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STAFF PAPER

Review of the City of Redding's 2018 Integrated Resource Plan

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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. The City of Redding submitted its *2018 Integrated Resource Plan* and supplemental information, which the Redding City Council adopted on November 6, 2018, to the Energy Commission for review on April 11, 2019. This staff paper presents the results of the Energy Commission staff review of the City of Redding'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 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 *Publicly Owned Utility Integrated Resource Plan Submission and Review Guidelines* require those utilities to file an IRP with data and supporting information sufficient to demonstrate that they meet these requirements and the various targets and planning goals from 2018 to 2030. The Energy Commission must review the IRPs to ensure consistency with the requirements of PUC Section 9621.

The City of Redding's (Redding) IRP provides a blueprint to meet its customers' energy demand in a cost effective manner while also meeting system reliability needs, state policy goals and requirements, and other targets established for the community. Redding has sufficient generating capacity to meet its energy needs through 2030 and beyond. However, relying on existing resources would fall short of meeting renewable procurement requirements and greenhouse gas emission reduction targets. Redding's goal for the IRP was to develop a long-term plan with a balanced mix of renewable energy projects that will comply with the Renewables Portfolio Standard procurement requirements, while allowing for flexibility to move away from spot market purchases and to adjust to system developments.

Redding's IRP examined current and proposed resource needs over a 20-year time frame, along with strategies for meeting renewable energy procurement requirements. In its IRP analysis, only solar and wind resources were considered for inclusion in the resource portfolio. As a result, eight scenarios consisting of solar and wind projects in Arizona, Oregon, and Northern California were evaluated based on their costs and characteristics. Each modeled scenario was rated based on Redding's adopted objectives of maintaining low cost, providing reliability, ensuring environmental responsibility, and offering a diversified portfolio.

Redding selected a preferred plan that achieves a 54 percent Renewables Portfolio Standard by 2030, of which 53 percent is wind and 36 percent is solar. The preferred plan also meets the greenhouse gas emission reduction targets and carries less exposure to extreme market conditions, brings less regulatory risk, provides better alignment of hourly production needs, and exhibits more resource diversity than the other scenarios analyzed.

In reviewing the Redding IRP and determining consistency with the requirements of PUC Section 9621, Energy Commission staff relied on the four standardized reporting tables and narrative descriptions in the IRP, 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 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 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 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 IRP filing includes values reported in the standardized tables and narrative discussion that demonstrate the utility addressed the procurement requirements for energy efficiency and demand response, energy storage, transportation electrification, portfolio diversification, and resource adequacy as set forth in PUC Section 9621(d).

This IRP is consistent with the PUC Section 9621 requirement to address energy efficiency and demand response. 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. 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 Energy Commission will report on progress in achieving the doubling targets, including those for Redding, and update the targets, as 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 (IRPs). 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 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 Energy Commission shall provide recommendations to correct the deficiencies. The Energy Commission 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 Energy Commission to review POU IRPs to ensure they achieve PUC Section 9621 provisions (see **Attachment I**).

This chapter outlines the Energy Commission's review process and provides an overview of the City of Redding (Redding) and its IRP development process. 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.

Energy Commission IRP Review Process

On April 11, 2019, Redding submitted its IRP and supporting documentation, as outlined in the *POU IRP Guidelines*, to the Energy Commission for review.[3] 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

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. https://efiling.energy.ca.gov/GetDocument.aspx?tn=224889.

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

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 Redding 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 and projections for renewable resource additions. Staff also examined whether the POU achieved Renewables Portfolio Standard (RPS) requirements, energy efficiency savings projections and programs, and plans for transportation electrification.

Overview of the City of Redding

Redding is a vertically-integrated, city-owned, not-for-profit electric and water utility in Shasta County, California as described below.[4]

- Redding serves approximately 44,200 residential and commercial customers in a service area that covers approximately 61 square miles in and near the City of Redding.
- In 2017, Redding delivered more than 740-GWh of energy and had slightly under 300 megawatts (MW) of dependable capacity with a peak demand of 231-MW.
- Redding expects investments in energy efficiency and increases in rooftop solar photovoltaic (PV) installations on new homes to limit growth in energy demand in future years.
- The Redding City Council governs the utility; the council consists of five-elected-members and has ultimate decision-making authority, including the setting of rates.

Redding's Planning Process

The development of Redding's IRP followed a process designed to achieve a reasonable balance between fiscal responsibility and environmental stewardship. The utility structured its plan to ensure system reliability while providing flexibility to accommodate future uncertainties. The utility identified the necessary resources to meet future peak and energy demand, ensuring stakeholder involvement and meeting all regulatory and legislative requirements.

Redding actively sought feedback and participation from several groups of constituents including customers, developers, governmental agencies, consultants, and other interested parties during the planning process. Two meetings were held in February and

4 A vertically-integrated utility is a utility that owns all levels of the supply chain: generation, transmission, and distribution assets.

June of 2018.[5] In the meetings, stakeholders indicated that a diverse portfolio that minimized system cost is important to them.

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. In addition, 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 Energy Commission's adopted demand forecast. 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.

Redding, located in Shasta County at the northern end of the Sacramento Valley, experiences hot summers and mild winters. Contributing to Redding's strong seasonal trends, the utility's peak demand is driven by air-conditioning load in the summer months and reduced energy usage during the mild spring and fall seasons. With an elevation in the area that ranges from 400 feet to over 10,000 feet at Lassen Park just outside of the county. Redding's peak demand during the summer exhibits a wide daily variation in load. Redding's highest peak demand reached 25-MW in 2006. From 2013 to 2017, Redding's annual peak demand varied from 231-MW to 250-MW. Redding's energy sales were 745-GWh in 2017.[6]

Energy and Peak Forecast, Methodology and Assumptions

Redding's demand forecast was developed using a model based on end-use factors that drive energy use, including trends in equipment saturation and efficiency based on observed loads. The model uses monthly energy sales, monthly peak demand, weather data, seasonal variables, and economic conditions. It also integrates the Energy Information Administration's sector-level end use saturation and efficiency forecast for the Pacific Region. Redding's end users include five classes of residential customers, large and small commercial customers, and industrial customers. Additional key variables incorporated into the model include residential solar installations, projected electric vehicle adoption, energy efficiency measures, local temperature data, and projections of population growth.

Redding's demand forecast methodology is adequately described in its IRP. Key input variables are explained in detail with specified assumptions and data sources. Based on

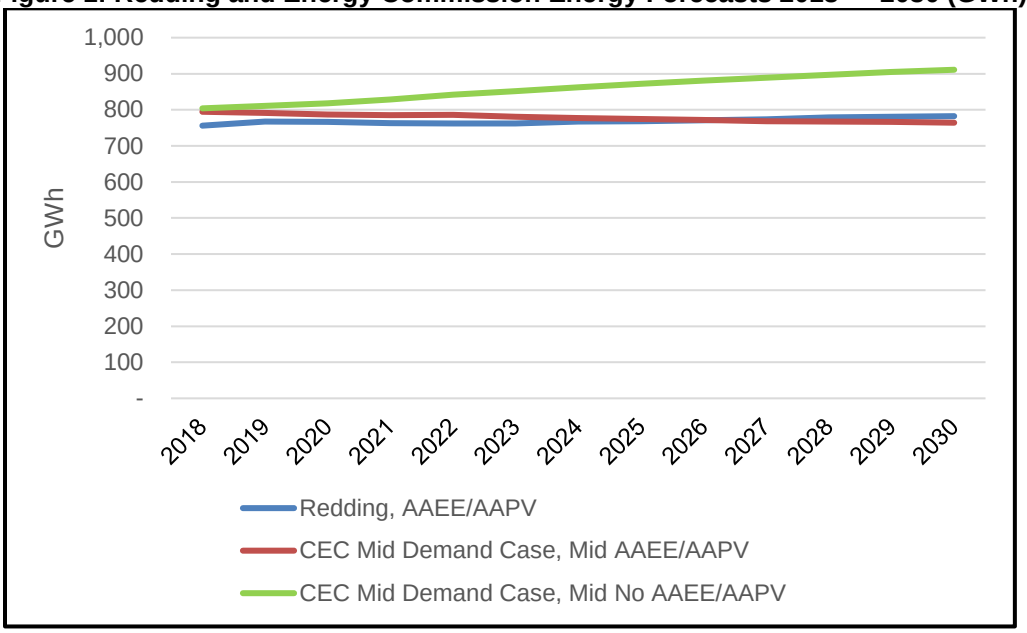
5 City of Redding *2018 Integrated Resources Plan.* 2018. City of Redding. https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=18-IRP-01.

6 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.

the econometric models presented, the overall framework, and key input variables identified, Redding's methodology is adequate in a long-term planning context.

Staff compared Redding's energy and peak demand forecast to the Energy Commission's *2018 Demand Forecast Update* report.[7] Similar to Redding, the Energy Commission's model uses econometric specifications relating historical electricity consumption data as a function of economic and demographic variables. Adjustments were made for policy-based drivers such as additional achievable energy efficiency (AAEE) and additional achievable photovoltaic (PV) (AAPV).[8] **Figure 1** and **Figure 2** show a comparison of Redding's energy and peak demand forecast including the AAEE and AAPV to two of the demand cases the Energy Commission developed, with and without the adjustments.[9]

Figure 1: Redding and Energy Commission Energy Forecasts 2018 — 2030 (GWh)



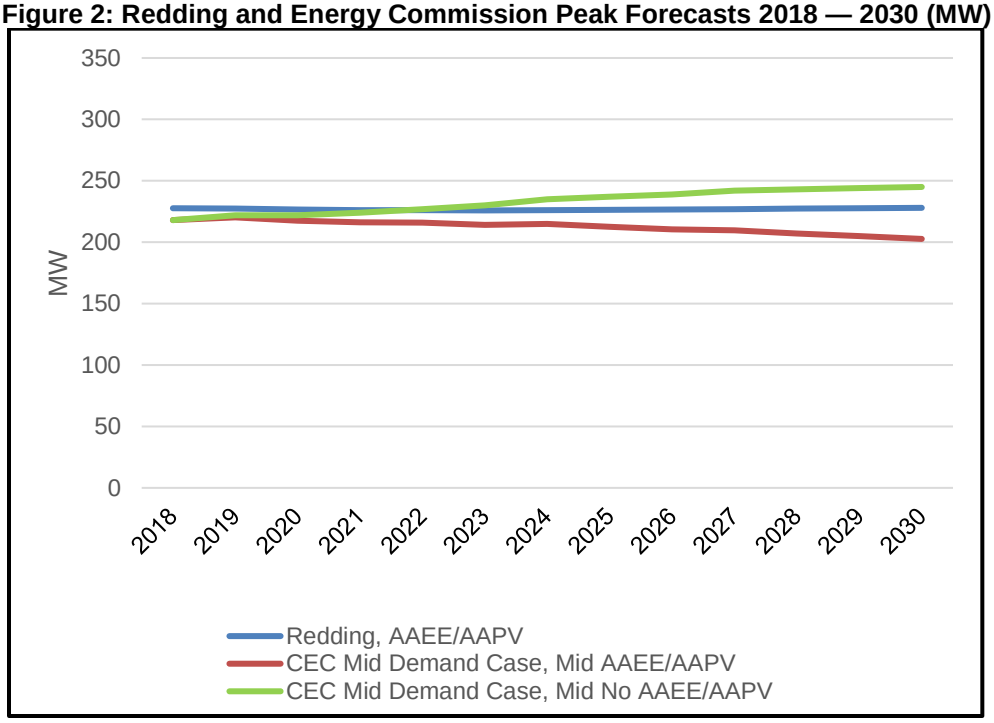
Source: California Energy Commission, based on Redding's 2018 IRP filing and the California Energy Commission 2019 Demand Forecast

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

8 Terms and definitions can be found on page 25 and Appendix A.

9 The Energy Commission develops several demand forecasts as part of its Integrated Energy Policy Report including the Mid Demand, Low Demand, and High Demand cases with varying level of AAEE and AAPV.

Figure 2: Redding and Energy Commission Peak Forecasts 2018 — 2030 (MW)



Source: California Energy Commission, based on Redding's 2018 IRP filing and the California Energy Commission 2019 Demand Forecast

In **Figure 1**, Redding's net energy increases slightly from 767-GWh in 2019 to 782-GWh in 2030. For the system, this is a 4 percent growth over the planning period. The Energy Commission forecast is comparable to Redding's forecast for 2030, ending at 764-GWh (Mid AAEE/AAPV). The small differences between the forecasts can be attributed to how energy efficiency is calculated and incorporated into the models.

In **Figure 2**, Redding forecasts a peak demand that differs slightly from the Energy Commission's. Redding's peak demand is flat: 227-MW in 2019 to 228-MW in 2030, while the Energy Commission's shows a slow decline from 218-MW to 203-MW (Mid AAEE/AAPV) over the same period. A contributing factor for the difference may be the way weather data is normalized across the two forecasts.[10]

Overall, due to Redding's relatively flat forecast growth, the projected system load factor remains fairly consistent at 38 percent.[11] The slight increase in its load factor and relatively flat peak demand growth rate results from a combination of factors: the continued increase of residential and commercial rooftop solar, implementation of energy efficiency measures, and assumptions regarding the growth of electric vehicles and demand response.

10 Weather normalization is a process that adjusts actual energy or peak outcomes to what would have happened under normal weather conditions.

11 A load factor is the ratio of the average energy demand to the peak energy demand. A constant load factor implies that energy demand and peak demand are growing (or declining) at the same rate.

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.[12] POUs are also required to provide an IRP with data and supporting information sufficient to demonstrate that the POUs plan to meet targets and goals. Staff has determined that Redding's IRP filing meets the requirements. The following is a discussion of the utility's existing resources, its procurement strategy, the portfolio analysis underlying resource selections, and the resources in 2030 identified in the standardized tables.

Existing Resources

Redding's current energy mix is comprised of natural gas, hydroelectric, wind, and distributed solar resources.[13] Before the termination of Redding's interest in the San Juan Generating Station (Unit #4) at the end of 2017, coal was a significant resource in the utility's resource mix. In 2016, it contributed to 13 percent of Redding's energy portfolio.[14] Prior to and during 2017, Redding sold its entire portion of the San Juan Generating Station production to another utility in the southwest.

Redding owns and operates two local power plants. In the 1980s, Redding constructed the Whiskeytown Project, a 3.5-MW hydroelectric power plant that is an RPS-eligible resource. Whiskeytown generates an average of 26-GWh annually. Redding also owns the Redding Power Station, a 183-MW (nameplate capacity) natural gas-fired power plant. It is the single largest source of greenhouse gas (GHG) emissions in its portfolio and the utility's primary local resource.

In addition to its two generating facilities, Redding supplements its energy needs through contractual purchases. In 2005, Redding entered into a power purchase agreement (PPA) with the Western Area Power Administration (WAPA) for an 8 percent share of hydroelectric generation on a take-and-pay basis.[15, 16] Power is primarily sourced from the Central Valley Project but also includes RPS-eligible hydroelectric facilities in the Sierra Nevada region.[17] Redding purchases the renewable energy certificates (RECs) from the RPS-eligible facilities through a separate contract with WAPA.

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

13 Distributed solar is a resource that generates electricity at or near the point of use behind the meter and does not qualify as a RPS-eligible renewable resource.

14 Redding's 2017 Electricity Resource Planning Forms submitted to the Energy Commission.

15 The Western Area Power Administration is one of four power-marketing administrations within the U.S. Department of Energy. It is responsible for marketing and delivering wholesale federal hydropower to customers in 15 central and western states.

16 A take-and-pay contract is an agreement that obligates the purchaser to take any product that is offered and pay a specified amount if the product is not taken.

17 The Central Valley Project is a complex, multi-purpose network of dams, reservoirs, canals, hydroelectric power plants and other facilities that extends 400 miles through central California.

In 2006, the utility entered into a 20-year contract with an optional 5-year extension with the Big Horn Wind Project (199.5-MW), located near Bickleton, Washington, for a 35 percent share of its output. The plant is RPS certified by the Energy Commission.

In 2017, the Redding Power Station provided 25 percent of Redding's annual load requirements, producing 191-GWh of energy. Redding's remaining energy requirements were met by wind (22 percent), large hydroelectric (48 percent), and small hydroelectric generation (5 percent). Overall, zero-carbon resources supplied 75 percent of Redding's retail sales. Redding projects it has sufficient generating capacity to meet energy needs through 2030 but would fall short of meeting the RPS and GHG emission reduction targets if they do not procure any new renewable resources.

Resource Portfolio Evaluation

In its IRP, Redding developed several portfolios designed to minimize system cost, while meeting the state's RPS and climate goals.[18] Redding evaluated eight scenarios including the existing system and seven other scenarios with various levels of additional renewable resources. Redding developed a cumulative present worth cost of the eight competing scenarios for a 20-year planning period to compare in its IRP analysis.[19, 20] **Table 1** summarizes each scenario's cumulative present worth cost and its proposed renewables resource mix.

Table 1: Redding's Scenario Comparison

Scenario	Description	Cumulative Present Worth Cost ($1,000)	2030 Renewables Portfolio	Achieving Renewables Balance		
				Wind	Solar	Hydro
A	Balanced Mix of Wind/Solar	575,766	52%	59%	30%	11%
B	Balanced Mix of Wind/Solar	602,421	51%	60%	29%	11%
C	Wind Heavy	642,176	65%	84%	6%	10%
D	Wind Heavy	564,925	65%	84%	6%	10%
E	Solar Heavy	601,558	61%	42%	47%	11%
F	Early Wind Balanced Mix	566,191	59%	81%	8%	11%
G	Existing System without solar	601,957	30%	81%	0%	19%
H	Optimized Balanced Mix	580,966	54%	53%	36%	11%

Source: California Energy Commission, based on Redding's 2018 IRP filing

18 The primary tool used in the IRP analysis was PowerSimm, a dispatch optimization and production cost tool that quantifies the cost of serving load and tracks objectives such as meeting the RPS, while considering volatility of key variables including fuel price, power price, energy production, outages, weather, and load.

19 The present worth method is commonly referred to as the net present value method. It evaluates the positive and negative cash flow of an investment alternative using present worth calculations that requires an analytical approach of systematically and quantitatively evaluating all of the economic considerations that affect the economic potential of the investment.

20 Present worth (value), also known as discounted value, is a financial calculation that measures the worth of a future amount of money or stream of payments in today's dollars adjusted for interest and inflation. In other words, it compares the purchasing power of a future dollar to the purchasing power of one today.

Portfolio Diversification

For each scenario, Redding included several sizes of solar and wind projects. The potential new resources included a range of solar projects ranging from a combined 10-MW solar PV with battery storage project to three different 100-MW projects. Wind projects included a 100-MW and a 200-MW project. The projects were variously located in Oregon, Arizona, and Northern California. Additional hydroelectric resources were not considered due to the environmental impacts of new hydroelectric projects and hydroelectric already accounts for 53 percent of Redding's resource mix. Achieving a balanced portfolio was vital for Redding to reduce the risk associated with over-reliance on a single technology and is one criteria the utility used to determine its preferred portfolio.

Redding Portfolio Costs

The cumulative present worth cost developed for each scenario included market power supply costs incurred through power producers but excluded existing fixed costs such as general and administrative expenses. Capital costs associated with the new resources were included and consisted of the following:

- Engineering, procurement, and construction costs
- Owner costs
- Developer fees
- Transmission interconnection costs
- Financing fees
- Construction interest

Redding used a least-cost planning study approach to help determine its preferred portfolio. Redding concluded that Scenario H, the Optimized Balanced Mix, from Table 1 would serve as its preferred portfolio. It consists of a 10-MW solar project added in 2021, an additional 60-MW solar project in 2026, and a 65-MW wind facility in 2034. That portfolio has the highest level of diversity and increases flexibility and reliability while reducing costs. Based on a cost-benefit analysis, costs for Redding's preferred plan are 2 percent higher than the least-cost plan but provided lower exposure to market volatility.

Risk Analysis

A significant risk to Redding is new legislation and regulations that impact utility operations. This can require the utility to reassess its plans during the implementation of its IRP. The preferred portfolio is flexible, balanced, and sufficient to meet Redding's future energy needs. The period between resource additions in Redding's plan allows for the continued assessment of industry events and system developments, and for Redding's plan to be adjusted, as needed. The diversity in the preferred portfolio helps mitigate future uncertainties that can either favor or oppose a specific technology, and procures more than the minimum renewable energy required to meet the existing RPS

requirements. This reduces the risk of the utility not being able to comply with future RPS requirements.

Procurement Strategy

Redding's existing system uses spot market purchases to meet some of its energy needs. Redding considered its future opportunities in the spot market and estimated the costs and revenues associated with purchases from, or sales into, the market. An economic analysis performed by the utility found that relying heavily on assumed market purchases increases the potential for higher retail rates. To keep costs low, Redding's long-term planning strategy is to minimize its reliance on spot market purchases by procuring a diversified portfolio of resources.

Redding highlighted the end of its 20-year contract with the Big Horn wind project in 2026 as an issue. However, there is the possibility of a 5-year extension. Redding's preferred plan assumes an extension of the contract and adds 70-MW of additional solar PV to meet system needs, a 10-MW project in 2021 and a 60-MW project in 2026.

With each renewable resource addition in its preferred portfolio, Redding will significantly decrease its spot market purchases and, subsequently, increase its spot market sales. In the short term, Redding will substantially increase the output from its natural gas power station until the new solar PV projects come online. By 2026, Redding will become a net energy seller into the spot market, and sales will continue to increase to the end of the forecast period as the utility attempts to capture the maximum value of the generation assets and minimize the cost of purchased power. Redding will also continue to rely on its natural gas plant at a reduced output to maintain its independence from the spot market.

Table 2 summarizes the amount of energy from the different resources in Redding's portfolio in 2019, 2025, and 2030. **Table 3** provides a summary of the capacity resources Redding will rely upon to meet peak demand and reliability requirements in those same years. **Table B-1** and **Table B-2** in **Appendix B** identify the energy and capacity for individual resources for all years.

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

		2019	2025	2030
Total Net Energy for Load		**767,119**	**768,249**	**782,358**
Non-RPS Resources	Natural Gas	143,185	256,004	241,228
	Large Hydro	241,623	236,799	236,797
	Spot Purchases	216,453	167,049	122,992
	Spot Sales	-46,584	-127,551	-205,223
RPS Resources	Small Hydro	32,364	32,167	32,485
	Solar PV	0	23,703	174,001
	Wind	180,078	180,078	180,078
Total Energy Procured		**767,119**	**768,249**	**782,358**
Surplus/Shortfall		**0**	**0**	**0**

Source: California Energy Commission, based on Redding's 2018 IRP filing

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

		2019	2025	2030
Peak Demand		**227.3**	**226.4**	**228.0**
Planning Reserve Margin		**34.1**	**34.0**	**34.2**
Peak Procurement Requirement		**261.4**	**260.4**	**262.2**
Non-RPS Resources	Natural Gas	169	169.0	169.0
	Large Hydro	86.2	85.3	85.3
RPS Resources	Small Hydro	4.2	4.2	4.2
	Solar PV	0.0	5.7	38.7
	Wind	14.5	14.5	14.5
Total Capacity Procured		**273.9**	**273.0**	**273.0**
Surplus/Shortfall		**12.5**	**12.6**	**10.8**

Source: California Energy Commission, based on Redding's 2018 IRP filing

CHAPTER 2:
Review for Consistency With PUC Section 9621 Requirements

This chapter summarizes the main elements of Redding'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 emission reduction targets established by the California Air Resources Board, in coordination with the Energy Commission and California Public Utilities Commission.[21] 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 Redding'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 the portfolio to ensure consistency with other data and information available to staff.

Based on this review, staff finds that Redding plans to achieve the California Air Resources Board established GHG emission reduction target range of 57,000 to 101,000 metric tons of carbon dioxide equivalent (mT CO_2e). Redding's resource portfolio results in roughly 64 MT CO_2e, which is near the lower end of the range and consistent with the requirement of PUC Section 9621(b)(1).[22] Redding estimated its GHG emissions for each plant by multiplying a specific emission intensity for a power plant, or spot market purchase, by its total generation for the planning horizon. As Redding procures additional renewable resources, it plans to significantly reduce its spot market purchases and ramp up its natural gas plant to make up the difference, while still achieving GHG reductions. To accomplish this, Redding will shift 40 MT CO_2e from its spot market purchases to its Redding Power Station between 2019 and 2030. At the same time, the utility will increase its spot market sales by 68 MT CO_2e, which does not count towards Redding's portfolio emissions, placing Redding in a net spot sales

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

22 The GHG emission is taken from Redding's standardized tables.

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

Table 3 in **Appendix B** identifies the GHG emission intensities and total emissions for individual resources for all years.

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

	Fuel Type	GHG Emission Intensity (mt CO_2e/MWh)	Total Emissions (MT CO_2e)		
			2019	2025	2030
Redding Power Plant	natural gas	0.438	59	105	99
Spot market purchases	system	0.428	93	71	53
Spot market sales	system	0.428	(20)	(55)	(88)
Total Portfolio emissions	**NA**	**NA**	**131**	**122**	**64**

Source: California Energy Commission, based on Redding's 2018 IRP filing

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 under the RPS, consistent with Article 16 (commencing with Section 399.11) of Chapter 2.3.[23] Staff reviewed the renewable procurement table, the discussion in the IRP filing, and the renewable procurement plan submitted. Staff finds that Redding plans to meet the RPS procurement requirements and all interim compliance periods, and is consistent with the requirements of PUC Section 9621(b)(2).

Redding plans to exceed the current 50 percent RPS requirement of PUC Section 9621(b)(2) with a target of 54 percent. The utility currently has enough renewable energy to cover its 2018 RPS procurement target of 29 percent of retail sales. Meeting the 50 percent RPS target will require Redding to procure an annual average of 16-GWh of renewable energy from 2019 to 2030. From 2019 through 2025, the portfolio relies on using banked RECs from previous years. With the installation of Redding's 60-MW solar project in 2026, Redding will have procured enough renewable resources to fulfill its RPS procurement requirements, and will continue to bank any excess RECs.

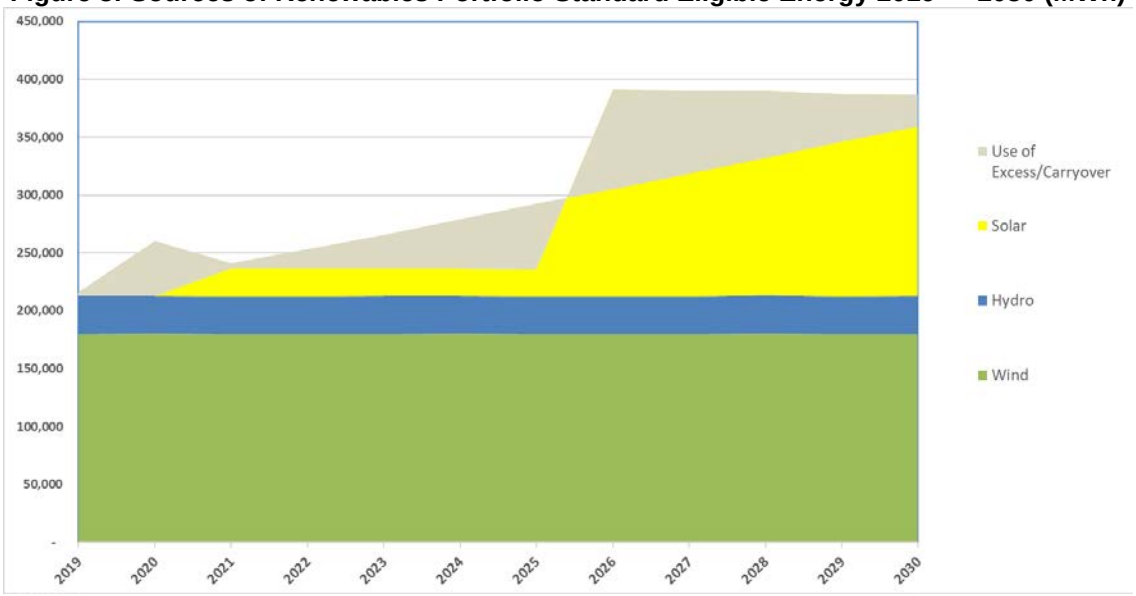
Redding's largest source of renewable energy is the Big Horn wind project. In 2019, it will account for 85 percent of Redding's renewable energy sources while small hydro makes up the rest.[24] By 2030, Redding will have multiple renewable resources: the

23 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.

24 Hydroelectric power in California is broken down into two categories: large hydro, which are facilities larger than 30 megawatts (MW), and small hydro. Small hydro plants qualify as renewable energy under the Renewables Portfolio Standard.

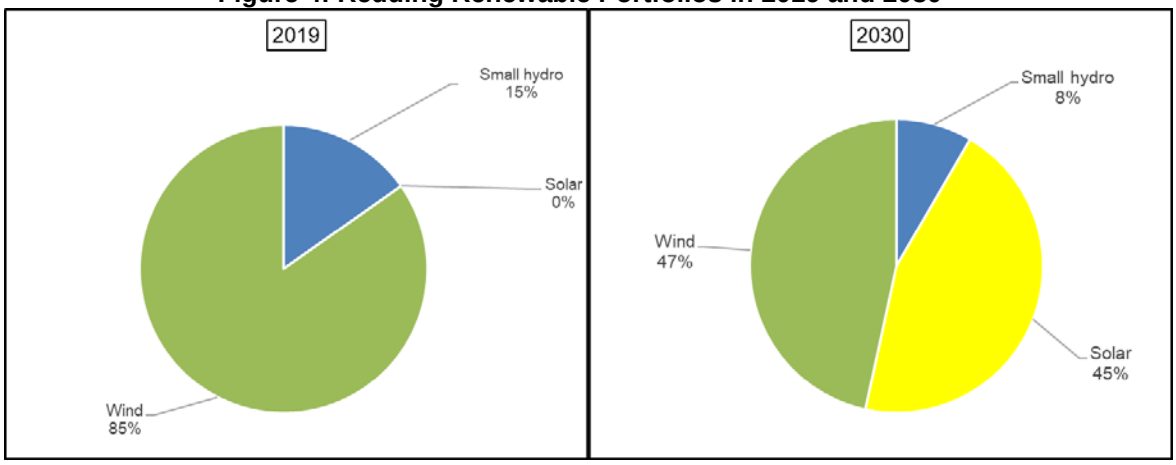
utility's locally-owned Whiskeytown hydroelectric generating plant, RPS-eligible hydroelectric generation received through the WAPA contract, Big Horn wind generation, and two solar PV projects that will come online in 2021 and 2026. **Figure 3** and **Figure 4** show the increase in renewable generation from 2019 to 2030.

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



Source: California Energy Commission, based on Redding's 2018 IRP filing

Figure 4: Redding Renewable Portfolios in 2019 and 2030



Source: California Energy Commission, based on Redding's 2018 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 Redding presented in its IRP filing on the rate and bill impacts from different resource portfolios

they evaluated. Staff finds the Redding IRP is consistent with the rates discussion, as required in PUC Section 9621(b)(3).

In Redding's budget for 2019, power supply costs made up 40 percent of the utility's budget. Other factors that Redding considered include debt service, personnel costs, operation and maintenance cost for its distribution system, and increasing reserves to manage financial risks associated with intermittent resources. These factors can also have a significant impact on revenue requirements.[25]

As previously discussed, Redding performed an economic analysis to determine the long-term cumulative present worth cost of incremental power to customers. This included estimating the costs and revenues associated with purchases from, or sales into the market. According to Redding's analysis, relying heavily upon energy market purchases increased the risk of higher rates. To reduce this potential for higher retail rates, Redding plans to reduce its market purchases as discussed in the Procurement Strategy section (page 11).

Redding's preferred portfolio cost in 2019 is $35 million and increases to $46 million by 2030. The utility's retail sales during this period are 700-GWh in 2019 and increases to 720-GWh by 2030. A $20 million increase in annual power portfolio costs represents an increase from today's rates of approximately 15 percent, or less than 1 percent annually, which is less than the expected increases in the Consumer Price Index.[26] Because of the expected limited impact on rates from power supply costs over the forecast period, Redding did not conduct a separate report or study, but will continue to evaluate rate impacts related to power supply costs.

System and Local Reliability

Senate Bill 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. Staff reviewed Redding's capacity reporting table and discussion and finds that Redding has planned for sufficient resources to maintain a reliable electric system. In addition, Redding'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).

25 Revenue requirements is the revenue that a utility needs to earn in a year to provide adequate service to its customers.

26 The Consumer Price Index is a measure that examines the weighted average of prices of a market basket of consumer goods and services, such as transportation, food, and medical care. It is calculated by taking price changes for each item in a predetermined basket of goods and averaging them. The basket is developed from detailed expenditure information provided by families and individuals to the Bureau of Labor Statistics on what they actually bought.

System Reliability

Redding receives a significant portion of its power supply through contractual purchases and the spot market. To ensure reliability, electric utilities must plan for and procure adequate resources to meet their planning reserve margin, peak demand, and operating reserve requirements. Contributing to Redding's system reliability is the multiple connections it has to the WAPA grid as discussed in the Transmission and Distribution Systems section, below.

In Redding's standardized tables, the utility uses the planning reserve margin of 15 percent set by the North American Electric Reliability Council. By 2030, Redding expects its system peak demand need, including its planning reserve margin, to be 228-MW, similar to its peak demand in 2019. With a relatively flat demand growth rate, Redding's surplus capacity is fairly consistent at 12-MW.

Redding is a member of the Balancing Authority of Northern California (BANC).[27] The Sacramento Municipal Utility District acts as the balancing authority operator on behalf of BANC, continuously balancing supply and demand within the BANC balancing authority area and between neighboring balancing authorities. BANC operates the transmission system, monitoring power lines to maintain its operation within reliable limits of the system.[28] BANC is relatively free from system-related congestion. As a member of BANC, Redding directly schedules its energy transactions over the California-Oregon Transmission Project within BANC and has an obligation to provide its own reserve energy requirements to cover unforeseen events such as generator and transmission outages.[29]

Local and Flexible Capacity Needs

Under the *POU IRP Guidelines*, a POU outside of the California Independent System Operator (California ISO) balancing authority must include in its IRP filing existing or emerging local capacity needs arising from transmission constraints and how they are expected to be met. Although it is not required, POUs are encouraged to discuss or refer to transmission solutions for emerging local capacity shortfalls or to reduce local capacity needs. As a member of BANC, Redding participates in both summer and winter assessments related to BANC's planning requirements to have adequate transmission and generation capacity. Apart from its primary local generation resource, the Redding

27 The Balancing Authority of Northern California (BANC) is a joint powers authority consisting of the Sacramento Municipal Utility District, Modesto Irrigation District, Roseville Electric Utility, Redding Electric Utility, the City of Shasta Lake, and the Trinity Public Utilities District. BANC is the third largest balancing authority in California. Its operations extend from the California-Oregon border to Modesto, California, covering most of the larger utilities in the Central Valley region north of Modesto.

28 Balancing authorities must meet the technical and operating standards established by the North American Electric Reliability Corporation and the Western Electric Coordinating Council to ensure reliability.

29 The benefit of scheduling on COTP is that it eliminates exposure to California ISO tariffs or charges and it is relatively free from related congestion and encumbrances.

Power Station, Redding has sufficient transmission and generation capacity in place to meet local capacity requirements that may arise from transmission constraints.

Redding does not identify any need for flexible capacity to address ramping requirements and the potential for over-generation from solar resources added to its system starting in 2025.

Transmission and Distribution Systems

PUC Section 9621(b)(3) also 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. The Energy Commission determined that Redding's IRP filing adequately plans to maintain and enhance its transmission and distribution systems. Staff finds that Redding has planned for enough transmission to adequately deliver resources to its service area to meet the requirement as discussed below. Staff also finds that Redding conducted sufficient 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

Redding's system is interconnected to the California transmission grid through two substation facilities that are owned and operated by WAPA. The Keswick substation and the Airport substation, the latter being jointly owned by Redding. Together, both facilities provide an interconnection capacity of 275-MW.

In 1995, Redding signed a 40-year transmission service contract with WAPA. The contract consists of two long-term and one short-term firm transmission service agreements that, together, provide an integrated transmission plan. WAPA's transmission system falls under BANC's balancing authority and interconnects with the California ISO balancing area. Through the transmission service contract, electricity needs not met by generation assets within the service area are imported from adjacent balancing areas.

The service contract includes the California-Oregon Transmission project (COTP), a transmission line that extends from southern Oregon to central California. As a member of the Transmission Agency of Northern California, a California joint power agency, the long-term agreement entitles Redding to 8.4 percent of the transmission line's transfer capability on a take-or-pay basis.[30] Redding purchased an additional 1.6 percent ownership interest in COTP, for a total of 10 percent ownership share, resulting in 140-MW of firm transmission capability. Currently a portion of its COTP transfer capability is used to provide transmission of renewable wind capacity and energy

30 Take-or-pay contracts require the company to either take the product from the supplier or pay the supplier a penalty.

purchased through a PPA with M-S-R.[31] The remaining transfer capability is used to make spot purchases of firm and non-firm energy and as reliability backup for firm power purchases and sales commitments.

Additionally, the WAPA service contract includes the Tesla-Midway Service, another long-term transmission service agreement which provides Redding with 31-MW of firm bi-directional transmission capacity. The transmission line is located between Pacific Gas and Electric's (PG&E's) substation in Tracy and the Midway substation in Buttonwillow. The other agreement is a short-term agreement with the Pacific AC Intertie, a two-line system that connects California utilities with other utilities in the Pacific Northwest. Together, both transmission lines increase the full transfer capability of the COTP and Redding's ability to exchange energy.

Distribution System

Redding's distribution system consists of approximately 72 miles of 115kV local transmission, 740 miles of 12 kV overhead lines, 11 substations, and 17,000 poles. The utility's service area is roughly 61 square miles and since its construction in the 1950s it has expanded and gone through periodic updates. From 1985 through 2008, Redding more than doubled its 12kV distribution system with underground cabling.

In 2017, Redding achieved its highest service availability index rating at 99.992 percent. This means that the average customer in that year experienced only 39 minutes without power compared to the country's average of 130 minutes. Redding's distribution system is continually evaluated and adjusted to optimize and improve its system. By 2019, Redding will complete its modernization program to update all substations in its service area to improve reliability and extend the lifespan of its assets. Through its *Electric Distribution Capital Expenditure Plan*, proposed projects are evaluated, approved, and funded. Current projects and modifications under consideration include:

- Re-conductoring the 115 kV lines between the Eureka Way and Oregon substations to increase their line rating.
- Installation of fiber optic communication links between Redding Power Station and the Texas Springs and Moore Road substations to increase stability.
- Reconfiguring the interconnection lines between the Redding Power Station and the bulk electric system to reduce system impedance and voltage drops by 2020.
- Installation of VAR capacitors at the Canby Substation system to minimize voltage drops to the substation.[32]

31 M-S-R is a public power agency created through a Joint Exercise of Powers Agreement among the Modesto Irrigation District, the City of Santa Clara (Silicon Valley Power) and the City of Redding for the purpose of acquiring, constructing, operating, and maintaining generation and transmission projects.

32 VAR is an abbreviation of voltage-ampere reactive, a term used extensively to represent reactive power within electrical circuits. VAR control is used to manage the relationship of varying current and voltage that collectively originates from active electrical components.

Redding is also considering several energy management projects related to communications systems that will help to automate and provide real-time information of the system to reduce response time.

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

In its IRP, Redding used the California Environmental Protection Agency's California Communities Environmental Health Screening Tool to identify disadvantaged communities within its service territory. Redding did not find any officially designated disadvantaged communities but recognizes that there are many areas that the utility serves that are deemed low income.

Redding developed strategies to increase the education and participation of low-income customers through its Low-Income Energy Efficiency Program. It coordinates with various programs, such as PG&E's *Energy Savings Assistance Program* and the Department of Community Services and Development's *Weatherization Program,* to maximize the benefits low-income customers can receive from each one. Other resources offered include a rate discount program and an emergency bill assistance program. Details of other energy efficiency measures are discussed in the Additional Procurement Goals section.

Net Energy Demand in Peak Hours

PUC Section 9621(c) requires POUs to consider existing renewable generation, grid operation efficiency, energy storage, distributed energy resources, and energy reduction measures (such as energy efficiency and demand response) to reduce the need for new or additional gas-fired generation, distribution and transmission resources. Redding's IRP includes a discussion of how preferred resources contribute to meeting peak demand and how that affects resource selection for its portfolio. This is consistent with the requirement that filing POUs address how they can meet peak hour demand with renewable and other preferred resources.

Redding plans to meet its net energy demand in peak hours with a diverse and balanced portfolio. In its analysis, Redding mentions that a balanced combination of solar and wind is a good fit for an hourly energy demand profile. The utility also has existing energy storage devices in place, which will help to shift electrical demand from peak hours to off-peak hours, creating value to its customers. Coupled with its energy efficiency programs and relatively flat peak demand, Redding has sufficient existing and

near-term capacity resources in its preferred portfolio to meet its projected energy requirements through 2030. With ample transmission line capacity, Redding plans to use minimal spot market purchases to make up the difference to meet its energy needs.

Additional Procurement Goals

PUC Section 9621(d)(1) requires filing POUs to address resource adequacy and procurement of energy efficiency and demand response, energy storage, transportation electrification, and portfolio diversification. The resource adequacy provisions of this code section are discussed in System Reliability (page 17); the remainder are discussed below.

Energy Efficiency and Demand Response Resources

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

Since 2013, Redding has continued developing its portfolio of energy efficiency programs to achieve energy efficiency goals. Redding currently offers a robust selection of residential and commercial energy efficiency programs to its customers. For residential customers, there are twelve rebate programs, a weatherization program, and a shade tree program. For commercial customers, there are eight rebate programs for building owners to install energy efficient mechanical equipment, refrigeration equipment, and appliances. Other commercial programs include the lighting rebate program and a custom program that serves commercial customers on large projects not addressed by other rebate programs. In addition, Redding has municipal program incentives for projects that reduce energy and operational costs within its service area. One such project is a lighting program, which retrofits existing streetlights with new LED fixtures. Redding estimates the program will save 3.7-GWh of energy by 2021.

By 2029, Redding's energy efficiency programs will reduce demand by 47-GWh. **Table 5** compares Redding's estimates of additional achievable energy efficiency (AAEE) savings incorporated in its IRP between 2018 and 2029 to the targets adopted in the Energy Commission's report, *Senate Bill 350: Doubling Energy Efficiency Savings by 2030*. Overall, Redding's estimates of energy efficiency savings (or AAEE) are slightly higher than the Energy Commission's SB 350 targets for doubling energy efficiency by 2030.

Redding does not currently offer any demand response programs. The utility analyzed energy usage by its large customers to determine their ability to shift load during periods of high demand and found customer limitations. Time-of-use rates may be offered in the future, but savings are expected to be negligible without the ability to include larger commercial customers.

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

	AAEE (GWh)	SB 350 targets (GWh)
2018	10	9
2019	13	12
2020	17	16
2021	21	20
2022	25	24
2023	29	27
2024	32	30
2025	36	33
2026	39	36
2027	42	39
2028	45	42
2029	47	44

Source: California Energy Commission, based on Redding's 2018 IRP filing

Energy Storage

Staff finds that Redding's IRP is consistent with the requirement in PUC Section 9621(d)(1)(B) to address procurement of energy storage as it discusses the potential role of energy storage on its system. Since 2004, Redding has been heavily involved in the thermal energy storage market to reduce the system's peak and provide energy when it is of most value. The utility installed its first thermal energy storage devices in 2005 and continued its pursuit of cost-effective energy storage installations within its territory before the passage of Assembly Bill 2514.

Assembly Bill 2514 (Skinner, Chapter 469, Statutes of 2010) requires POUs to evaluate the potential of energy storage systems as a resource and establish procurement targets, if appropriate. In compliance with Assembly Bill 2514, Redding opened a proceeding in 2012 to investigate energy storage and determine appropriate energy storage targets. A thermal energy supplier contracted by the Redding City Council, concluded that 14-MW of permanent load shifting could be achieved through thermal energy storage

programs.[33] In 2014, Redding adopted two energy storage targets: 3.2-MW in 2016 and 4.4-MW in 2020. The actual achieved energy storage capacity of the first target was 3.6-MW. In 2017, as required by legislation, Redding re-evaluated its energy storage targets, and, due to changing load conditions, lowered its 2020 target to 3.6-MW. Redding plans to continue to evaluate the potential of additional energy storage in the future.

Transportation Electrification

Staff finds that Redding's IRP is consistent with the requirement of PUC Section 9621(d)(1)(C) as it addresses transportation electrification, primarily for light-duty vehicles. Based on the 2016 Zero Emission Vehicle Action Plan, Redding projects electric vehicles to increase from roughly 200 in 2018 to more than 2,200 in 2026.[34] Contributing towards the rapid growth is Redding's 2017 electric vehicle rebate program. Under the program, incentives are given to customers who purchase or lease electric vehicles and to customers who install Level II electric vehicle chargers at their commercial or residential locations.

Other steps taken to encourage the adoption of electric vehicles include a dedicated webpage for customer outreach, educating local car dealers on electric vehicles and rebates, and a ride and drive program to further educate and create interest in electric vehicles by consumers. Redding currently has a city-wide study underway to develop an infrastructure plan for the installation of electric vehicle charging stations. The study will identify the best locations for installation, the ideal number of charging stations, and the estimated power requirements.

Portfolio Diversification

PUC Section 9621(d)(1)(D) requires that POUs address the procurement of a diversified portfolio of resources, consisting of short-term and long-term electricity, electricity related, and demand response products. Based on staff's review of Redding's existing resources, its portfolio analysis, and the selection of resource additions in its IRP, staff concludes that the utility has fulfilled this requirement. **Figure 5** shows a comparison of the energy mix by resource in Redding's preferred portfolio in 2019 and 2030.

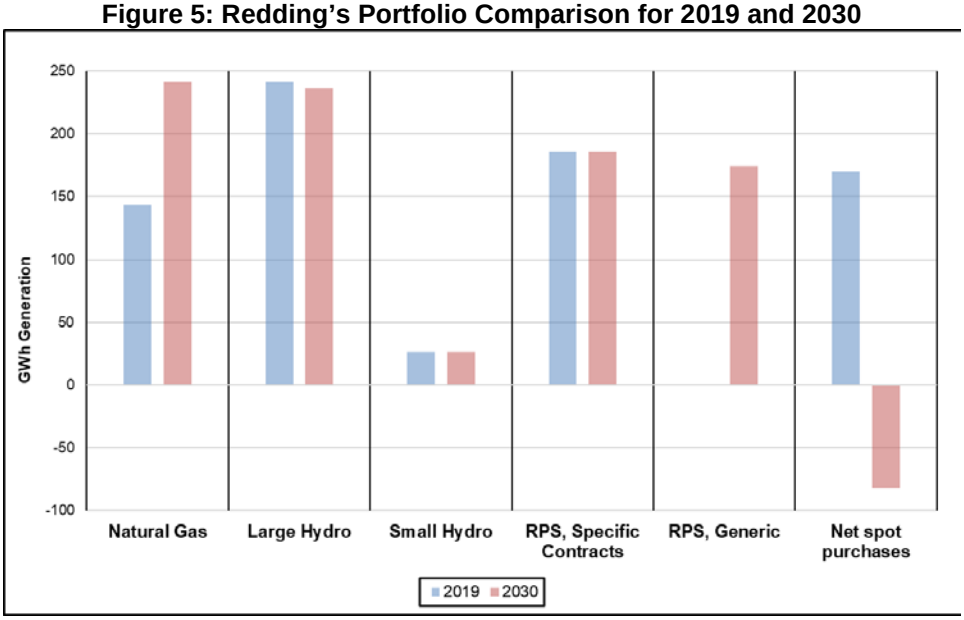
Redding currently has a variety of resources, including natural gas, hydroelectric, wind, and distributed solar. The utility plans to significantly reduce its reliance on spot market purchases, which have associated GHG emissions, by procuring additional renewable resources and increasing its natural gas resource by 68 percent. As Redding moves towards reducing GHG emissions and increasing its RPS portfolio, in 2030, the utility will be a net seller in the spot market, rather than a net purchaser, allowing it to sell nonrenewable energy with GHG emissions into the market. GHG emissions

33 Thermal energy storage allows excess thermal energy to be stored and used hours, days, or months later, at scales ranging from individual process, building, multiuser-building, district, town, or region.

34 The 2016 ZEV Action Plan is the product of an interagency working group led by the Governor's Office.

associated with market sales are not attributed to Redding's resource portfolio and instead must be attributed to the buyer. As a result, Redding will carry less exposure to extreme market conditions, have less regulatory risk, provide better hourly production, and exhibit more resource diversity in meeting its portfolio objectives during the planning period.

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



Source: California Energy Commission, based on Redding's 2018 IRP filing

ACRONYMS

Acronym	Term
AAEE	Additional achievable energy efficiency
AAPV	Additional achievable photovoltaic
BANC	Balancing Authority of Northern California
Barriers Study	Low-Income Barriers Study, Part A: *Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities*
California ISO	California Independent System Operator
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CRAT	Capacity Resource Accounting Table
EBT	Energy Balance Table
GEAT	GHG Emissions Accounting Table
GHG	Greenhouse gas
GWh	Gigawatt-hour
IRP	Integrated resource plan
mt	Metric ton
MT	Thousand metric tons
MW	Megawatt
MWh	Megawatt-hour
POU	Publicly owned utility
PUC	Public Utilities Code
RPS	Renewables Portfolio Standard
RPT	RPS Procurement Table
SB 350	Senate Bill 350 (de León, Chapter 547, Statutes of 2015)

Appendix A: Definitions

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.

Bundled renewable energy credit: An electricity product that, when procured by the POU claiming the electricity product to satisfy its RPS procurement requirements, includes both the electricity and the associated renewable energy credits from an eligible renewable energy resource. For example, if the POU claiming an electricity product owns the associated eligible renewable energy resource, then all electricity products, including those associated with electricity consumed onsite, may be considered bundled electricity products.

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 Energy Commission, 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.

Present worth: A financial calculation that measures the worth of a future amount of money or stream or payments in today's dollars adjusted for interest and inflation. It compares the purchasing power of a future dollar to the purchasing power of one today.

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.

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.

Sensitivity: A technique that determines how scenario analysis changes when an assumption is varied with all other scenario assumptions unchanged.

Standardized tables: The four tables that are required with the IRP filing submitted to the Energy Commission. These tables include information and data necessary to help staff determine if the IRP is consistent with PUC Section 9621. The four standardized

tables are Capacity Resource Accounting Table, 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 these guidelines. Supporting information may also include the inputs and assumptions that are based on the analyses, studies, data, work papers, and other material.

Take-or-pay: Take-or-pay contracts require the company to either take the product from the supplier or pay the supplier a penalty.

Unbundled renewable energy credit: A renewable energy credit from an eligible renewable energy resource that is not procured as part of the same contract or ownership agreement with the underlying energy from that eligible renewable energy resource; this includes RECs that were originally procured as a bundled product but were subsequently resold separately from the underlying energy.

Appendix B: Standardized Reporting Tables

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

		Technology	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Net Energy for Load			**767,119**	**766,632**	**763,013**	**761,992**	**762,510**	**767,096**	**768,249**	**770,535**	**773,399**	**778,734**	**780,769**	**782,358**
Non-RPS Resources	Redding Power Station	natural gas	**143,185**	**176,370**	**214,035**	**251,961**	**258,727**	**259,571**	**256,004**	**241,415**	**240,550**	**235,752**	**240,542**	**241,228**
	WAPA Base Resource	large hydro	**241,623**	**241,923**	**241,620**	**241,628**	**241,634**	**241,941**	**236,799**	**236,788**	**236,791**	**237,094**	**236,787**	**236,797**
	Spot Purchases	N/A	**216,453**	**199,329**	**167,379**	**161,419**	**156,543**	**160,376**	**167,049**	**115,368**	**117,571**	**116,561**	**116,584**	**122,992**
	Spot Sales	N/A	**-46,584**	**-63,895**	**-96,777**	**-129,612**	**-130,888**	**-131,586**	**-127,551**	**-214,326**	**-211,562**	**-200,631**	**-200,730**	**-205,223**
RPS resources	Whiskeytown	small hydro	**26,169**	**26,207**	**26,104**	**26,115**	**26,181**	**26,173**	**26,095**	**26,180**	**26,193**	**26,505**	**26,209**	**26,414**
	Big Horn	wind	**180,078**	**180,494**	**180,078**	**180,078**	**180,078**	**180,494**	**180,078**	**180,078**	**180,078**	**180,494**	**180,078**	**180,078**
	Western – Small	solar PV	**6,195**	**6,203**	**6,195**	**6,196**	**6,196**	**6,204**	**6,072**	**6,071**	**6,072**	**6,079**	**6,071**	**6,072**
	LocalPV	solar PV	**0**	**0**	**24,379**	**24,208**	**24,039**	**23,924**	**23,703**	**23,537**	**23,373**	**23,261**	**23,046**	**22,885**
	CV PV	Solar PV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**155,422**	**154,334**	**153,619**	**152,181**	**151,116**
Total Energy		N/A	**767,119**	**766,632**	**763,013**	**761,992**	**762,510**	**767,096**	**768,249**	**770,535**	**773,399**	**778,734**	**780,769**	**782,358**
Surplus/Shortfall		N/A	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Source: California Energy Commission, based on Redding's 2018 IRP filing

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

		Technology	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Peak Demand			227	227	226	226	226	226	226	227	227	227	228	228
Planning Reserve Margin			34	34	34	34	34	34	34	34	34	34	34	34
Peak Procurement Requirement			**261**	**261**	**260**	**260**	**260**	**260**	**260**	**261**	**261**	**261**	**262**	**262**
Non-RPS Resources	Redding Power Station	natural gas	169	169	169	169	169	169	169	169	169	169	169	169
	WAPA Base Resource (Large Hydro)	large hydro	86	86	86	86	86	86	85	85	85	85	85	85
	Planned System Capacity Contract(s)	N/A												
RPS resources	Whiskeytown	small hydro	2	2	2	2	2	2	2	2	2	2	2	2
	Big Horn	wind	15	15	15	15	15	15	15	15	15	15	15	15
	Western - Small	small hydro	2	2	2	2	2	2	2	2	2	2	2	2
	Local PV	solar PV	0	0	6	6	6	6	6	6	6	6	6	5
	CV PV	solar PV	0	0	0	0	0	0	0	34	34	34	33	33
Total Capacity Procured			**274**	**274**	**274**	**274**	**274**	**274**	**273**	**273**	**273**	**273**	**273**	**273**
Surplus/Shortfall			**12**	**13**	**20**	**20**	**20**	**20**	**18**	**52**	**51**	**51**	**50**	**49**

Source: California Energy Commission, based on Redding's 2018 IRP filing

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

	Fuel Type	GHG Intensity (MT CO_2e/ MWh)	Total Emissions (MT CO_2e)											
			2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Redding Power Plant (Units 1 -6 on CRAT Form)	natural gas	0.438	59	72	87	103	106	106	105	99	99	97	98	99
Spot market purchases	system	0.428	93	85	72	69	67	69	71	49	50	50	50	53
Spot market sales (system)	system	0.428	(20)	(27)	(41)	(55)	(56)	(56)	(55)	(92)	(91)	(86)	(86)	(88)
Portfolio emissions (Scenario H)	portfolio	NA	131	130	117	117	116	119	122	56	58	61	62	64

Source: California Energy Commission, based on Redding's 2018 IRP filing

Attachment I: Public Utilities Code

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.)