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STAFF PAPER

Review of Pasadena Water and Power's 2019 Integrated Resource Plan

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California Energy Commission
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ABSTRACT

Senate Bill 350 (de León, Chapter 547, Statutes of 2015), (Public Utilities Code section 9621) 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 *2018 Power Integrated Resource Plan* and supplemental information, which the City of Pasadena adopted on December 10, 2018, to the Energy Commission for review on December 20, 2018. This staff paper presents the results of the Energy Commission staff review of the Pasadena Water and Power's integrated resource plan.

Keywords: Publicly owned utility, integrated resource plan, demand, resources, portfolio, generation, transmission, distribution, Renewables Portfolio Standard, forecast, energy efficiency, transportation electrification, demand response, greenhouse gas, GHG, emissions, system reliability, integration, local reliability, energy storage, distributed generation

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EXECUTIVE SUMMARY

Public Utilities Code (PUC) section 9621 requires publicly owned utilities meeting and electrical demand threshold to adopt an integrated resource plan (IRP) that meets certain requirements, targets, and goals, including greenhouse gas emission reduction targets and renewable energy procurement requirements. The California Energy Commission's *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines* require the utilities to file an IRP with data and supporting information sufficient to demonstrate that they meet these requirements and the targets and planning goals from 2018 to 2030. The Energy Commission must review the IRPs for consistency with the requirements of PUC section 9621.

Pasadena Water and Power's (Pasadena) IRP builds upon its commitment to exceed state policies for renewable procurement and greenhouse gas emission reductions. Pasadena assessed scenarios for meeting its future energy and capacity needs while complying with state and federal mandates, as well as goals set by its city council to achieve a sustainable balance of system reliability, fiscal responsibility, and environmental stewardship. Each scenario showed a clear preference for increased procurement of renewables, such as solar and wind, and reduced reliance on fossil fuel resources, such as coal and natural gas. Pasadena plans to meet an ambitious near-term goal of meeting 40 percent of its retail sales from eligible renewable resources by 2020, which exceeds California's Renewables Portfolio Standard (RPS) requirement of 33 percent renewables by 2020. Pasadena also intends to meet the RPS procurement requirement established by Senate Bill 100 (de León, Chapter 312, Statutes of 2018) which requires energy be procured for 60 percent of retail sales by 2030, instead of the 50 percent by 2030 RPS requirement called for previously under Senate Bill 350 (de León, Chapter 547, Statutes of 2015). Pasadena's long-term goal is to exceed the state's greenhouse gas emission reduction target for the electric sector; they plan for an 81 percent reduction in greenhouse gas emissions from their 1990 levels by 2030.

In reviewing the Pasadena IRP and determining consistency with PUC section 9621, Energy Commission staff relied on the four standardized reporting tables and narrative descriptions in the IRP filing, as well as analysis and verification of the materials submitted. Staff presents the following conclusions in accordance with the requirements of PUC section 9621:

- *Achieving Greenhouse Gas Emissions Targets and Renewables Portfolio Standard Requirements:* The values reported in the standardized tables, along with the narrative in the IRP filing, demonstrate that 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).
- *Meeting Planning Goals:* The values reported in the standardized tables, along with the analysis and discussion in the IRP filing, demonstrate the utility

intends to meet planning goals related to retail rates, reliability, transmission and distribution systems, localized air pollution, and disadvantaged communities as set forth in PUC section 9621(b)(3).

- *Considering Peak Needs:* The values reported in the standardized tables, along with analysis and narrative, demonstrate that the utility has considered existing renewable generation, grid operational efficiencies, energy storage, and distributed resources (including energy efficiency) in helping to ensure the utility's energy and reliability needs in the peak hours as set forth in PUC section 9621(c).
- *Addressing Resource Procurement Types:* The filing includes values reported in the standardized tables and narrative that demonstrate the utility has 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).

In addition to the IRP provisions, Senate Bill 350 (de León, Chapter 547, Statutes of 2015) requires the Energy Commission to establish statewide and utility-specific targets to achieve a statewide doubling of energy efficiency by 2030. The IRP is consistent with the PUC section 9621 requirement in that energy efficiency and demand response are addressed. Staff observe that aggressive energy efficiency and demand response programs are needed for utilities and energy efficiency deliverers to meet the 2030 energy efficiency doubling targets and capture the benefits of demand response. As part of the *2019 Integrated Energy Policy Report*, the Energy Commission will report on progress in achieving the doubling targets, including those for Pasadena Water and Power, and update the targets if necessary.

Chapter 1:
Background, Demand Forecast, and Procurement Plan

Introduction

California public utilities code (PUC) section 9621 requires publicly owned utilities (POU) with an annual electrical demand exceeding 700 gigawatt hours to develop integrated resource plans (IRP). IRPs are electric system planning documents that describe how utilities plan to meet 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. PUC section 9621 requires the governing board of a POU to adopt an IRP and a process for updating it at least once every five years by January 1, 2019.[1]

Further, PUC section 9621 requires POUs meeting the size threshold to submit an IRP and updates to the California Energy Commission for review to determine consistency with the requirements of PUC section 9621. If the Energy Commission determines an IRP is inconsistent with these requirements, the Commission shall provide recommendations to correct the deficiencies. The Commission adopted the *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines* (*POU IRP Guidelines*) to govern the submission of the POU's IRPs.[2] PUC section 9622 requires the Commission to review POU IRPs to ensure they achieve PUC section 9621 provisions (see Appendix A).

This chapter outlines the Energy Commission's review process; provides an overview of Pasadena Water and Power (Pasadena) and its IRP development process; and addresses the *POU IRP Guidelines* requirements that POUs provide a demand forecast and a procurement plan.

Energy Commission IRP Review Process

On December 20, 2018, Pasadena submitted its IRP and supporting documentation to the Energy Commission for review. Staff's review includes two stages. First, staff performed a completeness review to ensure the IRP filing contained the POU board-adopted IRP, the four standardized tables, and supporting information needed for staff

1 Public Utilities Code Article 16 (commencing with section 399.11), Chapter 2.3, Part 1, Division 1.

2 California Energy Commission. *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines*. Revised Second Edition. October 2018, Publication Number CEC-200-2018-004-CMF. https://efiling.energy.ca.gov/GetDocument.aspx?tn=224889

to conduct the review. Then staff conducted a detailed review to determine consistency with the requirements of PUC section 9621.

Staff assessed and analyzed the data in the standardized tables and narrative provided, conducted informal discussions with Pasadena staff, and verified data and information as needed. Staff considered the data supporting the assertions in the IRP. In assessing whether the IRP is consistent with the requirements of PUC section 9621.

Staff relied on internal subject matter experts to review technical sections of the IRP filing including energy and peak demand forecasts; projections for renewable resource additions and whether they achieved RPS requirements; energy efficiency savings projections and programs; and plans for transportation electrification.

Overview of Pasadena Water and Power

Pasadena is a city-owned, not-for-profit electric and water utility in Los Angeles County, California, as described below:

- Pasadena delivers more than 1 million megawatt-hours (MWh) of energy to more than 55,000 residential and 8,400 commercial customers and has a system peak of just over 300 MW.
- Residential customers constitute nearly 83 percent of total customers; however, commercial customers consume nearly 70 percent of the total load.
- In 2016, Pasadena overhauled the Glenarm Power Plant, which it has operated for over 100 years, to add a new generating unit to provide increased reliability, flexibility, and efficiency.

Pasadena Water and Power's Planning Process

Pasadena developed its IRP with significant input from the local community through public processes, and with assistance from consultants. Management staff from the City of Pasadena and the utility created and led the Stakeholder Technical Advisory Group (STAG). In addition to City of Pasadena employees, STAG included residents, businesses, non-profit entities, such as educational institutions, and environmental groups. The purpose of STAG was to represent the interests of a diverse group by giving members opportunities to provide feedback on the development of the IRP. Pasadena held six City Council and community meetings with STAG and members of the public to discuss progress and results. Feedback on the IRP, based on a survey administered by Pasadena, was positive with nearly a third of the community pushing for a higher renewable mix (75 percent RPS) and general satisfaction with the direction of the IRP.

Demand Forecast

The *POU IRP 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.[3] Under the *POU IRP Guidelines* (Chapter 2.E.2) the POU must provide information on the methodology used in developing the demand forecast if the POU uses a forecast other than the Energy Commission's adopted demand forecast.[4] The demand forecast and supporting information provided were determined to present an adequate estimation of future energy and peak demand that meets the *POU IRP Guideline* requirements.

Energy and Peak Forecast, Methodology and Assumptions

Pasadena developed a reference case demand forecast by customer sector, including the residential and commercial sectors. The utility collected historical load data, weather information, and economic drivers to build an econometric model to project future load. Pasadena developed two models: an energy model and a peak demand model. Both expressed annual energy and peak demand on a per-customer-basis. A forecast of the number of customers was developed and input to both models.

Pasadena also accounted for impacts from energy efficiency, transportation electrification, and known local load impacts including:

- Known load changes that result in a reduction in demand through 2019 that begins to increase the load from 2020 forward.
- In 2024, increased load due to a large development project underway in West Pasadena.
- Plans to take on more of the load at a nearby university.
- Transportation electrification load that is expected to increase at a compound annual growth rate of 11.26 percent, resulting in an additional 4 MW of capacity by 2039.
- Future energy efficiency initiatives that could reduce electricity sales by 13,500 MWh annually over the planning period.

Staff compared Pasadena's energy and demand forecast from the standardized tables to the Energy Commission's *2018 Demand Forecast Update* report. Commission energy and peak forecast models are based on econometric specifications relating historical electricity consumption data to economic and demographic variables with adjustments for policy based drivers such as additional achievable energy efficiency (AAEE) and zero net energy homes, or additional achievable solar photovoltaic (AAPV). In its electricity demand forecast, Pasadena did not account for adoption of customer-side solar PV beyond what was embedded in the historical data, nor AAPV in new residential construction.

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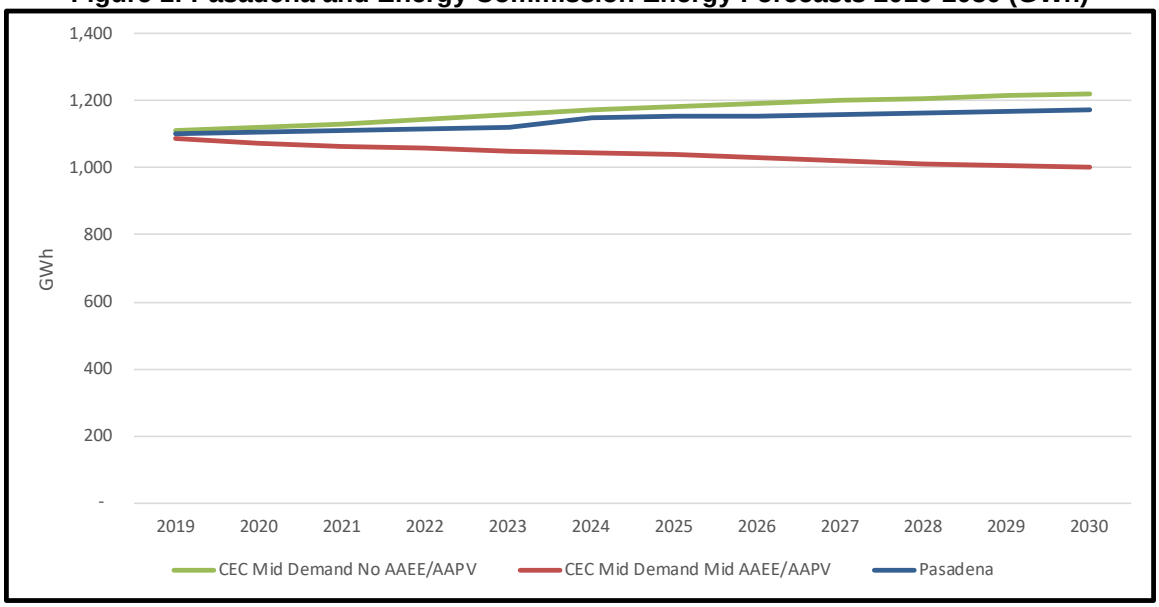
3 *POU IRP Guidelines*, Chapter 2, E., Pp 5-6.

4 The most recently adopted demand forecast is for the *2018 Integrated Energy Policy Forecast Update*. https://www.energy.ca.gov/2018_energypolicy/documents/

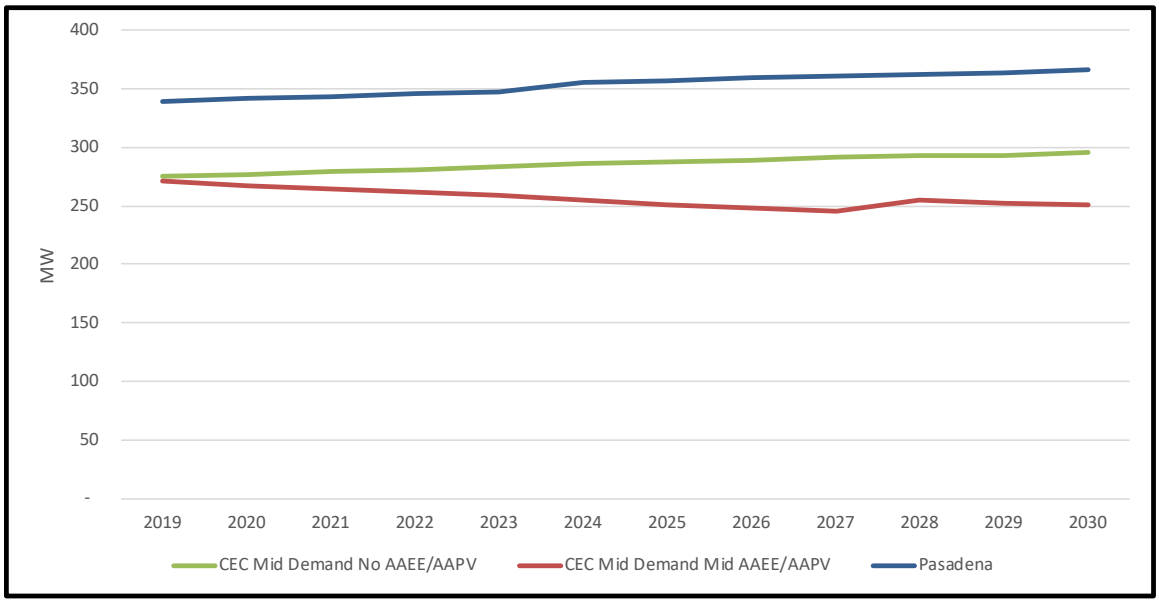
Differences in assumptions, data, and model specifications make it difficult to discern the reasons for differences between the long-term forecasts of energy and peak developed by Pasadena and the Energy Commission **(Figure 1** and **Figure 2.)** However, the treatment of PV in the forecasts may explain much of the difference. The green line (Energy Commission forecast), has no adjustments for energy efficiency savings or mandated PV system installation in new single-family homes constructed in the future. The red line (Energy Commission) accounts for future energy efficiency savings and reduction in electricity sales due to PV installations in new single-family homes. The blue line (Pasadena's long-term energy forecast) is in the range of the Commission's two mid-case scenarios. The utility's long-term peak forecast is higher than the Commission's forecast. This could be due to differences in historical weather data, weather normalization process, or model specifications. Pasadena's forecast is suitable for long-term planning given the uncertainties during the planning period.

Figure 1: Pasadena and Energy Commission Energy Forecasts 2019-2030 (GWh)



Source: California Energy Commission staff, Energy Assessments Division

Figure 2: Pasadena and Energy Commission Peak Forecasts 2019 - 2030 (MW)



Source: California Energy Commission staff, Energy Assessments Division

Resource Procurement Plan

The *POU IRP Guidelines* require that POUs report the mix of resources they plan to use to meet demand from 2018-2030.[5] The POUs are also required to provide an IRP with data and supporting information sufficient to demonstrate that the POU plans to meet targets and goals. Staff has determined that Pasadena's IRP filing meets the 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 forms.

Existing Resources

Pasadena uses a variety of resources to meet energy and peak demand obligations. The utility either owns or has long-term contracts to energy generated from coal, natural gas, geothermal, hydro, and other renewables. Pasadena meets about a third of its energy needs with out-of-state coal generation through a long-term contract with the Intermountain Power Project (IPP) in Utah. Starting in 2025, this resource will be converted to a natural gas facility, instead of coal. Between 2025 and 2027, when the contract expires, Pasadena will take energy from this facility when it uses natural gas. Pasadena owns natural gas fired resources to meet baseload, local capacity requirements, and flexible generation requirements to balance the output from intermittent resources such as solar and wind. Pasadena's Glenarm natural gas power

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

plant produced roughly 76,000 MWh or about 7 percent of its energy demand in 2017. Glenarm has five units ranging from 30 MW to 71 MW and is used as a peaking resource.

Pasadena also shares ownership with other members of the Southern California Public Power Authority (SCPPA) in the natural gas fired Magnolia Power Plant and contracts with generators outside of California, such as the Hoover Dam and the Palo Verde Nuclear Plant. Pasadena's share of output from the Magnolia Power Plant was 82,000 MWh or 7 percent of its energy demand in 2017. Pasadena received 45,000 MWh from Hoover Dam representing 4 percent of its energy demand in 2017. Palo Verde supplied over 84,000 MWh or 8 percent of its energy demand in 2017. Pasadena also purchases and sells energy in the wholesale energy market and is a net purchaser of energy. In 2017, Pasadena purchased 323,000 MWh from the spot market (about 29 percent of its energy demand) and sold 89,000 MWh to the spot market.

Pasadena does not own any RPS-eligible resources. Instead, the utility contracts with renewable developers, including joint renewable projects with SCPPA. In 2017, Pasadena met 37 percent of its retail sales or 416,000 MWh with renewable resources, primarily biomass (119,000 MWh or 11 percent), solar (104,000 MWh or 9 percent), wind (35,000 MWh or 3 percent), geothermal (17,000 MWh or 2 percent), and 142,000 MWh or 13 percent, from bundled and unbundled renewable energy credits.

Resource Portfolio Evaluation

Pasadena evaluated eight scenarios for meeting its forecasted demand for energy and peak over the planning horizon using both a capacity expansion model and a production cost model to account for broad state policies, electric reliability, and assumptions regarding resource costs and performance. The scenarios are as follows:

- A Base Case scenario that meets RPS requirements and GHG emission targets under SB 350 by 2030
- A Social Cost of Carbon (SCC) scenario with a much higher carbon price equal to the CPUC carbon planning price of $150/ton by 2030 applied to the dispatchable fossil-fired resources
- A Base Case + SB 100 scenario that meets RPS targets in SB 100, including 50 percent RPS by 2026 and 60 percent by 2030
- A SCC + SB 100 scenario similar to the Base Case + SB 100, but using the higher price of carbon as described above
- A SCC + SB 100 + Leave IPP Energy in Utah scenario, similar to the SCC + SB 100 scenario, but assuming that Pasadena will sell its IPP share starting in 2019 and substitute that energy with a geothermal plant California
- A SCC + SB 100 + Diversification scenario that attempts to diversify the resource mix by varying the heavy reliance on solar in all the scenarios with other renewable resources, such as geothermal, wind, and solar paired with energy storage

- A SCC + SB 100 + Diversification + Biogas scenario, similar to the diversification scenario above, that replaced natural gas with biogas in its natural gas generation
- SCC + SB 100 + Diversification + Biogas + Leave IPP Energy in Utah scenario, similar to the above scenario, but assuming that energy from IPP is replaced by a geothermal plant in California

The rate impact of each scenario was calculated by taking the net present value of total cost of generation over the planning horizon divided by net energy for load to express rate impacts on a dollar per kilowatt-hour ($/kWh) basis.[6] The Base Case scenario had the lowest increase in energy cost and met the GHG reduction targets and RPS requirements of SB 350. While the SCC + SB 100 + Diversification + Biogas + Leave IPP Energy in Utah scenario had the highest increase in energy cost, it had the lowest GHG emissions compared to the other portfolios over the planning period, thereby demonstrating the range of tradeoffs between cost and environmental goals.

Pasadena determined that relative to all eight scenarios, the preferred scenario, SCC + SB 100, ranked near the middle when considering likely increase in energy cost. This scenario is projected to be 2.7 percent higher than the 2019 power supply budget, and will allow Pasadena to meet CARB's GHG target and the SB 100 RPS requirements. Pasadena presented the results of its IRP analysis to the residents of Pasadena and to STAG members for consideration.

Pasadena developed ranking criteria to select the preferred scenario. The criteria included four factors: cost and ratepayer impact, compliance, environmental stewardship, and diversity. Each scenario received a score based on feedback from STAG and the ranking criteria was used to select the preferred SCC + SB 100 scenario, for planning purposes.

Procurement Strategy

Pasadena's long-term planning strategy is to align its future resource portfolio with the goals set by the City of Pasadena to reduce GHG emissions; promote building and transportation electrification; and encourage the development of renewables to transition away from fossil fuels while maintaining affordable rates and electric reliability. The utility does not plan to procure energy and capacity from new fossil fired resources, but instead intends to procure more renewable resources, such as solar.

The recommended portfolio from the scenario evaluation includes the following strategies:

- Only enter into long-term generation contracts from renewable or zero-carbon emitting resources

6 Net present value is a form of financial analysis that calculates the current value of a stream of payments occurring in the future.

- Decline to enter in a new contract for IPP when IPP repowers to use natural gas.
- Reduce GHG emissions by at least 75 percent from 1990 levels by 2030
- Meet a minimum RPS level of 60 percent by 2030
- Maintain reliability and flexibility in meeting changes to the electric industry

Pasadena also plans to either update or develop a new IRP within the next five years as it evaluates new resource needs to meet energy, peak, and RPS and GHG targets. As outlined in the standardized tables, Pasadena plans to meet future energy and peak demand through a mix of utility-owned generation, existing long-term contracts, new resource builds focusing on renewable energy such as solar, and energy purchases on the wholesale market.

Table 1 and **Table 2** summarize energy and capacity information from the standardized reporting tables. Pasadena notes a decrease in both capacity and energy from non-RPS-eligible resources of approximately 3 percent annually during the planning period. Capacity and energy from RPS-eligible resources increase approximately 10 percent and nearly 4 percent annually, respectively, over the same period. The most notable change is the elimination of coal in Pasadena's fuel mix in 2025. There is a slight increase in generation from natural gas resources in 2025 when Pasadena takes a smaller share of the generation from IPP after the coal to natural gas conversion. However, generation from natural gas resources returns to historical levels by 2030. Other non-RPS-eligible resources, such as large hydro and nuclear remain at a relatively constant level of output over the planning horizon.

As Pasadena procures more renewables to meet RPS targets, it increases reliance on spot-market purchases. While spot-market purchases represented 29 percent of its energy demand in 2017, this share grows to almost 40 percent by 2030. Solar PV will have the highest rate of growth of all the resources in Pasadena's preferred portfolio, with generation increasing from 103,000 MWh to over 450,000 MWh. Other renewables, such as biofuels and geothermal, will remain flat over the planning period. Pasadena does not expect to procure any new wind in its preferred portfolio and will let existing wind contracts expire with the output being replaced by relatively cheaper in-state solar PV resources. Pasadena's analysis concluded that wind resources located out-of-state were cost effective. However, transmission congestion and integration costs, along with RPS rules, showed in-state solar PV being less expensive than out-of-state wind resources. Pasadena also expects to rely on renewable energy credits (REC) to help meet RPS procurement obligations.

Table 1 provides a summary of the amount of energy from the resources in the utility's portfolio in 2019, 2025, and 2030.

Table 2 provides a summary of the capacity resources relied on to meet peak demand and reliability requirements in the same years. Appendix B includes a table identifying the energy and capacity for individual resources for all years, see **Table B-1** and **Table B-2**.

Table 1: Energy Resources by Type 2019, 2025, and 2030 (MWh)

		2019	2025	2030
Total Net Energy for Load		**1,100,269**	**1,154,075**	**1,173,688**
Non-RPS	Coal	413,091	204,972	0
	Large Hydroelectric	44,135	44,440	44,094
	Natural Gas	77,170	95,800	78,167
	Nuclear	75,282	73,934	72,193
	Spot Purchases	229,519	338,294	464,698
	Spot Sales	(10,467)	(67,624)	(71,011)
RPS Resources	Biofuels	122,299	122,299	116,531
	Geothermal	18,119	18,119	18,119
	Solar PV	103,352	312,274	451,556
	RPS Contracts	159,500	111,000	70,000
	Wind	27,996	10,476	0
Total Energy Procured		1,259,997	1,263,986	1,244,348
Surplus/Shortfall		159,728	109,911	70,660

Source: California Energy Commission, Energy Assessments Division, Based on Pasadena 2019 IRP filing

Table 2: Capacity Resources by Type for 2019, 2025, and 2030 (MW)

		2019	2025	2030
Peak Demand		**295**	**311**	**318**
Planning Reserve Margin		**44**	**47**	**48**
Peak Procurement Requirement		**339**	**358**	**366**
Non-RPS	Coal	83	41	
	Large Hydroelectric	20	20	20
	Natural Gas	207	214	207
	Nuclear	10	10	10
RPS Resources	Biofuels	21	21	20
	Geothermal	2	2	2
	Solar PV	36	111	161
	Wind	7	5	0
Total Capacity Procured		**386**	**424**	**420**
Surplus/Shortfall		**47**	**67**	**54**

Source: California Energy Commission, Energy Assessments Division, Based on Pasadena 2019 IRP filing

CHAPTER 2:
Review for Consistency with Public Utilities Code Section 9621 Requirements

This chapter summarizes the main elements of Pasadena's IRP and provides staff's findings regarding the consistency of the IRP filing with PUC section 9621 requirements, as well as the *POU IRP Guidelines*. These include whether the utility meets GHG 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 GHG targets established by CARB, in coordination with the Energy Commission and the California Public Utilities Commission.[7] These GHG targets reflect the electricity sector's percentage in achieving the economy-wide GHG emission reductions of 40 percent from 1990 levels by 2030. Energy Commission staff reviewed the GHG emissions associated with Pasadena's portfolio of resources in 2030, as identified in its IRP and standardized reporting tables. Staff independently assessed the emission factors associated with various resources in Pasadena's portfolio to ensure consistency with other data and information available to staff.

Staff finds that Pasadena plans to achieve the GHG emission target range established by CARB of 128 to 226 thousand metric tons of carbon dioxide equivalent (MT CO_2e). Pasadena's resource portfolio emissions are at the high end of the GHG range, at roughly 201 MT CO_2et, which is consistent with the requirement of PUC section 9621(b)(1). Pasadena estimated emissions for individual resources using a production cost modeling tool. For spot market purchases, Pasadena used a specific emission intensity value to estimate GHG emissions. **Table 3** shows GHG emissions for Pasadena's portfolio of resources in 2019, 2025, and 2030. Appendix B includes **Table B-3** identifying the emission intensities and total emissions for individual resources for all years.

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

Table 3: Greenhouse Gas Emissions from Pasadena's Resources Portfolio

	Fuel Type	GHG Intensity (MT CO2e/MWh)	Total Emissions (MT CO2e) 2019	2025	2030
Glenarm 1	natural gas	0.800	16	104	44
Glenarm 2	natural gas	0.775	16	178	58
Glenarm 3	natural gas	0.638	207	902	621
Glenarm 4	natural gas	0.640	73	680	409
Glenarm CC	natural gas	0.610	0	772	258
Intermountain Coal	coal	0.946	390,624	193,824	0
Intermountain CC	natural gas	0.363	0	5,301	0
Magnolia	natural gas	0.410	31,076	31,076	31,076
Magnolia 2	natural gas	0.410	384	550	102
Spot Market Purchases	system	0.428	98,234	144,790	198,891
Sport Market Sales	system	0.428	(4,480)	(28,943)	(30,393)
Total Portfolio Emissions	**NA**	**NA**	**516,151**	**349,234**	**201,066**

Source: California Energy Commission, Energy Assessments Division, Based on Pasadena 2019 IRP filing

Renewable Portfolio Standard Planning Requirements

PUC section 9621(b)(2) requires that POU IRPs ensure procurement of at least 50 percent renewable portfolio standard by 2030 consistent with Article 16 (commencing with section 399.11), Chapter 2.3.[8] Staff reviewed the renewable procurement standardized reporting table, the discussion in the IRP filing, and the renewable procurement plan submitted. Staff finds that Pasadena's plans are consistent with the RPS procurement requirements in 2030 and all interim compliance periods, and are consistent with requirements of PUC section 9621(b)(2).

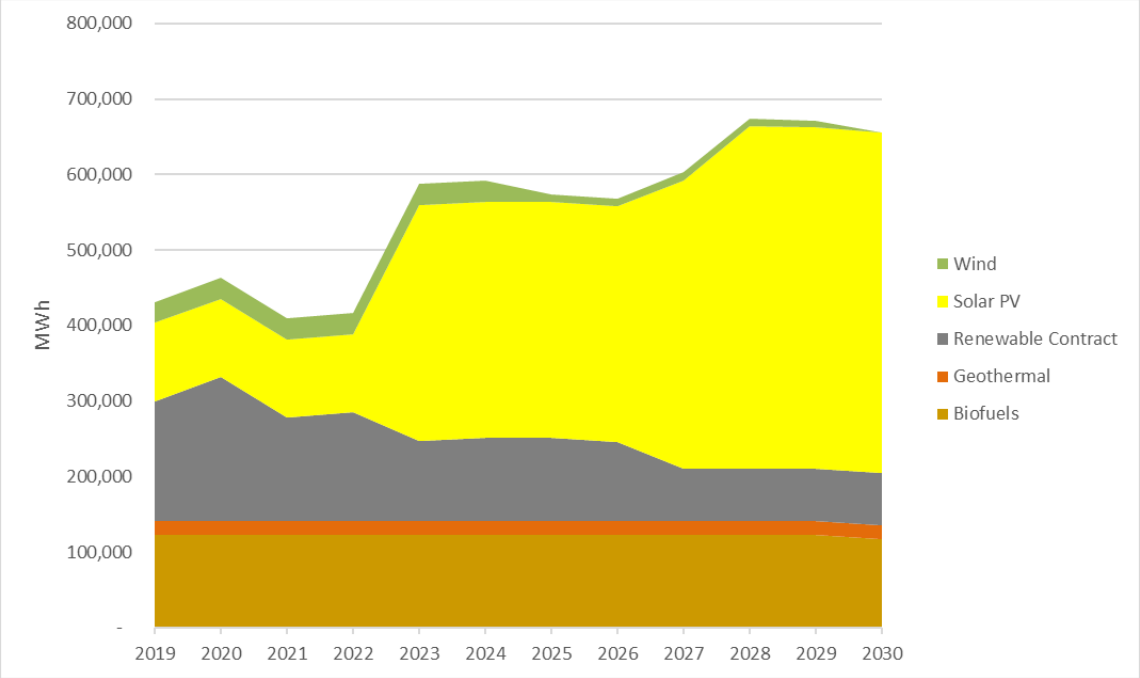
Pasadena plans to exceed the current RPS requirements of PUC section 9621(b)(2) by acquiring RPS-eligible resources to meet 60 percent of retail sales by 2030. Pasadena meets the 2030 RPS requirements through a combination of existing renewable contracts, planned new renewable resources, and proposed contracts for the purchase of energy and RECs. Pasadena plans to rely primarily on solar to meet its additional RPS requirements, while maintaining other biomass and geothermal resources from its portfolio starting in 2030. **Figure 3** shows the increase in renewable generation from 2019 to 2030. Pasadena expects to meet the following RPS targets over the planning period:

- 33 percent of retail sales by 2020
- 44 percent of retail sales by 2024
- 52 percent of retail sales by 2027

8 PUC Section 9621(b) requires the governing board of POUs to adopt an IRP on or before January 1, 2019, while PUC Section 9621(b)(3) requires the IRP ensure procurement of at least 50 percent eligible renewable resources by 2030. SB 100 (de León, Chapter 312, Statutes of 2018) increases the RPS requirement for 2030 from 50 to 60 percent. However, since the POUs were required to adopt their IRPs before SB 100 went into effect, the POU was only required to plan for the 50 percent RPS target in their IRP. Future POU IRPs will need to meet RPS requirements in effect when these updates are filed.

- 60 percent of retail sales by 2030

Figure 3: Sources of Renewable Generation 2019 — 2030 (MWh)



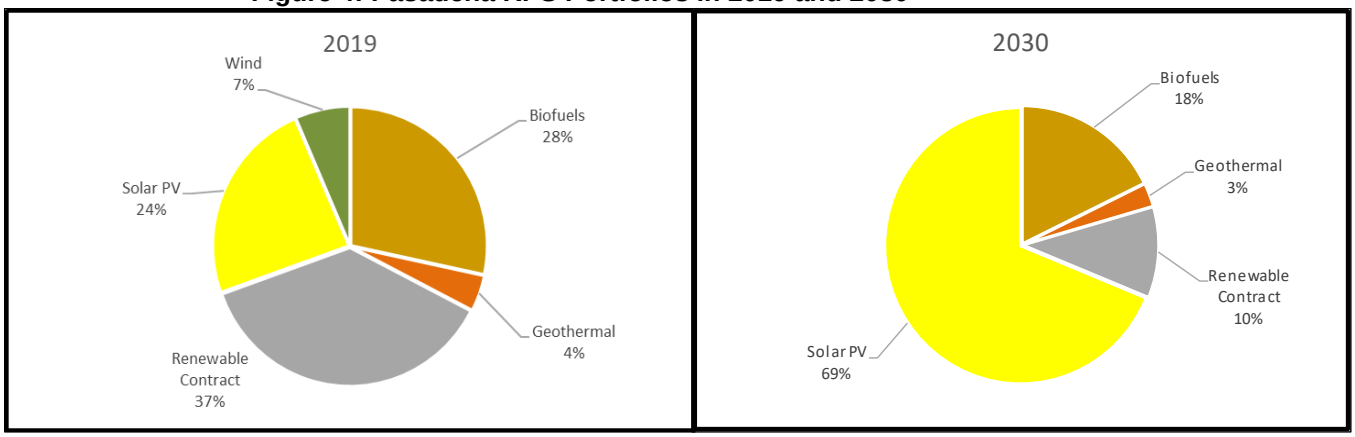
Source: California Energy Commission, Energy Assessments Division, based on Pasadena 2019 IRP filing

Pasadena expects to meet roughly one third of its renewable energy requirement in 2030 with existing resources, including:

- Summer Solar of Lancaster, a solar PV facility supplying nearly 3 percent of total renewable energy supply
- Columbia 2 Solar, a solar PV facility supplying over 1 percent of total renewable energy supply
- Puente Hills, a landfill gas facility supplying over 11 percent of total renewable energy supply
- Heber Geothermal, a geothermal facility supplying nearly 3 percent of total renewable energy supply
- Chiquita Canyon Landfill, a landfill gas facility supplying over 6 percent of total renewable energy supply
- Antelope Big Sky Ranch, a solar PV facility supplying nearly 3 percent of total renewable energy supply
- Kingbird Solar, a solar PV facility supplying nearly 9 percent of total renewable energy supply
- Windsor Reservoir Solar Project, a solar PV facility supplying nearly 0.1 percent of total renewable energy supply

Pasadena's general strategy in meeting RPS requirement is to procure RPS-eligible renewable resources and build an excess balance from portfolio content category (PCC) PCC 1 and PCC 2 eligible resources to use in later compliance periods. Pasadena also relies on PCC 3 resources to meet ratcheting RPS targets in interim periods. **Figure 4** shows the mix of renewable resources for 2019 and 2030.

Figure 4: Pasadena RPS Portfolios in 2019 and 2030



Source: California Energy Commission, Energy Assessments Division, based on Pasadena 2019 IRP filing

Pasadena maintains a significant balance of excess generation from PCC 1 and PCC 2 resources between RPS compliance periods, which are drawn down in later compliance periods to comply with RPS goals. The excess balance, as a share of total RPS eligible generation and purchases of RECs, varies from a low of 35 percent in compliance period 3 (2017-2020) to a high of 70 percent in compliance period 5 (2025-2027). While Pasadena relies on PCC 3 resources to meet RPS targets in the earlier part of the planning horizon, the utility stops relying on PCC 3 resources starting in 2029.

Retail Rates

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, and minimize impacts on ratepayer bills. Staff reviewed the analysis and information Pasadena presented on the rate and bill impacts from scenarios it evaluated. As discussed, Pasadena considered eight scenarios for meeting its future energy supply needs. The recommended scenario, SCC + SB 100, represents a balance of the community needs, compliance with electric reliability standards, and state regulations (RPS and GHG), and the financial health of the utility. Pasadena examined, in detail, the retail rate impact associated with each scenario using the output from the production cost model and other analysis.[9]

9 Pasadena staff calculated the net present value of total cost of generation over the planning horizon for each scenario and divided it by net energy for load to express rate impact on a $/kWh basis.

Pasadena compared each scenario to its 2019 power supply budget to quantify the rate impact of each scenario to a common baseline. The comparison used the output from the production cost model and included the following adjustments:

- Cost of debt service for IPP and Magnolia power contracts
- Renewable integration charge for out-of-state renewables
- Reliability payments to the California ISO
- Banking of renewable energy to meet RPS compliance requirements
- Replacement cost of energy from IPP with a geothermal resource at $75/MWh
- The cost of biogas for any scenario proposing to replace natural gas with biogas
- Include the cost for IPP defeasance fund and stranded investments

Pasadena used its rate analysis tool to assess the rate impact of each scenario. All scenarios had higher energy costs than the 2019 power supply budget, with considerable variation between the scenarios. For example, the Base Case scenario had the lowest increase in energy costs (1.6 percent higher than the 2019 power supply budget), while the SCC + SB 100 + Diversification + Biogas + Leave IPP Energy in Utah scenario had the highest increase in energy costs (10.1 percent higher than the 2019 power supply budget).[10] Pasadena determined that the preferred scenario ranked approximately in the middle when ranked by likely increase in energy cost. It would also be 2.7 percent higher than the 2019 power supply budget while allowing Pasadena to meet CARB's GHG target and the RPS requirements of SB 100.

Pasadena noted several emerging trends that could affect retail rates further including:

- A potential increase in renewable contract prices due to SB 100 if the supply of renewable resources does not match increase in demand from utilities trying to meet the new higher RPS standard.
- A potential increase in renewable contract prices due to an increased number of Community Choice Aggregators (CCA) that will be subject to RPS requirements if the supply of renewables becomes limited.
- Hotter summer temperatures increasing spot market prices as Pasadena expects the share of spot market purchases in its portfolio to grow.
- Uncertainty in capacity prices due to potential regulatory changes in resource adequacy requirements when moving from a year ahead procurement market structure to a multiyear procurement structure.

10 The Base Case scenario reflects requirements of SB 350 by 2030 such as RPS and GHG emissions targets. The SCC + SB 100 + Diversification + Biogas + Leave IPP Energy in Utah scenario is the Base Case scenario with a much higher carbon price applied to the dispatchable level of Pasadena's fossil-fired resources. It also diversifies the resource mix by the capacity expansion model since new resource build in all the scenarios were heavily tilted towards solar. It also assumes that biogas replaces natural gas for Pasadena's natural gas resources. Finally, this scenario assumes that energy from IPP is replaced by a geothermal plant located in California.

- Cost increases related to transmission and distribution system and other customer charges.
- The upgrade of Pasadena's customer information system.

These trends can affect retail rates in addition to the assumptions relied on in the IRP. Pasadena notes that it can be difficult to quantify the impact of these trends on retail rates due to the high degree of uncertainty associated with them.

System and Local Reliability

SB 350 requires filing POUs to adopt an IRP that ensures system and local reliability and addresses resource adequacy requirements.[11] Energy Commission staff reviewed Pasadena's capacity reporting table and discussion and finds Pasadena has planned for sufficient resources to maintain a reliable electric system. Pasadena'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 reliability requirements in PUC section 9621(b)(3) and resource adequacy requirements in PUC section 9621(d)(1)(E).

Pasadena is a California Independent System Operator (California ISO) certified scheduling coordinator and participating transmission owner, and its transmission rights (owned and under contract) have been turned over to California ISO for operation and planning. As such, the California ISO is responsible for evaluating the regional short and long-term infrastructure needs for reliability during its annual Transmission Planning Process. Under state and federal mandates, Pasadena is required to hold sufficient generation capacity to ensure uninterrupted service to retail loads under a variety of conditions, and to meet California ISO reliability and resource adequacy criteria. The California ISO has defined three types of resource adequacy: system, local, and flexible.

System Reliability and Resource Adequacy

Pasadena maintains a planning reserve margin of 15 percent, which requires the utility to procure enough capacity to exceed its one-in-two system peak by at least 15 percent.[12] Pasadena modeled its planning reserve requirement in the production cost modeling analysis for this IRP by assessing the ability of each resource in the portfolio, including market purchases, to ensure system reliability. Pasadena expects system peak demand, including the planning reserve margin, to increase from 340 MW in 2019 to 366 MW by 2030. A surplus capacity is expected over the planning period with a 50 MW surplus in 2030. While the bulk of new planned capacity will come from solar PV, Pasadena will maintain its existing natural gas resources to ensure system reliability.

11 Public Utilities Code section 9621(b)(3).

12 One-in-two system peak demand is the peak demand that can be expected to occur 50 percent of the time and reflects normal or average weather conditions.

Local Capacity Needs

The California ISO establishes requirements for local capacity needs. Pasadena is located in California ISO's LA Basin and Big Creek/Venture local reliability areas. The California ISO conducts an annual Local Capacity Technical Analysis based on its one-in-ten-year peak forecast to establish local capacity needs for distribution companies.[13] Local capacity need is expected to be just under 125 MW, and plans include reliance on existing natural gas resources to fulfill local capacity requirements.

Flexible Capacity Needs

The California ISO establishes requirements for flexible resources through its flexible resources adequacy requirements. The need for flexible capacity has increased due to retirement of coastal power plants (once-through-cooling units) and growth of intermittent resources such as solar PV. To count towards flexible resource adequacy, a resource must be able to ramp up and maintain output for a minimum of three hours. Based on California ISO's 2018 flexible resource adequacy requirements analysis, Pasadena has a flexible resource adequacy obligation between 31 MW to 62 MW. Growth of intermittent renewable resources interconnected to California ISO system may require higher flexibility requirements, which this need can only be identified when California ISO completes its next flexibility requirements analysis.

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. Energy Commission staff determined that Pasadena's IRP adequately plans to maintain and enhance its transmission and distribution systems. Staff finds Pasadena has planned for enough transmission to deliver resources to its service area to meet the requirement discussed below. Staff also finds that the utility conducts planning activities to address the adequacy of its distribution system. As such, staff finds the IRP is consistent with the transmission and distribution requirements set forth above.

Transmission System

Power imported over transmission from outside Pasadena's system is received at the Goodrich Station. Most of the 230-kV equipment at Goodrich is owned by Pasadena, but is maintained and operated by Southern California Edison (SCE) under the direction of the California ISO. As a distribution utility operating within the transmission system managed by the California ISO, activities related to transmission planning such as grid reliability requirements, system upgrades, and projects to help implement California's energy policy goals are handled by the California ISO. In its IRP, Pasadena notes that the most recent transmission assessment conducted by the California ISO did not identify

13 One-in-ten system peak demand is the peak demand that can be expected to occur 10 percent of the time and reflects extreme weather conditions.

reliability concerns requiring new projects to meet transmission system planning requirements.

Distribution System

Pasadena undertakes regular assessments of its distribution system to ensure that it meets reliability standards, accommodates new technologies such as solar PV and electric vehicles, and plans for general maintenance of its distribution equipment. Pasadena noted several efforts related to distribution planning including:

- Construction of underground structures in San Rafael Avenue and Nithsdale Road
- Extension of 17kV circuits (Paloma and San Rafael Avenue)
- Update the Power Delivery Master Plan to accommodate technologies such as distributed solar PV, transportation electrification, energy storage, and demand response.[14] Future IRP plans may incorporate findings from this update.

Pasadena plans to update its Power Delivery Master Plan in 2019 to help guide future infrastructure needs. Examples of projects may include replacement of power poles, transformers, distribution switches, underground cabling, overhead conductors, circuit breakers, and capacitor banks. Pasadena will also consider further automation of its distribution system to maintain reliability and resilience.

Disadvantaged Communities and Localized Air Pollutants

PUC section 9621(b)(3) requires POUs to minimize localized air pollutants and GHG emissions with early priority on disadvantaged communities (DAC). Energy Commission staff reviewed Pasadena's IRP filing to determine the extent to which it is minimizing local air pollutants with a priority placed on DACs. Staff finds that Pasadena has made efforts to address these issues in selecting the resources to include in its portfolio consistent with the requirement.

Pasadena used the California Environmental Protection Agency's (Cal EPA) California Communities Environmental Health Screening Tool (CalEnviroScreen) to identify DACs in its service area. Pasadena identified one area within its service area that met the air pollution, socio-economic, and health criteria that qualify it as a DAC. This area is in zip code 91103, along Interstate 210 north of the Ventura Freeway intersection. While CalEnviroScreen identifies DACs by census tract, Pasadena extended the definition of a DAC to include additional areas for its energy efficiency and electrification programs for a total of five areas, all in zip code 91103 along Interstate 210.

14 The last update occurred in 2005 and a new update is needed to focus on distribution impacts including a review of impacts from distributed energy resources.

There are three generation facilities more than two miles away from DAC communities identified by Pasadena, but only one is owned by Pasadena. The California Institute of Technology owns the other two facilities. Pasadena does not expect significant effects from these facilities since all three are more than two miles away.

Pasadena DAC customer programs include:

- Energy Savings Assistance Program. Offers no-cost home improvement services based on income. Targets include attic insulation, water heater blankets, door weather stripping, faucet aerators, caulking, low-flow showerheads, evaporative cooler vent covers, furnace repair or replacement, and water heater repair or replacement.
- Home Energy Rebates. Available to all Pasadena customers with rebates doubling for low-income customers. This program targets home appliances, fixtures, heating and cooling systems, insulation, landscaping, irrigation, and pools.
- Refrigerator Exchange Program. Provides no-cost replacement of old refrigerators for a new energy efficient refrigerator.
- The Water and Energy Direct Install Program (WeDIP). Available to small business customers. Provides no-cost water and energy saving equipment such as lighting upgrades, faucet aerators, pre-rinse spray valves, low-flow showerheads, efficient toilets, efficient urinals, refrigeration gaskets, strip curtains, LED refrigerated case lighting, evaporator fan controllers, and anti-sweat heaters.
- Under One Roof Program. Collaboration with the city of Pasadena on programs benefitting low-income residential customers.
- Commercial Charger Incentive Program. Doubles the incentive for installing EV chargers in a DAC.

Other plans include applying for grant funding from CARB's Cap and Trade Expenditure Plan, which targets communities heavily impacted by air pollution. This could provide funding up to $255 million for reducing toxic and criteria pollutants and $460 million for Low Carbon Transportation. Pasadena also plans to invest in transportation electrification of city resources, such as municipal trucks, school buses, and refuse collection, that are within DACs.

Net Energy Demand in Peak Hours

PUC section 9621(c) requires POUs to consider existing renewable generation, grid operation efficiencies, 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, distribution and transmission resources. Pasadena's IRP discusses how these factors contribute to meeting net demand in peak

hours, This is consistent with the requirement that filing POUs address how they can meet peak hour demand with renewable and other preferred resources.

The capacity expansion modeling analysis undertaken by Pasadena for its preferred portfolio selected no new fossil-fired resources.[15] The production cost analysis optimized the operation of existing and new resources along with spot market purchases to ensure Pasadena could reliably satisfy net peak demand and maintain sufficient reserves to meet reliability requirements.

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 on page 19.

Energy Efficiency and Demand Response Resources

Staff finds that Pasadena's IRP is consistent with the requirement in PUC section 9621(d)(1)(A), as they include a discussion of energy efficiency and demand response programs to implement and quantify the targeted amount of energy efficiency savings they plan to achieve. The standardized tables submitted by Pasadena show the energy efficiency programs would reduce demand by 162 GWh by 2030, which is slightly higher than the targets set by the Energy Commission under SB 350.

Table 4: Pasadena Additional Achievable Energy Efficiency Estimates (GWh)

Year	AAEE (GWh)	SB 350 Targets (GWh)
2019	14	13
2020	27	26
2021	41	39
2022	54	52
2023	68	65
2024	81	77
2025	95	88
2026	108	99
2027	122	109
2028	135	118
2029	149	126
2030	162	

Source: Pasadena 2019 IPR filing

15 Capacity expansion modeling is a method to select generation and transmission needs of a power system over a time period given load growth, retirement of existing resources, and regulatory and policy drivers such as RPS, emissions standards, and reserve margins. Production cost modeling simulates the most efficient and least cost resources to meet the next increment of load given the characteristics of a power system, and can be done in sequence with capacity expansion modeling analysis.

Pasadena initiated a demand response program, the voluntary load curtailment program (VLCP), in 2016 in response to natural gas supply disruption from the restricted use of the Aliso Canyon gas storage system. The California ISO designed the load curtailment program for use in an emergency. Pasadena targeted its 50 largest customers to reduce load when an event triggered the VLCP. While the California ISO did not call for reductions in 2016, VLCP secured nearly 3 MW of load reduction potential. While the VLCP was only in place for 2016, Pasadena continues to seek new opportunities to encourage customer participation in demand response. As mentioned, Pasadena will update its Power Delivery Master Plan in 2019. This update will examine distribution system impacts from technologies such as solar PV. Pasadena intends to examine options to expand demand response as part of the update.

Energy Storage

Staff finds that Pasadena's IRP is consistent with the requirement in PUC section 9621(d)(1)(B) to address procurement of energy storage as they discussed the potential role of energy storage on their system. AB 2514 (Skinner, Chapter 469, Statutes of 2010) requires POUs to evaluate the potential of energy storage systems as a resource and establish procurement targets. Pasadena's AB 2514 analysis found that a reliable procurement target could not be set, given the existing costs and performance characteristics of energy storage systems. Pasadena finds that while the price of energy storage systems has come down, energy storage is still a relatively expensive resource for utility scale applications. While energy storage was included as a candidate resource, the capacity expansion modeling analysis for the preferred portfolio did not select energy storage due to its relatively higher cost. Pasadena will continue to monitor trends in the cost and performance of energy storage systems and seek opportunities to integrate energy storage into its portfolio.

Transportation Electrification

Staff finds that Pasadena's IRP is consistent with the requirement of PUC section 9621(d)(1)(C), as they address transportation electrification, primarily for light-duty vehicles. Pasadena has several efforts underway to promote transportation electrification in its service area and provides rebates targeting:

- The purchase or a lease of plug-in EVs (PEV) for residential customers.
- The installation of Level 2 and Level 3 DC-Fast Charging for non-residential customers.
- The installation of "Wi-Fi" based EV chargers for residential customers.

Pasadena examined recent trends in PEV ownership for its service area and, along with other supporting data, developed a forecast of light-duty PEV adoption. Pasadena estimates there will be roughly 9,000 PEVs by 2030 in its service area. This forecast is significantly lower than the Energy Commission's of nearly 40,000 PEVs in Pasadena's service area by 2030. Pasadena notes that the Energy Commission's PEV reflects State policy to promote and increase transportation electrification. The goal of 40,000 PEVs

reflects Pasadena's proportional share of a statewide goal of having 5 million PEVs in California by 2030.[16] Pasadena's forecast is also below the statewide goal of 1.5 million PEVs in California by 2025.[17] Pasadena believes its forecast offers a more realistic assessment of PEV adoption due to:

- A lack of available charging infrastructure in the service area.
- A customer base where up to 40 percent of residents are at the low to moderate income level.
- Saturation of PEVs by higher income residents.

To promote transportation electrification in its service area, Pasadena will examine options to expand charging infrastructure and rebates for vehicle purchases by leveraging funding opportunities from the Energy Commission, CARB, and Pasadena's air quality district. Pasadena offers higher incentives for installing charging infrastructure in DACs, plans to examine electrification of the city vehicle fleet that operate primarily in DACs, such as buses and refuse collection equipment. Based on the data submitted by Pasadena in the standardized tables, the incremental load from transportation electrification is expected to be just over 6,000 MWh in 2019, and grow to approximately 27,000 MWh by 2030. Pasadena noted a corresponding increase in GHG emissions of approximately 11,500 MTCO2e by 2030 from transportation electrification.

Portfolio Diversification

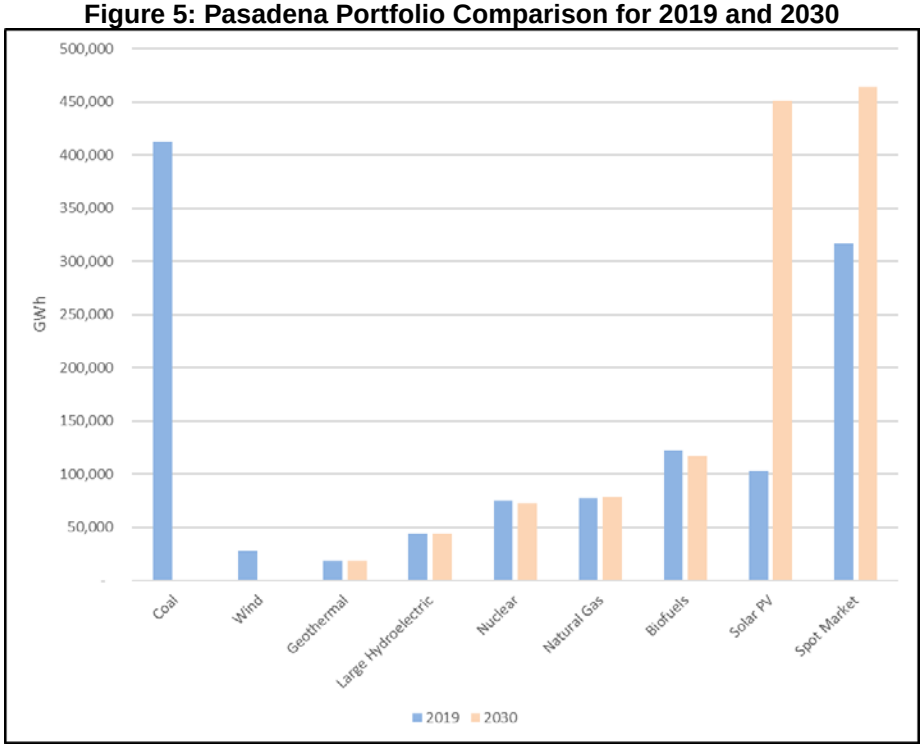
PUC section 9621(d)(1)(D) requires that POUs address procurement of a diversified portfolio of resources consisting of short and long-term electricity, electricity related, and demand response products. Based on staff's review of Pasadena's existing resources, their portfolio analysis, and the selection of resource additions in their IRP, staff concludes that Pasadena has fulfilled this requirement.

Figure 5 shows a comparison of the energy mix by resource type in Pasadena's preferred portfolio in 2019 and 2030.

16 Executive order B-48-18 signed on January 26, 2018. https://www.ca.gov/archive/gov39/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/index.html.

17 Executive order B-16-2012 signed on March 23, 2012. https://www.ca.gov/archive/gov39/2012/03/23/news17472/index.html.

Figure 5: Pasadena Portfolio Comparison for 2019 and 2030



Source: California Energy Commission, Energy Assessments Division, Based on Pasadena 2019 IRP filing Energy Balance Table

By 2030, Pasadena will have transitioned from coal to a portfolio emphasizing solar PV and spot market purchases of energy. This portfolio also maintains a consistent supply of renewable and GHG-free resources such as geothermal, nuclear, and biofuels.

Appendix A

PUBLIC UTILITIES CODE - PUC

DIVISION 4.9. RESTRUCTURING OF PUBLICLY OWNED ELECTRIC UTILITIES IN CONNECTION WITH THE RESTRUCTURING OF THE ELECTRICAL SERVICES INDUSTRY [9600 - 9622]

(Division 4.9 added by Stats. 1996, Ch. 854, Sec. 12.)

9621.

(a) This section shall apply to a local publicly owned electric utility with an annual electrical demand exceeding 700 gigawatt hours, as determined on a three-year average commencing January 1, 2013.

(b) On or before January 1, 2019, the governing board of a local publicly owned electric utility shall adopt an integrated resource plan and a process for updating the plan at least once every five years to ensure the utility achieves all of the following:

(1) Meets the greenhouse gas emissions reduction targets established by the State Air Resources Board, in coordination with the commission and the Energy Commission, for the electricity sector and each local publicly owned electric utility that reflect the electricity sector's percentage in achieving the economy wide greenhouse gas emissions reductions of 40 percent from 1990 levels by 2030.

(2) Ensures procurement of at least 50 percent eligible renewable energy resources by 2030 consistent with Article 16 (commencing with Section 399.11) of Chapter 2.3 of Part 1 of Division 1.

(3) Meets the goals specified in subparagraphs (D) to (H), inclusive, of paragraph (1) of subdivision (a) of Section 454.52, and the goal specified in subparagraph (C) of paragraph (1) of subdivision (a) of Section 454.52, as that goal is applicable to each local publicly owned electric utility. A local publicly owned electric utility shall not, solely by reason of this paragraph, be subject to requirements otherwise imposed on electrical corporations.

(c) In furtherance of the requirements of subdivision (b), the governing board of a local publicly owned electric utility shall consider the role of existing renewable generation, grid operational efficiencies, energy storage, and distributed energy resources, including energy efficiency, in helping to ensure each utility meets energy needs and reliability needs in hours to encompass the hour of peak demand of electricity, excluding demand met by variable renewable generation directly connected to a California balancing authority, as defined in Section 399.12, while reducing the need for new electricity generation resources and new transmission resources in achieving the state's energy goals at the least cost to ratepayers.

(d) (1) The integrated resource plan shall address procurement for the following:

(A) Energy efficiency and demand response resources pursuant to Section 9615.

(B) Energy storage requirements pursuant to Chapter 7.7 (commencing with Section 2835) of Part 2 of Division 1.

(C) Transportation electrification.

(D) A diversified procurement portfolio consisting of both short-term and long-term electricity, electricity-related, and demand response products.

(E) The resource adequacy requirements established pursuant to Section 9620.

(2) (A) The governing board of the local publicly owned electric utility may authorize all source procurement that includes various resource types, including demand-side resources, supply side resources, and resources that may be either demand-side resources or supply side resources, to ensure that the local publicly owned electric utility procures the optimum resource mix that meets the objectives of subdivision (b).

(B) The governing board may authorize procurement of resource types that will reduce overall greenhouse gas emissions from the electricity sector and meet the other goals specified in subdivision (b), but due to the nature of the technology or fuel source may not compete favorably in price against other resources over the time period of the integrated resource plan.

(e) A local publicly owned electric utility shall satisfy the notice and public disclosure requirements of subdivision (f) of Section 399.30 with respect to any integrated resource plan or plan update it considers.

(Amended by Stats. 2017, Ch. 389, Sec. 2. (SB 338) Effective January 1, 2018.)

PUBLIC UTILITIES CODE - PUC

DIVISION 1. REGULATION OF PUBLIC UTILITIES [201 - 3260]

(Division 1 enacted by Stats. 1951, Ch. 764.)

PART 1. PUBLIC UTILITIES ACT [201 - 2120]

(Part 1 enacted by Stats. 1951, Ch. 764.)

CHAPTER 3. Rights and Obligations of Public Utilities [451 - 651]

(Chapter 3 enacted by Stats. 1951, Ch. 764.)

ARTICLE 1. Rates [451 - 467]

(Article 1 enacted by Stats. 1951, Ch. 764.)

454.52.

(a) (1) Beginning in 2017, and to be updated regularly thereafter, the commission shall adopt a process for each load-serving entity, as defined in Section 380, to file an integrated resource plan, and a schedule for periodic updates to the plan, to ensure that load-serving entities do the following:

(A) Meet the greenhouse gas emissions reduction targets established by the State Air Resources Board, in coordination with the commission and the Energy Commission, for the electricity sector and each load-serving entity that reflect the electricity sector's percentage in achieving the economy wide greenhouse gas emissions reductions of 40 percent from 1990 levels by 2030.

(B) Procure at least 50 percent eligible renewable energy resources by December 31, 2030, consistent with Article 16 (commencing with Section 399.11) of Chapter 2.3.

(C) Enable each electrical corporation to fulfill its obligation to serve its customers at just and reasonable rates.

(D) Minimize impacts on ratepayers' bills.

(E) Ensure system and local reliability.

(F) Strengthen the diversity, sustainability, and resilience of the bulk transmission and distribution systems, and local communities.

(G) Enhance distribution systems and demand-side energy management.

(H) Minimize localized air pollutants and other greenhouse gas emissions, with early priority on disadvantaged communities identified pursuant to Section 39711 of the Health and Safety Code.

(2) (A) The commission may authorize all source procurement for electrical corporations that includes various resource types including demand-side resources, supply side resources, and resources that may be either demand-side resources or supply side

resources, taking into account the differing electrical corporations' geographic service areas, to ensure that each load-serving entity meets the goals set forth in paragraph (1).

(B) The commission may approve procurement of resource types that will reduce overall greenhouse gas emissions from the electricity sector and meet the other goals specified in paragraph (1), but due to the nature of the technology or fuel source may not compete favorably in price against other resources over the time period of the integrated resource plan.

(3) In furtherance of the requirements of paragraph (1), the commission shall consider the role of existing renewable generation, grid operational efficiencies, energy storage, and distributed energy resources, including energy efficiency, in helping to ensure each load-serving entity meets energy needs and reliability needs in hours to encompass the hour of peak demand of electricity, excluding demand met by variable renewable generation directly connected to a California balancing authority, as defined in Section 399.12, while reducing the need for new electricity generation resources and new transmission resources in achieving the state's energy goals at the least cost to ratepayers.

(b) (1) Each load-serving entity shall prepare and file an integrated resource plan consistent with paragraph (2) of subdivision (a) on a time schedule directed by the commission and subject to commission review.

(2) Each electrical corporation's plan shall follow the provisions of Section 454.5.

(3) The plan of a community choice aggregator shall be submitted to its governing board for approval and provided to the commission for certification, consistent with paragraph (5) of subdivision (a) of Section 366.2, and shall achieve the following:

(A) Economic, reliability, environmental, security, and other benefits and performance characteristics that are consistent with the goals set forth in paragraph (1) of subdivision (a).

(B) A diversified procurement portfolio consisting of both short-term and long-term electricity and electricity-related and demand reduction products.

(C) The resource adequacy requirements established pursuant to Section 380.

(4) The plan of an electric service provider shall achieve the goals set forth in paragraph (1) of subdivision (a) through a diversified portfolio consisting of both short-term and long-term electricity, electricity-related, and demand reduction products.

(c) To the extent that additional procurement is authorized for the electrical corporation in the integrated resource plan or the procurement process authorized pursuant to Section 454.5, the commission shall ensure that the costs are allocated in a fair and equitable manner to all customers consistent with Section 454.51, that there is no cost shifting among customers of load-serving entities, and that community choice aggregators may self-provide renewable integration resources consistent with Section 454.51.

(d) To eliminate redundancy and increase efficiency, the process adopted pursuant to subdivision (a) shall incorporate, and not duplicate, any other planning processes of the commission.

(e) This section applies to an electrical cooperative, as defined in Section 2776, only if the electrical cooperative has an annual electrical demand exceeding 700 gigawatt hours, as determined based on a three-year average commencing with January 1, 2013.

(Amended by Stats. 2018, Ch. 92, Sec. 174. (SB 1289) Effective January 1, 2019.)

Appendix B

Table B-1: Energy Resources, All Years (MWh)

			2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Net Energy for Load			1,100,269	1,105,908	1,109,485	1,117,365	1,120,779	1,150,414	1,154,075	1,156,687	1,161,104	1,165,446	1,169,614	1,173,688
Non-RPS Resources	Glenarm 1	natural gas	20	0	0	0	0	40	130	101	91	49	117	55
	Glenarm 2	natural gas	20	0	0	0	0	82	229	140	118	97	123	75
	Glenarm 3	natural gas	324	326	314	370	357	822	1,413	1,346	1,168	1,211	1,642	974
	Glenarm 4	natural gas	115	153	207	207	193	463	1,064	1,010	831	805	1,265	639
	Glenarm CC	natural gas	-	-	-	-	185	589	1,265	1,270	1,448	2,010	2,682	423
	Hoover	large hydro	44,135	44,277	44,291	44,473	44,752	44,501	44,440	44,613	44,460	44,826	44,448	44,094
	Intermountain CC	natural gas	0	0	0	0	0	0	14,605	18,836	3,538	0	0	0
	Intermountain Coal	coal	413,091	416,608	415,066	414,552	414,246	415,427	204,972	0	0	0	0	0
	Magnolia	natural gas	75,753	75,965	75,753	75,753	75,753	75,965	75,753	75,753	75,753	75,965	75,753	75,753
	Magnolia 2	natural gas	937	19	217	305	456	685	1,341	1,489	1,528	1,888	2,225	249
	Palo Verde	nuclear	75,282	75,440	75,198	75,268	74,758	74,144	73,934	74,323	73,937	73,773	72,728	72,193
	Spot market purchases	not reported	229,519	233,666	237,056	242,953	144,728	163,319	338,294	487,796	463,497	442,161	444,949	464,698
	Spot market sales	not reported	(10,467)	(10,486)	(9,513)	(8,316)	(114,678)	(104,721)	(67,624)	(12,490)	(38,391)	(77,488)	(76,023)	(71,011)
RPS Resources	Antelope Big Sky Ranch Solar Facility	solar PV	18,131	18,188	18,131	18,131	18,131	18,188	18,131	18,131	18,131	18,188	18,131	18,131
	Chiquita Canyon Landfill	biofuels	46,925	47,077	46,925	46,925	46,925	47,077	46,925	46,925	46,925	47,077	46,925	41,157
	Columbia 2 Solar	solar PV	7,391	7,411	7,391	7,391	7,391	7,411	7,391	7,391	7,391	7,411	7,391	7,391
	Planned Intermittent	solar PV					208,922	209,530	208,922	208,922	278,563	349,217	348,203	348,203
	Heber Geothermal	geothermal	12,942	12,978	12,942	12,942	12,942	12,978	12,942	12,942	12,942	12,978	12,942	12,942
	Heber Geothermal 2	geothermal	5,177	5,191	5,177	5,177	5,177	5,191	5,177	5,177	5,177	5,191	5,177	5,177
	High Wind	wind	17,520	17,568	17,520	17,520	17,520	17,568	0	0	0	0	0	0
	Kingbird Solar	solar PV	59,010	59,188	59,010	59,010	59,010	59,188	59,010	59,010	59,010	59,188	59,010	59,010
	Milford Wind Corridor	wind	10,476	10,477	10,476	10,476	10,476	10,477	10,476	10,476	10,476	10,477	8,895	
	Puente Hills	biofuels	75,374	75,592	75,374	75,374	75,374	75,592	75,374	75,374	75,374	75,592	75,374	75,374
	Summer Solar of Lancaster	solar PV	18,129	18,182	18,129	18,129	18,129	18,182	18,129	18,129	18,129	18,182	18,129	18,129
	Windsor Reservoir Solar Project	solar PV	691	693	691	691	691	693	691	691	691	693	691	691
	Planned RPS Contracts	n/a	159,500	190,500	138,000	145,000	107,000	110,000	111,000	105,000	70,000	70,000	70,000	70,000
Total Energy		n/a	**1,259,997**	**1,299,013**	**1,248,355**	**1,262,331**	**1,228,438**	**1,263,394**	**1,263,986**	**1,262,356**	**1,230,788**	**1,239,491**	**1,240,777**	**1,244,348**
Surplus/Shortfall		n/a	**159,728**	**193,104**	**138,871**	**144,966**	**107,658**	**112,980**	**109,911**	**105,669**	**69,684**	**74,045**	**71,164**	**70,660**

Source: California Energy Commission, Energy Assessments Division, Based on Pasadena 2019 IRP filing Energy Balance Table

Table B-2: Capacity Resources, All years (MW)

			2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Peak Demand			295	297	299	301	302	310	311	312	314	315	317	318
Planning Reserve Margin			44	45	45	45	45	46	47	47	47	47	48	48
Peak Procurement Requirement			339	342	344	346	348	356	358	359	361	363	364	366
Non-RPS Resources	Glenarm 1	natural gas	22	22	22	22	22	22	22	22	22	22	22	22
	Glenarm 2	natural gas	22	22	22	22	22	22	22	22	22	22	22	22
	Glenarm 3	natural gas	44	44	44	44	44	44	44	44	44	44	44	44
	Glenarm 4	natural gas	42	42	42	42	42	42	42	42	42	42	42	42
	Glenarm CC	natural gas	64	64	64	64	64	64	64	64	64	64	64	64
	Hoover	large hydro	20	20	20	20	20	20	20	20	20	20	20	20
	Intermountain CC	natural gas	0	0	0	0	0	0	7	14	7	0	0	0
	Intermountain Coal	coal	83	83	83	83	83	83	41	0	0	0	0	0
	Magnolia	natural gas	10	10	10	10	10	10	10	10	10	10	10	10
	Magnolia 2	natural gas	4	4	4	4	4	4	4	4	4	4	4	4
	Palo Verde	nuclear	10	10	10	10	10	10	10	10	10	10	10	10
RPS Resources	Antelope Big Sky Ranch Solar Facility	solar PV	7	7	7	7	7	7	7	7	7	7	7	7
	Chiquita Canyon Landfill	biofuels	8	8	8	8	8	8	8	8	8	8	8	7
	Columbia 2 Solar	solar PV	3	3	3	3	3	3	3	3	3	3	3	3
	Heber Geothermal	geothermal	1	1	1	1	1	1	1	1	1	1	1	1
	Heber Geothermal 2	geothermal	1	1	1	1	1	1	1	1	1	1	1	1
	High Wind	wind	2	2	2	2	2	2	0	0	0	0	0	0
	Kingbird Solar	solar PV	20	20	20	20	20	20	20	20	20	20	20	20
	Milford Wind Corridor	wind	5	5	5	5	5	5	5	5	5	5	4	-
	Puente Hills	biofuels	12	12	12	12	12	12	12	12	12	12	12	12
	Summer Solar of Lancaster	solar PV	7	7	7	7	7	7	7	7	7	7	7	7
	Windsor Reservoir Solar Project	solar PV	1	1	1	1	1	1	1	1	1	1	1	1
	Planned Intermittent	solar PV	0	0	0	0	75	75	75	75	100	125	125	125
Total Capacity Procured			386	386	386	386	461	461	424	390	408	426	426	420
Surplus/Shortfall			47	44	43	40	113	105	67	31	47	64	61	54

Source: California Energy Commission, Energy Assessments Division, Based on Pasadena 2019 IRP filing Capacity Resource Accounting Table

Table B-3: GHG Emissions from Pasadena's Resource Portfolio, All Years

	Fuel Type	GHG Intensity (MT CO2e/MWh)	Total Emissions (MT CO2e)											
			2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Glenarm 1	natural gas	0.800	16	0	0	0	0	32	104	81	73	40	94	44
Glenarm 2	natural gas	0.775	16	0	0	0	0	63	178	108	91	75	96	58
Glenarm 3	natural gas	0.638	207	208	200	236	228	524	902	859	745	772	1,047	621
Glenarm 4	natural gas	0.640	73	98	132	132	124	296	680	646	532	515	809	409
Glenarm CC	natural gas	0.610	0	0	0	0	113	359	772	775	883	1,226	1,636	258
Intermountain Coal	coal	0.946	390,624	393,950	392,492	392,005	391,716	392,832	193,824	0	0	0	0	0
Intermountain CC	natural gas	0.363	0	0	0	0	0	0	5,301	6,837	1,284	0	0	0
Magnolia	natural gas	0.410	31,076	31,163	31,076	31,076	31,076	31,163	31,076	31,076	31,076	31,163	31,076	31,076
Magnolia 2	natural gas	0.410	384	8	89	125	187	281	550	611	627	774	913	102
Spot Market Purchases	system	0.428	98,234	100,009	101,460	103,984	61,943	69,901	144,790	208,776	198,377	189,245	190,438	198,891
Sport Market Sales	system	0.428	(4,480)	(4,488)	(4,071)	(3,559)	(49,082)	(44,821)	(28,943)	(5,346)	(16,432)	(33,165)	(32,538)	(30,393)
Portfolio Emissions	NA	NA	516,151	520,947	521,378	523,999	436,305	450,632	349,234	244,423	217,256	190,646	193,571	201,066

Source: California Energy Commission, Energy Assessments Division, Based on Pasadena 2019 IRP filing Greenhouse Gas Emissions Accounting Table