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STAFF REPORT

Review of Pasadena Water and Power 2023 Integrated Resource Plan

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Brian McCollough
Primary Author

Elise Ersoy
Program and Project Supervisor
RELIABILITY & EMERGENCY UNIT

Liz Gill
Branch Manager
RELIABILITY ANALYSIS BRANCH

Aleecia Gutierrez
Director
ENERGY ASSESSMENTS DIVISION

Drew Bohan
Executive Director

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

California Energy Commission

Usman Mohammad

Bryan Neff

Cynthia Rogers

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. Pasadena Water and Power submitted its 2023 Integrated Resource Plan and supplemental information for review on December 28, 2023. This staff paper presents the results of the Energy Commission staff review of the *Pasadena Water and Power 2023 Integrated Resource Plan.*

Keywords: Publicly owned utility, integrated resource plan, Pasadena Water and Power, PWP, demand, resources, portfolio, generation, transmission, distribution, Renewables Portfolio Standard, forecast, energy efficiency, transportation electrification, demand response, greenhouse gas, GHG, emissions, system reliability

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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.

Pasadena Water and Power prepared the 2023 Integrated Resource Plan as a strategic guidance document and action plan. This document will help develop a diverse portfolio of power supply resources that meet legal and regulatory requirements while providing reliable, affordable, and environmentally responsible electricity. Among the requirements is Pasadena City Council Resolution 9977, which directs the utility to source 100 percent of Pasadena's electricity from carbon-free resources by the end of 2030.

The resource plan follows modeling results to achieve the 100 percent clean energy goal in a flexible manner so current risks and challenges can be carefully addressed. The resource plan is designed to meet performance and reliability standards at the least possible cost while complying with requirements for greenhouse gas emission reductions, Renewables Portfolio Standard requirements, and operational and transmission constraints.

Pasadena's 2023 Integrated Resource Plan is part of a broader strategy guiding the way to achieving the city's 2030 zero-carbon goal, with reassessment of the plan at waypoints on the path to 2030. The 2023 Integrated Resource Plan uses analysis of multiple scenarios to determine the most effective path to achieving policy and reliability goals. Scenario 2, which focuses on early procurement and development of carbon free resources, was selected to guide procurement until the next assessment of the plan. Scenario 2 provides the greatest capacity additions toward the carbon-free target. Pasadena Department of Water and Power is using an incremental approach to reaching its carbon-free goal by evaluating plans at waypoints in 2026 and 2028. Using this waypoint framework, the procurement path will be reassessed in the 2028 Integrated Resource Plan process, with evaluation and reassessment of emerging technologies and changing costs.

In reviewing the *Pasadena Water and Power 2023 Integrated Resource Plan* and determining consistency with the requirements of Public Utilities Code Section 9621, CEC 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 by 2030 of Public Utilities Code Section 9621(b)(1) and the renewable energy procurement requirement of Public Utilities Code Section 9621(b)(2). The end of Pasadena Water and Power's contracts with the Intermountain Power Plant, with coal ending in 2025 and natural gas ending in 2027, will help reduce greenhouse gas emissions. Pasadena Water and Power owns, contracts with, or has plans to purchase from additional zero-carbon resources such as the Calpine Geysers and EDF Sapphire Solar and Storage to meet the GHG and RPS requirements through 2030.

- *Meeting Planning Goals:* The values reported in standardized forms along with the analysis and discussion in the integrated resource plan filing demonstrate the utility intends to meet planning goals related to retail rates, reliability, transmission, and distribution systems as set forth in Public Utilities Code Section 9621(b)(3). Pasadena Water and Power evaluated reliability, costs, and compliance through scenario modeling and production cost simulations. Pasadena is transmission constrained and plans to rely on additional distributed energy resources, storage, wind, and solar. Because of reliability requirements, Pasadena Water and Power anticipates between 100 and 200 percent increase in its resource capacity needs by 2031 with the potential for Pasadena Water and Powers's energy supply costs to double over the same time frame.
- *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). Pasadena Water and Power applied trends from historical data with consideration of distributed storage, distributed solar, energy efficiency, and other resources in the utility's service territory to develop peak and energy forecasts. The load forecast also includes additional load from energy storage and transportation electrification.
- *Addressing Resource Procurement Types:* The integrated resource plan filing 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 Pasadena Department of Water and Power's planned procurement of renewables includes a variety of resource types including solar, wind, and other renewables, including an increased share of The Geysers geothermal resource and a utility-scale hybrid solar and storage project in Riverside County.

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] Pasadena Water and Power (PWP) filed its initial IRP with the California Energy Commission (CEC) on December 20, 2018, and was deemed compliant by the CEC in April 2019.

Public Utilities Code (PUC) Section 9622 requires the CEC to review POU IRPs to ensure they achieve PUC Section 9621 provisions. If the CEC determines that 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 of the POU's IRPs.[3]

This chapter outlines the CEC's review process and provides an overview of PWP and its IRP development process. In addition, the chapter addresses the guidelines requirements that POUs provide a demand forecast and a procurement plan as part of its IRP.

Pasadena Water and Power

PWP is a municipally owned, vertically integrated electric utility that provides electricity and water to the city of Pasadena that is nine miles northeast of Los Angeles in the Los Angeles Basin as shown on Figure 1. It has about 65,000 customers, composed of roughly 57,000 residential customers and 8,000 commercial customers within a service area of 23 square miles. It has historical average electric sales of about 1000 GWh annually and peak loads of roughly 370 megawatts (MW). PWP is treated as part of the larger Southern California Edison

1 Public Utilities Code Section 9621, https://codes.findlaw.com/ca/public-utilities-code/puc-sect-9621/.

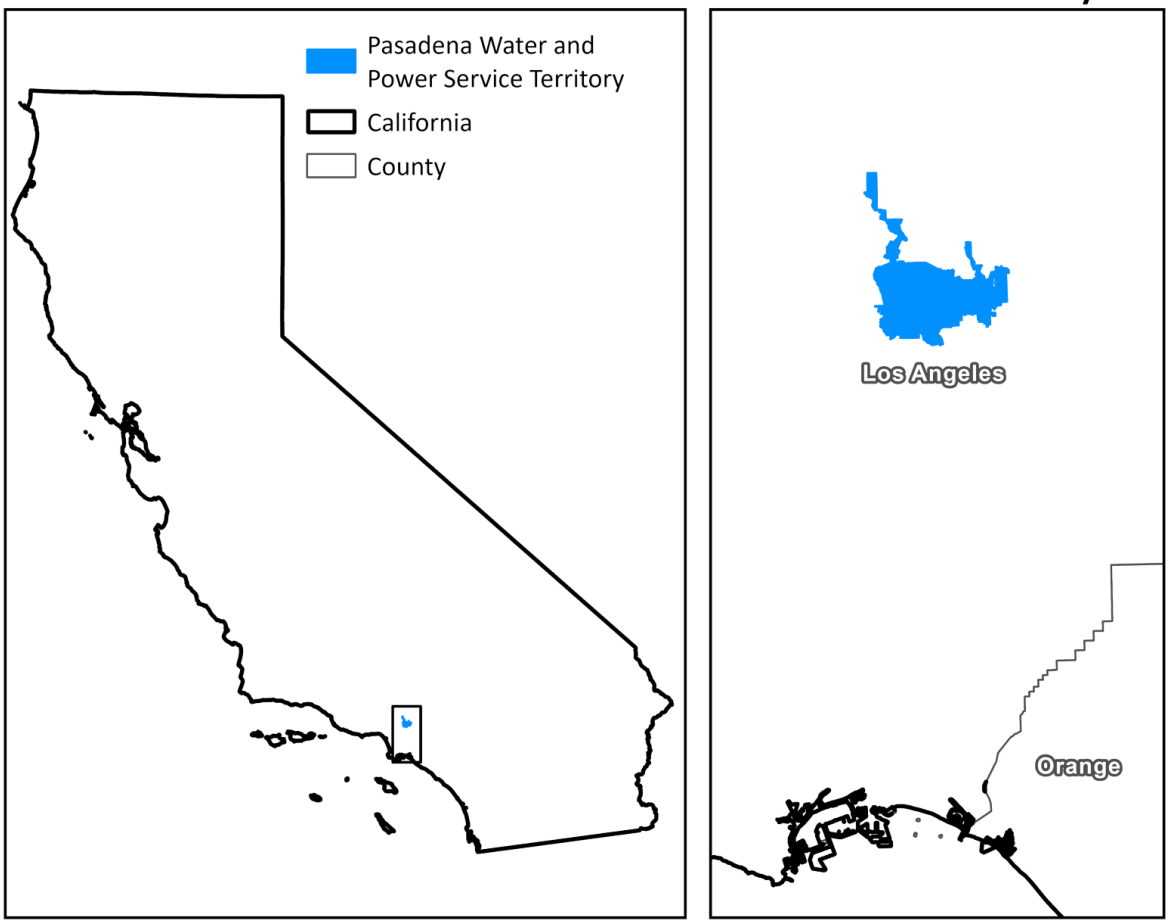
2 Public Utilities Code Article 16 (commencing with Section 399.11) of Chapter 2.3 of Part 1 of Division 1, https://law.justia.com/codes/california/code-puc/division-1/part-1/chapter-2-3/article-16/section-399-11/.

3 McCollough, Brian and Melissa Jones. August 2022. *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines*. California Energy Commission. Publication Number: CEC-200-2022-005-D, https://www.energy.ca.gov/publications/2022/publicly-owned-utility-integrated-resource-plan-submission-and-review-guidelines.

forecast area in which it resides and is transmission-constrained, interconnecting with the transmission system at the Goodrich Substation in Pasadena.

The *Pasadena Water and Power 2023 Integrated Resource Plan* (PWP 2023 IRP) includes PWP's most recent update to its renewable energy resource procurement plan, which is in accordance with the 60 percent renewable energy by 2030 target established in 2018 through Senate Bill 100 (De León, Chapter 312, Statutes of 2018).

Figure 1: Map of Pasadena Water and Power Service Territory



Source: California Energy Commission

PWP Planning Process

The PWP 2023 IRP is Pasadena's long-range blueprint for supplying reliable and environmentally responsible electricity at competitive rates. The IRP is developed through a multistakeholder process, as PWP considers stakeholder and community involvement important to the IRP development. The process for developing the PWP 2023 IRP began in 2022 with the selection of technical contractors to support PWP staff with modeling and consulting services. In January 2023, PWP began the public process of developing the IRP. To ensure community priorities were represented, 10 stakeholder advisory group meetings and three community meetings were held throughout the process, in addition to utility presentations and public involvement at city council meetings.

On January 30, 2023, the Pasadena City Council passed Resolution 9977, which declares climate change to be an emergency and sets a policy goal to obtain 100 percent of Pasadena's electricity from carbon-free sources by the end of 2030. Resolution 9977 also directs the city manager to use the 2023 IRP process to plan several approaches to achieving this goal while optimizing affordability, rate equity, stability, and reliability of electricity.

In alignment with this direction, the PWP studied six scenarios and evaluated them under different sensitivities to help identify risks, opportunities, and decision points. Each scenario builds on the existing set of owned and contracted resources guided by constraints or goals for that scenario. For example, the reference scenario examines the resources necessary to comply with existing state laws, such as achieving a 60 percent RPS by 2030 and 100 percent renewable and zero-carbon energy by 2045. Capacity expansion models and production cost models were developed and run for each scenario, generating a least-cost, best-fit resource mix for that scenario within the constraints of the assumptions. The specific scenarios are discussed below in the "Resource Portfolio" evaluation section.

The IRP modeling results and analysis prompted discussion at the October 10, 2023, meeting of the City of Pasadena's Municipal Services Committee. The committee directed the PWP to return with a waypoint framework identifying specific near-term actions and plans for ongoing assessments to achieve the carbon-free goals of Resolution 9977 by guiding future resource planning decisions. This waypoint framework has been incorporated into the PWP 2023 IRP and allows the PWP to implement resource procurement to have a clean energy portfolio by the end of 2030 while allowing for midcourse reassessment at the waypoint, the 2028 IRP. PWP highlights that proactive planning is critical to ensure ongoing safe and reliable electric service while meeting policy and environmental goals and minimizing cost impacts to ratepayers.

Energy and Peak Demand Forecast, Method, and Assumptions

The guidelines[4] 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.[4] 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.[5] The demand forecast and supporting information provided in the IRP present an adequate representation of future energy and peak demand that meets the guidelines requirements.

PWP based its IRP on the *California Energy Demand Forecast Update 2022–2035* (CED), using the update of economic, demographic and rate data, and methods for electricity demand scenario design and modeling transportation electrification. The CED does not include a level

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4 *POU IRP Guidelines*, Chapter 2, E., Pp 5-6

5 Given the timing of these POU IRP submittals the adopted forecast vintage is the 2022 CED Update. "California Energy Demand Update, 2022-2035," https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2022-integrated-energy-policy-report-update-2

of granularity sufficient to have a specific forecast for PWP, as PWP is treated as part of the larger Southern California Edison (SCE) forecast area in which it resides. Because the CED does not have a specific forecast for the PWP service territory, PWP refined its forecast using the CED planning scenario forecast for the SCE planning area as a starting point.

Although PWP is within the SCE planning area territory, PWP expects its service territory to be different than the load growth behavior of the larger SCE territory. For example, PWP considers itself a dense urban area that is more fully developed with less open space than the SCE planning area on average, resulting in lower new distributed solar estimates than the CED estimates for the SCE forecast area. PWP's forecast applied the utility's historically observed distributed solar growth rates to installed distributed solar capacity, along with other forecast modifications based on historical load experience and expectations for the future. PWP anticipates continued load growth driven by electric vehicle adoption and building electrification.

The total net energy for load forecast for PWP's preferred scenario (Scenario 2) shows a compound annual growth rate of roughly 5 percent from 2023 to 2030, reaching 1,511 GWh in 2030. This total energy demand forecast differs from the CED forecast of PWP load in 2030 of 1,152 GWh. The discrepancy in these forecasts is due to the CED forecast not aiming for serving load with 100 percent clean energy by the end of 2030. Achieving reliability requirements in PWP's preferred clean energy scenario requires more generation and storage as combustion is phased out of the system. The CED 1-in-2 Net Electricity Peak Demand forecast of 292 MW (and 320 MW for the more extreme 1-in-10 forecast) are both lower than the PWP forecast 1-in-2 peak of 351 MW. The PWP forecast is higher because of the higher amounts of storage and other requirements necessary to meet the needs of the 100 percent clean energy scenario.

Resource Procurement Plan

The guidelines require that POUs report the mix of resources they plan to use to meet demand through 2030.[6] POUs are also required to provide an IRP with data and supporting information sufficient to demonstrate that the POUs' plan to meet the various targets and goals. Staff has determined that the PWP 2023 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.

6 *POU IRP Guidelines*, Chapter 2.F., P. 6.

Existing Resources

PWP owns or contracts with a range of resources, outlined below which include generation from natural gas, coal, nuclear, hydroelectric, landfill gas, geothermal, wind, and solar resources.

PWP owns 197 MW of natural gas generation capacity from the Glenarm facility in Pasadena, which consists of four combustion turbines and one combined-cycle unit. This generation facility is on the PWP side of the Goodrich interconnection facility, which connects the PWP system with the California Independent System Operator (California ISO) transmission system. As a result, Glenarm provides local reliability benefits if the PWP system loads exceed the Goodrich transfer limits, as well as resource adequacy capacity to help meet system reliability requirements. PWP also has a partial ownership stake in Magnolia of 14 MW, a natural gas generator operated by Burbank Water and Power.

PWP also has a contract with Intermountain Power Project for 108 MW of capacity. This resource is switching from coal to natural gas in 2025, which will reduce the amount available to PWP by roughly half, to 50 MW. The natural gas contract with Intermountain is expected to conclude in 2027.

PWP has a long-term contract for 10 MW of nuclear generation capacity from the Palo Verde Nuclear facility in Arizona. PWP also purchases up to 14 MW of the output from Hoover Dam, with the daily and hourly capacity and energy varying because of river flow requirements, and annual output varying due to hydrology and storage conditions.

PWP has two landfill gas contracts for a combined 16 MW of capacity. PWP's recent addition of Calpine Geysers and Coso Geothermal contracts provide 45 MW of capacity and help address its energy needs. Additional contracted resources include 7 MW of wind generation capacity from the Milford Wind in Utah and High Winds Projects. PWP has 5 solar contracts that provide a combined 37 MW of capacity. PWP also recently contracted with EDF Sapphire Solar projects for a solar plus storage project that has 39 MW of solar paired with 20 MW of storage.

Despite the contracts, PWP still relies on market purchases to meet its capacity and energy requirements. Table 1 shows electric facilities that are owned or contracted by PWP and associated expiration dates.[7]

7 Pasadena Water and Power staff. December 2023. *Pasadena Water and Power – 2023 Integrated Resource Plan*, pages 70-72. https://efiling.energy.ca.gov/GetDocument.aspx?tn=255421&DocumentContentId=91241.

Table 1: Electric Facilities Owned or Contracted by PWP

Facility	Owned or Contracted	Fuel Type	PWP Share (MW)	Retirement or Exit Date
Glenarm	Owned	Natural Gas	197	N/A
Intermountain Power Plant (IPP) Coal	Contracted	Coal	108	6/30/2025
IPP Natural Gas	Contracted	Natural Gas	54	6/30/2027
Magnolia	Contracted	Natural Gas	14	7/1/2036
Hoover Hydro	Contracted	Hydroelectric	14	Beyond 2050
Palo Verde Nuclear	Contracted	Nuclear	10	2045–2047
Milford Wind	Contracted	Wind	5	11/14/2029
High Winds Project	Contracted	Wind	2	12/31/2023
Chiquita Landfill	Contracted	Landfill Gas	6	11/22/2030
Puente Hills Landfill	Contracted	Landfill Gas	10	12/31/2030
Coso Geothermal	Contracted	Geothermal	10-20	12/31/2046
Geysers Geothermal	Contracted	Geothermal	25	12/31/2041
Antelope Solar	Contracted	Solar	7	12/31/2041
Columbia Two Solar	Contracted	Solar	2	12/18/2034
Kingbird Solar	Contracted	Solar	20	12/18/2036
Summer Solar	Contracted	Solar	7	12/31/2041
Windsor Reservoir Solar	Contracted	Solar	1	5/30/2031
Sapphire Solar + Battery	Contracted	Solar, with Battery Energy Storage System	39 (Solar); 20 (Battery)	12/31/2046

Source: CEC, Energy Assessments Division, Based on the *PWP 2023 IRP* filing

Resource Portfolio Evaluation

Resolution 9977, which directs PWP to achieve 100 percent energy from zero-carbon sources by the end of 2030, also directs PWP to plan multiple pathways to meet this goal while optimizing affordability, rate equity, stability, and reliability. Scenarios are selections of resources optimized to meet capacity, energy, and renewables needs. PWP modeled six scenarios, where each scenario generated a least-cost, best-fit resource mix within the constraints of its assumptions.

Scenario 4 acts as the reference case, which meets regulatory compliance with all relevant state laws, including CARB's utility-specific GHG emission reduction targets, the RPS procurement target of 60 percent by 2030, and the 100 percent renewable resource and zero-carbon goal by the end of 2045. Scenarios 1 through 3 add the requirement from Pasadena's Resolution 9977 to achieve 100 percent electricity from clean sources by the end of 2030 to meet the state's requirements. Scenario 5 incorporates a social cost of carbon (SCC) cost adder as a hypothetical carbon tax on all carbon-generating resources. Scenario 6 explores emerging technologies by examining the value of peak-load reduction. Of these, Scenario 2 was chosen as the preferred scenario.

The six scenarios are described in greater detail below. For all scenarios, PWP treats generation within its service territory as internal and generation or electricity imports from the grid outside its territory as external. For internal resources, PWP is modeled as an area with load, and the load is adjusted to include the impacts of energy efficiency, electric vehicles, distributed solar, and distributed storage.

- **Scenario 1**: 100 Percent Carbon Free by 2030 With No Limit on Internal Resources

  Without a limit on internal resources, Scenario 1 envisions PWP's internal capacity of owned and contracted resources of 859 MW in 2030. This capacity is 2.5 times its peak load of 348 MW. Of this, 806 MW of the 859 MW Scenario 1 installed capacity would be internal to PWP, potentially running into land-use constraints not evaluated in the scope of the IRP. To serve load in each hour with carbon-free resources, Scenario 1 requires at least 110 MW of fuel cells powered by carbon-free fuels such as hydrogen produced from renewable resources in 2030. That load could be served by other resources that can provide dispatchable, carbon-free power that can operate for extended periods.

  For the 100 percent carbon-free by 2030, Scenarios 1, 2, and 3 require the Glenarm power plant to either be replaced, converted, or adapted with carbon-free dispatchable alternatives such as carbon capture, green hydrogen, or other future technologies as they emerge and before 2030.

- **Scenario 2**: 100 Percent Carbon Free by 2030 With a Limit on Available Internal Resources

  Scenario 2 requires a total capacity of 1,489 MW, with the modeling showing the need for a minimum of 400 MW of commercial storage and 400 MW of commercial solar needed in 2030 to serve load with carbon-free electricity in every hour. This scenario includes the procurement steps that lead to the next step in the waypoint framework,

where a re-evaluation of technologies, costs, and availability will guide PWP's procurement in alignment with policy goals.

- **Scenario 3**: 100 Percent Carbon Free by 2030 with a Limit on Available Internal Resources and Doubled Distributed Resources

  Scenario 3 models a focused effort on increased distributed resource deployment, doubling the distributed solar and storage growth each year, split between residential and commercial installations, contributing a total of 745 MW new commercial and residential solar and 265 MW of storage by 2030. Under this scenario distributed resources account for 1010 MW of the 1,345 MW total installed capacity needed.

- **Scenario 4**: Reference Case (Meeting SB 1020)

  Scenario 4 meets or exceeds state requirements, including 90 percent renewable and zero-carbon resources by 2035, 95 percent by 2040, and 100 percent by 2045. Scenario 4 requires 478 MW of new resources by 2030, and this scenario elects to install more wind than low-carbon combustion resources, such as biofuel or green hydrogen. PWP created forecasts for hydrogen and biofuel prices, but incentives, changing technologies, and local circumstances may change the economics of these fuel sources.

- **Scenario 5**: Reference Case + Social Cost of Carbon (SB 1020 + SCC)

  Adding a social cost of carbon to carbon-emitting resources provides an incentive to other renewable resources and could alter operation of the PWP system to avoid firing combustion resources.

- **Scenario 6**: Emerging Technologies Study Scenarios

  These scenarios examined the financial viability of a new technology that could reduce energy load and peak power demand, either with an energy efficiency proxy, or a demand response proxy.

Sensitivity tests place stresses on the scenarios to evaluate how the scenarios would perform under different conditions. These tests help identify potential vulnerabilities and highlight considerations for the scenarios. Each scenario was subjected to four sensitivity tests:

- **Sensitivity 1**: Heat Wave — This sensitivity tests the scenario against a persistent, record-setting heat wave, and tests the ability of each scenario to meet load, with peak load times in late August through early September.
- **Sensitivity 2**: Goodrich Transfer Contingency — Goodrich is the transfer point that connects PWP's system to external transmission and resources. This sensitivity analyzes an outage that would halve the expected import capacity in 2030, reducing available external resources to 140 MW for a week in the summer.
- **Sensitivity 3**: High Technology Costs — This sensitivity stresses the results of the scenarios under the high end of the range of estimates for new resource costs.
- **Sensitivity 4**: Low Technology Costs — This sensitivity tests the scenario results under low end of the range of estimates for new resource costs.

The sensitivity analyses allowed the PWP planners to answer fundamental questions about the scenarios, with Sensitivities 1 and 2 focusing on reliability and Sensitivities 3 and 4 focusing on

costs. The questions the sensitivities answered include the total amount of additional energy and generating capacity needed, the hours and days when additional energy would be required, and the percentage increase or decrease in costs depending on high or low costs for new technologies.

The waypoint procurement plan that preserves a pathway to the 100 percent carbon-free electricity by 2030 is defined by the Scenario 2 modeling results, which PWP chose as its preferred scenario. Scenario 2 installs the largest number of new resources, and PWP decided that this approach provides the best opportunity for achieving carbon-free electricity by 2030. Progress in the development and maturation of new and emerging technologies will be reassessed at the 2028 waypoint, which will be incorporated into the 2028 IRP.

Procurement Strategy

PWP identifies the challenge that it will need to add contracted and owned resources cost-effectively that will meet forecasted requirements for energy supply, resource adequacy, and being carbon-free. PWP selected the carbon-free resource, Scenario 2, as its preferred scenario on the path to the 2028 waypoint. Scenario 2 entails phasing out all carbon resources by the end of 2030, aligning with Resolution 9977. PWP estimates it will need between 700 and 1,300 MW of new installed capacity by the end of 2030, depending on the resource, location, storage, and system reliability requirements. This amount of new generation capacity would be roughly double PWP's current system generation capacity.

PWP proactively began adding to its carbon-free resource portfolio 2022 and 2023 by contracting with Calpine Geysers, Coso Geothermal, and EDF Sapphire Solar to help meet upcoming qualifying capacity needs. The years 2025 and 2027 show additional resource needs because 108 MW of capacity from IPP coal retired June 30, 2025. A portion of the existing contract for IPP coal-fired capacity will be replaced by a contract for 54 MW of natural gas-fired capacity at IPP, but that expires on June 30, 2027.

PWP relies on the natural gas-fired generators Glenarm and Magnolia to provide reliability and resource adequacy. In transitioning to zero-carbon fuel by 2030, PWP assumed that the Glenarm plant would be either replaced, converted, or adapted with carbon-free dispatchable alternatives such as carbon capture, green hydrogen, or other future technologies. PWP's contract with Magnolia would need to be exited early, which would require negotiations with other Magnolia project participants.

Resolution 9977 limits PWP's use of biogas and system power. PWP has contracts with landfill gas generation that expire in 2030 and are not planned to be replaced with additional landfill gas or biogas contracts. While considered renewable for the state RPS, biogas does not meet PWP's definition of clean or carbon-free energy that would comply with Resolution 9977.PWP operationally modeled its system as an island with no market access, because electricity imports from outside of PWP would be associated with GHG emissions. This modeling constraint was essential in creating a plan to operate a reliable, carbon-free system on an hourly basis that met the intentions of Resolution 9977.

Scenario 2 adds large quantities of solar and storage, as well as wind, geothermal, and carbon free resources. PWP is planning on adding about 224 MW of utility scale solar, 400 MW of distributed solar, and 30 MW of wind by 2030. The utility is also planning on adding 685 MW of storage by 2031, including 400 MW of distributed storage. PWP also considers the possibility of adding more cost-effective wind generation outside the planning horizon for this IRP as resources such as offshore wind potentially become available. PWP adds 35 MW and geothermal in 2027, and an additional 10 MW in 2037. PWP adds 35 MW of fuel cell capacity in 2030, fueled by renewable hydrogen, which is considered a zero-carbon resource. Table 2 shows PWP's incremental installation of new resources under Scenario 2, its preferred scenario.

Table 2: Incremental Installation of New Resources, Scenario 2 (MW)

Resource Type	2025	2026	2027	2028	2029	2030
Fuel Cells						35
Geothermal			35			
Solar (utility and community)	185		39			400
Storage	85		20		10	570
Wind	30					

Source: PWP 2023 IRP

CHAPTER 2:
Review for Consistency With PUC Section 9621 Requirements

This chapter summarizes the main elements of the PWP 2023 IRP and provides CEC staff's findings regarding the consistency 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 energy efficiency 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 California Public Utilities Commission (CPUC).[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. Staff finds that PWP plans to achieve the established GHG emission target range of 128 million and 162 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) published in the *SB 350 IRP Electric Sector GHG Planning Targets: 2020 Update* (2020 CARB Update). [13] PWP's planning scenario results comply with the requirement of PUC Section 9621(b)(1).

In 2023, 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] This electricity sector GHG planning target range of 30–38 $MMTCO_2e$, retains the lower bound of 30 $MMTCO_2e$ from CARB's 2020 CARB Update but reduces the upper bound from the 53 $MMTCO_2e$ to 38 $MMTCO_2e$.[10] The City of Pasadena's Resolution 9977 and the policy goal of sourcing 100 percent of Pasadena's electricity from carbon-free sources by the end of 2030 exceed the GHG emission reduction targets set by CARB. As seen in Table 3, the majority of GHG emissions are from the IPP coal-fired generator and Glenarm natural gas units. As noted earlier in this report, the IPP coal-fired generator is planned to shut down in 2025. PWP has executed contracts for two geothermal projects (Coso and Calpine Geysers)

8 Public Utilities Code Section 9621(b)(1).

9 CARB. September 2023. *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; CARB. December 2022. *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.

10 CARB. March 2021. *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.

and the EDF Sapphire Solar + Storage project, as well as other projects to replace that generation while decreasing GHG emissions. Table 3 shows GHG emissions for PWP's Scenario 2 Portfolio of resources in 2023, 2025, and 2030. PWP's Scenario 2 shows a substantial decrease in emissions from 2023 to 2025.

Table 3: Greenhouse Gas Emissions From PWP Scenario 2

Generation Resource	Fuel Type	GHG Intensity (MT CO2e/MWh)	Total Emissions (MT CO2e) 2023	Total Emissions (MT CO2e) 2025	Total Emissions (MT CO2e) 2030
Glenarm Unit 1	Natural Gas	0.800	1000	0	0
Glenarm Unit 2	Natural Gas	0.775	2000	0	0
Glenarm Unit 3	Natural Gas	0.638	18000	25000	0
Glenarm Unit 4	Natural Gas	0.640	15000	24000	0
Glenarm Unit 5	Natural Gas	0.610	35000	34000	0
Intermountain Coal	Coal	0.946	289000	66000	0
Intermountain Repower Gas	Natural Gas	0.36	0	68000	0
Magnolia	Natural Gas	0.41	37000	34000	0
Hoover Hydro	Large Hydro	0.0	0	0	0
Palo Verde	Nuclear	0.0	0	0	0
EDF Sapphire Storage	Solar + Battery	0.0	0	0	10
Generic non-RPS Resource	Unspecified/System Power	0.428	0	39,000	388,000
Net Spot market purchases (sales)	System	0.428	118000	-77000	-222000
Emissions Adjustment	Undelivered RPS Energy	NA	0	0	0
Total Portfolio emissions	**NA**	**NA**	**514,000**	**212,000**	**176,000**

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

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. In 2018, Senate Bill 100 (De León, Chapter 312, Statutes of 2018) increased the RPS requirement for 2030 from 50 to 60 percent by 2030.[11] Staff reviewed the renewable procurement table, the discussion in the IRP filing, and the renewable procurement plan submitted. Staff finds that PWP's plans are

11 Public Resources Code Section 399.11(a).

consistent with the RPS procurement requirements and all interim compliance periods, as well as the requirements of PUC Section 9621(b)(2).

PWP's Scenario 2 includes the addition of renewable resources starting in 2025 (the first year allowed in the model). PWP anticipates that its diversified portfolio of RPS resources will account for at least 60 percent of retail sales in 2030, which will meet the RPS target.

Retail Rates

SB 350 (PUC Section 9621[b][3]) requires POUs 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. Staff reviewed the analysis and information PWP presented in its IRP filing on the rate and bill impacts from different resource portfolios they evaluated. Staff finds the PWP 2023 IRP is consistent with the rates discussion, as required in PUC Section 9621(b)(3).

PWP resources staff worked with PWP finance staff to consider the effect on customer rates from the additional costs of implementing this IRP. Cost factors such as inflation, high demand, limited supply, and supply-chain issues have increased utility costs, which are projected to result in a potential energy charge increase from 2024 to 2030. The estimated cost increase for the energy charge portion of a customer's bill is 91 percent for the preferred scenario, Scenario 2, which rapidly adds zero-carbon generation to meet Resolution 9977.[12]

To better understand system needs and costs, PWP plans to perform a cost-of-service study, as well as a rate impact study. The results of these studies will inform a rate ordinance proposal that supports the necessary power supply and capital development costs for the power system changes to meet PWP's goals. This information and understanding will guide the ongoing planning processes that are part of the waypoint framework, including the development of the 2028 Pasadena IRP.

System and Local Reliability

SB 350 requires filing POUs to adopt an IRP that ensures system and local reliability and addresses resource adequacy requirements.[13] Staff reviewed the PWP 2023 IRP filing capacity reporting table and discussion and finds that PWP has planned for sufficient resources to maintain a reliable electric system. In addition, PWP's selected portfolio of resources contains sufficient capacity to meet anticipated resource adequacy requirements in 2030. Staff finds that this IRP is consistent with the SB 350 reliability requirements in PUC Section 9621(b)(3) and resource adequacy requirements in PUC Section 9621(d)(1)(E). As a participant in the

12 Pasadena Water and Power staff. Pasadena Water and Power – 2023 Integrated Resource Plan, Figure 197, pages 197–202.

13 Public Utilities Code Section 9621(b)(3).

California ISO market, PWP has obligations for three types of resource adequacy: system, local, and flexible.

For system resource adequacy (RA), PWP has a planning reserve margin (PRM) of 15 percent following ISO's default PRM. The PRM is required monthly using a 1-in-2 peak demand forecast, assuming a 50 percent probability that the forecasted peak will be either greater or less than the actual peak. The RA calculation makes PWP's system RA obligation equal to the monthly peak load plus the 15 percent PRM, which PWP plans to meet with a combination of owned and contracted resources. Reserve margins are increasing as increasing amounts of intermittent generating resources are incorporated into the electrical system. PWP modeled a 15 percent reserve margin through 2025, followed by 17.5 percent for the remainder of the study period.

For local RA purposes, PWP's load is in the Los Angeles Basin subarea of the SCE transmission access charge area. Glenarm and Puente Hills are in the Los Angeles Basin subarea, and Chiquita Canyon, Antelope Solar, Kingbird Solar, and Summer Solar are in the Big Creek/Ventura subarea. Glenarm can provide quick ramping support and fulfills the need for local and flexible RA requirements.

The flexible RA capacity requirement is based on the largest three-hour net load ramp in a month. Glenarm provides and is sufficient to meet all of PWP's flexible RA capacity requirements.

Transmission and Distribution Systems

PUC Section 9621(b)(3) requires filing POUs 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 PWP 2023 IRP demonstrates plans to maintain and enhance its transmission and distribution systems, which will adequately deliver resources to its service area to meet the requirement. Staff also finds that PWP conducted sufficient planning to address the capacity and reliability of its distribution system. As such, staff finds the PWP 2023 IRP is consistent with the transmission and distribution requirements set forth above.

Transmission System

The PWP system interconnects to the California ISO power grid at the T. M. Goodrich substation (Goodrich). Power is received via two 220-kilovolt (kV) transmission lines from SCE's Mesa and Gould substations. The 220-kV equipment at Goodrich is owned by PWP but maintained and operated by SCE under the ISO's direction. Contractually, the Goodrich interconnection may import up to 336 MW. However, the import capacity is limited to 280 MW so that PWP can address N-1 contingency operations under its distribution system limitations. N-1 is an industry planning standard that ensures continued operation in the event the largest element of a system fails.

Distribution System

In alignment with the 2018 IRP,[14] PWP analyzed its distribution system, leading to the development of the *Power Delivery Master Plan* (PDMP), which was approved by the Pasadena City Council in June 2022. The PDMP provides a high-level guide for planning, operating, and maintaining PWP's electric distribution system over the next 20 years. It describes the utility's infrastructure, assesses its current condition, and provides an ambitious long-term capital improvement plan of projects designed to enhance reliability, safety, and cost-effectiveness. The PDMP describes PWP's electric distribution system as reliable, despite aging infrastructure, and identifies a few crucial areas that need to be addressed systematically.

The PDMP specifically identifies several improvements directly related to the 2023 IRP. As previously stated, PWP has a contractual ability to import up to 336 MW, but it is limited to 280 MW due to distribution system limitations, primarily transformer capacity limitations at the Goodrich transmission substation. The PDMP recommends upgrading the capacity and protection of the crosstown subtransmission lines that connect the Glenarm and Santa Anita Receiving Stations through the distribution substations within five years. These upgrades would increase overall system power-flow capability. Once the lines are upgraded, they would be reconfigured to create a second crosstown connection, adding redundancy and improving capacity. The PDMP also recommends that the Goodrich transformers at the interconnection with California ISO should also be upgraded to increase PWP's power import capacity from 280 MW to the contractual 336 MW import limit.

PWP plans to complete the projects in a way that maintains operations and minimizes community impacts. The scope for these upgrades, replacements, and improvements is expected to be completed within 10 years. The upgrades would improve system reliability and equipment life, and promote the growth of distributed energy resources, utility-scale energy storage, and renewable energy projects. Precise locations, types, sizes, and installation dates of new generation and storage projects connected to PWP's distribution system have yet to be determined and will require the PDMP be revised to address distribution system effects based upon incremental engineering evaluations.

Disadvantaged Communities and Localized Air Pollutants

PWP is making efforts to minimize localized air pollutants and GHG emissions. CEC staff reviewed the PWP 2023 IRP filing to determine the extent to which it minimizes local air pollutants with a priority placed on disadvantaged communities. PWP's service territory includes one disadvantaged community, with a population of about 6,000 people. Glenarm, the only utility-scale generating station in Pasadena, is outside this disadvantaged community.

PWP has reduced emissions from its power supply portfolio to benefit all area communities. PWP is exploring additional actions that support the overall carbon reduction goals to further

14 Pasadena Water and Power staff. 2023. *Pasadena Water and Power – 2023 Integrated Resource Plan*, https://efiling.energy.ca.gov/GetDocument.aspx?tn=253767-1&DocumentContentId=89019.

rate equity, expanding distributed energy resources, and evaluating potential customer incentives or subsidies. PWP considers prioritizing the disadvantaged community and rate equity essential as clean energy programs and projects are implemented.[15]

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 (such as energy efficiency and demand response) to reduce the need for new or additional gas-fired generation and distribution and transmission resources (PUC Section 9621[c]). The PWP 2023 IRP includes a discussion of how it considers preferred resources to meet peak demand when selecting resources for its portfolio. PWP's Scenario 2 is consistent with this requirement.

PWP plans to meet peak energy demand with a balanced mix of power resources, including solar, wind, and geothermal. Behind-the-meter solar resources paired with storage help offset midday and evening peak demand.[16]

Additional Procurement Goals

PUC Section 9621(d)(1) requires filing POUs to address procurement of energy efficiency and demand response, energy storage, transportation electrification, and a diversified portfolio, 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 the PWP 2023 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 savings it plans to achieve.

PWP describes the mechanism by which the City of Pasadena collects funds to allocate to various initiatives, including power programs. The initiatives include energy efficiency programs, demand response programs, and a newly developed focus on building electrification. Pasadena splits its energy efficiency programs between the residential and commercial sectors and describes each program included in its portfolio.[17] PWP's actual cumulative energy efficiency savings demonstrate the growth of energy efficiency following the passage of SB 350. From 2015 to 2020, PWP amassed roughly 80 GWh of energy efficiency savings. This progress aligns with the 2020 interim savings target that the CEC projected for Pasadena in the *Revised SB 350 Doubling EE Savings by 2030* report. These

15 Ibid., pages 117–121.

16 Ibid., pages 210–211.

17 Ibid., pages 39-40.

cumulative savings put PWP on the path toward achieving the 2030 SB 350 electricity savings goal of 184 GWh.[18] PWP states that this new savings goal and the energy efficiency savings data included within the IRP exclude codes and standards. PWP's energy efficiency forecast aligns with the CEC's reporting method for energy efficiency savings and provides details of the energy efficiency savings data.[19]

The City of Pasadena's adopted building electrification ordinance supports PWP's energy efficiency efforts. As building electrification data become available, the savings from efficient electrification can supplement the savings from energy efficiency programs and will count toward PWP's annual energy efficiency goal. Based on PWP's current energy efficiency trajectory, if PWP continues to hit annual energy efficiency targets, Pasadena is expected to surpass its SB 350 cumulative savings goal by 2029, before the 2030 target year.

The PWP 2023 IRP confirms the transition to advanced metering infrastructure (AMI) over the next few years within the demand response (DR) subsection of the IRP.[20] PWP has a DR program where the largest commercial customers voluntarily reduce load by a predetermined amount during a flex event. The utility has on-call access to 2.5 MW across the 20 participating customers. Additional programs are in development, and PWP hopes to explore further potential for DR with future support from AMI data.

PWP is on track to meet or potentially exceed its portion of the statewide energy efficiency goal set forth within SB 350.

Energy Storage

CEC staff finds that the PWP 2023 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.

PWP included battery storage as an important resource in its portfolio modeling. Although several storage technologies exist or are undergoing research, lithium-ion remains the most implemented type of battery storage. PWP levelized battery costs into a fixed rate depending on the year of installation, with the cost scaling linearly to the duration of storage based on National Renewable Energy Laboratory estimates. The round-trip efficiency of the battery storage is a measure of how much energy that goes into the battery can be used, with 85 percent efficiency used in the model.

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18 California Energy Commission. October 2017. *Revised SB 350 Doubling Energy Efficiency Savings by 2030*, page A-21, Table A-11. Publication Number: CEC-400-2017-010-CMF, https://efiling.energy.ca.gov/GetDocument.aspx?tn=224615&DocumentContentId=55172.

19 Pasadena Water and Power staff. *Pasadena Water and Power – 2023 Integrated Resource Plan*, page 43.

20 Ibid, page 44.

Energy storage will help store generation from renewable sources when it is not needed, allowing the energy to be applied to later use, such as evening ramps. In 2031, PWP anticipates producing more energy than is needed on an annual basis with the anticipation that excess energy could be sold or stored. PWP points out that batteries are a net consumer of energy due to roundtrip losses but anticipates monitoring grid conditions, learning from others, and gaining experience to better understand how excess renewable generation and storage can interact to serve PWP and its customers.[21] PWP has issued a solicitation for the 25-MW, four-hour lithium-ion Glenarm Battery Energy Storage System Project (Glenarm BESS). On May 8, 2025, PWP was awarded $9,660,000 in funding to support the construction of this project through the Distributed Energy Backup Assets Program administered by the CEC.

Transportation Electrification

CEC staff finds that the PWP 2023 IRP is consistent with the requirement of PUC Section 9621(d)(1)(C) as it addresses transportation electrification, projecting for light-duty electric vehicle growth, and includes details of the utility's rate design, incentives, rebates to encourage transportation electrification, and customer education efforts.

PWP's website includes electric vehicle- (EV) related educational materials for customers, including descriptions of EV features and benefits, home charging tips, and links to additional resources, including a cost-comparison calculator for EVs and gasoline fueled vehicles and information about available rebates. PWP has three electric vehicle (EV) incentives that are outlined below.

- The Commercial EV Charger Rebate Program provides a $3,000 rebate for installed, smart Level 2 (240V) chargers, with up to a $6,000 rebate available for DC fast chargers. This program is available to schools, income-qualified housing, or in a disadvantaged community.
- The Residential EV Rebate Program provides eligible customers rebates of $250 each for the purchase or lease of up to two plug-in EVs per address every three years, with customers in PWP's income-qualified Bill Payment Assist Program eligible for an additional $1,000 rebate.
- The Residential EV Charging Rebate offers customers $600 for installing a wi-fi enabled EV charger, or $200 for a noninternet-connected charger.

PWP's IRP includes some additional measures to further the goals of the IRP, including support for mass transit and EV fleet development, including pursuing vehicle-to-grid charging opportunities. A future cost-of-service and rate impact study could also guide a proposed investigation of rate structure, which may lead to EV charging rates.[22]

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21 Ibid, pages 186-188.

22 Ibid, pages 212-213.

Portfolio Diversification

PUC Section 9621(d)(1)(D) requires that POUs address the procurement of a diversified portfolio of resources consisting of short-term and long-term electricity, electricity-related, and demand response products. Based on staff's review of the PWP 2023 IRP, PWP's standardized tables and planning portfolios indicate that the utility has addressed this requirement. PWP's planning portfolios include a diversified mix of resources composed of wind, solar, hydroelectric, natural gas combustion, and battery storage. This mix of resources was identified for planning portfolios, including Scenario 2, after validating feasibility, economics, reliability, compliance, and risk.

APPENDIX A: Abbreviations

Acronym	Term
AAEE	Additional achievable energy efficiency
AMI	Advanced metering infrastructure
BESS	Battery energy storage system
California ISO	California Independent System Operator
CARB	California Air Resources Board
CEC	California Energy Commission
COTP	California-Oregon Transmission Project
CPUC	California Public Utilities Commission
DERs	Distributed energy resources
DR	Demand response
DSGS	Demand side grid support
EE	Energy efficiency
EV	Electric vehicle
GHG	Greenhouse gas
GWh	Gigawatt-hours
IEPR	Integrated Energy Policy Report
IPP	Intermountain Power Plant
IRP	Integrated resource plan
kV	Kilovolt
kWh	Kilowatt-hour
LD PEV	Light-duty plug-in electric vehicle
LED	Light-emitting diode
LOLE	Loss of Load Event
MMTCO2e	Million metric tons of carbon dioxide equivalent
MTCO2e	Metric tons of carbon dioxide equivalent
MW	Megawatt

Acronym	Term
MWh	Megawatt-hour
NERC	North American Electric Reliability Corporation
PDWP	Power Delivery Master Plan
POU	Publicly owned utility
PPA	Power purchase agreement
PRM	Planning reserve margin
PUC	Public Utilities Code
PV	Photovoltaic (solar)
PWP	Pasadena Water and Power
REC	Renewable energy credit
RPS	Renewables Portfolio Standard
RA	Resource adequacy
SB	Senate Bill
SB 1020	Senate Bill 1020 (Laird, Chapter 361, Statutes of 2022)
SB 350	Senate Bill 350 (De León, Chapter 547, Statutes of 2015)
SCC	Social cost of carbon
SCE	Southern California Edison
WECC	Western Electricity Coordinating Council

APPENDIX B: Glossary

Term	Definition
1-in-10 Loss of Load Event (LOLE)	On day in ten years loss of load event.
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)
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 infrared radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), halogenated fluorocarbons (HCFCs) , ozone (O3), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).
Index+	A contract structure where energy with attributes such as a renewable energy credit is purchased at a price based on a market index plus an additional fixed amount for the attribute. The attribute is assigned to the purchaser, and the energy is settled in an energy market at the index price.
Integrated Energy Policy Report (IEPR)	Senate Bill 1389 (Bowen, Chapter 568, Statutes of 2002) requires the Energy Commission to prepare a biennial integrated energy report. The report contains an integrated assessment of major energy trends and issues facing California's electricity, natural gas, and transportation fuel sectors. The report provides policy recommendations to conserve resources, protect the environment, ensure reliable, secure, and diverse energy supplies, enhance the state's economy, and protect public health and safety.
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.
Renewable Energy Credit (REC)	Renewable Energy Credit (1 MWh renewable energy = 1 REC) is a tradable, nontangible energy commodity representing proof that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource

Term	Definition
Renewables Portfolio Standard (RPS)	A regulation that requires a minimum procurement of energy from renewable resources, such as wind, solar, biomass, and geothermal.
Renewables Portfolio Standard (RPS) Eligible	Consistent with the California Code of Regulations, Title 20, Section 3201(k), means an electrical generating facility that the Energy Commission has determined meets the definition of a ”renewable electrical generation facility” in Section 399.12(e) of the Public Utilities Code, including a facility satisfying the criteria of Section 399.12.5 of the Public Utilities Code, and has certified as an RPS-certified facility.
Senate Bill 1020 (Laird, Chapter 361, Statutes of 2022)	This bill revised state policy to require eligible renewable energy resources and zero-carbon resources supply 90 percent of all retail sales of electricity to California end-use customers by December 31, 2035, 95 percent of all retail sales of electricity to California end-use customers by December 31, 2040, 100 percent of all retail sales of electricity to California end-use customers by December 31, 2045, and 100 percent of electricity procured to serve all state agencies by December 31, 2035, as specified
Social Cost of Carbon (SCC)	A measure, in dollars, of the long-term damage done by a ton of carbon dioxide emissions in a given year.