecast off long-term demand trends while incorporating the projected changes of industrial businesses leaving Palo Alto, data center growth, building efficiency improvements, additional customer-sited solar, additional electric vehicles (EVs), and customers switching from natural gas to electric appliances. These variables were modeled individually using econometric forecasts, the components of which were broken into their linear and nonlinear parts. The linear part captures historical trends while the nonlinear part captures staff's anticipated future load growth that exceeds historical growth and would not be adequately captured in a linear regression analysis. A linear regression was used to combine the linear components of the variables into a single trend. Staff then added the nonlinear components to the future load growth.

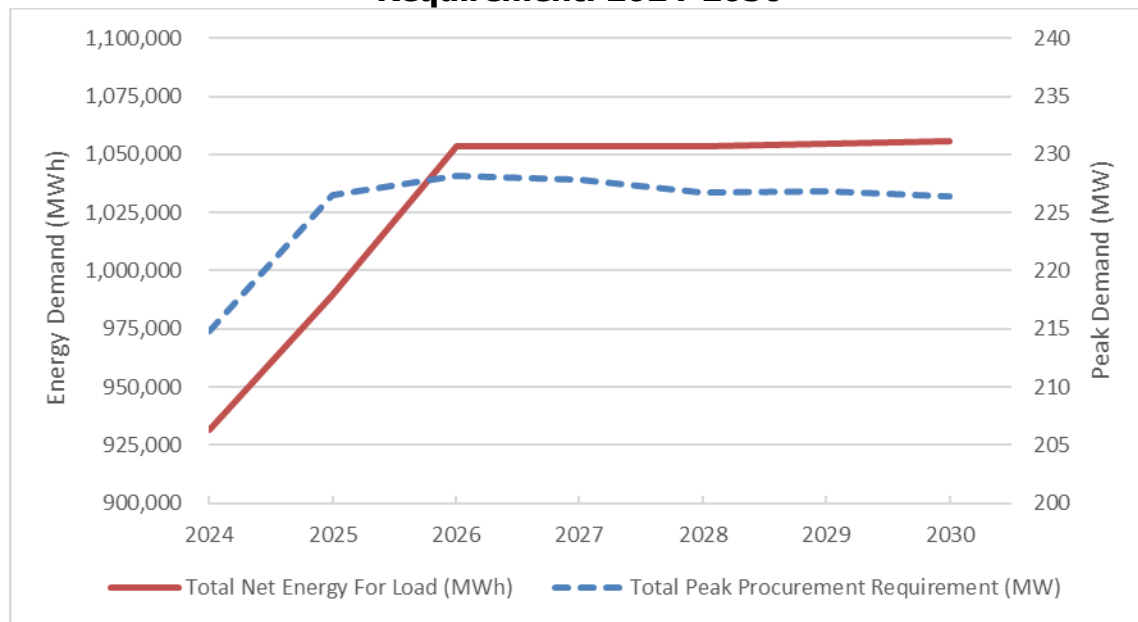
5 POU IRP Guidelines, Chapter 2, E., pgs. 5–6.

6 The most recently adopted demand forecast is for the California Energy Demand Forecast 2023–2040.

CPAU's peak demand forecast also used an econometric model that maps a set of calendar variables, weather variables, and the energy forecast onto CPAU's monthly peak demand. The weather driver is the daily heating and cooling degree days that correspond to the peak day of the month. Staff used dummy variables in the model to capture the underlying changes to customer's electricity consumption. Staff added monthly historical energy usage as a final variable.

CPAU's net energy for load increased post-pandemic and is expected to fully rebound by 2026 at roughly 1,053 gigawatt-hours. Electric load is forecast to increase only a few gigawatt-hours by 2030, with long-term declines in energy efficiency and behind-the-meter solar offset by load growth due to building electrification, vehicle electrification, and potential new data centers. CPAU's peak demand is also expected to fully rebound by 2026, peaking at 228 megawatts (MW). This decreases slightly over the forecast to 226 MW in 2030. CPAU's total net energy for load and total peak procurement requirement are shown in **Figure 2**.

Figure 2: CPAU's Total Net Energy for Load and Total Peak Procurement Requirement: 2024-2030



Source: CEC staff analysis of CPAU Standard Tables

CPAU's monthly energy demand is relatively flat in 2025, with February being the month with the highest amount of consumption, followed by August, while April has the lowest. While monthly energy demand is estimated to increase by 2035, this monthly ranking order does not change. This energy demand profile has implications for resource procurement and utility operation, which are discussed further in the Procurement Strategy section.

CPAU's energy forecast starts higher than the CEC's energy demand forecast, increasing to 17 percent higher in 2026, before ending 4.5 percent lower than the CEC's energy demand forecast in 2030. CPAU's peak demand follows a similar trend, starting higher than the CEC's peak demand forecast, increasing to 19 percent higher in 2025, before decreasing and ending 7 percent lower than the CEC's peak demand forecast in 2030. These differences are caused

by the large increase in CPAU's near-term forecast followed by a leveling off in both energy and peak demand increases, while the CEC forecast projects a more gradual and steady increase in energy and peak demand through 2030.

CPAU's forecast includes variables such as energy efficiency, rooftop solar, EV adoption, and building electrification. Based on staff's review, CPAU's energy and peak demand forecast appears suitable for long-term planning.

Resource Procurement Plan

The *Guidelines* require that POU's report the mix of resources they plan to use to meet demand through 2030.⁷ POU's are also required to provide an IRP with data and supporting information sufficient to demonstrate that the POU's plan to meet the various targets and goals. Staff has determined that CPAU's IRP filing meets these requirements. The following is a discussion of the utility's existing resources, procurement strategy, the portfolio analysis underlying resource selections, and the resources in 2030 identified in the standardized reporting tables.

Existing Resources

As of 2024, CPAU's resource portfolio is comprised of net-zero emission resources including large hydroelectric, solar, landfill gas, and wind.

Large hydro makes up the largest portion, meeting 47 percent of CPAU's energy demand. Roughly one-third of this energy comes from CPAU's shared ownership of Calaveras hydroelectric project, and the other two-thirds from its Western Area Power Authority (WAPA) Base Resource contract. CPAU's share of Calaveras hydroelectric project is 22.92 percent and serves about 10 percent of the city's annual load. The FERC license for the facility expires in 2032 and efforts are already underway to apply for relicensing. No immediate decisions need to be made about this facility. The WAPA contract expired in 2024, and the City of Palo Alto acted on this contract as a result of this IRP process, which is discussed further in the Procurement Strategy section.

Six solar contracts make up the second largest energy supply at 39 percent. The first of these contracts was signed in 2012 and all are at least 25 years in length. Three of the contracts are with AES: the 26.7 MW Hayworth Solar project located in Bakersfield, the 20 MW Western Antelope Blue Sky Ranch B project, and the 40 MW Elevation Solar C project – both located in Lancaster. Two of the contracts are with Boralex: the 20 MW EE Kettleman Land project in Kettleman City, and the 20 MW Frontier Solar project located in Newman. One contract is with Clearway Energy, the 26 MW Golden Fields Solar III project in Rosamond. The first of these contracts expires in 2040. In addition, roughly 1 percent of solar energy comes from CPAU's

7 POU IRP Guidelines, Chapter 2.F., pg. 6.

CLEAN (Clean Local Accessible Energy Available Now) program, a feed-in tariff for local renewable generation systems located in CPAU's territory.

CPAU has five landfill gas contracts that supply about 10 percent of total electricity needs. This includes a 1.5 MW share of a project located in Watsonville, a 5.1 MW share of a project located in Half Moon Bay, a 1.9 MW share of a project located in Pittsburg, and the entire output of a 1.4 MW project located in Gonzales, and a 4.1 MW project located in Linden. Each of these contracts are 20 years in length with expiration dates between 2025 and 2034. These contracts are not renewed in CPAU's preferred plan and allowed to expire.

CPAU's sole wind contract is with Avangrid Renewables for a 20 MW share of the output of the High Winds I project located in Solano County. This provides about 4 percent of the electricity supply.

The high dependence of hydro resources means that supply varies annually. CPAU uses the spot market to balance its under- or over-supply, being energy long (having more energy contracted than modeled demand) in 2025, and short (having less energy contracted than modeled demand) in 2026 through 2030. These positions vary less than 10 percent, except for 2029, which is 14 percent short.

Resource Portfolio Evaluation

CPAU staff worked with a consultant, Ascend Analytics (Ascend), to perform the modeling required to develop a resource portfolio. CPAU relied on PowerSIMM, a capacity expansion and production cost model developed by Ascend. Setting the model up involved gathering historical generation data, resource specifications, cost projections, and other relevant inputs and feeding them into the model. CPAU staff and Ascend worked together to develop assumptions around the long-term generation levels and costs for its existing portfolio of resources. Ascend provided a forecast of long-term capital and operating costs for various new resource options.

CPAU staff evaluated potential resource additions by comparing their relative merits based on net value cost, portfolio fit, geographic and resource diversity, contract flexibility, and cost certainty. CPAU staff then ran a set of economic dispatch studies to select resource additions based on minimizing the cost of procuring and operating new and existing resources while also satisfying all the IRP objectives. CPAU staff tested this portfolio of new and existing resources using a dispatch study, which used a stochastic framework of hourly intervals to validate the portfolio's viability. After many iterations of running the model, CPAU staff arrived at CPAU's base case.

CPAU staff analyzed three additional scenarios as sensitivity analyses to understand the overall cost and cost uncertainty of the selected supply resources. These scenarios included reduced hydro output, a dry year with high prices, and a wet year with low prices. The dry year and wet year scenarios selected the same new capacity additions as in the base case, meaning that the changes to hydro output were not sufficient to alter the model's resource selection. The model bought and sold more energy and capacity in the short-term market instead. In the reduced hydro output scenario, the model resulted in significantly different procurement decisions, including earlier battery energy storage system (BESS) procurement and wind

additions. The reduced hydro output scenario is significantly more costly than the base case but is more valuable in dry and wet years than the base case. These conclusions are helping focus CPAU's continued study of the value of its WAPA contract, market restructuring to deal with issues related to variable renewable resource integration, and seasonal discrepancies between demand and energy supply. CPAU ultimately chose the base case as its recommended plan.

Procurement Strategy

CPAU evaluated the need for additional resource procurement during the IRP planning period by comparing its load forecast with its resource supply projections (on both a monthly and an annual basis) in terms of energy, RPS supplies, and capacity. Although CPAU projects having surplus energy through 2025, the projected load growth is expected to result in energy deficits beginning in 2029, with these deficits growing over time as existing contracts expire.

Despite hydro resources being the largest share of CPAU's portfolio, the modeling results favored re-contracting with WAPA, and more active participation in energy and capacity markets. CPAU recommended renewing this contract and the City of Palo Alto executed a new 30-year extension of the WAPA hydroelectric contract. In addition, a new geothermal contract for 10 MW of capacity, coming online in 2025 and 2026, was executed prior to the IRP's completion.

The modeling results include new solar capacity starting in 2030, and new storage capacity starting in 2041. Solar additions of 25 MW occur in each of 2030, 2031, 2036, 2041, 2043, and 2045, with 50 MW additions in 2037 and 2042. BESS additions are all 25 MW in capacity but vary in duration. A 4-hour BESS is added in 2041, a 10-hour BESS is added in 2043, and an 8-hour BESS is added in 2045. Small energy deficits exist in a few of the years between the resource additions, which would be covered using short-term market purchases. Over the IRP planning period, 98 percent of the energy supplied is from contracted resources.

CPAU's recommended plan would yield significant energy surpluses in the spring and summer months, followed by significant energy deficits in the fall and winter months. CPAU would sell and buy power in the energy market as appropriate to resolve these energy imbalances. To assist in its purchase and sale of power, CPAU has nine active master agreements (with BP Energy, Shell Energy North America, Powerex Corp, Cargill Power Markets, Exelon Generation, Avangrid Renewables, NextEra Energy Marketing, Turlock Irrigation District, and PacifiCorp). CPAU's recommended plan includes sufficient system capacity throughout the planning period and it does not rely on short-term resource adequacy purchases.

CPAU provides the caveat that the actual contracted resources will depend heavily on the responses received in future resource procurement requests. Changing market conditions, the specific characteristics and quality of individual offers, and changing regulatory requirements all add uncertainty to the selection of future resources.

CHAPTER 2:

Review for Consistency with PUC Section 9621 Requirements

This chapter summarizes the main elements of CPAU’s 2023 IRP and provides staff’s findings regarding the consistency of the IRP filing with PUC Section 9621 requirements, as well as the *Guidelines*. These findings include whether the utility meets GHG emission reduction targets and RPS energy procurement requirements, as well as planning goals for retail rates, reliability, transmission and distribution systems, net load, and disadvantaged communities. In addition, the IRP must address procurement of EE and demand response, energy storage, transportation electrification and portfolio diversification.

Greenhouse Gas Emission Reduction Targets

POUs are required to meet the GHG targets established by the California Air Resources Board (CARB), in coordination with the CEC and the California Public Utilities Commission.⁸ The initial GHG targets set by CARB reflect the electricity sector’s percentage in achieving the economywide GHG emission reductions of 40 percent from 1990 levels by 2030.

The 2030 electricity sector GHG planning target range was brought into alignment with CARB’s *2022 Scoping Plan for Achieving Carbon Neutrality* (2023 CARB Update) adopted in September 2023.^{9,10} This electricity sector GHG planning target range of 30–38 million metric tons of carbon dioxide equivalent (MMTCO_{2e}), retains the lower bound of 30 MMTCO_{2e} from CARB’s *2020 Update* but reduces the upper bound from the 53 MMTCO_{2e} to 38 MMTCO_{2e}.¹¹

The 2020 planning target range for the City of Palo Alto was 52,000–92,000 metric tons of carbon dioxide equivalent (MTCO_{2e}), while the 2023 planning target range is 52,000–66,000 MTCO_{2e}. Even though the 2023 CARB Update was published after CPAU completed its 2023 IRP analysis, staff finds the *CPAU 2023 IRP* in compliance with both ranges. The GHG emissions associated with CPAU’s recommended plan are summarized in **Table 1**.

8 PUC Section 9621(b)(1).

9 [Senate Bill 350 Integrated Resource Planning Electricity Sector Greenhouse Gas Planning Targets: 2023 Update](https://ww2.arb.ca.gov/sites/default/files/2023-09/sb350-final-report-2023.pdf), <https://ww2.arb.ca.gov/sites/default/files/2023-09/sb350-final-report-2023.pdf>.

10 CARB’s *2022 Scoping Plan for Achieving Carbon Neutrality*, <https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents>.

11 CARB’s *Senate Bill 350 Integrated Resource Planning Electricity Sector Greenhouse Gas Planning Targets: 2020 Update*, <https://ww2.arb.ca.gov/sites/default/files/2021-04/sb350-final-report-2020.pdf>.

Table 1: Greenhouse Gas Emissions from CPAU's Resource Portfolio

Power Source	Fuel Type	GHG Intensity (MT CO ₂ e/MWh)	Total Emissions (MT CO ₂ e) 2024	Total Emissions (MT CO ₂ e) 2027	Total Emissions (MT CO ₂ e) 2030
Short-Term and Spot Market Purchases	System	0.428	66,400	140,000	126,400
Short-Term and Spot Market Sales	System	0.428	(91,600)	(113,200)	(81,600)
Net Short-Term and Spot Market Purchases (Sales)	System	0.428	0*	26,800	44,800
Total Portfolio Emissions	NA	NA	0*	26,800	44,800

*Negative net short-term and spot market purchases are given a zero value.

Source: CEC, Energy Assessments Division, Based on CPAU 2023 IRP filing

CEC staff reviewed the GHG emissions associated with CPAU's portfolio of resources in 2030, as identified in its IRP and standardized reporting tables. CPAU noted in its IRP narrative that CPAU staff used the mid-range value of the 2020 planning target as a planning target and modeling parameter for 2030 (72,000 MTCO₂e).

CPAU has more spot market sales than purchase in the years 2023 through 2025, yielding no net portfolio emissions in those years. CPAU's portfolio emissions are positive in subsequent years, attributable to the higher amount of short-term and spot market purchases. In 2030, the estimated amount of total portfolio emissions is 44,800 MTCO₂e. This is below CARB's low end planning target for CPAU of 52,000 MTCO₂e. Staff finds CPAU's plans to be consistent with the requirement of PUC Section 9621(b)(1).

Renewables Portfolio Standard Planning Requirements

PUC Section 9621(b)(2), as established by SB 350, requires that POU IRPs ensure procurement of at least 50 percent renewable energy resources by 2030, consistent with Article 16 (commencing with Section 399.11) of Chapter 2.3 of Part 1 of Division 1 of the PUC. In 2018, Senate Bill 100 (De León, Chapter 312, Statutes of 2018) increased the RPS requirement for 2030 from 50 to 60 percent.¹² Staff reviewed the renewable procurement table, the discussion in the IRP filing, and the renewable procurement plan submitted. Staff finds that CPAU's plans are consistent with the RPS procurement requirements and all interim compliance periods, as well as the requirements of PUC Section 9621(b)(2).

While CPAU's large hydro resources are not GHG emitting, they do not count toward the utility's RPS compliance. CPAU's contract with High Winds expires in 2028 and three of its landfill gas contracts expire prior to 2030. CPAU's renewable procurement plans of geothermal

¹² PUC Section 399.11(a).

in 2025 and solar in 2030 increase the amount of renewable energy procured, helping offset these losses. CPAU fully expects to meet the required renewable energy procurement requirement of 60 percent of retail sales in 2030.

Retail Rates

SB 350 (PUC Section 9621(b)(3)) requires POU's to develop IRPs that enhance each POU's ability to fulfill its obligation to serve its customers at just and reasonable rates, minimizing impacts to ratepayer bills, as required in PUC Section 454.52 (a)(1)(C)-(D). Staff reviewed the analysis and information CPAU presented in its IRP filing on the rate and bill impacts. Staff finds the CPAU IRP is consistent with the rates discussion, as required in PUC Section 9621(b)(3).

CPAU evaluates and implements its rates in compliance with cost-of-service requirements set forth in the California Constitution and applicable statutory law. CPAU uses a methodology developed for previous rate setting work conducted in 2016, "City of Palo Alto Electric Cost of Service and Rate Study," to create a financial plan based on assessment of the financial position of CPAU.

CPAU chose to hold off its planned rate increases through the pandemic, with no rate increases occurring during fiscal years 2021 and 2022, and only a 5 percent increase in 2023. CPAU was able to use reserves to mitigate the rate increases; however, costs continue to rise, and higher rates are needed to recover the utility's costs. Retail rates are projected to rise due to substantial additional capital investment in the electric distribution system and operational cost increases. These are largely driven by upgrades to existing metering infrastructure to advanced metering infrastructure (AMI) and modernization of the residential portion of the distribution system to accommodate increased building and transportation electrification.

To ensure adequate revenue recovery, the Palo Alto City Council recently approved a 21 percent retail base rate increase for fiscal year 2024, and 5 percent annual rate increases between fiscal years 2025 through 2028. However, the large increase in 2024 is offset by the elimination of the hydroelectric rate adjuster, which went to stabilizing the utility's hydro risk reserve fund. This cost is being incorporated into the general rate base instead. The net effect is a decrease in residential rates for fiscal year 2024, before increasing in 2025.

For residential rates, CPAU has two tiers with rates for fiscal year 2024 of \$0.17522 per kWh for tier 1, and \$0.2466 per kWh for tier 2. CPAU has also implemented a minimum rate in dollars per day to help flatten its overall rates and provide more predictable and stable revenue. This allows CPAU to maintain lower incremental rates for its customers. The residential minimum bill is \$0.41812 per day. While CPAU plans on raising rates between fiscal years 2025 and 2028 by 5 percent annually, its current rates and anticipated rate increases are similar to other POU's with low residential rates. CPAU also has a Rate Assistance Program for qualified low-income customers, which provides a 25 percent discount for electric and gas charges based on their medical or financial need.

System and Local Reliability

SB 350 requires filing POU's to adopt an IRP that ensures system and local reliability and addresses resource adequacy requirements.¹³ Staff reviewed the CPAU's IRP filing capacity reporting table and discussion and finds that CPAU has planned for sufficient resources to maintain a reliable electric system. In addition, CPAU's selected portfolio of resources contains sufficient capacity to meet anticipated resource adequacy requirements in 2030. Staff finds that the IRP is consistent with the SB 350 reliability requirements in PUC Section 9621(b)(3) and resource adequacy requirements in PUC Sections 9620 and 9621(d)(1)(E).

System Reliability

CPAU expects to continue operating within the Northern California Power Agency's (NCPA's) agreement with the California ISO.¹⁴ Long-term planning for the reliability of the bulk power system is the responsibility of the California ISO. Under NCPA's operating agreement, CPAU has access to sufficient system, local, and flexible capacity, along with resources to provide ancillary services, to meet its loads reliably. The majority of CPAU's long-term generation contracts are deemed fully deliverable and provide sufficient resource adequacy (RA) capacity to satisfy California ISO regulatory requirements, including CPAU's federal and owned hydro plants and three of its contracted landfill gas projects.

Local and Flexible Capacity Needs

Two of Palo Alto's contracted landfill gas projects are in the Bay Area local capacity area, as is its long-term wind project. CPAU also has a set of locally sited natural gas-fired back-up generators, installed in 2002. These four generators, together known as the Cooperatively Owned Back-Up Generator (COBUG), total 4.5 MW in capacity. While close to the end of their life, they are another source of local capacity in the Bay Area. In total, these resources provide an average net qualifying capacity of 14.65 MW. CPAU's owned hydro, Calaveras hydroelectric project, provides 58 MW of flexible RA capacity.

Transmission and Distribution Systems

SB 350 (PUC Section 9621(b)(3)) requires filing POU's to adopt an IRP that achieves the goal of strengthening the diversity, sustainability, and resilience of the bulk transmission and distribution systems and local communities, as further specified in PUC Section 454.52(a)(1)(G). Staff determined that the CPAU's *2023 IRP* demonstrates plans to maintain and enhance its transmission and distribution systems. Staff find that CPAU is planning for enough transmission to adequately deliver resources to its service area to meet the requirement as discussed below. Staff also find that the CPAU's *2023 IRP* demonstrates

¹³ PUC Section 9621(b)(3).

¹⁴ NCPA has a metered subsystem aggregation agreement in which NCPA balances CPAU's loads and resources to comply with the California ISO planning and operating protocols.

progress toward increasing the capacity and reliability of its distribution system. As such, staff find that the IRP is consistent with the transmission and distribution requirements set forth above.

CPAU's distribution system consists of the 115 kV to 60 kV delivery point, two 60 kV switching stations, nine distribution substations, roughly 12 miles of 60 kV sub-transmission lines, and roughly 469 miles of 12 kV and 4kV distribution lines, including 223 miles of overhead lines and 245 miles of underground lines.

CPAU's distribution system is directly interconnected with the transmission system of Pacific Gas and Electric Company (PG&E) by three 115 kilovolt (kV) lines, which have a delivery point at CPAU's Colorado substation. CPAU is pursuing an additional interconnection point with PG&E's transmission system to provide redundancy, thereby increasing local reliability.

CPAU is one of fifteen members of the California joint powers agency known as the Transmission Agency of Northern California (TANC). TANC, together with the City of Redding, WAPA, two California water districts, and PG&E, own the California-Oregon Transmission Project (COTP), a 339-mile long, 1,600 MW, 500 kV transmission power project between Southern Oregon and Central California. CPAU is entitled to 4.0 percent of TANC's share of COTP transfer capability (50 MW). This transmission capacity was of low value to CPAU, so it has been under a 15-year layoff¹⁵ to other POUs (Sacramento Municipal Utility District, Turlock Irrigation District, and Modesto Irrigation District), expiring at the beginning of 2024. Palo Alto City Council decided to enter a new layoff, this time for 10 years, with the same POUs.

CPAU conducted an assessment of its distribution system in 2018 and designed a plan for upgrades needed to support increased end use electrification. This includes distribution system upgrades for the average residential customer to support capacity demand of 6 kilovolt-amperes (kVA), up from the current 2 kVA. To support this effort, CPAU is upgrading distribution transformers and secondary conductors, 12 kV circuit ties, and substation transformers. The upgrades are expected to cost \$220 to \$306 million over the implementation period, which runs through 2030. These upgrades will modernize CPAU's distribution system, increase its system capacity, and allow for the installation of cost-effective technologies that can reduce peak load and improve reliability.

Disadvantaged Communities and Localized Air Pollutants

The City of Palo Alto does not have any areas that qualify as disadvantaged communities, but CPAU is making efforts to minimize localized air pollutants and GHG emissions with early priority on disadvantaged communities, consistent with the statutory requirements of PUC Section 454.52(a)(1)(I) established by SB 350. Staff find that CPAU has made efforts to

¹⁵ Layoff is a transfer of use during a period of idleness without transfer of ownership.

address these issues in selecting the resources to include in its portfolio consistent with the requirement.

CPAU notes that the City of Palo Alto does not have any areas that qualify as disadvantaged communities but does offer rate and financial assistance for income-qualified residents. CPAU focuses on lowering emissions overall by offering various building electrification and transportation electrification program services to both residential and nonresidential customers. By lowering consumption of gasoline and natural gas use in buildings, these programs contribute not only to achieving the City's aggressive GHG emissions reduction goal, but also reducing localized air pollutants including NO_x, SO_x, and particulate matter.

CPAU has three programs to offer financial assistance to qualified low-income residents: Residential Energy Assistance Program (REAP), Rate Assistance Program (RAP), and ProjectPLEDGE. REAP provides qualifying low-income residents with free energy and water efficiency measures such as LED lighting, heating system upgrades, weather stripping, shell insulation, high efficiency toilets, heat pump water heaters, and air source heat pump systems. This program has equal focus on efficiency and comfort, so there may not be reported energy savings for a customer project. RAP provides a 25 percent discount for electric and gas charges for income-qualified customers facing medical or financial need. ProjectPLEDGE provides a one-time contribution of up to \$750 applied to the utilities bill of qualifying residential customers for those experiencing recent employment and/or health emergency events. While administered by CPAU, this program is funded by voluntary customer contributions.

Net Energy Demand in Peak Hours

Senate Bill 338 (Skinner, Chapter 389, Statutes of 2017) requires POUs to consider existing renewable generation, grid operation efficiency, energy storage, distributed energy resources, and energy reduction measures to reduce the need for new or additional gas-fired generation and distribution and transmission resources.¹⁶ As part of its modeling process, CPAU considered resource options that included all of the technologically feasible and cost-effective options available, including what options would be best used to meet energy needs and reliability requirements during hours of net peak demand. CPAU's IRP discusses how renewable resources, grid equipment upgrades, energy storage (both in front-of and behind-the-meter), and distributed energy resources, including energy efficiency and DR, were considered for meeting energy and reliability needs during the net-peak hours. CPAU's IRP is consistent with the requirement set forth above.

Additional Procurement Goals

SB 350 (PUC Section 9621(d)(1)) requires filing POUs to address procurement of energy efficiency and DR, energy storage, transportation electrification, and a diversified portfolio,

¹⁶ PUC Section 9621(c).

which are discussed in the next section. The resource adequacy provisions of this code section are discussed in the system reliability section above.

Energy Efficiency and Demand Response Resources

CEC staff finds that CPAU's IRP is consistent with the requirement in PUC Section 9621(d)(1)(A), as it includes a discussion of energy efficiency and demand response programs it plans to implement and quantifies the amount of energy efficiency (EE) savings it plans to achieve.

CPAU does not include a forecast of additional achievable energy efficiency (AAEE) savings in its IRP as it implemented aggressive AAEE programs starting in 2016, and these savings are already included in its demand forecast. CPAU included its AAEE as part of its adopted EE goals for 2022 to 2031. CPAU's most recent 10-year EE goals update, which occurred in 2021, provided cumulative EE savings goals of 4.4 percent for between 2022 and 2031.

CPAU has a small volume of demand response capacity, which provides some system capacity. Demand response is included in CPAU's analysis of distributed energy resources, along with EE, solar PV, and storage. More robust growth in voluntary large commercial demand response is expected after CPAU finishes the installation of AMI and implementation of its advanced metering program.

CPAU has a suite of programs to support its building energy efficiency goals, including:

- Heat Pump Water Heater program: incentivizes switching from a gas water heater to a heat pump water heater by providing zero-interest on-bill financing and discounted project costs using a city contractor. CPAU also offers a \$2,300 rebate for those who choose their own contractor to do the installation.
- Home Efficiency Genie Program: provides phone consultation to customers to review their utility bills and advise on efficiency upgrade projects. For a fee, residents can receive an in-depth home efficiency assessment and home electrification readiness assessment. The home efficiency assessment includes air leakage testing, duct inspection, and insulation analysis. The home electrification readiness assessment helps homeowners determine existing home amp loads and electric main panel size that supports home electrification projects such as adding EV charger or a heat pump water heater.
- REAP: provides qualifying low-income residents with free energy and water efficiency upgrades as discussed above.
- Multifamily Residence Plus Program: provides free direct installation of energy efficiency measures for multifamily buildings (four or more units), including below-market rate apartment complexes, hospices, care centers, and rehabilitation facilities. Efficiency measures covered under this program include efficient lighting, attic insulation, refrigerator replacement, high efficiency toilets, and replacing gas furnaces with heat pump systems.
- Business Energy Advisor: free consultation and on-site assessment for commercial customers with custom recommendations for more efficient equipment, identifying electrification opportunities, and free consultation for contractor selection, equipment selection, and permitting. Electrification rebates are available for eligible products to offset

project costs. This service can help connect commercial customers to qualified contractors, identify rebates available, and explore financing options.

- Commercial and Industrial Energy Efficiency Program: provides commercial and industrial customers with a free high-level assessment of their facility's energy usage and recommendations for saving energy.

Palo Alto's local building reach code, the Green Building Ordinance, is more stringent than the state's building standards, Title 24. For the 2022 code cycle, the City of Palo Alto now requires that all new construction projects be all-electric with no gas-fired equipment or appliances.

Energy Storage

Staff finds that CPAU's IRP is consistent with the requirement in PUC Section 9621(d)(1)(B) to address procurement of energy storage as it discussed the potential role of energy storage on its system. Assembly Bill 2514 (Skinner, Chapter 469, Statutes of 2010) also requires POUs to evaluate the potential of energy storage systems as a resource and establish procurement targets, if appropriate.

The results of CPAU's modeling efforts included BESS procurement starting in 2041. As noted in the procurement strategy section, all BESS additions are 25 MW in capacity, but vary in duration, with a 4-hour BESS to be added in 2041, a 10-hour BESS to be added in 2043, and an 8-hour BESS to be added in 2045. These additions help ensure that CPAU meets its system capacity needs during those years without having to rely on short-term resource adequacy purchases.

CPAU's most recent analysis of BESS, conducted in 2020, showed that customer sited BESS are not cost effective from a societal perspective within its service territory. Therefore, CPAU does not currently offer any rebates for BESS. Some incentive is inherent in its net energy metering rate, as CPAU offers a lower buyback rate for exported power, which encourages BESS for increasing use of energy generated onsite. High demand charges for commercial customers also provide an incentive to install BESS as a potential way for customers to lower their monthly peak demand.

Transportation Electrification

Staff finds that CPAU's IRP is consistent with the requirements of PUC Section 9621(b)(4) and (d)(1)(C) as it addresses transportation electrification, projecting for light-duty EV growth. At the end of 2022, 15 percent of total registered vehicles in Palo Alto were EVs. CPAU staff projects continued EV adoption and linear growth in EV energy consumption until 2045. CPAU estimates that light duty EV electricity consumption contributed 6 MW to peak demand in 2022, increasing to 19 MW in 2030. They also estimate that energy demand for light duty EVs was 13,000 MWh in 2022, increasing to roughly 50,000 MWh in 2030.

CPAU has yet to offer EV specific rates; however, the ongoing installation of AMI will enable potential EV specific rates in the future. CPAU is currently evaluating commercial rates for DC fast charging.

CPAU supports EV adoptions by providing information on EVs and financial and technical assistance to support the installation of EV charging equipment. Qualifying customers (including schools, non-profits, and multi-family properties) can receive rebates of up to \$80,000 for installing EV charging equipment. CPAU also offers rebates for transformer upgrades in cases where the charging infrastructure requires an upgrade to the electric service capacity.

CPAU provides customers free online estimates for home EV charger installation and provides references for vetted professionals that can handle the permitting and inspection processes. CPAU also offers technical assistance for schools, non-profits, multifamily properties, and small to medium businesses through its EV Charging Technical Assistance Program. This program provides free personalized technical assistance to help navigate the process of installing EV charging infrastructure, and may include help with site assessments, engineering, design, vetting contractor bids, and project managing the installations.

Portfolio Diversification

PUC Section 9621(d)(1)(D) requires that POUs address the procurement of a diversified portfolio of resources consisting of both short-term and long-term electricity, electricity-related, and demand-response products. CPAU's IRP and CPAU's standardized tables demonstrated use of modeling and reliability analyses to balance a diverse resource portfolio including new resource procurement. The resource mix contains an array of zero-emission resources, including solar, wind, geothermal, battery storage, and large hydroelectric generation. Resource development is spread throughout the planning period and prioritizes resources that support system and local reliability. Based on staff's review, CPAU's IRP meets this portfolio diversification requirement.

ABBREVIATIONS

Acronym	Term
CARB	California Air Resources Board
California ISO	California Independent System Operator
CEC	California Energy Commission
CPAU	City of Palo Alto Utilities
EE	Energy Efficiency
EV	Electric vehicle
GHG	Greenhouse gas
GWh	Gigawatt-hours
IRP	Integrated resource plan
MMTCO ₂ e	Million metric tons of carbon dioxide equivalent
MTCO ₂ e	Metric tons of carbon dioxide equivalent
MW	Megawatt
MWh	Megawatt-hour
POU	Publicly owned utility
PPA	Power purchase agreement
PUC	Public Utilities Code
PV	Photovoltaic
SB 100	Senate Bill 100 (De León, Chapter 312, Statutes of 2018)
SB 1020	Senate Bill 1020 (Laird, Chapter 361, Statutes of 2022)
SB 350	Senate Bill 350 (De León, Chapter 547, Statutes of 2015)

APPENDIX A:

Glossary

Term	Definition
Behind-the-meter resources	Generation and storage located at the customer site. More generally, it can refer to any device located at the customer site that affects the consumption of grid-provided energy (appliance control systems, for example)
In front-of-the-meter resources	Generation and storage located on the utility side of the meter.
California Air Resources Board (CARB)	The "clean air agency" in California government. CARB's main goals include attaining and maintaining healthy air quality, protecting the public from exposure to toxic air contaminants, and providing innovative approaches for complying with air pollution rules and regulations.
California Energy Commission (CEC)	The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's seven major areas of responsibilities are: • Forecasting statewide energy demand. • Licensing of power plants and transmission lines sufficient to meet those needs. • Promoting energy conservation and efficiency measures. • Promoting the development of renewable energy. • Promoting the transition to clean transportation fuels. • Investing in energy innovation. • Planning for and supporting the state's response to energy emergencies. Funding for the Commission's activities comes from the Energy Resources Program Account, Federal Petroleum Violation Escrow Account, and other sources.
Demand forecast	A forecast of electricity demand served by the electric grid, measured by peak demand and energy consumption. Some factors that determine load forecast include economics, demographics, behind-the-meter resources, and retail rates.

Term	Definition
Demand response	Providing wholesale and retail electricity customers with the ability to choose to respond to time-based prices and other incentives by reducing or shifting electricity use, particularly during peak demand periods, so that changes in customer demand become a viable option for addressing pricing, system operations and reliability, infrastructure planning, operation and deferral, and other issues.
Distributed energy resources	Small-scale power generation technologies (typically in the range of 3 to 10,000 kilowatts) located close to where electricity is used (for example, a home or business) to provide an alternative to or an enhancement of the traditional electric power system.
Greenhouse gas (GHG)	Any gas that absorbs infra-red radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O), halogenated fluorocarbons (HCFCs), ozone (O ₃), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).
Integrated resource plan (IRP)	A plan adopted by the governing board of a POU under PUC Section 9621.
IRP filing	An IRP adopted by the filing POU's governing board that is electronically submitted to the Energy Commission, along with the standardized tables and supporting Information, by the filing POU or authorized representative.
Plug-in electric vehicle (EV)	A vehicle that uses one or more electric motors for propulsion. Electric vehicles include battery-electric and plug-in hybrid vehicles.
Public Utilities Code (PUC)	The set of laws that regulates public utilities in California, including natural gas, telecommunications, private energy producers, and municipal utility districts.
Renewables Portfolio Standard (RPS)	A regulation that requires a minimum procurement of energy from renewable resources, such as wind, solar, biomass, and geothermal.
Senate Bill 350 (De León, Chapter 547, Statutes of 2015)	Also known as the Clean Energy and Pollution Reduction Act, this bill established clean energy, clean air, and greenhouse gas reduction goals, including reducing greenhouse gas to 40 percent below 1990 levels by 2030 and to 80 percent below 1990 levels by 2050. The California Energy Commission is working with other state agencies to implement the bill.
Standardized Tables	The four tables that are required with the IRP filing submitted to the Energy Commission. These tables include information and data necessary to help staff determine if the IRP is consistent with PUC Section 9621. The four standardized tables are Capacity Resource Accounting Table (CRAT), Energy Balance Table (EBT), Renewable Procurement Table (RPT), and Greenhouse Gas Emissions Accounting Table (GEAT).
Zero-emission resources	An engine, motor, process, or other energy source, that emits no waste products that pollute the environment or disrupt the climate.