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STAFF REPORT

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

Gavin Newsom, Governor

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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 (CEC) to review the integrated resource plans of publicly owned utilities that exceed a specified demand threshold 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. Glendale Water and Power submitted their 2019 Integrated Resource Plan and standardized reporting tables, which the Glendale City Council adopted on July 23, 2019, to the CEC for review on July 29, 2019. This staff paper presents the results of the CEC staff review of the Glendale Water and Power 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 an 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 (CEC's) *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines* requires those 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 CEC must review the IRPs to ensure consistency with the requirements of PUC Section 9621.

The objective of Glendale Water and Power's (Glendale) IRP is to determine a cost effective and reliable resource portfolio that meets the utility's environmental and policy goals. The primary challenge was to replace the soon to be retired units of Grayson Power Plant, which currently provides a significant portion of generation needed to meet local reliability requirements. The Glendale service area is in a load pocket with limited transmission availability, so it is critical that a sufficient amount of new generating resources are local.

Initially, Glendale had proposed to repower the retiring Grayson units with 262 megawatts (MW) of new combined cycle and combustion turbine units. After community engagement, the Glendale City Council asked the utility to evaluate clean energy options as alternatives to the proposed repowering. Glendale issued a solicitation for zero- and low-carbon resources and used the results of the Request for Proposals to develop the resource scenarios for evaluation in this IRP. Glendale evaluated several scenarios over a 20-year horizon for reliability, cost and greenhouse gas emissions. The scenarios ranged from the original proposed repower, to a repower with natural gas-fired internal combustion engine (ICE) units, to a 100 percent clean replacement portfolio, all with similar capacity values and asset costs. Glendale first eliminated portfolios that were determined to not be reliable and then used the total cost and greenhouse gas metrics to select a proposed replacement portfolio.

The preferred replacement portfolio ultimately selected consists of local resources including 75 MW of battery storage (of which, only 50 MW is planned to be online in 2030), five 18.6 MW ICE-units, distributed energy resources and load reduction programs, as well as 130 MW of remote wind and 130 MW of remote solar resources. Glendale determined this portfolio was reliable, while providing more flexibility than the original proposed repower. However, Glendale is required to report to the City Council on any new potential distributed energy

resources, new transmission opportunities or options to renegotiate its reserve requirement agreements before purchasing the ICE-units.

In reviewing the Glendale IRP and determining consistency with the requirements of PUC Section 9621, CEC staff relied on the four standardized reporting tables and narrative descriptions in the IRP, as well as analysis and verification of 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 discussion in the IRP filing, demonstrate the utility plans to meet the greenhouse-gas emission reduction requirements of PUC Section 9621(b)(1), and the renewable energy procurement requirements of PUC Section 9621(b)(2).
- *Meeting Planning Goals:* The values reported in 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 the analysis and narrative discussion, demonstrate 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 during peak hours as set forth in PUC Section 9621(c).
- *Addressing Resource Procurement Types:* The IRP filing includes values reported in the standardized tables and narrative discussion that demonstrate the utility has addressed the procurement requirements for energy efficiency and demand response, energy storage, transportation electrification (the use of electricity for vehicles vessels, trains, boats, or other equipment that are mobile sources of air pollution), 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 CEC to establish statewide and utility-specific targets to achieve a statewide doubling of energy efficiency by 2030. Staff observes that aggressive energy efficiency and demand response programs are needed for utilities and energy efficiency providers 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 CEC will report on progress in achieving the doubling targets, including those for Glendale, and update the targets, if necessary.

CHAPTER 1:
Background, Demand Forecast, and Procurement

Introduction

California Public Utilities Code (PUC) Section 9621 requires publicly owned utilities (POUs) with an annual electrical demand exceeding 700 gigawatt hours (GWh) to develop integrated resource plans (IRP). 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. 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 demand threshold to submit an IRP and updates to the California Energy Commission (CEC) for review to determine consistency with the requirements of PUC Section 9621. If the CEC determines an IRP is inconsistent with these requirements the CEC shall provide recommendations to correct the deficiencies. The CEC adopted the *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines* (*POU IRP Guidelines*) to govern the submission of the POUs' IRPs.[2] PUC Section 9622 requires the CEC to review POU IRPs to ensure they achieve PUC Section 9621 provisions (see **Attachment I**).

This chapter outlines the CEC's review process and provides an overview of Glendale Water and Power (Glendale) and its IRP development. In addition, the chapter addresses the *POU IRP Guidelines* requirements that POUs provide a demand forecast and a procurement plan as part of its IRP.

1 Public Utilities Code Article 16 (commencing with Section 399.11) of Chapter 2.3 of Part 1 of Division 1. See ATTACHMENT I.
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.

Energy Commission IRP Review Process

On July 29, 2019, Glendale submitted its IRP and standardized reporting tables, as outlined in the *POU IRP Guidelines*,[3] to the CEC for review. Staff's review occurred in 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 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 Glendale 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 the POU achieved Renewables Portfolio Standard (RPS) procurement requirements, energy efficiency savings projections and programs, and plans for transportation electrification.

Overview of Glendale Water and Power

Glendale is a vertically-integrated, city-owned, not-for-profit electric and water utility in Los Angeles County and in the Los Angeles Department of Water and Power (LADWP) Balancing Area.

- Glendale serves approximately 89,000 customers.
- In 2017, Glendale delivered approximately 1,453 GWh of energy, with a peak load of 346 MW. Glendale has 417 MW of local and remote generation owned or contracted with to serve load.
- A unique feature of Glendale is that it exists in a load pocket with only about 200 MW of import capability.

Glendale's Planning Process

Glendale focused its planning process on the replacement of the retiring units at Grayson Power Plant (Grayson). Glendale's primary planning objective is to maintain reliability, pursue all available and cost-effective clean energy options,

3 The *POU IRP Guidelines* define an *IRP filing* to include the IRP adopted by the POU local governing board, along with standardized tables and other supporting information required to review the IRP for consistency with SB 350.

develop community-supported clean energy programs, maintain optionality as technology evolves, and maintain affordability.

In April 2018, the Glendale City Council asked the utility to evaluate clean energy alternatives to a proposed 262 MW repowering of Grayson in response to community input and a desire to reduce dependence on fossil fuel-based generation and develop a cleaner portfolio. Glendale issued its Clean Request for Proposals (Clean RFP) in May 2018 for zero- and low-carbon resources to replace the retiring local fossil fuel capacity. In December 2018, the Clean RFP was not yet complete so the City Council adopted an interim IRP but directed the utility to update the IRP with the results of the Clean RFP. While the filing deadline for POU IRPs was April 2019, Glendale requested an extension to include the most current information in its evolving resource plan.[4] During the development of the updated IRP, Glendale contracted with Rocky Mountain Institute to convene a series of four community workshops plus two focus groups in April 2019 to seek community feedback. Glendale also made a survey available to residents on issues in the IRP.

On July 23, 2019, the Glendale City Council adopted the new IRP and passed a resolution limiting the use of any gas engines to situations such as peak weather or adverse system conditions. At least 60 days before the purchase of any ICE units, the utility was also required to report on any potential additional distribution energy resources, new transmission opportunities, options to renegotiate agreements with LADWP regarding reserve requirements, as well as develop a plan to achieve 100 percent clean energy by 2030.[5] Glendale submitted its IRP to the CEC on July 29, 2019.

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.[6] Under the *POU IRP Guidelines* (Chapter 2.E.2), 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.[7] 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 Guidelines* requirements.

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4 City of Glendale Water and Power Application for Extension of Time to File 209 Integrated Resource Plan.

5 2019 Glendale City Council Motion, Resolution No 19-90.

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

7 The most recent adopted demand forecast is for the *2018 Integrated Energy Policy Forecast Update.*

Energy and Peak Forecast, Method and Assumptions

Glendale developed its demand forecast using the CEC's *2017 Integrated Energy Policy Report (IEPR)* mid-demand, mid-additional achievable energy efficiency (AAEE)/additional achievable photovoltaic (AAPV) energy demand and peak load forecasts.[8] Load contributions from EVs were developed using the CEC's electric vehicle calculator.[9] Overall, the net energy for load grows by slightly greater than 2 percent per year through 2030.[10] While Glendale forecasts new AAEE and AAPV, the additional load from electric vehicle charging effectively offsets the forecasted load reductions. As can be seen in **Figure** 1, Glendale's energy demand is generally in line with the *2018 IEPR Update* mid-demand, mid-AAEE/AAPV forecast until around 2025 and then accelerates to reach the *2018 IEPR Update* high-demand, low-AAEE/AAPV forecast around 2029.

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.[11] 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 Glendale's IRP meets these requirements. The following is a discussion of the utility's existing resources, procurement strategy, portfolio analysis underlying resource selections, and resources in 2030 identified in the standardized reporting tables.

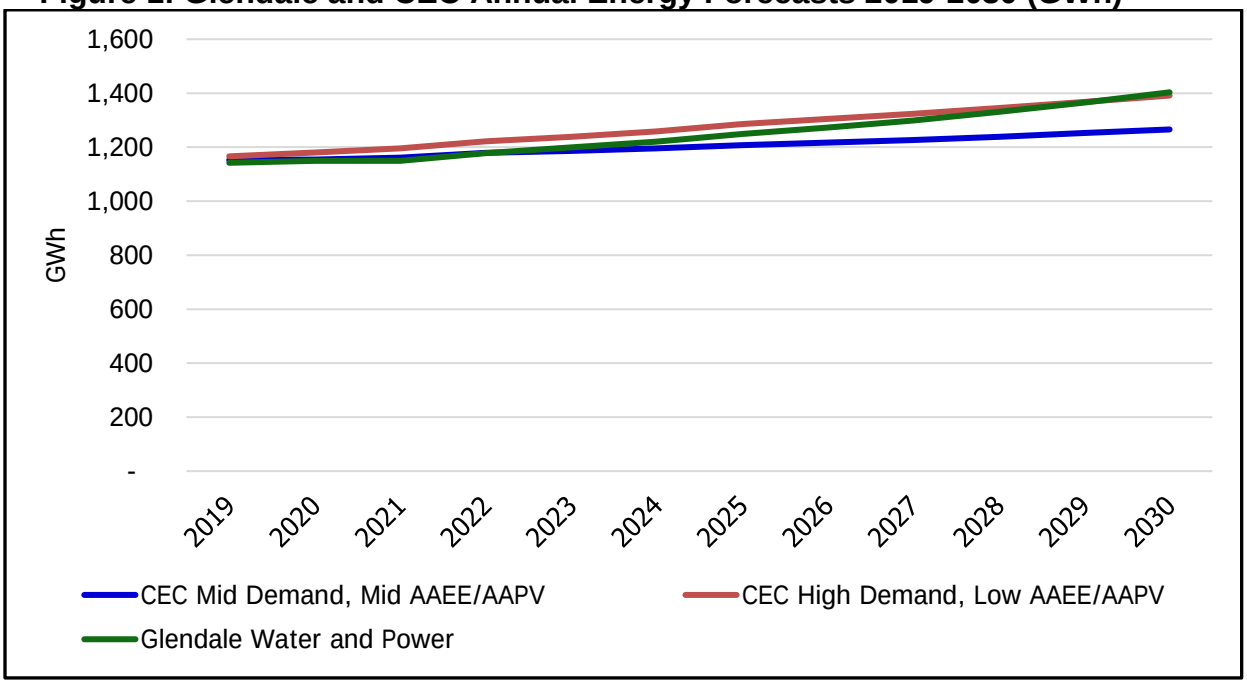
8 The CEC produced several different demand forecasts for load-serving entities and balancing authorities for the *2018 Integrated Energy Policy Report* that reflect varying demand conditions combined with varying amounts of energy efficiency and solar photovoltaic. AAEE refers to additional achievable energy efficiency *Additional achievable energy efficiency* are those savings which result from or are reasonably expected to occur from energy efficiency programs and measures that have yet to be funded and/or implemented. AAPV refers to additional achievable PV. *Additional achievable PV* is the energy from rooftop solar deployment expected from implementation of the 2019 Building Energy Efficiency Standards, which will require solar panels on new residential construction beginning January 1, 2020.

9 CEC Light-duty Plug-in Electric Vehicle Energy & Emission Calculator

10 For the purposes of IRP filings, a load-serving entity's net energy for load is the total amount of energy that it must generate or purchase to meet its retail load obligations. It includes retail consumption and transmission, distribution, storage and other losses, but excludes energy needed to meet wholesale sales obligations.

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

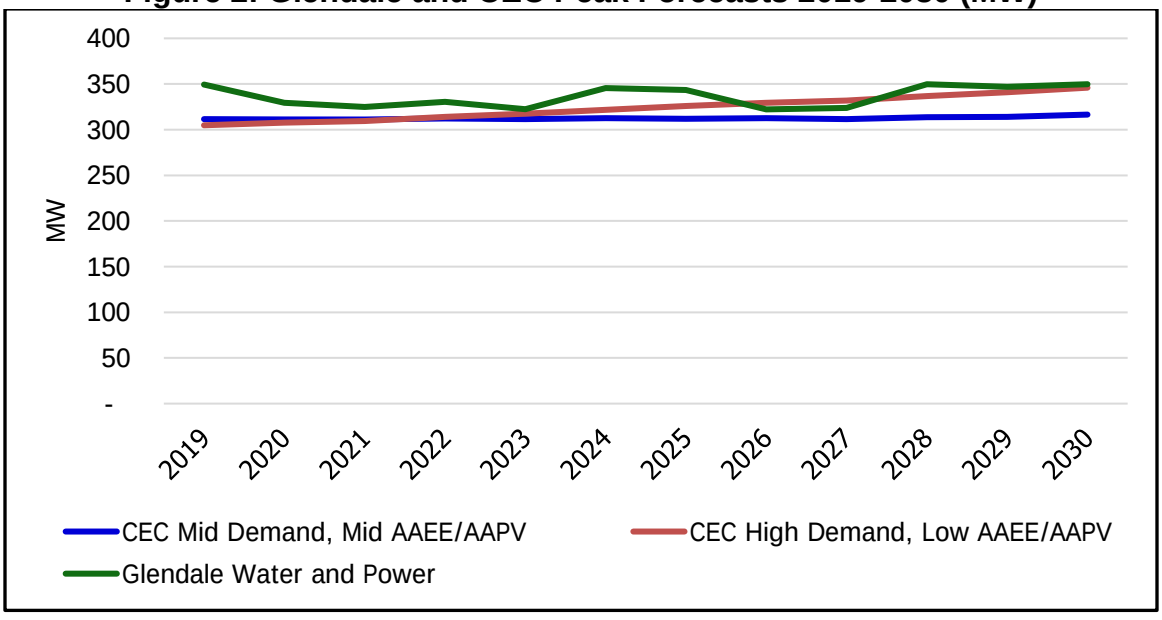
Figure 1: Glendale and CEC Annual Energy Forecasts 2019-2030 (GWh)



Source: California Energy Commission, based on Glendale's 2019 IRP Filing and the California Energy Commission 2018 Demand Forecast Update.

As can be seen in **Figure 2**, the forecasted peak demand is typically above the *2018 IEPR Update* high-demand, low-AAEE/AAPV forecast. This is likely due to a difference in assumed load shape.

Figure 2: Glendale and CEC Peak Forecasts 2019-2030 (MW)



Source: California Energy Commission, based on Glendale's 2019 IRP Filing and the California Energy Commission 2018 Demand Forecast Update.

Existing Resources

Glendale's current resource portfolio includes a mix of natural gas, coal, hydro, nuclear, landfill gas, geothermal, and wind.

Glendale's largest resource is the city-owned and –operated Grayson Power Plant. The steam turbines (Units 1-5) were installed between 1941 and 1964. The combined cycle turbine units (Units 6-8) were installed in 1977, when Units 1 and 2 were also repowered. Unit 9, a simple cycle gas turbine was installed in 2003. Grayson Units 1-8 are planned to be retired in 2021. Unit 9 is planned to continue to operate throughout the planning period, although with a lower annual output after new resources come online to replace the retiring units in 2021.

Glendale has a 30-year contract with Magnolia, a natural gas-fired power plant, through the Southern California Public Power Authority (SCPPA) for 40 MW of baseload generation beginning in 2005. Glendale is entitled to an additional 7 MW if the unit is operating in duct-firing mode.[12]

Intermountain Power Plant (IPP) is a 2 unit coal plant located near Delta, Utah. IPP has 1,800 MW of nameplate capacity and is operated by LADWP. Glendale has a 39 MW entitlement with a "take or pay" contract that expires in 2027. IPP will be repowered to an 840 MW natural gas combined cycle plant in 2025. Glendale is entitled to 35 MW of the replacement generation and 128 MW of transmission associated with the project.

Palo Verde Nuclear Generating Station is a nuclear power plant operated by Arizona Public Service with three reactors totaling 4,010 MW. Glendale has rights to 11 MW with a contract that terminates in October 2030.

Hoover Dam has a nameplate capacity of 2,080 MW of which Glendale is entitled to 20 MW. The original contract expired in 2017 and was renewed for another 50 years.

Tieton Hydropower Project was built in 2006 at the base of Tieton Dam near Yakima, Washington. Glendale bought a 50 percent ownership of the 13.6 MW of nameplate capacity starting in 2009 with an annual energy allotment of approximately 24,000 MWh.

Glendale has PPAs with several wind projects. The High Winds Generation Facility, a 145.8 MW wind project in Solano County was contracted by Glendale beginning in 2003. Glendale has a 25-year PPA for a 9 MW firmed and shaped share.

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12 Duct-firing mode is when the gas turbine exhaust is heated and re-mixed with the natural gas fuel. This increases the capacity but decreases the efficiency of the unit.

The Southwest Wyoming Wind Generation Facility, located in southwest Wyoming, was contracted by Glendale and began delivering energy in 2006. Glendale holds a 16-year PPA for 10 MW of firmed and shaped capacity.

Glendale has an 18-year agreement beginning January 2009 with Pebble Springs Wind Project in Gilliam County, Oregon for an 18 MW share. The agreement is for a non-simultaneous energy exchange with Powerex from the Pebble Springs project, where Powerex receives the energy generated and then redelivers the energy to Glendale on-peak, March through October via the Nevada Oregon Border hub on the DC intertie.

Glendale has a 25-year contract, which began February 2006, through SCPPA for 3 MW from the Ormat Geothermal Power Project, which is located in Imperial Valley, California.

Glendale's Skylar contract is a 25-year Western States Power Pool Agreement for 50 MW of power. The contract is specified for 55 percent RPS eligible, 20 percent additional carbon free energy and 25 percent system power.

Glendale also has transmission lines which access imports from out-of-state, which are discussed in the section titled Transmission and Distribution System.

Resource Portfolio Evaluation

Glendale developed a range of portfolios to replace the retiring capacity of Grayson Power Plant with comparable nameplate capacity and asset costs. The scenarios included a base case with no new resources, two natural gas repower options, a "100% Clean" scenario and incremental portfolios between a full internal combustion engine (ICE) repower and a "100% Clean" scenario.

Table 1 summarizes the portfolios evaluated. The table also includes the net present value (NPV), or total value of the portfolio in present day dollars, and whether the portfolio met the reliability criteria, as described below. The base case is not included in the table as it includes no new resources and not all metrics were reported on.

- "NG Repower" refers to a scenario in which Grayson Units 1-8 are repowered with combined cycle (CC) and combustion turbine (CT) natural gas-fired units.
- "ICE Repower" refers to a scenario in which Grayson Units 1-8 are repowered with eight 18.6 MW natural gas-fired ICE Units.
- "50 MW Battery + 6xICE" refers to a scenario in which Grayson Units 1-8 are repowered with six 18.6 MW natural gas-fired-ICE Units and 50 MW of battery energy storage. The portfolio also contains all distributed energy resource (DER), energy efficiency (EE) and demand response (DR) projects from the Clean RFP deemed feasible.

- "75 MW Battery + 5xICE" refers to a scenario in which Grayson Units 1-8 are repowered with five 18.6 MW natural gas-fired-ICE Units and 75 MW of battery energy storage. The portfolio also contains all DER, EE, and DR projects from the Clean RFP deemed feasible.
- "100 MW Battery + 3xICE" refers to a scenario in which Grayson Units 1-8 are repowered with three 18.6 MW natural gas-fired-ICE Units and 100 MW of battery energy storage. The portfolio also contains all DER, EE, and DR projects from the Clean RFP deemed feasible.
- "100% Clean" refers to a scenario in which Grayson Units 1-8 are repowered with 150 MW of battery storage. The portfolio also contains all DER, EE, and DR projects from the Clean RFP, regardless of whether Glendale deemed them to be feasible.

Table 1: Glendale's Scenario Comparison

Scenario	DER (MW)	EE + DR (MW)	Solar (MW)	Wind (MW)	Battery (MW)	CC (MW)	CT (MW)	ICE (MW)	NPV ($M)	Reliability?
NG Repower	0	0	140	140	50	71	120	0	704	Yes
ICE Repower	0	0	140	140	50	0	0	149	488	Yes
50 MW Battery + 6xICE	23	27.9	130	130	50	0	0	112	569	Yes
75 MW Battery + 5xICE	23	27.9	130	130	75	0	0	93	570	Yes
100 MW Battery + 3xICE	23	27.9	130	130	100	0	0	56	596	No
100% Clean	33	40.9	130	130	150	0	0	0	604	No

Source: California Energy Commission, based on Glendale's 2019 IRP Filing.

Glendale used the PowerSimm model to evaluate each scenario and understand the impacts over the 20-year planning horizon.[13] Loss of load studies were conducted to evaluated the reliability of each portfolio.[14] Within the reliability studies, Glendale included a forced outage of the Pacific DC intertie to test whether the portfolios were reliable during a transmission contingency.[15] In selecting the replacement portfolio for the retiring capacity of Grayson Power

13 Glendale used the production cost model PowerSimm to evaluate the candidate resource portfolios. PowerSimm optimizes the dispatch of the resource portfolio given a set of inputs, including the load profile, weather and fuel prices, and quantifies metrics such as the cost to serve load, greenhouse gas emissions and renewable generation.

14 A loss of load study evaluates a large number of scenarios to determine the number of hours the resource portfolio is unable to meet all of the load. The reliability standard is less than one cumulative day of power outage in 10 year, or less than 2.4 hours of power outage per year.

15 A transmission contingency is an event where a major transmission line is unable to deliver power. Typically, a loss of the largest one or two transmission lines or generators is studied to evaluate reliability.

Plant, Glendale first eliminated the portfolios that did not meet the modelled reliability standard. The loss of load studies showed that the "100% Clean" scenario, the 100 MW Battery + 3xICE and the base scenario with no new resources did not meet the 1 day in 10 year loss of load standard. Load could not be met during the contingency as there was not sufficient local capacity or transmission to import capacity into the local area to charge the battery energy storage. For this reason, Glendale eliminated the "100% Clean," the 100 MW Battery + 3xICE, and Base Case scenarios.

Glendale evaluated the GHG emissions impact of each of the scenarios within the PowerSimm model. The Base Case resulted in the highest level of emissions, followed by the natural gas repowers. Each of the incremental portfolios and the "100% Clean" portfolio resulted in similar levels of GHG emissions. Glendale then eliminated the portfolios that only consisted of natural gas repowers due to higher GHG emissions.

Finally, Glendale evaluated the cost of each candidate portfolio. The remaining portfolios, 50 MW Battery + 6xICE and 75 MW Battery + 5xICE, each resulted in similar NPVs. Glendale selected the portfolio deemed more environmentally-friendly, 75 MW Battery + 5xICE, as the preferred portfolio. However, 25 MW of the battery capacity is not proposed to be deployed until 2031, which is beyond the scope of this IRP review.

Procurement Strategy

Glendale's procurement strategy is focused on ensuring local generation is available to meet its local reliability needs while maintaining low rates and meeting the GHG targets. Glendale currently relies on the Grayson Power Plant to provide local generation, as it is limited in its ability to import power due to significant transmission constraints. Grayson Units 1-8 are due to retire in 2021, creating a 262 MW local generation need, as identified in Glendale's 2015 IRP.

The local resources selected in this IRP include 50.9 MW of local distributed energy resources and load reduction, 75 MW of battery energy storage and 5-18.6 MW ICE units to come online in the 2021. However, at least 60 days prior to the purchase of the ICE units, Glendale is required to report to the City Council regarding additional distributed energy resources, opportunities for new transmission, options to renegotiate with LADWP regarding reserve requirements, options to reduce or eliminate the need for the five ICE units, as well as develop plans to achieve 100 percent clean energy by 2030.[16] Any fossil fuel-fired resources, such as the ICE units, are only to be dispatched to meet peak reliability and contingency needs. This requirement was imposed

16 2019 Glendale City Council Motion, Resolution No 19-90

simultaneously to the adoption of Glendale's IRP and may change the operation of the ICE units as compared to the modelling conducted. **Table 2** summarizes the expected total energy generation by resource type in 2019, 2025 and 2030.

Table 2: Energy Resources by Type for 2019, 2025 and 2030 (MWh)

Resource	2019	2025	2030
Total Net Energy for Load*	**1,100,117**	**1,214,631**	**1,364,448**
Non-RPS Resources			
Natural Gas	166,473	379,097	384,368
Large Hydroelectric	52,851	52,796	52,741
Coal	208,948	88,496	0
Nuclear	85,848	85,848	85,848
Unspecified Power	134,625	121,163	121,163
Spot Purchases	368,713	149,984	152,915
Battery	0	-9,667	-14,352
RPS Resources			
Solar PV	0	130,627	256,884
Wind	96,533	314,487	445,009
Geothermal	21,900	21,900	21,900
RPS Generic	134,625	148,088	148,088
Small Hydro	28,814	28,814	28,813
Total Energy Procured	1,299,330	1,511,632	1,683,374
Spot Sales	-114,949	-227,088	-241,254
Surplus/Shortfall	0	0	0

Source: California Energy Commission, based on Glendale's 2019 IRP Filing.

Table 3 summarizes expected total capacity by resource type in 2019, 2025 and 2030.

Table 3: Capacity Resources by Type for 2019, 2025 and 2030 (MW)

	2019	2025	2030
Peak Demand	349	343	350
Planning Reserve Margin	148	148	148
Peak Procurement Requirement	497	491	498
Non-RPS Resources			
Natural Gas	264	224	224
Large Hydroelectric	12	12	12
Coal	39	39	0
Nuclear	10	10	10
Unspecified Power	23	23	23
Spot Purchases	91	48	85
Battery	0	50	50
RPS Resources			
Solar PV	0	60	120
Wind	23	72	119
Geothermal	3	3	3
RPS Generic	28	28	28
Small Hydro	7	7	7
Total Capacity Procured	497	491	498
Surplus/Shortfall	0	0	0

Source: California Energy Commission, based on Glendale's 2019 IRP Filing.

CHAPTER 2:
Review for Consistency with PUC Section 9621 Requirements

This chapter summarizes the main elements of Glendale'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 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.[17] 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. CEC staff reviewed the GHG emissions associated with Glendale'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 Glendale's portfolio to ensure consistency with other data available to staff.

Staff finds that Glendale plans to achieve the CARB-established GHG emission target range of 119,000 to 210,000 metric tons of carbon dioxide equivalent (MMT CO_2e). Glendale's resource portfolio results in roughly 193,000 MT CO_2e, which is consistent with the requirement of PUC Section 9621(b)(1). Glendale estimated its emissions by multiplying each emitting resource by a specific emissions factor associated with each plant. Spot market purchases and sales were multiplied by the system power emissions of 0.428 MT eCO2 per MWh, as established by CARB. The GHG emission reductions from 2019 to 2030 are largely attributed to the repower of IPP from coal to natural gas, reduced spot market purchases and increased spot market sales. The reported GHG emissions in Glendale's GHG Emissions Reporting Table is roughly consistent with the GHG emissions reported from the modelling conducted, which is approximately

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

200,000 MT CO2e. Both the GHG emissions reported in the GHG Emissions Reporting Table and from the modelling are within the CARB adopted range.

Table 4 shows GHG emissions for Glendale's portfolio of resources in 2019, 2025, and 2030.

Table 4: Greenhouse Gas Emissions from Glendale's Resources Portfolio

Source	Fuel Type	GHG Intensity (MT CO_2e / MWh)	2019 Emissions (MT CO_2e)	20205 Emissions (MT CO_2e)	2030 Emissions (MT CO_2e)
Grayson Units 3-8	Natural Gas	0.702	12,230	-	-
Grayon Unit 9	Natural Gas	0.684	13,836	5,188	4,724
Wartsila ICEs	Natural Gas	0.532	-	62,647	56,803.7
MSCG/Skylar (not RPS-eligible)	Unspecified	0.428	57,620	28,810	28,810
Magnolia	Natural Gas	0.535	70,143	76,281	62,164
IPP - Coal	Coal	1.303	269,914	120,284	-
IPP - Repower	Natural Gas	0.492	-	51,580	78,702
Spot market purchases	system	0.428	157,809	64,193	65,447
Spot market sales	system	0.428	-49,198	-97,194	-103,257
Total Portfolio emissions	**NA**	**NA**	**532,354**	**311,789**	**193,394**

Source: California Energy Commission, based on Glendale's 2019 IRP Filing.

Appendix B includes a table identifying the emission intensities and total emissions for individual resources for all years; see **Table B-2.**

Renewables Portfolio Standard Planning Requirements

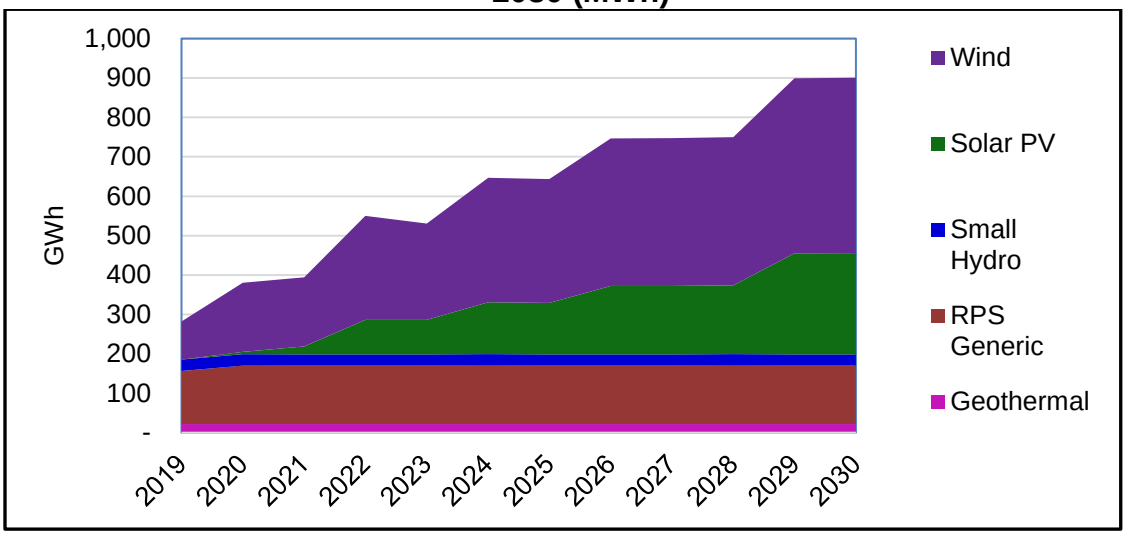
PUC Section 9621(b)(2) requires that POU IRPs ensure procurement of at least 50 percent renewable energy resources by 2030, consistent with Article 16 (commencing with Section 399.11) of Chapter 2.3.[18] Staff reviewed the

18 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

renewable procurement table, the discussion in the IRP filing, and the renewable procurement plan submitted. Staff finds that Glendale's plans are consistent with the RPS procurement requirements and all interim compliance periods, as well as the requirements of PUC Section 9621(b)(2).

Glendale plans to exceed the SB 350 target of a 50 percent RPS and the SB 100 target of a 60 percent RPS target in 2030. In addition to increasing RPS targets, Glendale also has 23 MW of expiring wind contracts to replace before 2030. **Figure 3** illustrates the growth in anticipated renewables from 2019 to 2030.

Figure 3: Sources of Renewables Portfolio Standard Eligible Energy 2019-2030 (MWh)

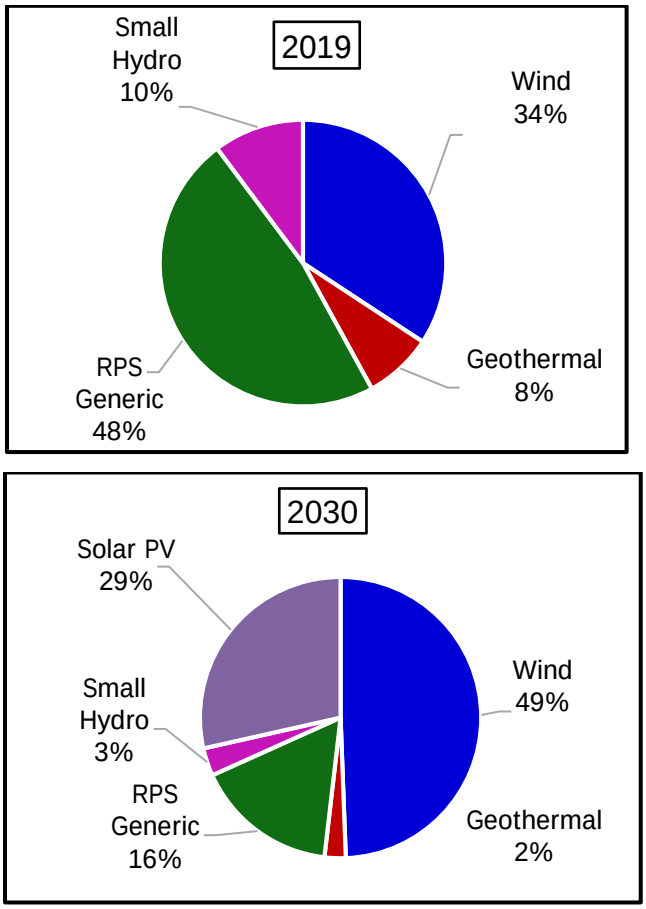


Source: California Energy Commission, based on Glendale's 2019 IRP Filing.

Glendale intends to meet its RPS obligation through the procurement of new wind and solar resources. A contract for 10 MW of "Public Spaces DER," local solar projects, beginning in 2020 was procured through the Clean RFP. Additionally, Glendale intends to procure around 30 MW of new solar in 2022 and an additional 20 MW in 2024, 20 MW in 2026, and 40 MW in 2029. Glendale also intends to contract 30 MW of new wind in 2022 and an additional 20 MW in 2024, 20 MW in 2026, and 40 MW in 2029. Contracts to fulfill these plans were not reported as of the writing of this IRP Review and Glendale notes that the quantities of generic resources reported may not match the precise quantities procured. **Figure 4** illustrates the overall balance of the Glendale renewable portfolio in 2019 and 2030.

plan for the 50 percent RPS target in their IRP. Future POU IRPs will need to meet RPS requirements in effect when those updates are filed.

Figure 4: Glendale Renewable Portfolios in 2019 and 2030



Source: California Energy Commission, based on Glendale's 2019 IRP Filing.

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 to ratepayer bills. Staff reviewed the analysis and information Glendale presented in its IRP filing on the rate and bill impacts from different resource portfolios they evaluated. Staff finds the Glendale's IRP is consistent with the rates discussion, as required in PUC Section 9621(b)(3).

Cost effectiveness and impacts on ratepayer bills were key considerations in the development and selection of the replacement portfolio for the retiring units of Grayson Power Plant. Resource portfolio options were selected to have similar capacity and asset costs. The evaluation of portfolios included a comparison of the net present value of each portfolio. Ultimately, the final portfolios that met the reliability and GHG targets had similar costs, so Glendale selected the portfolio deemed to be the more environmentally-friendly portfolio. Glendale also completed its Electric Cost of Service and Rate Design Study in 2017, which

evaluated the utility's ongoing and future costs and was used to update the rates for each customer class for years 2019 through 2023.[19]

System and Local Reliability

SB 350 (de León, Chapter 547, Statutes of 2015) requires filing POUs to adopt an IRP that ensures system and local reliability and addresses resource adequacy requirements.[20] Staff reviewed the Glendale's capacity reporting table and discussion and finds that Glendale has planned for sufficient resources to maintain a reliable electric system. In addition, Glendale'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).

System Reliability

Glendale is located in a load pocket and therefore plans for system reliability based on the local reliability standard of maintaining reliability in N-1-1 contingencies during peak load hours.[21] The largest contingency on the Glendale system is the 100 MW of capacity on the Pacific DC intertie. Grayson Unit 9 or Glendale's share of Magnolia Power Plant is the second largest contingency, both 48 MW. Therefore, the reserve requirement is 148 MW. Glendale strategically selected small, more flexible units for the Grayson repower in order to reduce the amount of reserves needed in comparison to the original proposed repower scenario, which increased the reserve requirement as one of the new units was larger than 48 MW. Glendale has planned for enough capacity to meet the system reliability requirement.

Local Capacity Needs

As Glendale has significant transmission constraints, it primarily relies upon local resources to meet its system reliability needs. As described above, Glendale plans for an N-1-1 contingency during peak load hours, which results in a reserve requirement of 148 MW. Glendale plans to meet its local reliability needs through a combination of preferred resources, such as energy efficiency, solar or demand response, with new local gas generation as a last option. Due to the short timeline for new resources to be deployed to replace the retiring units of Grayson power plant, Glendale plans to only include new preferred resources identified

19 Electric Rate Study- Executive Summary
20 Public Utilities Code section 9621(b)(3).
21 An "N-1" contingency is an event where the largest resource (a generation or transmission asset) fails and is unable to deliver power. An "N-1-1" contingency is an event where the largest resource is unable to deliver power and the second largest resource fails and is unable to deliver power. An N-1-1 contingency is the industry standard for maintaining reliability in local areas.

through the Clean RFP that Glendale deemed feasible for deployment. However, the utility is required to bring an evaluation of any additional preferred resource potential to the City Council before moving forward with any natural gas repowers. If no other preferred resources appear feasible, the utility will move forward with a five unit 18.6 MW internal combustion unit natural gas plant.

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. Staff determined that Glendale's IRP filing adequately plans to maintain and enhance its transmission and distribution systems. Staff finds that Glendale has planned for enough transmission to adequately deliver resources to its service area to meet the requirement as discussed below. Staff also finds that Glendale is planning 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

Glendale is located in a highly transmission constrained area which is interconnected to the western grid through two major transmission lines, the Pacific DC Intertie and the Southwest Intertie. Glendale has rights to 100 MW of transfer capacity on Pacific DC Intertie, which facilitates access to the Nevada Oregon Border trading hub. Glendale has additional rights to 100 MW of transfer capacity on the Southwest Intertie, which facilitates access to IPP, Mead, Hoover, Palo Verde, wind resources, and several trading hubs. Transmission utilization is highest in June and July, when demand is the highest.

Currently, future transmission development includes the Southern Transmission System line upgrade associated with the IPP repower. Given the current limited import capacity, combined with the limited local preferred resource development potential, Glendale cited a clear need for new transmission in order to procure new clean resources to replace fossil resources and meet the 100 percent GHG-free goal in 2045.

Distribution System

Glendale's distribution system consists of 520 miles of distribution lines, 58 miles of sub-transmission lines, 15,000 poles and 14 substations. Glendale is currently in the process of updating its Electric Services Master Plan. This plan addresses substation upgrades, transmission and distribution updates (both in terms of physical infrastructure and voltage rating), and transmission and distribution additions. It also addresses enhanced requirements and continued incentives for DER installations, a demand response program to reduce peak load stress, and enhancement of infrastructure to minimize the likelihood of wildfire ignition.

Glendale also stressed the importance of evaluating the impacts of new electric vehicle load on the distribution system as higher levels of electric vehicles are adopted, especially in the more affluent areas of its service territory.

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. Staff reviewed Glendale's IRP filing to determine the extent to which they minimize local air pollutants with a priority placed on disadvantaged communities. Staff finds that Glendale has made efforts to address these issues in selecting the resources they plan to include in their portfolio consistent with the requirement.

Approximately 35 percent of the population in Glendale's service territory live in a disadvantaged community as defined by the California Environmental Protection Agency[22]. Glendale has many programs targeting low-income customers and is in the process of designing new programs for low-income and disadvantaged communities. A notable program Glendale is designing will evaluate the efficiency of low-income customers' homes and offer free upgrades to apartment owners with low-income residents. Glendale is also exploring community solar programs.

Net Energy Demand in Peak Hours

PUC Section 9621(c) requires POUs to consider existing renewable generation portfolio, 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, distribution and transmission resources. Glendale's IRP includes a discussion as to how efficiency and demand-side resources can reduce net energy demand in peak hours. This plan is consistent with the requirement set forth above.

Glendale estimates that current energy efficiency programs contribute approximately 2 MW of peak demand reduction. Glendale expects this to increase to over 3 MW of peak demand reduction beginning in 2021. Peak load reduction from demand response programs are expected to be approximately 8-9 MW in 2021-2022 and vary between 0 MW and 5 MW from 2023 to 2030.

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22 CalEnviroScreen is a mapping tool developed by the California Environmental Protection Agency's California Office of Environmental Health Hazard Assessment to identify communities that are most affected by pollution and where people are most vulnerable to the impacts. The tool uses environmental, health and socioeconomic information to produce a score for each census tract. The top 25% of scores are considered to be a disadvantaged community.

Glendale specifically evaluated varying capacities of battery energy storage in its portfolio analysis. Ultimately, Glendale selected a total of 50 MW of battery energy storage, 25 MW to be deployed after 2030, to contribute to meeting energy demand in peak hours before 2030.

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 beginning on page 18.

Energy Efficiency and Demand Response Resources

Staff finds that Glendale's IRP is consistent with the requirement in PUC Section 9621(d)(1)(A) as it includes a discussion of energy efficiency and demand response programs they plan to implement and quantifies the amount of energy efficiency savings they plan to achieve.

In the past 5 years, Glendale has surpassed its energy savings targets, as established by the *Energy Efficiency Potential Forecasting for California's Publicly Owned Utilities* by Navigant Consulting, Inc.[23] These targets are beyond the energy efficiency targets established in the CEC's *Senate Bill 350: Doubling Energy Efficiency Savings by 2030* report.[24] Glendale estimates that additional energy efficiency programs will provide an additional 2.5 MW of peak load reduction in 2019 and 2020, increasing to 3.5 MW of peak load reduction in 2021, onwards. The total AAEE shown in **Table 5** for Glendale's proposed power plan includes both new load reduction programs and AAEE embedded in the customer forecast.

Glendale also estimated the peak load reduction from demand response programs. Small commercial demand response programs will deliver up to 10.8 MW of demand reduction, while residential response programs will provide up to 5 MW of demand reduction and large commercial demand response programs will deliver up to 2.5 MW of demand reduction. The average annual on-peak demand reduction varies between 0 and 9 MW.

23 *Energy Efficiency Potential Forecasting for California's Publicly Owned Utilities* by Navigant Consulting, Inc.

24 *Senate Bill 350: Doubling Energy Efficiency Savings by 2030*

Table 5: Glendale's Additional Achievable Energy Efficiency Estimates (GWh)

	AAEE (GWh)	SB 350 targets (GWh)
2018		56
2019	29	65
2020	47	74
2021	72	83
2022	78	93
2023	103	103
2024	120	112
2025	130	120
2026	148	128
2027	160	135
2028	164	141
2029	167	147
2030	167	

Source: California Energy Commission, based on Glendale's 2019 IRP Filing and California Energy Commission's Senate Bill 350: Doubling Energy Efficiency Savings by 2030.

Energy Storage

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

Glendale considered varying levels of battery energy storage for the replacement of Grayson Power Plant Units 1-8. Portfolios with lower levels of natural gas resources included higher levels of battery storage. The portfolio ultimately chosen included 50 MW of battery storage to be deployed before 2030. The size of the battery was limited by transmission constraints and the amount of generating capacity that could be located within the load pocket, due to the need to charge in the event of a contingency lasting longer than 4 hours.

Transportation Electrification

Staff finds that Glendale's IRP is consistent with the requirement of PUC Section 9621(d)(1)(C) as it addresses transportation electrification, projecting for light-duty electric vehicle (LDEV) growth.

Glendale used the CEC's EV Forecast Tool with the assumption of 5 million EVs statewide to predict annual load increases due to EV charging. A key component of Glendale's forecast was the use of a "naïve" charging profile, or a charging profile expected for EV owners in which most charging occurs in the evening due to the lack of a price signal to disincentivize charging at peak load times. By 2030, that becomes a more optimized charging profile with most charging occurring midday. The projected load increase is relatively modest in 2019, with a 2 percent contribution to total load and a less than 1 percent contribution to peak demand. By 2030, the EV charging load will create a much more significant load impact with a 12 percent contribution to total load and a 9 percent contribution to peak load.

Glendale has deployed 86 public and private EV charging stations through the city and is considering 8 additional sites. Glendale's strategy for deploying EV charging stations is to identify which areas of the city currently do not have chargers locally available. Glendale also offers rebates of up to $500 for residential chargers and up to $2,000 for charges in public locations.

Glendale also recognized the need to address distribution infrastructure as EVs are deployed more prevalently, particularly in more affluent areas of its service territory.

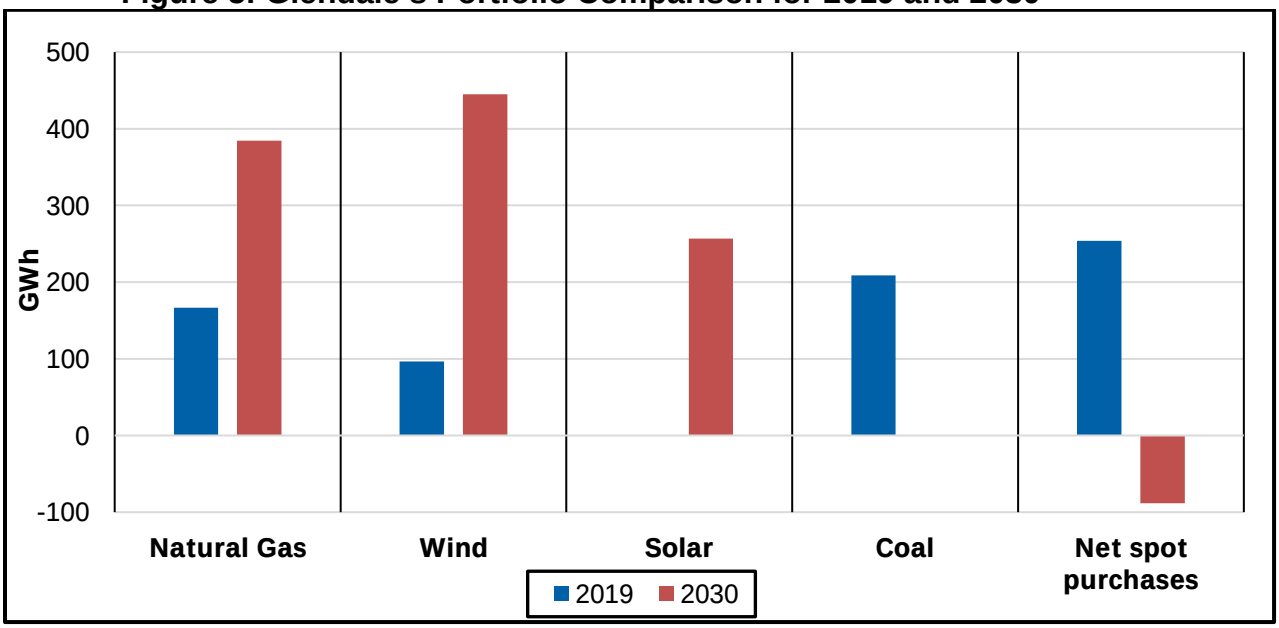
Portfolio Diversification

PUC Section 9621(d)(1)(D) requires that POUs address the procurement of a diversified portfolio of resources consisting of both short-term and long-term electricity, electricity related, and demand response products. Based on staff's review of Glendale's IRP, Glendale has fulfilled this requirement.

Glendale's total portfolio includes a variety of resources types, including natural gas, hydroelectric, coal, nuclear, wind and geothermal, but for local reliability needs the portfolio is almost exclusively natural gas-fired resources. Glendale's total portfolio and local portfolio will increase in diversity through 2030. Solar energy will be introduced to the portfolio in 2020 and 2022, as well as significantly more wind. Glendale also plans to significantly reduce spot market purchases and ultimately become a net-spot market seller. Through its Clean RFP, Glendale sought to increase the diversity of resources relied upon for local capacity needs to rely less on gas-fired resources. Glendale plans to add local distributed energy resources and batteries, as well as additional load reduction

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

Figure 5: Glendale's Portfolio Comparison for 2019 and 2030



Source: California Energy Commission, based on Glendale's 2019 IRP Filing.

ACRONYMS

Acronym	Term
AAEE	Additional achievable energy efficiency
AAPV	Additional achievable photovoltaic
CARB	California Air Resources Board
CC	Combined cycle
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CPUC	California Public Utilities Commission
CT	Combustion turbine
DER	Distributed energy resource
DR	Demand response
GHG	Greenhouse gas
GWh	Gigawatt-hour
ICE	Internal combustion engine
IEPR	*Integrated Energy Policy Report*
IRP	Integrated resource plan
LADWP	Los Angeles Department of Water and Power
LDEV	Light-duty electric vehicle
mT	Metric ton
MT	Thousand metric tons
MW	Megawatt
MWh	Megawatt-hour
POU	Publicly owned utility
PRC	Public Resources Code
PUC	Public Utilities Code
RFP	Request for proposals

Acronym	Term
RPS	Renewables Portfolio Standard
SB 350	Senate Bill 350 (de León, Chapter 547, Statutes of 2015)
SCPPA	Southern California Public Power Authority

Appendix A

Additional achievable energy efficiency (AAEE): Energy efficiency savings not yet considered committed but deemed likely to occur, including impacts from future updates of building codes and appliance standards and utility efficiency programs expected to be implemented.

Additional achievable photovoltaic (AAPV): Distributed PV developed as a result of the requirement in the 2019 California Building Energy Efficiency Standards that new residential construction include solar PV as of January 1, 2020.

Assumption: A statement made about the future for a given load forecast, or demand-side or supply-side energy resource, that should be used for procurement and transmission modeling.

Balancing area: The responsible entity that integrates resource plans ahead of time, maintains demand and resource balance within a Balancing Authority Area, and supports interconnection frequency in real time.

Bundled renewable energy credit: A renewable energy credit from an eligible renewable energy resource that is procured as part of the same contract or ownership agreement with the underlying energy from that resource.

Committed energy efficiency: Energy efficiency savings estimated to occur from utility and public agency programs, codes, standards, legislation, and ordinances having final authorization, firm funding, and a design that can be readily translated into evaluable characteristics.

Demand forecast: A forecast of electricity demand served by the electric grid, measured by both peak demand and energy consumption. Some factors that determine load forecast include economics, demographics, behind-the-meter resources, and retail rates.

Excess balance: Any amount of RPS-eligible RECs that a utility holds at the end of a compliance period that may be used to meet their compliance obligation in the next compliance period. Excess balance can include excess procurement, historic carryover, or purchased RECs that have not been retired.

Filing POU: 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.

Integrated resource plan (IRP): A plan adopted by the governing board of a POU pursuant to PUC Section 9621.

IRP filing: An IRP adopted by the filing POU's governing board that is electronically submitted to the CEC, along with the standardized tables and supporting information, by the filing POU or authorized representative.

Net-peak demand: The highest hourly electricity demand in the utility area, when excluding demand met by variable renewable generation resources directly connected to a California Balancing authority. Net-peak demand is calculated by taking the highest hourly demand (peak

demand) and subtracting the electricity produced by variable renewable resources meeting that demand.

Noncoincident peak demand: The largest amount of power a POU must generate or procure in any hour of the year. Compare this to coincident peak demand which is the amount of power the POU must generate or procure in the hour in which system wide demand is greatest. Noncoincident peak demand is referred to as peak demand throughout these guidelines.

Plug-in electric vehicle (EV): A vehicle that uses one or more electric motors for propulsion. Electric vehicles include, but are not limited to, battery-electric and plug-in hybrid vehicles.

Renewable energy credit (REC): A certificate of proof, as defined in PUC Section 399.12 (h), associated with the generation of electricity from an eligible renewable energy resource. RECs are certificates that represent the environmental attributes or 'greenness' of renewable electricity production.

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 Portfolio Balance Requirements: The minimum and maximum limits on certain types of bundled and unbundled RECs that may be counted towards California's Renewables Portfolio Standard.

Retail sales: Electricity consumption after accounting for behind-the-meter onsite generation including storage charge and discharge. It indicates the net energy delivered through the meter to the end-use customer, and thus excludes any generation or procurement in satisfaction of firm wholesale commitments (e.g., firm and spot market sales).

Scenario: A set of assumptions about future conditions used in power system modeling performed to support generation or transmission planning.

Standardized tables: The four tables that are required to be submitted with the IRP filing submitted to the CEC. These tables include information and data necessary to help staff determine if the IRP is consistent with PUC Section 9621. The four standardized tables are the Capacity Resource Accounting Table, Energy Balance Table, Renewable Procurement Table, and Greenhouse Gas Emissions Accounting Table.

Supporting information: Analyses, studies, data, and work papers, or other material (on which inputs, assumptions, or conclusions are based) that the POU used or relied upon in creating the IRP (such as, but not limited to, market conditions current at the time of the analyses, energy infrastructure, state policies and laws, and needs of the filing POU) but are not included in the IRP itself; and additional information required by the *POU IRP Guidelines*. Supporting information may also include the inputs and assumptions that are based on the analyses, studies, data, work papers, and other material.

Appendix B

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

	Fuel Type	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Retail sales		**1,084,695**	**1,098,586**	**1,113,975**	**1,140,711**	**1,159,881**	**1,180,424**	**1,206,954**	**1,228,705**	**1,252,674**	**1,282,367**	**1,314,545**	**1,349,861**
Net energy for load		**1,100,117**	**1,114,876**	**1,117,247**	**1,146,185**	**1,167,835**	**1,186,432**	**1,214,631**	**1,237,557**	**1,263,642**	**1,295,448**	**1,326,484**	**1,364,448**
Non-RPS Resources													
Grayson 3-8	Natural Gas	18,073	42,261	7,833	0	0	0	0	0	0	0	0	0
Grayson Unit 9	Natural Gas	20,021	21,336	15,355	7,052	6,046	5,119	7,611	6,513	6,091	6,611	6,526	6,918
BESS	Battery Storage	0	0	-3,499	-4,069	-4,959	-7,082	-9,667	-11,663	-11,582	-11,464	-14,453	-14,352
Wartsila ICEs	Natural Gas	0	0	179,735	138,368	127,942	114,173	117,668	105,345	102,047	103,086	102,952	106,634
MSCG/Skylar	System Power	134,625	121,500	121,163	121,163	121,163	121,500	121,163	121,163	121,163	121,500	121,163	121,163
Magnolia	Natural Gas	128,380	277,353	275,662	218,073	187,548	144,375	142,656	121,683	126,832	133,251	108,943	116,412
IPP - Coal	Coal	208,948	221,112	222,321	206,753	198,107	192,752	88,496					
IPP - Repower	Natural Gas	0	0	0	0	0	0	111,162	177,906	176,842	177,378	153,719	154,404
Palo Verde	Nuclear	85,848	86,083	85,848	85,848	85,848	86,083	85,848	85,848	85,848	86,083	85,848	85,848
Hoover	Large Hydro	52,851	52,799	52,829	52,774	52,705	52,681	52,796	52,737	52,695	52,782	52,753	52,741
Total Non-RPS energy		**648,746**	**822,444**	**957,247**	**825,961**	**774,400**	**709,602**	**717,733**	**659,533**	**659,936**	**669,227**	**617,451**	**629,767**
RPS Resources													
Tieton	Small Hydro	28,814	28,812	28,813	28,811	28,812	28,812	28,814	28,814	28,814	28,812	28,813	28,813
Scholl Landfill	Wind	0	78,492	78,699	78,479	78,613	78,536	78,110	68,917	69,152	69,533	68,750	69,056
MSCG/Skylar	Generic RPS	134,625	148,500	148,088	148,088	148,088	148,500	148,088	148,088	148,088	148,500	148,088	148,088
Public Spaces DER	Solar PV	0	5,734	19,899	20,217	20,164	20,012	19,868	19,705	19,652	19,583	19,469	19,404
Highwinds	Wind	17,496	17,568	17,496	17,496	17,496	17,568	17,496	17,496	17,496	17,568	0	0
Pleasant Valley	Wind	37,709	37,815	37,763	20,204	0	0	0	0	0	0	0	0
Pebble Springs	Wind	41,328	41,328	41,328	41,328	41,328	41,328	41,328	41,328	41,328	41,328	0	0
Ormat Geothermal	Geothermal	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900
RPS Solar	Solar PV	0	0	0	66,874	66,970	111,393	110,759	153,701	154,242	154,995	236,714	237,480
RPS Wind	Wind	0	0	0	106,959	107,051	178,369	177,553	246,983	247,166	248,019	375,271	375,953
Total RPS energy		**281,871**	**380,148**	**393,987**	**550,357**	**530,421**	**646,419**	**643,915**	**746,931**	**747,838**	**750,238**	**899,005**	**900,693**
Spot purchases:	Unspecified	368,713	132,399	68,243	58,042	145,513	134,950	149,984	143,651	151,704	161,570	142,766	152,915

	Fuel Type	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Spot sales	Unspecified	114,949	151,737	237,596	223,796	220,136	235,230	227,088	241,706	225,581	215,140	255,092	241,254
Surplus/shortfall		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table B-1: Capacity Resources, All Years (MW)

	Fuel Type	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Forecast Peak Demand		349	329	325	330	322	345	343	322	324	350	347	350
Demand Response		0	0	0	0	0	0	8	0	0	0	11	0
Planning Reserve Margin		148	148	148	148	148	148	148	148	148	148	148	148
Total Procurement Requirement		**497**	**477**	**473**	**478**	**470**	**493**	**491**	**470**	**472**	**498**	**495**	**498**
Non-RPS Resources													
Grayson Units 3-8	Natural Gas	168	168	168	0	0	0	0	0	0	0	0	0
Grayson Unit 9	Natural Gas	48	48	48	48	48	48	48	48	48	48	48	48
Wartsila ICEs	Natural Gas	0	0	93	93	93	93	93	93	93	93	93	93
MSCG/Skylar (not RPS-eligible)	Unspecified	23	23	23	23	23	23	23	23	23	23	23	23
Magnolia	Natural Gas	48	48	48	48	48	48	48	48	48	48	48	48
IPP - Coal	Coal	39	39	39	39	39	39	39	0	0	0	0	0
IPP - Repower	Natural Gas	0	0	0	0	0	0	35	35	35	35	35	35
Palo Verde	Nuclear	10	10	10	10	10	10	10	10	10	10	10	10
Hoover	Large Hydro	12	12	12	12	12	12	12	12	12	12	12	12
RPS Resources													
Tieton	Small Hydro	7	7	7	7	7	7	7	7	7	7	7	7
Scholl Landfill	Wind	0	9	9	9	9	9	9	9	9	9	9	9
MSCG/Skylar (RPS-eligible)	Generic	28	28	28	28	28	28	28	28	28	28	28	28
Public Spaces DER	Solar PV	0	10	10	10	10	10	10	10	10	10	10	10
Highwinds	Wind	3	3	3	3	3	3	3	3	3	3	0	0
Pleasant Valley	Wind	10	10	10	10	0	0	0	0	0	0	0	0
Pebble Springs	Wind	10	10	10	10	10	10	10	10	10	10	0	0
Ormat Geothermal	Geothermal	3	3	3	3	3	3	3	3	3	3	3	3
Total planned capacity		**407**	**426**	**519**	**351**	**341**	**341**	**376**	**337**	**337**	**337**	**324**	**324**
Additions													
Battery Storage/Energy Storage	Storage	0	0	50	50	50	50	50	50	50	50	50	50
RPS Solar (Generic)	Solar PV	0	0	0	30	30	50	50	70	70	70	110	110

	Fuel Type	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
RPS Wind (Generic)	Wind	0	0	0	30	30	50	50	70	70	70	110	110
Short-term/spot purchases	Unspecified	91	52	(96)	67	69	85	48	59	60	86	82	85
Total peak capacity, with planned additions		**497**	**477**	**473**	**478**	**470**	**493**	**491**	**470**	**472**	**498**	**495**	**498**
Surplus/shortfall		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table B-2: GHG Emissions from Glendale's Resource Portfolio, All Years

Supply Resources	Fuel Type	Emissions Intensity (mt CO_2-e/MWh)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Grayson Units 3-8	Natural Gas	0.702	12,230	30,391	5,552	0	0	0	0	0	0	0	0	0
Grayon Unit 9	Natural Gas	0.684	13,836	14,688	10,489	4,815	4,126	3,495	5,188	4,446	4,156	4,511	4,456	4,724
Wartsila ICEs	Natural Gas	0.532	0	0	95,644	73,671	68,121	60,786	62,647	56,086	54,343	54,902	54,834	56,804
MSCG/Skylar (not RPS-eligible)	Unspecified	0.428	57,620	28,890	28,810	28,810	28,810	28,890	28,810	28,810	28,810	28,890	28,810	28,810
Magnolia	Natural Gas	0.535	70,143	148,200	146,036	115,990	100,404	77,466	76,281	65,056	67,776	71,180	58,232	62,164
IPP - Coal	Coal	1.303	269,914	280,023	281,647	267,491	260,255	256,239	120,284	0	0	0	0	0
IPP - Repower	Natural Gas	0.492	0	0	0	0	0	0	51,580	87,079	86,714	86,944	78,510	78,702
Total GHG emissions - planned resources			**423,743**	**502,192**	**568,178**	**490,776**	**461,716**	**426,876**	**344,790**	**241,477**	**241,799**	**246,427**	**224,842**	**231,204**
Spot-market/short-term purchases	Unspecified	0.428	157,809	56,667	29,208	24,842	62,280	57,759	64,193	61,482	64,929	69,152	61,104	65,447
Spot-market/short-term sales	Unspecified	0.428	-49,198	-64,943	-101,691	-95,785	-94,218	-100,678	-97,194	-103,450	-96,549	-92,080	-109,179	-103,257
Total GHG emissions			**532,354**	**493,915**	**495,695**	**419,833**	**429,777**	**383,956**	**311,789**	**199,509**	**210,180**	**223,499**	**176,767**	**193,394**
Emissions adjustment			0	0	0	0	0	0	0	0	0	0	0	0
Adjusted Portfolio emissions			**532,354**	**493,915**	**495,695**	**419,833**	**429,777**	**383,956**	**311,789**	**199,509**	**210,180**	**223,499**	**176,767**	**193,394**

Attachment I
Public Utilities Code for SB 350

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 gigawatthours, 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 economywide 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 economywide 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 gigawatthours, 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.)