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2023 INTEGRATED RESOURCE PLAN

TABLE OF CONTENTS

1 Executive Summary

Roseville Electric Utility's (Roseville) 2023 Integrated Resource Plan (IRP) is a comprehensive plan for transitioning a reliable and affordable portfolio of power supply resources to meet State and Federal decarbonization mandates. The IRP also supports Roseville's mission to serve and support our community by delivering exceptional reliability, customer experience, and advocacy in a transforming industry.

The IRP is a comprehensive and long-term strategic plan that outlines how Roseville intends to meet its future energy needs while considering factors like reliability, affordability, and environmental compliance. Roseville's IRP provides a general plan for resource evaluation and procurement and is required by California Senate Bill (SB) 350. This IRP provides a framework and strategies to meet State and Federal requirements and our customers' needs reliably and affordably through December 31, 2035.

Key components and objectives of Roseville's 2023 IRP:

- **Assessment of Electricity Needs**: Forecasts of Roseville's customer demand considering various levels of residential and commercial customer growth, electric vehicle adoption, and increasing use of electric home appliances.
- **Regulatory Compliance**: Catalogues the current State and Federal laws and regulations related to providing public electric service in California and recommends a plan and strategies to ensure Roseville meets the current and future compliance milestones.
- **Resource Portfolio**: Considers the current generation investments and power supply contracts in Roseville's portfolio and recommends future resourcing options to affordably maintain reliability and meet compliance obligations. While the analysis and recommendations focus on the technologies and costs of today, Roseville will adjust as new resource opportunities emerge that may more effectively meet our future needs.

- **Renewable Energy Integration**: Roseville's IRP examines the direct resource costs and future energy storage costs that intermittent resources like wind and solar will require. As Roseville's share of renewable energy increases to meet regulatory compliance requirements, so will intermittency and the need to integrate energy storage technology. The timing of renewable integration and energy storage technology will be of the utmost importance to Roseville over the IRP planning period.
- **Cost Analysis**: Roseville's IRP projects future costs associated the resourcing strategies analyzed based on proven technologies today. The portfolios analyzed provide great insight into the drivers of future cost, namely increasing levels of battery storage. The "Balanced" portfolio, commonly referred as to the "Low Cost Plan," that the IRP recommends relies on proven technologies like hydro and geothermal – baseload clean resources. Roseville will prioritize acquiring these resources, or those with similar characteristics, as they infrequently come to market.
- **Reliability and Grid Stability**: Roseville's IRP accounts for the obligations Roseville has within its grid, the Balancing Authority of Northern California, and ensures the resources needed in the future can meet those obligations. This includes meeting the necessary planning reserve margin to support a reliable and resilient electric system.
- **Public Input**: Roseville utilized a public process that included public meetings and other opportunities to get direct input from our customers. Roseville's IRP reflects our customers' priorities in how we serve their future electricity needs.

Achieving goals requires a thorough understanding of the tradeoffs of both actions and inactions. All options have costs, risks, and are subject to an ever-changing environment of new mandates, emerging markets, and the broader economy. The Low Cost Plan is today's best option moving forward and performed favorable under all load scenarios. Roseville will pursue this Low Cost Plan, but its success depends on Roseville's ability to secure or develop the recommended assets or those with similar attributes, preferably with our municipal partners. It is important to note that adjustments to the Low Cost Plan may be necessary in light of a variety of factors that impact specific procurement efforts.

1. IRP vs Resource Procurement

Roseville's IRP serves as a roadmap for meeting the City's energy future, outlining the necessary resources, timing, and strategies to ensure a cost effective, reliable, and sustainable power supply. It is crucial to acknowledge that the alignment between the IRP and future resource procurement may not always be perfect. The implementation of the IRP relies heavily on several dynamic factors outside of Roseville's control, such as project or resource availability, including technology type, project size, location, partnership opportunities, and timing, along with the ever-fluctuating market prices. New technologies may also become available that have similar attributes and performance characteristics, replacing the need for resources shown in the Low Cost Plan. These variables introduce a level of unpredictability into the procurement process, necessitating a degree of flexibility to the Low Cost Plan in order to adapt to the evolving energy landscape. While the IRP provides a clear direction, the practical execution of procuring resources may require adjustments to timing, possibly even accelerating some procurements given the compliance timelines and the limited availability or opportunities presented in the marketplace. As the procurements occur, the Low Cost Plan will be adjusted to ensure that Roseville continues to meet its energy needs in a cost effective manner while meeting necessary compliance and reliability requirements. It is important to note that specific resource procurement recommendations will be presented to the City Council for consideration.

2. Resource Overview

Roseville has a diverse portfolio of resources that includes large and small hydroelectric, geothermal, natural gas fired thermal, system power contracts, and additional contracts for renewable supply. Notably, the City owns and operates the Roseville Energy Park and the Roseville Power Plant 2. Both power plants are connected to the Roseville electric distribution system and serve as important assets in promoting electric system reliability, as well as helping manage overall power supply costs to serve the community. The City also has a long-term contract with Western Area Power Administration for a share of the Central Valley Project generation and entitlements to the power output of several Northern California Power Agency generating projects.

Sources of Power Supply
Fiscal Year Ended June 30, 2023

Source	Type	Area	Capacity Available (MW)	Estimated Power (GWh)[2]	% of Total
Roseville Energy Park	Natural Gas	Local	168	543	45%
Roseville Power Plant 2	Natural Gas	Local	48	7	1%
Western Area Power Administration	Hydro	Western	35	70	6%
NCPA					
Geothermal Project	Geothermal	ISO	8	49	4%
Hydroelectric Project	Hydro	ISO	30	107	9%
South Feather Hydroelectric Project	Hydro	ISO	20	81	7%
Steam Injected Gas Turbine Generator Project	Natural Gas	ISO	18	3	
Market Purchases			79		
Renewable	Various	Various		68	6%
Non-renewable	Various	Various		269	22%
TOTAL			**406**	**1,197***	**100%***

At present, Roseville gets most of its energy from natural gas and hydro-electric sources, but this will need to change in the future. State regulatory requirements, including the Renewable Portfolio Standard (RPS) mandates are driving the transformation in Roseville's portfolio, which sets minimum requirements for renewable energy generation within a utility's overall energy supplies. Starting with SB 1078 in 2002, the RPS goals have steadily ratcheted up culminating in SB 100, which set the ambitious target of reaching 60 percent of retail sales to be served from eligible renewables by 2030. Additionally, SB 100 mandated zero-carbon emissions in the electricity supply by 2045. Our 2023 IRP presents a plan to meet the 2030 RPS requirements, and places Roseville on the path towards meeting the 2045 targets.

3. Roseville's Electricity Needs

The way that Roseville's customers use electricity is changing. Recent years have seen higher peak demand in the summer while annual customer use or electricity consumption has been relatively flat. The load forecast in the 2023 IRP reflects several key trends:

- More customers, particularly those with rooftop solar which is driving an increase in our peak loads after sunset. All new homes require roof-top solar in order to meet building efficiency requirements, and many commercial customers are choosing to add solar in order to meet business or corporate sustainability goals.

- Widespread electrification of the transportation sector and home appliances. The electrification of homes and cars will add to peak loads as well as increase annual loads as annual average customer demand will increase.
- Industrial customer development and expansion. In addition to technological and customer changes that will impact overall electricity demands, Roseville must also be prepared to meet the commercial and industrial development needs in the community. This will require that the electric utility also look to preserve and invest in resources that support local reliability and resiliency needed to attract and promote economic development in the community.

These trends will require Roseville to carefully plan for the future to ensure that we have the needed electric system infrastructure, as well as the necessary power supply resources to meet changing electric demands in the community.

4. Community Feedback/CC Guidance

Roseville Electric is publicly owned, and as such, in preparing the 2023 IRP utilized a number of platforms of community engagement. Roseville held two public workshops, presented to the Roseville Public Utility Commission (RPUC), and addressed the City Council. When presented with the tradeoffs involved with excelling in reliability, affordability, or renewable energy, the clear preference was to be reliable and affordable, and to meet, not exceed, California's renewable energy and greenhouse gas (GHG) emissions requirements. This is important guidance as Roseville assesses future resource planning for the community.

5. Key Initiatives under the Low Cost Plan

The 2023 IRP analyzed many portfolios under a variety of load conditions, with the key driver of lower cost being portfolios with resources aligned with load to minimize near term storage investments. The transition to cleaner resources will be expensive, but the following key initiatives will ensure we continue to deliver reliable and sustainable electric service to our community while managing upward pressure to our customer rates:

- **Expansion of Hydroelectric Resources**: Roseville is dedicated to pursuing additional hydro resources as they become available. This initiative underscores our commitment to harnessing clean and renewable energy sources to meet growing energy demands.
- **Extension of Current Hydro Resource Agreements**: We will proactively work with our partners and counterparties in an attempt to extend existing hydro resource agreements to ensure a stable and consistent supply of hydroelectric power, contributing to our regulatory compliance objectives.
- **Enhancing Import Capacity**: Roseville will seek opportunities with our high voltage transmission provider to increase our available import capacity to our electric system, enabling Roseville to maintain service during summer peaks even with a major generator outage at our Roseville power plants.
- **Engagement in Gas Transportation Cost Management**: Continue our participation with other public power and similarly impacted partners to influence PG&E's natural gas transportation costs to ensure our power plants can compete fairly and help deliver cost-effective energy to our customers.
- **Utilization of Advanced Metering Infrastructure (AMI) Data**: We will leverage AMI data to assess and develop new programs, optimize system operations, and enhance our ability to meet customer needs efficiently.
- **Development of Robust Load Reduction Programs**: To provide more tools for managing emergency grid conditions, Roseville will develop and implement opt-in load reduction programs, both for our residential and commercial customers.
- **Local Generating Resource Development**: We will actively pursue the development of local generating resources within the grid we share with our neighboring public utilities, further bolstering our energy independence and resilience.

- **Continued Maintenance and Upgrades**: Roseville will remain diligent in conducting proactive maintenance on our generation units and upgrades to our electric distribution system. This ensures that our infrastructure remains resilient in the face of increased and more volatile loads.
- **Diverse Resource Assessment**: Although the Low Cost Plan does outline a roadmap for resource procurement, Roseville will remain open and receptive to assessing a variety of procurement and development opportunities as they arise, specifically those presented under joint arrangements with our partner utilities. This "stay at the table" approach will help complement our other key initiatives and ensure that we are assessing a diverse set of resource technologies in this evolving market.

6. Future Cost Drivers

Power Supply portfolio costs are a significant portion of Roseville's overall budget and contain the most variability due to external energy market and State and Federal legislation and regulatory mandates. Having a portfolio that limits costs and risk is a key priority. Although the electric utility does operate under a well-established and a robust risk management program to limit market exposure to power supply costs, Roseville is not immune to energy market forces. Notably, the rapid transition to increasing amounts of renewable energy and volatility in the natural gas markets has put pressure on our electric rates. All the scenarios analyzed in the 2023 IRP show upward rate pressure. The Low Cost Plan limits the cost increase and associated market risks; however, it cannot totally mitigate all risks. If the resources can be procured in the timeline as reflected in the Low Cost Plan, the forecasted power supply costs will increase at least seven to twelve percent over the twelve year planning horizon of this IRP. However, flexibility during the specific procurement process will be essential in order to address uncertainties related to limited supply availability, prevailing technology, or timing, which may result in higher rate pressure.

7. Other Considerations

The next two decades will be challenging as Roseville strives to maintain its historic high reliability and affordability, while ensuring compliance with the transition to higher levels of renewable and zero-carbon regulations. Roseville will consider all opportunities that contribute to meeting these objectives and find partnerships to help share the burden and risk. Key areas of focus will be:

- **Optimal Risk Management**: We will continually assess analytical methods and market instruments to manage risks effectively and affordably, ensuring the stability and sustainability of our energy resources.
- **Aligning Environmental Mandates with Energy Sources**: With more renewables on the system, the need for flexible fast responsive resources will increase. Roseville will seek directly connected renewable and zero emission assets that contribute to compliance, serving customer load, and improving reliability.
- **Enhancing Regional Transmission**: As regional market development, we will actively examine opportunities to augment our transmission capabilities to the Pacific Northwest, facilitating efficient energy exchange and collaboration within the broader energy ecosystem.
- **Storage Solutions for Intermittency**: As the need arises, we will closely monitor system requirements for intermittency and proactively implement suitable energy storage solutions.
- **Advocacy**: In an effort to inform both State and Federal legislators and regulators, Roseville will continue to seek opportunities to share our community's values with the goal of influencing decisions that can create challenges and opportunities for our customers.

8. Implementation Principles

The 2023 IRP delineates several key actions and strategies. Over efforts to maximize value and reduce risk to our customers include the following implementation principles:

1. **Participation in Joint Power Opportunities**: Many of Roseville's assets are available through joint action with other public agencies. This approach has enabled Roseville to participate in projects that are too large for Roseville to develop on its own. Scale, risk sharing, and cost savings are benefits we have received with this approach. As new technologies emerge to address the problems of decarbonizing, joint action will be all the more important.
2. **Consideration of Local Opportunities and Factors**: Local projects within Roseville service territory and within the grid it shares with other public power providers will provide greater benefits and reduce risks. We are committed to evaluating all local opportunities and considering region-specific factors to make informed decisions that are aligned with the unique needs of our customers' energy needs.
3. **Cost Assessment**: A fundamental aspect of our strategy is the rigorous evaluation of costs, ensuring that our energy choices are economically sound and fiscally responsible.
4. **Demand-Side Strategies**: We are dedicated to exploring and implementing customer influencing demand-side strategies that enhance energy efficiency and meet the evolving requirements of our consumers.

As we navigate the evolving California energy sector, it is imperative to maintain a steadfast approach of monitoring the trends, being engaged in various market forums, and being cautious to not take action too early in a rapidly changing market environment. Roseville's Low Cost Plan, in particular, focuses on preserving grid reliability and resilience while limiting cost exposure to customers. To this end, we remain committed to manage risk optimally and affordably, ensuring that our operations remain both financially prudent and adaptable to the shifts in State energy policy. Roseville's commitment to these strategic initiatives underlines our dedication to providing sustainable, reliable, and innovative energy solutions to our community and stakeholders while staying at the forefront of industry developments

2 Purpose and Background

Roseville's IRP priorities are:

- **Reliability**: Providing reliable and safe power to our customers. This includes minimizing outages and service interruptions and having a diverse portfolio of resources and resource locations to limit events such as wildfires, transmission line outages, and weather that impacts renewable generation. The evaluated areas were capacity, energy, flex, and diversity.
- **Compliance**: Meeting local, state, and federal regulations. This includes the latest renewable and greenhouse gas mandates (SB 1020 and AB 1279).
- **Affordability**: Providing our customers with affordable, nonvolatile electricity rates. This includes making the correct investments in existing infrastructure and resources, as well as procuring the best fit resources at the right time.

2.2 California Energy Commission IRP Guidelines

Roseville files this IRP in accordance with the requirements of SB 350, which requires certain Publicly Owned Utilities (POUs), including Roseville, to submit an IRP to the California Energy Commission (CEC). Roseville's City Council serves as Roseville Electric's governing board and must adopt Roseville's IRP in 2023 and adopt each update to the IRP. Updates are required at least once every five years. All IRP requirements are specified, addressed, and referenced in section 2.4.

2.3 IRP Objectives

The IRP is a process that utilities undertake to determine a long-term plan to ensure that generation resources are adequate to meet projected peak capacity, energy needs, and intra-hour load variation. IRPs must ensure generation reliability is maintained at or above industry standard levels. In addition, IRPs must plan how to meet California's mandated renewable and carbon-free goals. Sound IRPs also need to forecast long-term costs, potential rate impacts, and risks to customers to ensure that the utility can monitor and track trends with sufficient time to implement solutions to ensure reliability, compliance, and affordable electric service. An effective IRP should also provide a reasonable degree of flexibility for the utility to deal with uncertainty in technological change and future regulations. An IRP is a planning document, not a procurement policy.

Sophisticated analytical tools are required in order to evaluate and compare the costs, risks, and benefits of a comprehensive set of alternative supply and demand resources. Supply options typically include evaluating new conventional generation resources, renewable energy technologies, carbon-free resources, and storage. Demand options typically include consideration of Demand Response (DR) programs, Energy Efficiency (EE) programs, and other "behind the meter" options that may reduce the overall customer load that the utility must meet.

IRPs utilize various economic analyses and methodologies to assess alternative scenarios (e.g., different combinations of supply, demand resources, and market prices) and sensitivities to key assumptions to arrive at a holistic economically optimal resource plan. However, it is important to understand that the optimal economic plan derived through IRP analysis of generation resources may or may not reflect the same conclusions that a purely financial analysis might reach. Thus, modifications to the preferred or recommended plan may result after incorporating customer preferences, environmental goals, new technologies, constraints, risk, and utility financial metrics. It is also important to note that the Low Cost Plan may have characteristics not available to the market at the exact size, location, and timing.

The key steps in the resource planning process are illustrated in Figure one.

Examine Planning Framework and Risks
Identify and assess challenges inherent in the current business and regulatory environment. Develop a multi-faceted risk management approach that considers how drivers may change during the planning period.

Assess Needs
Develop load growth forecasts, including possible scenarios, existing plant conditions, contract terms, and operational constraints to determine resource needs over the planning period.

Consider Resource Options
Evaluate available generation resources, including conventional, renewable, carbon-free, storage, and long-term market power purchases to identify the role each will play in meeting customer needs, and regulatory and policy goals.

Develop Resource Portfolios
Develop resource portfolios through a screening process, followed by a detailed quantitative and qualitative evaluation process for preferred portfolios. Evaluation relies upon RPS goals, GHG emission requirements, needs assessment, and planning data specified in the previous steps.

Perform Scenario and Risk Analysis
To assess performance under a range of potential market and regulatory conditions perform a detailed evaluation of preferred resource portfolios through scenario and risk analysis.

Identify Plan
Identify a Low Cost Plan based on the resource portfolio expected that will reliably serve the demand at a reasonable long-term cost, while achieving compliance, accounting for inherent risks, and allowing for flexibility to respond to future policy changes.

Figure 1: IRP Process

In the last twenty years, California's energy policy and regulations have led to very aggressive carbon reduction objectives and accelerating time scales. These changing regulations frame the conditions and circumstances in which utilities must make decisions about how to meet customers' future electric energy needs. An IRP is prepared at a point in time and with resourcing options based on proven technologies. For this reason, it is good utility practice and a requirement by the CEC to update the IRP at least every five years. The IRP process utilizes a methodology and framework for forecasting a utility's operating requirements and adapting to regulations and customer behavior. Assumptions, scenarios, and results are reviewed and updated as information and events change. This process is continually revisited under formal or informal resource planning efforts.

The objective of the IRP is to evaluate Roseville's portfolio of resources against the changing utility landscape and California's environmental requirements while recommending strategies to ensure Roseville continues to meet the City Council's goals as Roseville's power supply transitions to more renewable resources.

2.4 Updates from the Previous IRP

Roseville's 2018 IRP met the requirements of SB 350 and set a pathway for achieving RPS compliance, Greenhouse Gas (GHG) obligations, and capacity needs while retaining affordable rates. Figure two summarizes the action plan, of which many of the goals were accomplished, specifically:

- **RS-1**: Maintained the NCPA assets and renewed the WAPA Base Resource contract from 2025 and beyond.
- **RS-2**: Refurbished RPP2 Combustion Turbine 2 (CT2) and performed reliability improvements to both units at RPP2.
- **RS-3**: Completed the A+ upgrade (AET) and low-level turn down at REP to improve efficiency, reduce the Pmin, and increase the Pmax.
- **RS-4**: Procured additional transmission to the Pacific Northwest, tripling Roseville's position.
- **RS-5 and RS-7**: Created a DR program with the wastewater treatment plant to reduce load by up to 4 MW.
- **RS-8**: An RPS plan is being created.
- **RM-2**: Joined the California Independent System Operator's (CAISO) Energy Imbalance Market (EIM) in May 2021.

Figure 2: Action Plan from the 2018 IRP

In addition to the 2018 plan, Roseville continued to progress towards a portfolio with more renewable energy and lower carbon emissions. This included signing a Power Purchase Agreement (PPA) with South Feather Water and Power Agency for a 20 MW share of their large and small hydroelectric assets. In addition, Roseville extended the 50 MW long-term transmission contract with PacifiCorp to allow Roseville to import carbon-free power for an additional five years. Lastly, Roseville executed a PPA with community solar projects from 2017-2041.

2.5 Public Process

Roseville had an extensive public process that included two RPUC meetings, two public workshops, and a Council meeting. A dedicated e-mail account was created, allowing the public to ask questions, submit concerns, and survey results. In addition, a dedicated webpage hosts all information related to the IRP, including the background, public meeting details and the recordings, survey results, contact information, and the IRP document. Finally, customers had the opportunity to complete a survey with a

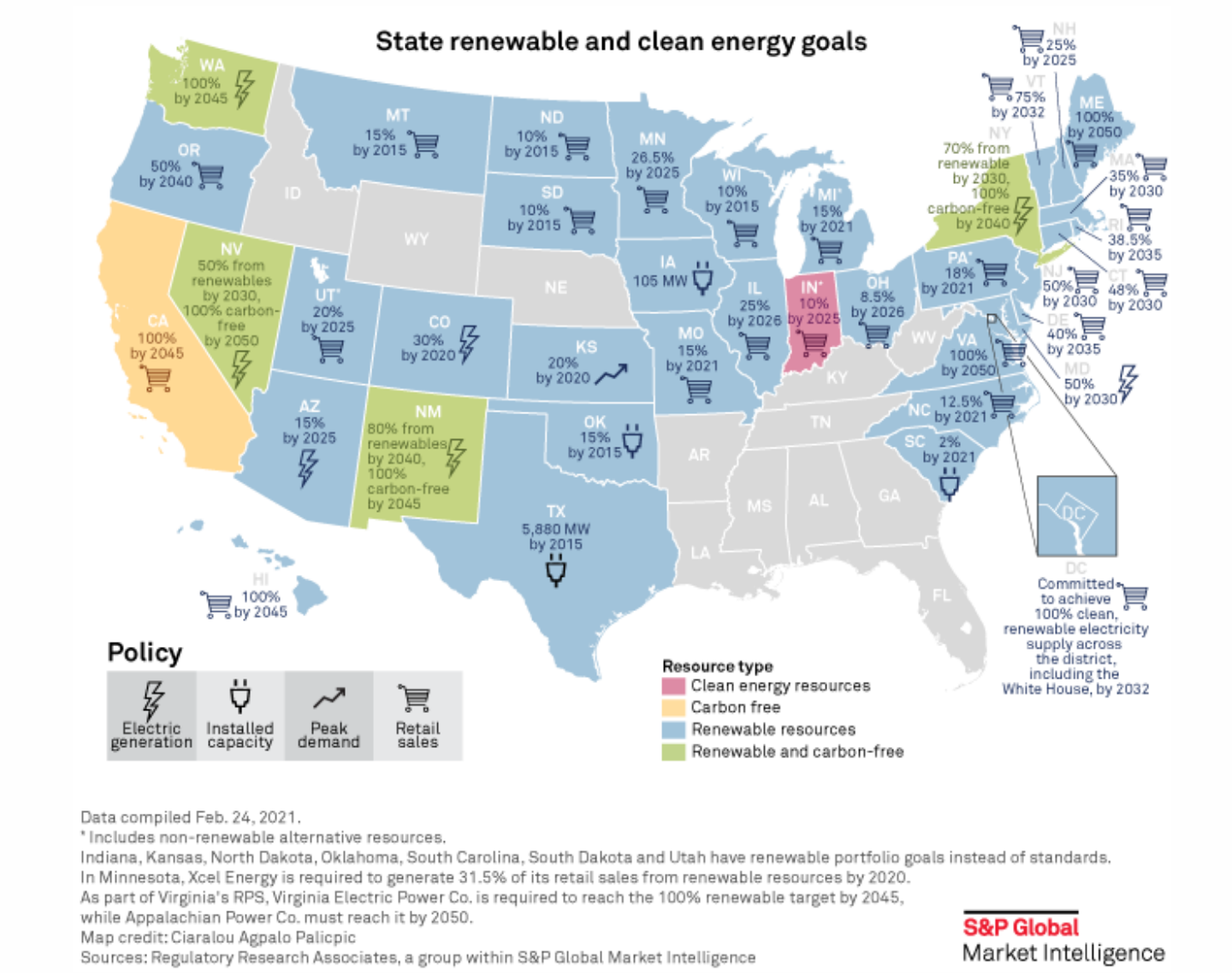
consensus showing customers preferred reliability and affordability. The preference was to meet compliance but not exceed.

2.6 Other Challenges and IRP Considerations

Roseville's 2023 IRP addresses several other challenges throughout the report. These challenges arise from rapidly evolving state energy policies and include:

- **Energy and Capacity Markets**
    - Capacity constraints from a combination of large plant retirements, decreasing carbon allowances/increased carbon pricing of our dispatchable resources, changes to the Effective Load Carrying Capability (ELCC) that have reduced the effective capacity of renewable resources, the increased planning reserve margin requirement, and penalties that create scarcity.
    - Challenges due to climate change such as wildfires, drought, and higher summer peak loads.
    - New technologies such as Electric Vehicles (EV), electrification, and changes in customer use alter the load shape and timing. These new daily load shapes can cause capacity and ramping constraints, which require new resources and possible Time-of-Use (TOU) incentives to flatten load shapes.
    - Generation from reliable dispatchable thermal resources will reduce with the lower carbon grid.
    - California continues to advance its renewable and carbon reduction goals, pushing intermittent resources well in advance of utilities meeting existing goals. The increased goals put constraints on reliability and affordability. The daily load shapes are changing and, as a result, lead to lower market pricing for certain times of the day and elevated volatile pricing during other times. Intermittent resources have increased the ramping requirements, requiring resources to respond and move much faster to meet the grid's needs. Requiring a specific amount of certain resources can create net load impacts, where generation exceeds load in certain parts of the year. This can be an issue for Roseville in the non-summer shoulder months. Zero Net Energy (ZNE) and rooftop solar exacerbate the capacity and net load impact by providing energy when it is less valuable and consuming energy under constrained, high-priced conditions.
    - Land zoning issues for renewables and the transmission system. Renewables require a large footprint and areas of the transmission system will need to be constructed or upgraded to handle the interconnection of the generation and load.
    - The transmission interconnection process is overwhelmed in California. New renewable projects are being delayed and commercial operation dates are being pushed out. This further drives up costs to comply with renewable energy requirements as utilities are bidding for the same scarce projects and the price of compliance instruments is increasing with low supply.
    - California has the sixth highest average residential retail price per capita at $0.22/kW-hr. Swift changes to the grid will further increase rates.

- In addition to California's renewable and carbon reduction goals, other states have increased their RPS and zero-carbon goals (Figure three). With the amount of imports into California, this causes a supply constraint and will affect availability and pricing.



Data compiled Feb. 24, 2021.
* Includes non-renewable alternative resources.
Indiana, Kansas, North Dakota, Oklahoma, South Carolina, South Dakota and Utah have renewable portfolio goals instead of standards.
In Minnesota, Xcel Energy is required to generate 31.5% of its retail sales from renewable resources by 2020.
As part of Virginia's RPS, Virginia Electric Power Co. is required to reach the 100% renewable target by 2045, while Appalachian Power Co. must reach it by 2050.
Map credit: Ciaralou Agpalo Palicpic
Sources: Regulatory Research Associates, a group within S&P Global Market Intelligence

S&P Global Market Intelligence

Figure 3: United States Renewable and Clean Energy Goals as of February 2021

- Increasing RPS requirements will create more instances of over-generation and depressed midday pricing. With surrounding states also imposing RPS goals, the available imports into California will make balancing the grid more challenging. Almost three-tenths of California's electricity comes from outside the state.
- Traditional energy price hedging instruments are becoming less effective at mitigating price risk and may become less liquid as fewer counterparties are willing to offer to the markets.
- Additional intermittency will add volatility in real-time markets and may require the CAISO to add more segments to the day-ahead markets.
- Resource Adequacy (RA) has been in an ongoing evolution to ensure the market has appropriate resources to meet the challenges of a rapidly changing generation fleet.

Traditional dispatchable resources face challenges from lower market prices, higher operating costs, and emission regulations.

  - Changing rules to incentivize/disincentivize certain types of capacity and flexibility can significantly impact the capacity market, along with modifying the requirements mandating higher levels of reserves.
  - Roseville has realized a significant increase in the cost to transport gas on Pacific Gas and Electric's (PG&E) natural gas distribution system. The increased gas transportation cost has significantly impacted the utilization of efficient gas-fired generation in Northern California and is a cost that cannot be hedged.
  - Supply chain issues causing delays and increased pricing on utility and generation equipment.
  - Lithium-ion batteries are a limited resource and many industries (storage, consumer electronics, EVs, etc.) are competing for the same commodity, driving up prices and extending lead times.

- **Legislation and Regulation**
  - Cap-and-Trade allowance pricing has traded near the floor for some time. Still, potential future changes to Cap-and-Trade regulations may tighten the market and cause allowances to become costly and difficult to predict, which occurred in parts of 2022.
  - Uncertainty with the regional market structure, particularly transmission cost impacts, is a key risk to Roseville.
  - Doubling EE was codified in SB 350 in 2015. The uncertainty here is the amount of control utilities like Roseville have in meeting this goal, as EE requires effective utility programs and customer adoption.
  - Legislative uncertainty makes long-term decision making on new investments challenging for utilities. Capital investments are made with thirty-year life-cycle time horizons to realize the projects' benefits. However, with regulations changing every few years, there is a high risk of incurring stranded assets, dramatically increasing customer costs.
  - Decarbonizing the transportation sector with EVs is paramount to successfully achieving the emission reduction goals of SB 32. Increased load from EVs and electrification of the home heating and cooking systems will result in greater decarbonizing responsibility for the utility sector.

- **Distribution Reliability**
  - The grid was designed for uni-directional flow from generation to load. Increases in Distributed Generation (DG) have created a bi-directional network where reverse flow could stress or overload grid circuits.
  - Distribution planning has changed and will continue to change with the adoption of DG and EVs that may create clusters of high electricity demand in certain neighborhoods, challenging existing distribution circuits' ability to meet load at certain times of the day.

3 Policy and Economic Planning

The policy and economic planning environment is a driver that influences the IRP from requirements to overall costs and risks. Roseville's IRP incorporates the latest regulation as of 2023, with the main focus over the past decade of creating a lower carbon grid. Figure four summarizes the major clean bills affecting the electric utilities. As noted in the challenges, policies can change, which impacts the plan.

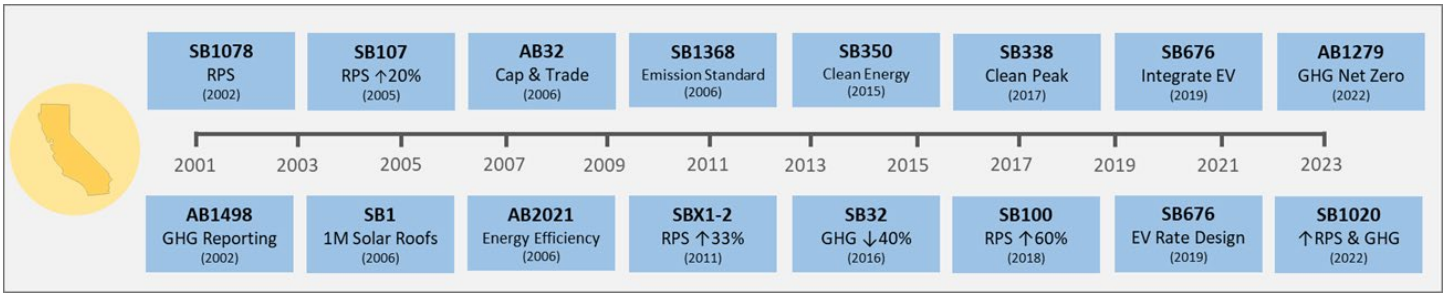


Figure 4: Significant California Energy Policies from 2001-2023

3.1 Renewable Portfolio Standard

One mechanism to transition to a lower carbon grid is the RPS program, which mandates a minimum percentage of load to be served by qualifying renewable generation. SB 1078 (2002) was the first RPS bill, with many subsequent bills that ratcheted the goals. Signed right after the completion of Roseville's previous IRP, SB 100, further increases the renewable target for electric utilities to 60 percent by 2030. SB 100 also requires the electricity supplied to have no emissions (zero-carbon) by 2045. Signed in September 2022, SB 1020 further refined the percentages summarized below:

- SB 100
    - 33% of Roseville's retail sales must be met by eligible renewables by December 31, 2020.
    - 44% RPS by December 31, 2024.
    - 52% RPS by December 31, 2027.
    - 60% RPS by December 31, 2030.

- SB 1020
    - 90% eligible renewable resources and zero-carbon resources by 12/31/2035.
    - 95% eligible renewable resources and zero-carbon resources by 12/31/2040.
    - 100% eligible renewable resources and zero-carbon resources by 12/31/2045.

Roseville has a diverse portfolio of qualifying renewable resources – geothermal, wind, solar, and small hydro that help meet its RPS targets. In addition, nearly one-quarter of Roseville's load is served by large hydro,[1] a carbon-free resource that helps reduce its GHG emissions.

3.2 Greenhouse Gas Standards

Another mechanism to transition to a cleaner grid is reducing GHG emissions. In 2006, California passed Assembly Bill (AB) 32,[2] formally known as the California Global Warming Solutions Act of 2006. AB 32 mandates several sectors, including the electricity sector, to reduce GHG emissions to 1990 levels by 2020. In 2016, AB 32 was augmented by SB 32,[3] which mandated a statewide GHG emissions reduction target of 40% below 1990 levels (433 MMT CO_2e)[4] by 2030 (260 MMT CO_2e), displayed in Figure five. For the electric sector, a 40% reduction by 2030 amounts to approximately 62 MMT CO_2e. The implementation of SB 32 directed the 2017 California Air Resource Board (CARB) Scoping Plan[5] (Scoping Plan), which presents more stringent targets for 2030; 30 to 53 MMT of total electricity sector wide CO_2e is addressed further in this section.

Roseville's IRP incorporates the overarching GHG reduction targets for the state of California, the role of utilities within these targets, and Roseville's role within the utility industry. The CARB Scoping Plan is an update of status and projections to meet California AB 32, SB 32, SB 100, and SB 1020 GHG reduction targets. As with RPS, the GHG standards are continually refined, as Figure six shows proposed values to the 2022 Scoping Plan.

[1] Hydroelectric resources rated above 30 MW are deemed by California to be carbon-free, but not renewable.
[2] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32
[3] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32
[4] Million Metric Tons of carbon dioxide equivalent. A metric ton of other greenhouse gases, such as methane, are more potent than a metric ton of carbon dioxide, and would require an accordingly greater amount of allowance.
[5] https://www.arb.ca.gov/cc/scopingplan/scopingplan.htm

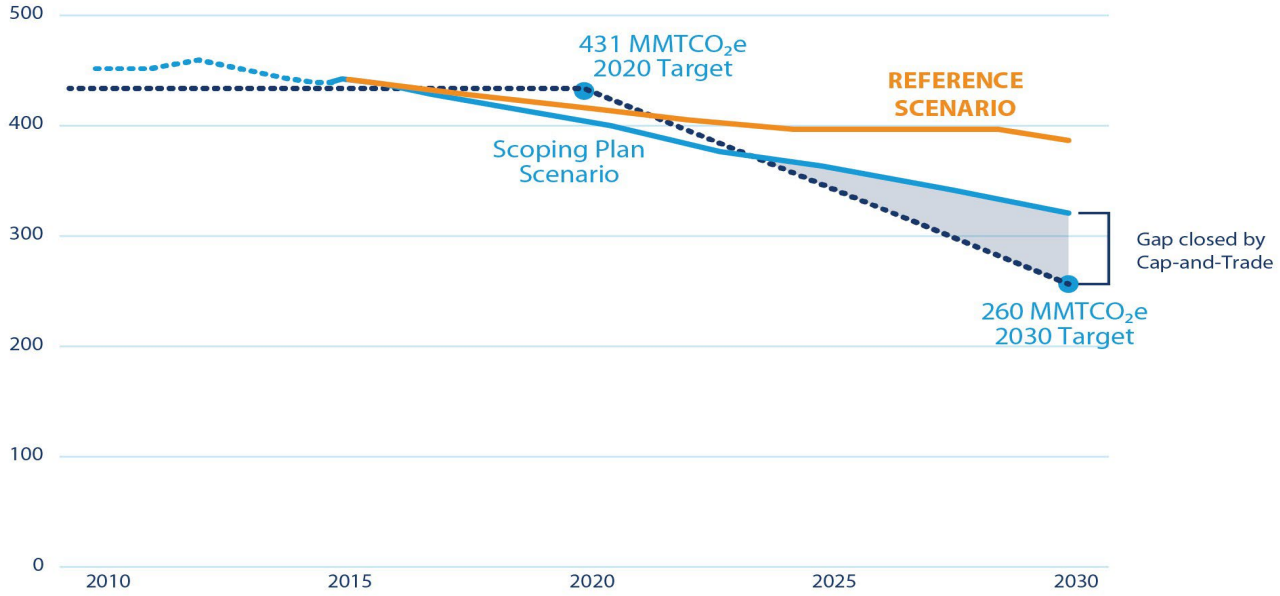


Figure 5: Statewide Carbon Reductions under the 2017 Scoping Plan

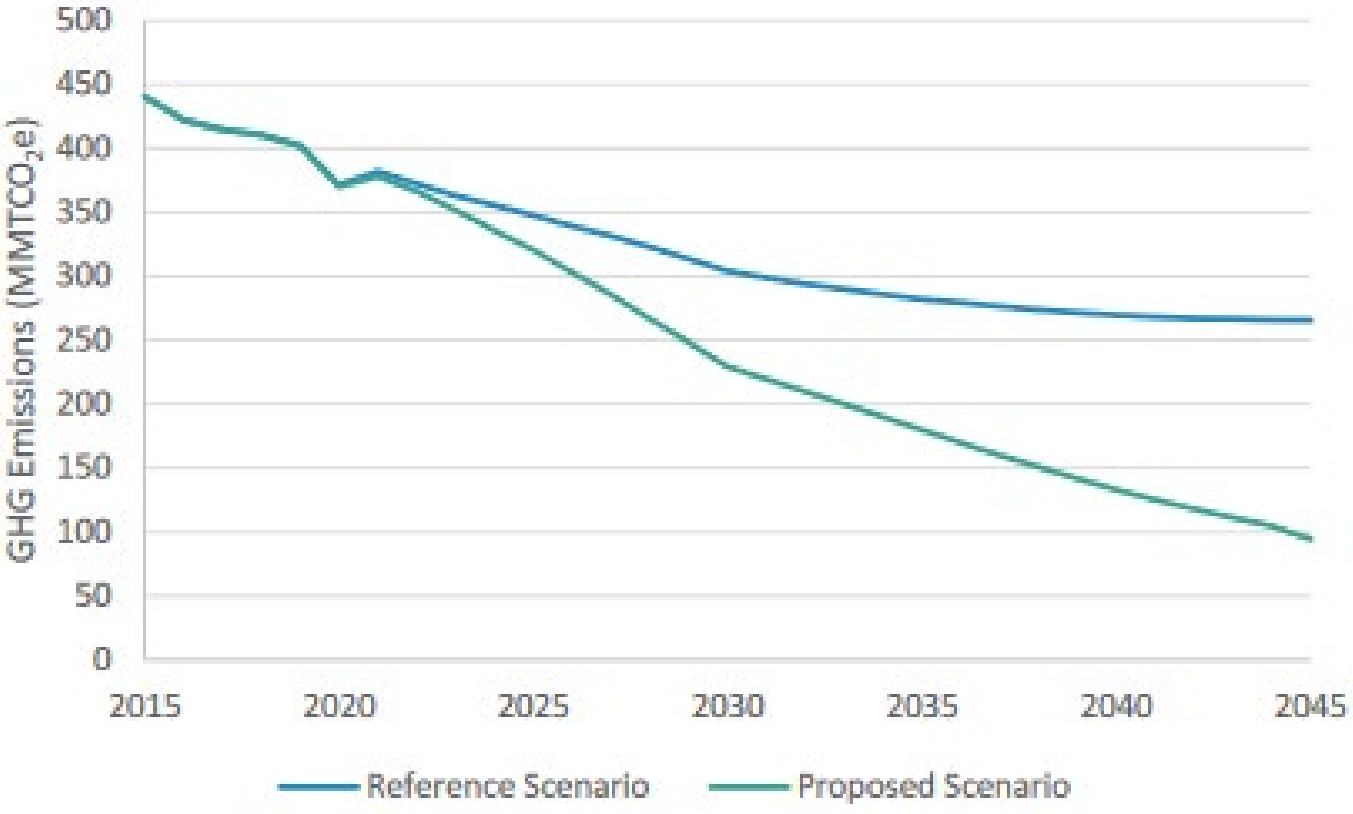


Figure 6: Proposed Statewide Carbon Reductions under the 2022 Scoping Plan

To achieve California's emission reduction targets, several sectors, including industrial, transportation, and electricity will need to reduce their carbon emissions.

CARB's range of 30-53 MMT CO_2e is a 51% to 72% reduction, in excess of the sector's pro-rata share of the 40% reduction target. As shown in Figure seven, the two other major sectors in the market are the industrial and

transportation sectors. In the 2017 Scoping Plan, CARB estimated the industrial sector could reduce GHG emissions between 8% and 15%, while the transportation sector could reduce GHG emissions between 27% and 32%. Much of the transportation sector's carbon burden will be shifted to the electricity sector via transportation electrification, or EVs. This means the electricity sector's GHG emissions reduction burden will be even greater than it appears. CARB estimated these values below in Table one.

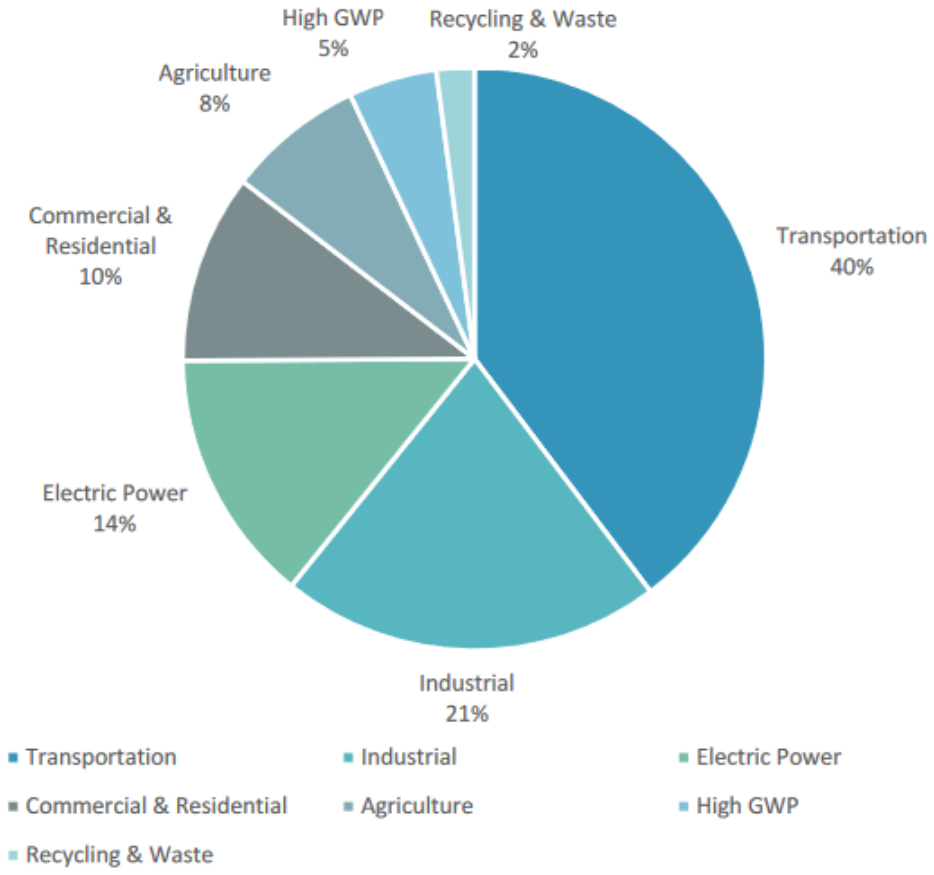


Figure 7: Scoping Plan's 2019 State GHG Emission Contributions by Sector

Although the electricity sector will exceed its pro-rata share to meet the overall target, as shown by the light blue area in Figure five, there is still an overall annual gap of 34 to 79 MMT CO_2e. This is where the Cap-and-Trade market creates an economic incentive for organizations to reduce additional emissions. If an organization has excess allowances, they can monetize them by selling at the quarterly auctions or on the secondary market. This transition from prescriptive targets to Cap-and-Trade arises because there are fewer allowances than carbon produced.

Table 1: 2017 CARB Scoping Plan Reductions by Sector

	1990	2030 Scoping Plan Ranges	% Change from 1990
Agriculture	26	24-25	-8 to -4
Residential and Commercial	44	38-40	-14 to -9
Electric Power	**108**	**30-53**	**-72 to -51**
High GWP	3	11-Aug	267 to 367
Industrial	98	83-90	-15 to -8
Recycling and Waste	7	9-Aug	14 to 29**
Transportation (Including TCU)	152	103-111	-32 to -27
Natural Working Lands Net Sink*	-7***	TBD	TBD
Sub Total	431	294-339	-32 to -21
Cap-and-Trade Program	n/a	34-79	n/a
Total	**431**	**260**	**-40**

* Work is underway through 2017 to estimate the range of potential sequestration benefits from the natural and working lands sector

** The SLCP will reduce emissions in this sector by 40% from 2013 levels. However, the 2030 levels are still higher than the 1990 levels as emissions in this sector have grown between 1990 to 2013.

*** This number reflects net results and is different than the intervention targets discussed in Chapter 4.

The utility industry is expected to surpass its emission reduction share due primarily to the 60% RPS goal and aggressive EE achievements. SB 350 requires that POU IRPs not only describe how they will meet their 2030 60% RPS target but also how they will contribute to the electricity sector's share of GHG emissions reductions by 2030[6]. For benchmarking in this IRP and portfolio analysis, Roseville used the 53 MMT CO_2e as the 2030 target. These goals are for planning purposes and not compulsory; however, if changes to the regulations occur, Roseville will reflect those updates in its future resource planning efforts.

[6] PU Code 9621(b): On or before January 1, 2019, the governing board of a local publicly owned electric utility shall adopt an integrated resource plan and a process for updating the plan at least once every five years to ensure the utility achieves all of the following: (1) Meets the greenhouse gas emissions reduction targets established by the State Air Resources Board, in coordination with the commission and the Energy Commission, for the electricity sector and each local publicly-owned electric utility that reflect the electricity sector's percentage in achieving the economy-wide greenhouse gas emissions reductions of 40 percent from 1990 levels by 2030. (2) Ensures procurement of at least 50 percent eligible renewable energy resources by 2030 consistent with Article 16 (commencing with section 399.11) of Chapter 2.3.

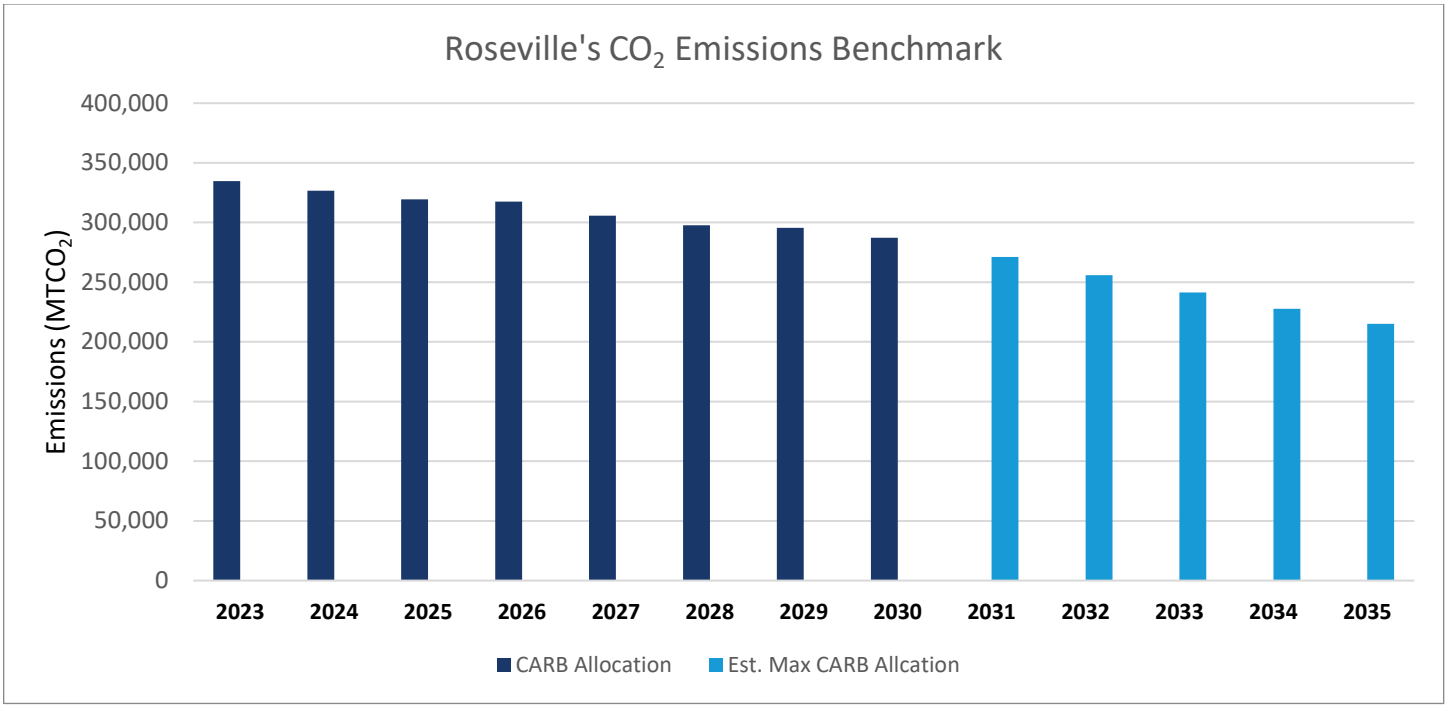


Figure 8: Roseville's Aspirational Share of MMTCO2e Reduction Goal

Roseville's aspirational share of pro-rata GHG emissions reduction in Figure eight is shown for illustrative and planning purposes and is not an enforceable target mandated by regulation or legislation. Mandatory RPS targets and the economic incentives of the Cap-and-Trade market mechanism are expected to ensure these aspirational goals are met.

California's goal of reducing GHG emissions will be achieved through a combination of market mechanisms (Cap-and-Trade) and prescriptive mandates (such as RPS) to retire and replace high-emitting resources with cleaner resources.

Cap-and-Trade is a market-based mechanism authorized by AB 32 and recently extended to 2030 by AB 398. The "cap" is an annual, declining limit of GHG emissions on covered sectors and entities within those sectors. These emissions are accounted for via compliance instruments such as allowances and offsets, each of which permit emissions for the equivalent of a metric ton of carbon dioxide emissions. Allowances and offsets may be traded in the market, incentivizing entities to invest in the most economically efficient or least-cost means to reduce emissions.

Roseville periodically surrenders a number of allowances equal to the GHG emissions from its resources, including the REP and out-of-state imports.

Allowances can be bought and sold at the quarterly auction. Roseville's clean portfolio allows for the selling of surplus allowances. Roseville has successfully participated in quarterly GHG allowance auctions and utilized those funds to directly benefit Roseville customers and further reduce GHG emissions. Proceeds have not only been returned to customers as a bill credit based on customer class but also used to fund projects such as AMI, low-income and multi-family EE retrofit programs, fridge replacement, LED streetlights, new EV and EV charger rebates, and for procuring renewable energy.

3.3 Energy Efficiency

EE is using less energy to get the same job done, reducing overall energy consumption.

SB 1037 (2005) requires Roseville to report annual EE savings to its customers and the CEC.[7] AB 2021 (2006) requires the CEC to consult with the California Public Utilities Commission (CPUC) and POUs, such as Roseville, to develop a statewide estimate of potential achievable EE savings as well as statewide annual targets for EE savings and demand reduction over ten years.[8] AB 2227 (2012) updated the reporting frequency of the ten-year potential study to every four years, aligning with the CEC's biennial IEPR.[9]

In 2015, SB 350 required California to double the EE savings in electricity by 2030. Roseville prioritizes EE and continuously analyzes its program offerings and their cost-effectiveness. Roseville's goal is to design and deliver programs that offer a range of cost-effective EE measures that benefit Roseville's customers, contribute towards achieving EE goals, and educate customers on emerging technologies.

Two measurements of EE include:

- **Committed Energy Efficiency (Committed EE)**: Committed ten-year potential EE from programs that have been, or are proposed to be, implemented by end-use customers.
- **Additional Achievable Energy Efficiency (AAEE)**: Future potential savings from EE programs that are incremental to Committed EE. This includes savings from future updates of building codes, appliance standards, or new utility programs not modeled in the utility's ten-year potential study targets in 2016.

These EE savings resulted from Roseville's various EE rebate programs, including:

- **Residential**
    - **Bright Ideas**: The Bright Ideas Program brings simple everyday things customers can purchase to help save energy and money. This includes LED light bulbs, smart thermostats, smart strips, occupancy sensors, and ENERGY STAR certified televisions.
    - **Heating Ventilation and Air Conditioning (HVAC) and Smart Thermostat**: One of the most effective ways to save energy and money is upgrading to a higher efficiency HVAC system and programming the thermostat.
    - **HVAC Tune-Up**: An efficient, well maintained HVAC system uses less energy, keeps living spaces comfortable, and extends the life of the system.
    - **Shade Trees**: Trees beautify the property and clean the air by providing oxygen and reducing pollution. They can also save energy and money by providing shade and reducing cooling costs by as much as 40%.
    - **Pool Pump**: Replacing a single speed pump with a variable speed version can create noticeable energy cost savings while leaving the pool just as clean. Running the pool pump for eight hours at full speed uses twice as much energy as running at low speed for sixteen hours. Longer circulation times can also help reduce algae and increase chlorine production in salt system pools.
    - **Fan Program**: Operating a whole house fan can reduce the temperature in the home and clears the attic of the heat blanket. Ceiling fans keep the room airy and breezy creating coolness, allowing a higher thermostat setpoint.
    - **Sunscreens**: Sunscreens can reduce the heat entering your room by more than 60% by filtering out the sun's rays.

[7] "PU Code 9615(b) Each local publicly owned electric utility shall report annually to its customers and to the State Energy Resources Conservation and Development Commission, its investment in energy efficiency and demand reduction programs. A report shall contain a description of programs, expenditures, and expected and actual energy savings results."
[8] http://www.energy.ca.gov/sb1/meetings/ab_2021_bill_20060929_chaptered.pdf
[9] PU Code 9505(b). See also: http://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill_id=201120120AB2227
28 https://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill_id=201520160SB350

- **Window Replacement Rebate**: Windows can transfer up to ten times more heat than an insulated wall. Switching to higher efficient windows can help keep a home at comfortable temperatures without using as much energy.
- **Home Energy Reports**: Customized analysis, comparisons, and recommendations are provided regularly to residential customers to educate and empower customers to adopt behaviors that increase EE in the home.
- **EV**: EVs reduce GHG emissions and have lower fuel and maintenance costs when compared to traditional internal combustion engines. Roseville offers education, an advisor, and residential rebates for new vehicles, used vehicles, new and used motorcycles, level-two chargers, and panel upgrades.
- **Electric Home Rebate**: California's buildings represent about 25% of the state's total GHG emissions and switching from fossil fuels to electricity, also referred to as electrification, and reduces emissions. In addition to helping the environment, in Roseville, it is better for your pocketbook.

- **Business**
  - **Reopen Energy Smart**: This is an enhanced rebate program targeted at two ways to save. The first is EE rebates up to 200% above normal levels and the second is energy audits and direct install programs, including food service, HVAC tune-ups, lighting upgrades, and smart thermostats.
    - Rebates for food service include combination ovens, convention ovens, fryers, griddles, insulated hot food holding cabinets, demand ventilation controls, glass door refrigerators, solid door refrigerators, solid door freezers, and ice machines.
  - **Customized**: Designed to provide EE rebates to mid-size and large business customers who install energy reducing measures, where the project is not offered in a prescriptive rebate program.
  - **Energy Advisor**: Provides guidance on EE options and solutions.
  - **EV**: As noted above, EVs reduce GHG emissions. Roseville offers education, an advisor, and business rebates for light-duty cars, trucks, and semi-tractors, forklifts, and level-two charging.
- **Other EE measures**
  - **City-wide LED street-lighting retrofit project**: The LED street-light project is over 70% complete. When complete, the 12,200 converted streetlights will save 4,600 MWh and 1,900 tonnes of carbon dioxide annually.

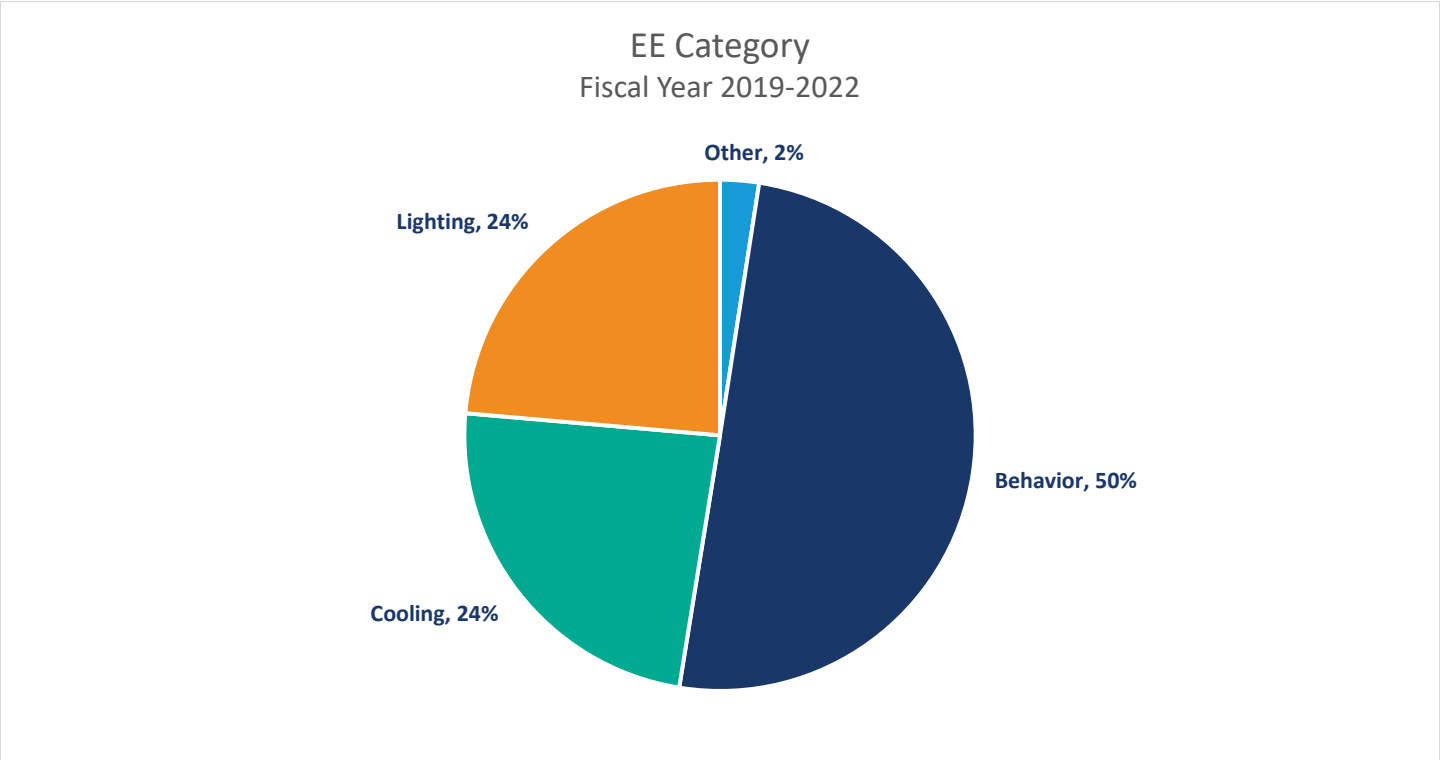


Figure 9: EE Achieved By Program Category | Fiscal Year 2019-2022

The majority of customers in Roseville are residential, which aligns with the majority of EE savings.

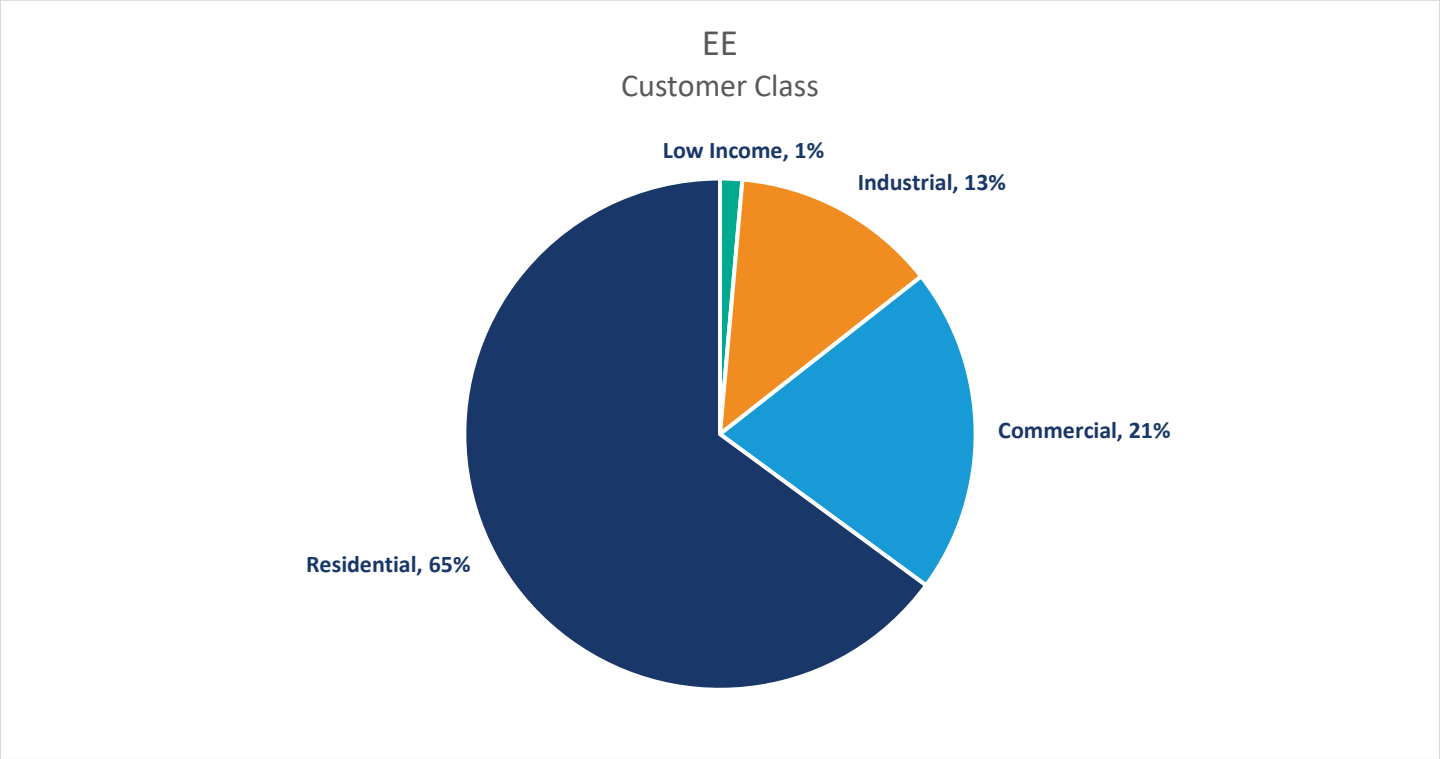


Figure 10: The Customer Class Breakout | Fiscal Year 2019-2022

Figure 11 illustrates the potential 2018 – 2031 incremental savings for the residential and non-residential sectors and the percent of forecasted retail sales reduction each year.

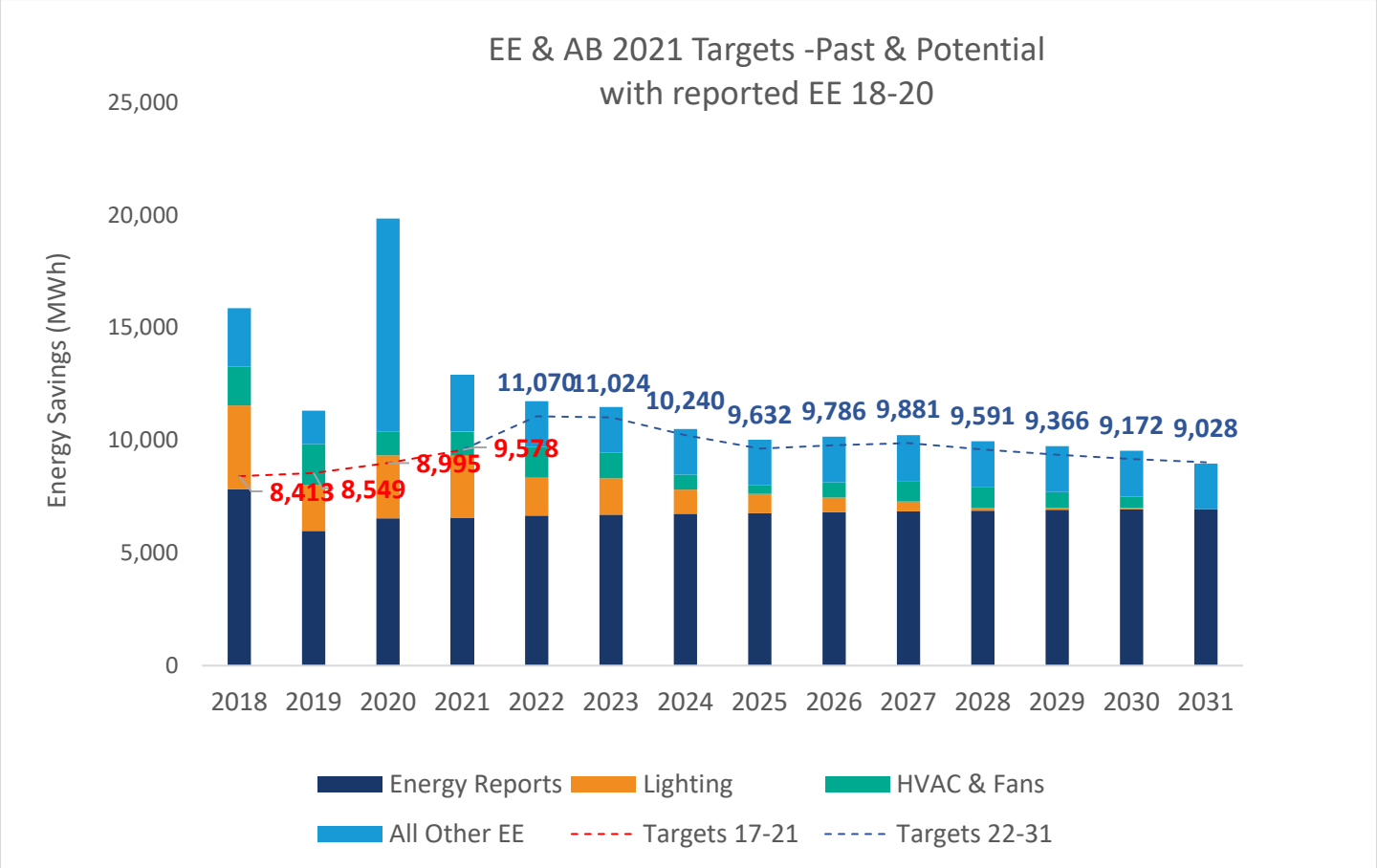


Figure 11: Annual EE Potential Targets

The findings for Roseville include:

- A ten-year (2018-2027) average annual target of 0.76%/year of forecasted retail sales.
- Roseville did not include energy savings from codes & standards in the potential study.
- The potential study is a ten-year forecast for EE savings. The annual 1037 reports actual achieved EE.
- Like the rest of California, Roseville has seen a surge in customer-installed Distributed Energy Resources (DER) that are predominantly rooftop solar but also include EVs.
- In addition to energy savings, EE can also help reduce the peak. Each year, Roseville submits actual energy and peak savings in the 1037 report. Peak savings in the past five years have averaged 1.4 MW.

In addition, California has continually increased the EE of new construction and appliances since the Warren Alquist Act of 1974. These efficiency standards (Title 24)[10] were updated to mandate ZNE residential new construction starting in 2020. ZNE homes require EE that will be achieved through implementing a high-efficiency envelope (insulation, windows, etc.) and efficient HVAC units. The remaining energy consumption must be offset by DG/DER, predominantly rooftop solar generation, sized so that the annual building

[10] http://www.energy.ca.gov/title24/

consumption (excluding natural gas) is approximately equal to the building's electricity generation. Effective in 2030, all commercial new construction will also be required to meet the ZNE standard.

SB 338[11] (2017) requires POUs to consider the role of DER in meeting peak demand.[12] SB 338 further requires the City Council to consider distribution-level, carbon-free resources such as DR, EE, and energy storage to reduce the need for transmission level generation resources. Roseville's IRP meets the requirements of SB 338 and all other bills.

3.4 Economic Planning

Economic and supply chain situations are out of Roseville's control and changes can impact the plan. This plan uses the best available information for inflation, market pricing, capital expenditures, and other assumptions such as load growth and customer behavior.

[11] https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB338

[12] PU Code 9621(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 customers.

4 IRP Modeling Methodology

Simulation models are a vital tool that aid in determining the Low Cost Plan by building a portfolio that satisfies Roseville's goals of reliability and meeting compliance at affordable rates. Models provide quantitative insight on current and future asset performance, pricing, and risks. Conditions can change, and modeling allows for various scenarios and sensitivities to be simulated and studied.

4.1 Software

Roseville utilizes the Electric Power Resource Institute's (EPRI) portfolio cost model Energy Book System (EBS). EBS has the ability to characterize many resource options, simulate the costs and benefits of each, and assess total portfolio risk. It's important to understand each resource, how it performs, and how it can integrate into an evolving portfolio to contribute towards meeting Roseville's needs. Comprehensive portfolio analysis allows for a holistic assessment that considers many competing constraints. EBS is a stochastic model that is able to provide risk metrics by varying key inputs to provide a range of probable outcomes. Risk can be just as important as cost as it directly affects rates.

In conjunction with EBS, Excel is utilized for additional post-processing of the EBS output for reporting on various positions such as energy, capacity, resource diversity, hedge percentages, natural gas exposure, renewable outlook, carbon outlook, forward pricing, flex requirements, individual instrument, and portfolio cost and risk.

4.2 Assumptions

Roseville utilizes the best available information on assumptions for modeling the system properly and included scenarios for additional studies to understand the exposures and possible paths.

4.2.1 Scenarios

In order to understand various probable future events, the following scenarios were studied, each having a Low Cost Plan. The scenarios are:

1. **Base Plan:** The Base Plan includes the current local, state, and federal requirements, the expected or 1-in-2 load forecast, including anticipated adoption of technologies, and the expected forward pricing and project costs. The Base Plan is the scenario that is part of the

monthly on-going analysis as part of Roseville's normal budgeting process. The Base Plan was the only load case studied in the 2018 IRP.

2. **Green Goal**: The Green Goal scenario matches the Base Plan with the exception of accelerating the zero-carbon goal from 2045 to 2035. This scenario provides the impact(s) on procurement, rates, and reliability. As the timeline gets closer to zero carbon, more GHG-free gas, either renewable natural gas or hydrogen, is utilized. The blend assumption is noted in Table two. The Green Goal is more in line with the regulatory changes Roseville has observed over the last 20 years, where the State chooses to take statute, enhance the target, and decrease the implementation timeframe.

Table 2: Assumed Blend of Natural Gas and Zero-Carbon Gas Used in the Green Goal

2029	2030	2031	2032	2033	2034	2035
NG (no blend)	Blend at 25%	Blend at 35%	Blend at 45%	Blend at 60%	Blend at 75%	Clean at 100%

3. **Electrification:** The Electrification scenario matches the Base Plan with the exception of studying a high case for all of the technologies that increase load, such as greater EV adoption by our customers and building electrification (appliances, space heating, water heating, etc.). Electrification also includes more recent weather data, which has warmer summers and cooler winters. The Electrification scenario will result in an increase to load, making an upper-bound for required resource procurement.
4. **Customer Choice:** This Customer Choice scenario matches the Base Plan with the exception of studying a high case for all of the technologies that reduce load, such as EE, additional rooftop solar, and less EV adoption. Customer Choice also includes more historical weather data, dampening the extremes, resulting in milder summers and winters. Customer Choice is the lower bound, reducing Roseville's expected load protecting over procurement, which can cause rate pressure.

The resources studied to meet each scenario are covered in detail in Appendix B. A collection of resources make a portfolio, of which four were utilized to meet each scenario listed above. These four include:

- **100% Solar:** All new resources are met with utility-scale single-axis photovoltaic systems. Solar is the easiest renewable technology to site in California.
- **Solar:** The majority, ~70% installed capacity, of new resources are met with utility-scale single-axis photovoltaic systems, and the remaining are a variety of RPS resources (wind, hydroelectric, and geothermal).
- **Wind:** The majority, ~70% installed capacity, of new resources are met with onshore wind, and the remaining are a variety of RPS resources (solar, hydroelectric, and geothermal). Wind has fewer available sites in California, and much of the wind in the west currently comes from the Pacific Northwest.
- **Balanced:** The installed capacity of new resources is balanced between solar, wind, geothermal, and hydro. Hydro and geothermal have limited untapped resource regions in California.

Table 3: Installed Capacity of New Resource Scenarios for the Base Plan

SUMMARY SCENARIOS - BASE PLAN													
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
100% Solar		SOLAR: 25			SOLAR: 75	SOLAR: 80	SOLAR: 40	SOLAR: 20			SOLAR: 40	SOLAR: 10	
Solar		SOLAR: 25			HYDRO: 20	SOLAR: 100	NC WIND: 25			GEO: 10			SOLAR: 15
Wind		SOLAR: 25			HYDRO: 20	NC WIND: 75	SC WIND: 10			GEO: 5			SC WIND: 10
Balanced		SOLAR: 25		GEO: 10	HYDRO: 20	NC WIND: 20	WIND: 10,SOLAR: 25	GEO: 10	NC WIND: 10		HYDRO: 10		

Demand side resources, also known as behind the meter or customer side, aid in meeting load requirements. Specific programs were not studied; it is expected that following Roseville's full deployment of AMI, Roseville will explore demand side efforts more closely, which should be reflected in a subsequent IRP.

4.2.2 Pricing

For the gas and energy price forecast, Roseville adopted ACES'[13] methodology. The forward gas price curve includes the NYMEX futures (Henry Hub), available on Intercontinental Exchange (ICE), with a locational basis. The forward energy price curve uses a combination of market quotes, short-term models, and blending into a fundamental forecast after 2034 due to a lack of available actual trading and market quotations running out.

- Gas transportation and plant Variable Operating Maintenance (VOM) costs applied actuals and a forecast when available. For timeframes outside the forecast, an annual escalation factor was applied.
- California Carbon Allowance (CCA) price consists of ICE broker quotes and is escalated per the Cap-and-Trade rules (inflation plus 5%).
- REC prices are derived from Roseville's contract broker.
- Resource options used a combination of the latest Lazard's levelized cost confirmed with information from various sources like the CEC, E3, National Renewable Energy Laboratory (NREL), and actual market offers that were received during similar timeframes.

All market prices used a quote date of September 13, 2022. For the study period, 2023 – 2035, both natural gas and power pricing for Roseville's area show a near-term reduction and then pricing levelizing. The expected and one standard deviation of the range is shown in the figures below. Volatility is expected to increase with more environmental regulations and renewable integration costs. Gas prices are daily, whereas power pricing is a more frequent timestamp. EBS uses hourly market price shapes to simulate hourly prices with block Heavy Load Hour (HLH) and Light Load Hour (LLH)[14] outputs.

[13] ACES provides energy services to Roseville, specifically scheduling coordinator and market insight.
[14] Common periods to transact electricity are HLHs, from 6:00-21:59, and LLHs which are weekends, holidays, and hours between 22:00 – 5:59.

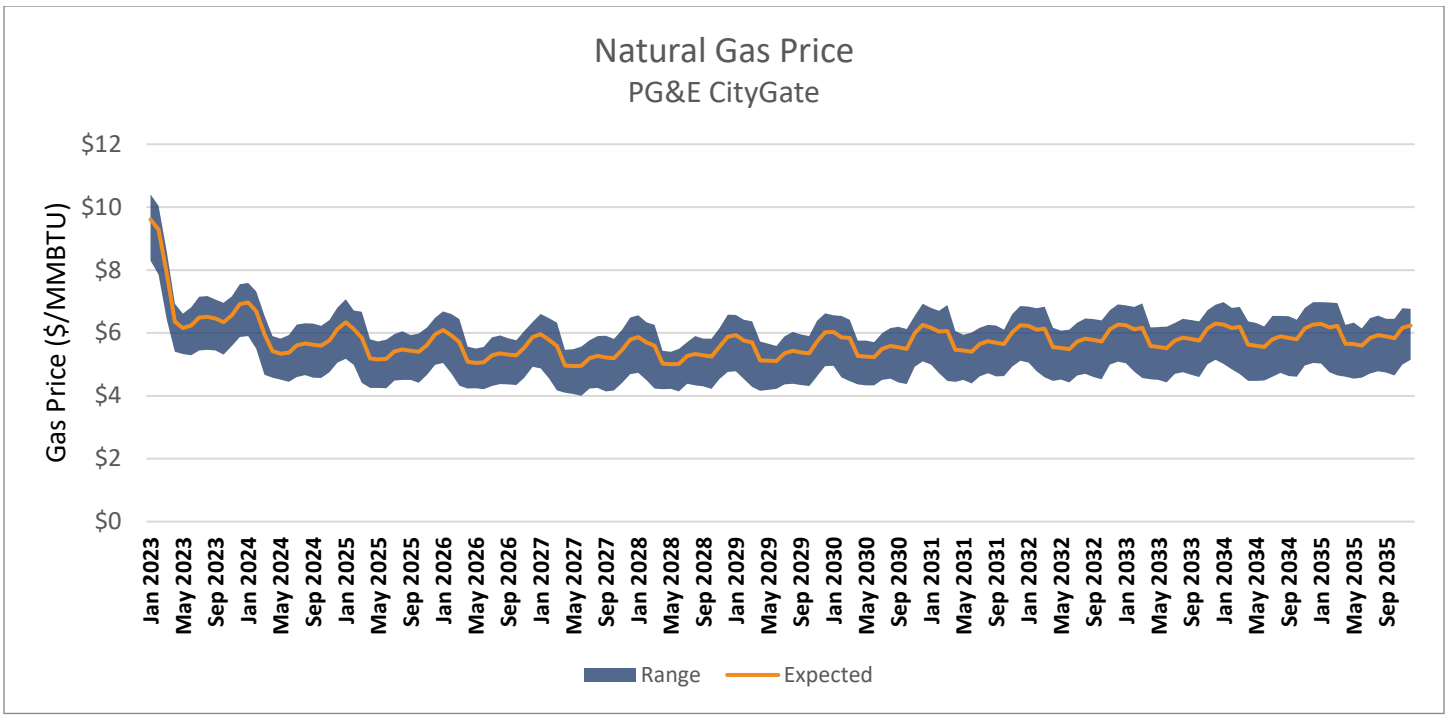


Figure 12: Expected and One Standard Deviation of Natural Gas Pricing at PG&E CityGate

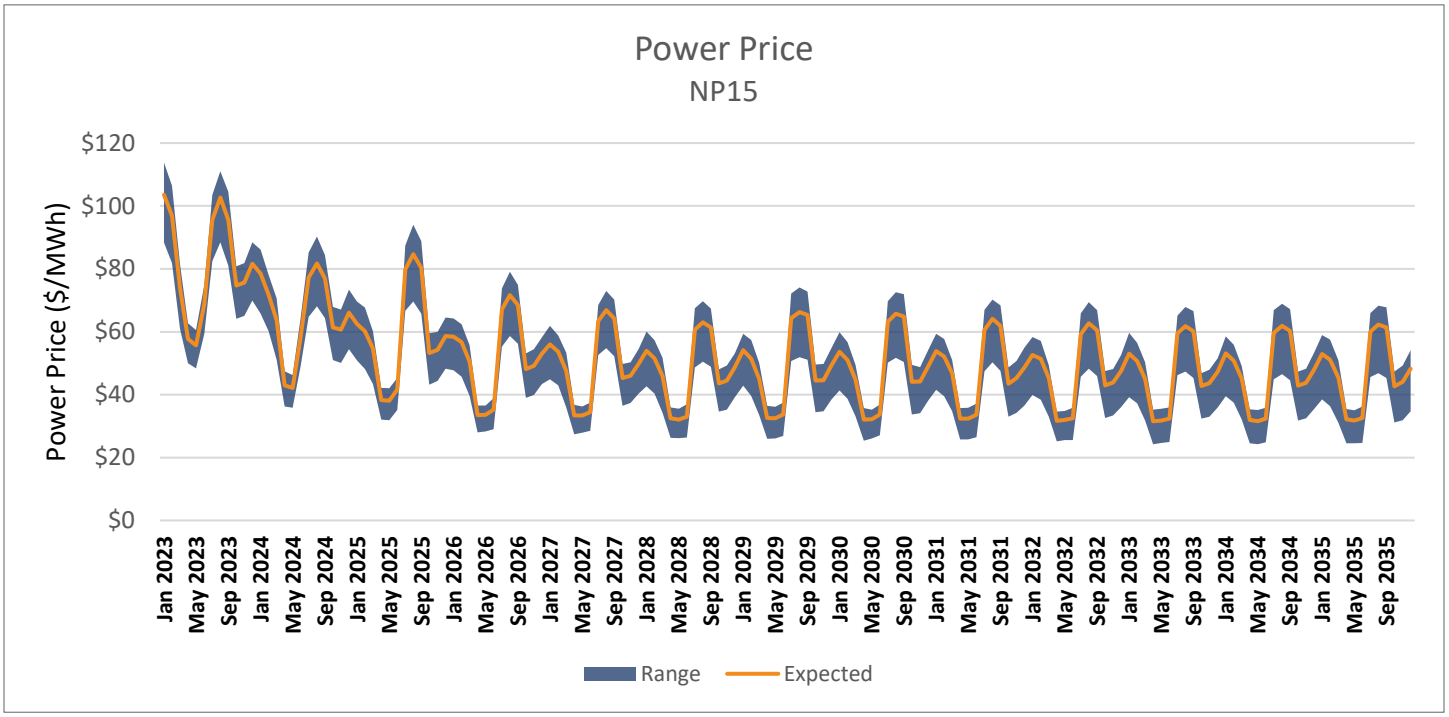


Figure 13: Expected and One Standard Deviation of Around the Clock Power Pricing at North Path 15 (NP15)

During the HLH shoulder hours, natural gas generation is forecasted to be online as the marginal resource (the resource setting the market clearing price). Forecasted HLH average prices decrease over the forecast period. This projected decrease is due to the reduction in midday prices. Traditionally, HLH periods are a premium to LLH periods due to higher customer electricity demand. Since solar generation is unavailable to serve demand

beyond daylight hours, natural gas remains the marginal fuel during LLH. This price spread[15] between HLH and LLH power is forecast to narrow and eventually cross in 2024, where LLH power is more expensive than HLH. The increased penetration of higher levels of renewables does depress the market clearing price but is not enough to overcome the increase in natural gas prices given the number of hours natural gas resources will still be the marginal resource.

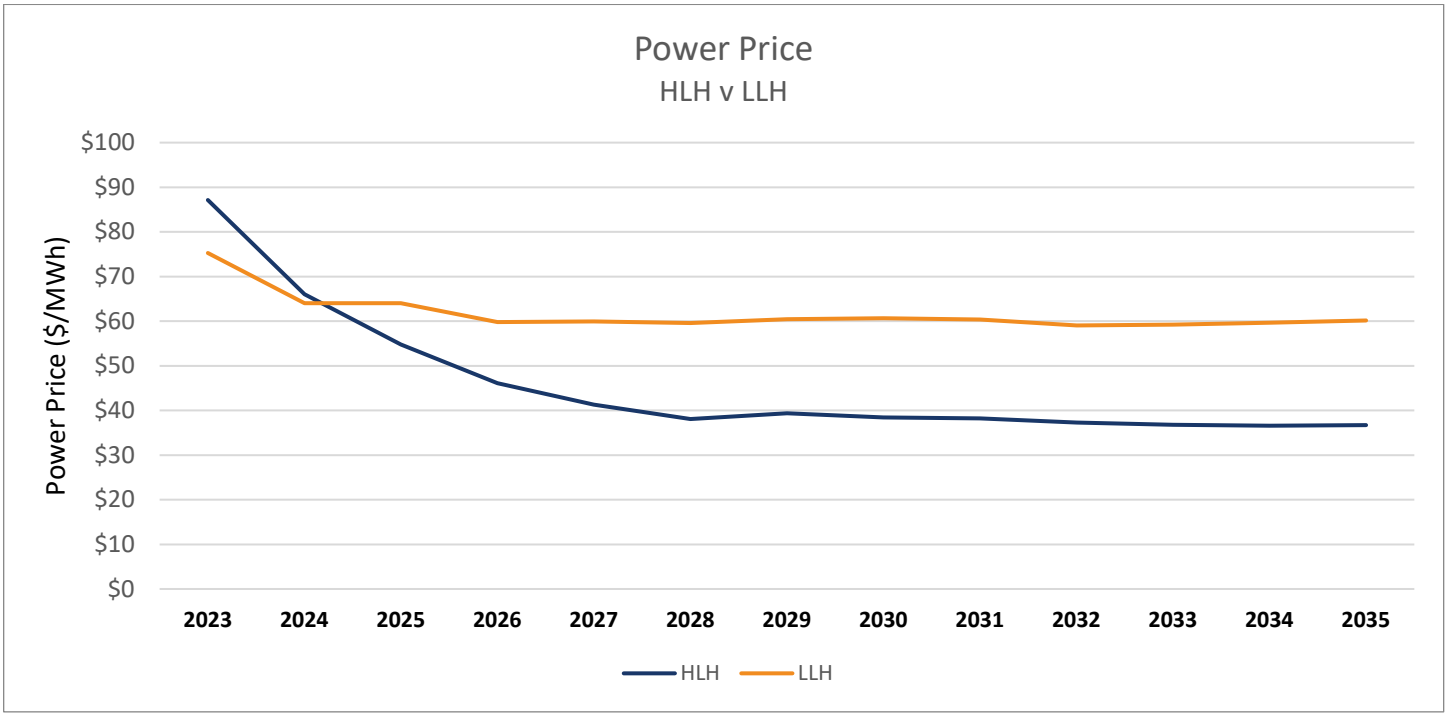


Figure 14: HLH and LLH Forward Power Price

Compliance costs for RECs and allowances continue to increase over the time horizon, as well as other rates, like PG&E's gas transportation and transmission.

[15] Spread is the difference of one price to another, in this case the difference in pricing between HLH and LLH.

5 Load Forecasting

Load forecasting is a foundational element in determining Roseville's future electricity needs. All planning starts with a need and for electric utilities that is the load forecast. Roseville's long-term load forecast (Load Forecast) is necessary for long-term resource planning, rate design, and financial planning. Roseville employs advanced statistical techniques to develop accurate energy and peak demand forecasts to 2035.

Roseville applies a specific load forecasting methodology within each customer class, including the five outlined in Table four.

Table 4: Rate Class

CLASS	DESCRIPTION
Residential	All residential customers
GS-1 Small General Service	Monthly demand < 20 kW
GS-2 Medium General Service	20 kW < Monthly demand <= 500 kW
GS-3 Large General Service	500 kW < Monthly demand <= 1,000kW
GS-4 Very Large General Service	Monthly demand > 1,000kW

Multivariate time series regression is used to forecast system energy, system peak demand, and retail energy sales to customer classes. Each of Roseville's customer classes are forecasted using regression models and the individual results are summed and shifted to calendar month to forecast total energy. The total energy is used to forecast peak demand. Roseville uses both Statistically Adjusted End-Use (SAE) regression and econometric regression.

For residential, GS-1, and GS-2 customers, Roseville uses Itron's SAE model. The SAE model predicts end-use assumptions for the main end uses driving energy demand, such as heating and cooling saturation, efficiency, home size, appliances, and plug load. These variables utilize Energy Information Administration (EIA) energy assumptions for these various end uses.

Customers under GS-3 and GS-4 rate classes are forecasted using econometric regression models. The forecast uses historic growth combined with estimates of likely future growth from the City of Roseville Planning and Business Development Departments.

Since the previous IRP, Roseville has made improvements to its load forecast prompted by growth in EVs and DG rooftop solar. These demand-side impacts will be discussed in detail in sections 5.1.1 and 5.1.2. Adjustments are made for future customers to reflect changes in EE, EV, and building standards. Another advancement has been the inclusion of Itron's MetrixLT software, which takes the monthly sales and peak forecast and scales to hourly granularity to provide more visibility into the total forecast and the impact of each technology. This is increasingly important for more intermittent renewables and more granular markets like the EIM.

Customer growth is a key driver of the load forecast. For the residential class, the near-term forecast includes the City of Roseville's specific plans, which account for new construction and customer demands. Additionally, Roseville specific population forecasts are used to develop forecasted residential customer counts.

The small commercial growth rate is calculated using regression models with employment as the driver. The large commercial growth rate is based on a combination of internal expert knowledge of upcoming projects, external commercial development forecasts, and available land inventory. Customer additions have been forecasted using economic variables. There are several drivers in the creation of the load forecast.

Table five summarizes the data sources used to develop the Load Forecast.

Table 5: Load Forecast Assumptions and Sources

DATA/ASSUMPTIONS	DEFINITION
Historical Retail Sales	Historical billed sales to Roseville customers in energy (MWh) after energy losses, EE, and DG.
Other Loads	Other loads include the City "self" load, which is excluded from retail sales for the purposes of calculating the RPS obligation.
Interval Data	A random sample of medium commercial, small commercial, residential single-family, and residential multi-family classes with meters that collect fifteen-minute interval data is used to create an average profile for each type of customer class. All large and very large commercial classes have fifteen-minute interval meters.
Customer Growth	Data was collected from Roseville's Development Services and Economic Development Department, incorporating various City specific plans. Residential and small commercial growth is forecasted using regression models with economic drivers.
Demographics and End Use	Pacific Area residential and small commercial data inputs for energy assumptions.[16] Residential Appliance Saturation Study (RASS)[17] – PG&E study for Climate Zone 12 used to adjust certain EIA end-use assumptions.
Economics	Economic data is purchased from Woods and Poole Economics. The main economic variables used are employment, household income, and total households.

[16] https://www.eia.gov/outlooks/aeo/
[17] http://www.energy.ca.gov/appliances/rass/

Committed Energy Efficiency	SB 1037[18] annual reporting requirement of all committed EE programs.
Energy Efficiency	AB 2021 requirement was adopted by Roseville City Council in 2015.
Transportation Electrification	Provided by consulting with AECOM/Energia. The latest forecast was completed in 2022.
Distributed Generation	Historical and forecasted behind-the-meter solar installations, both residential and commercial, including ZNE homes.

Roseville's population is growing, yet energy needs have a modest growth due in large part to forecast EE for both residential and commercial sectors and the implementation of ZNE homes. Figure 15 shows Roseville's retail sales energy forecast from 2023-2035 for the three scenarios described in section 4.2.1. For the planning horizon, the Base Plan has a nine percent increase from 2023 to 2035. When comparing the Base Plan to Customer Choice, it is two percent higher year over year and between five to nine percent lower than Electrification. The various forecasts provide a range of possibilities and different procurement needs, which allows Roseville to plan properly.

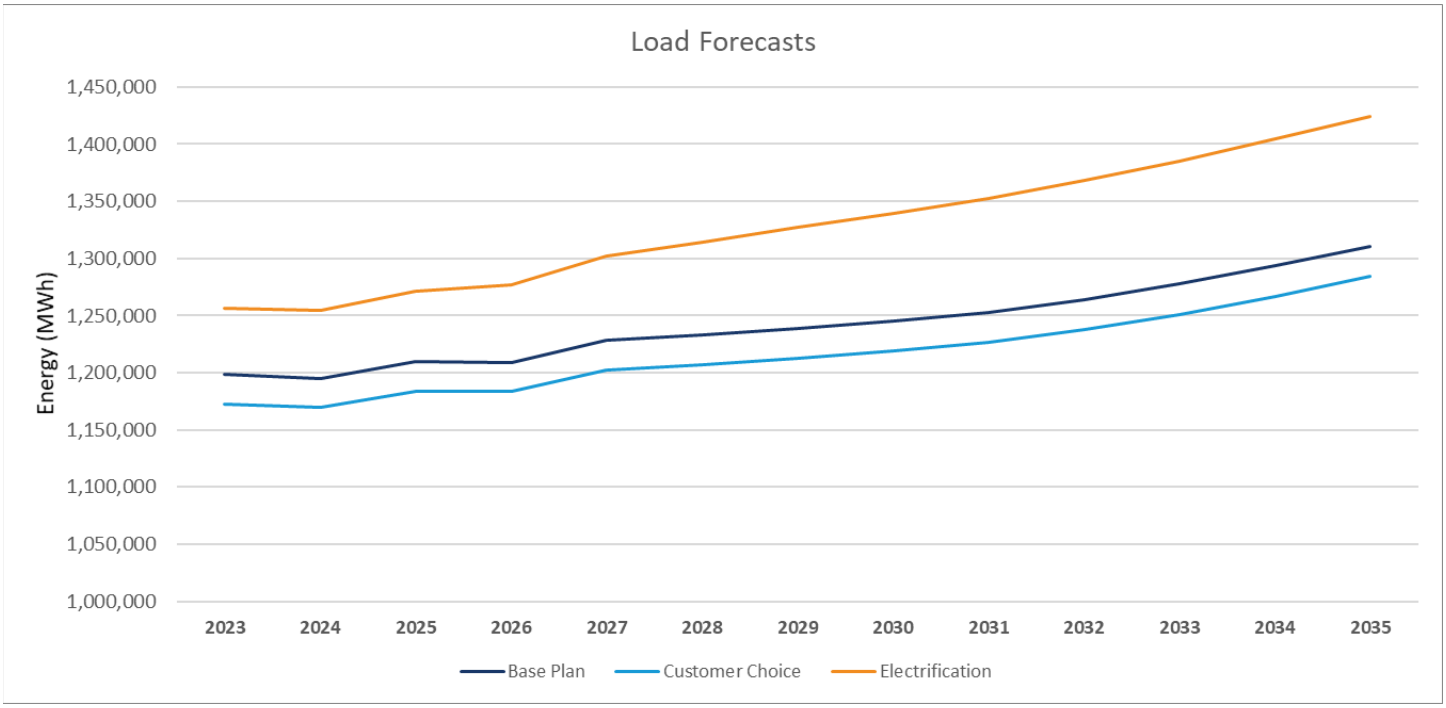


Figure 15: Annual Load Forecast for Base Plan, Customer Choice, and Electrification

The added solar (detailed in section 5.1.1) contributes to load reductions due to over production during the middle of the day while minimally contributing to peak demand reduction. Figure 16 shows as more rooftop solar is installed, it alters Roseville's net load in the mid-day and pushes the peak to later hours. For 2023, the peak occurs at 18:00; with the additional installations by 2035, it is expected to occur one hour later.

[18] http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060SB1037

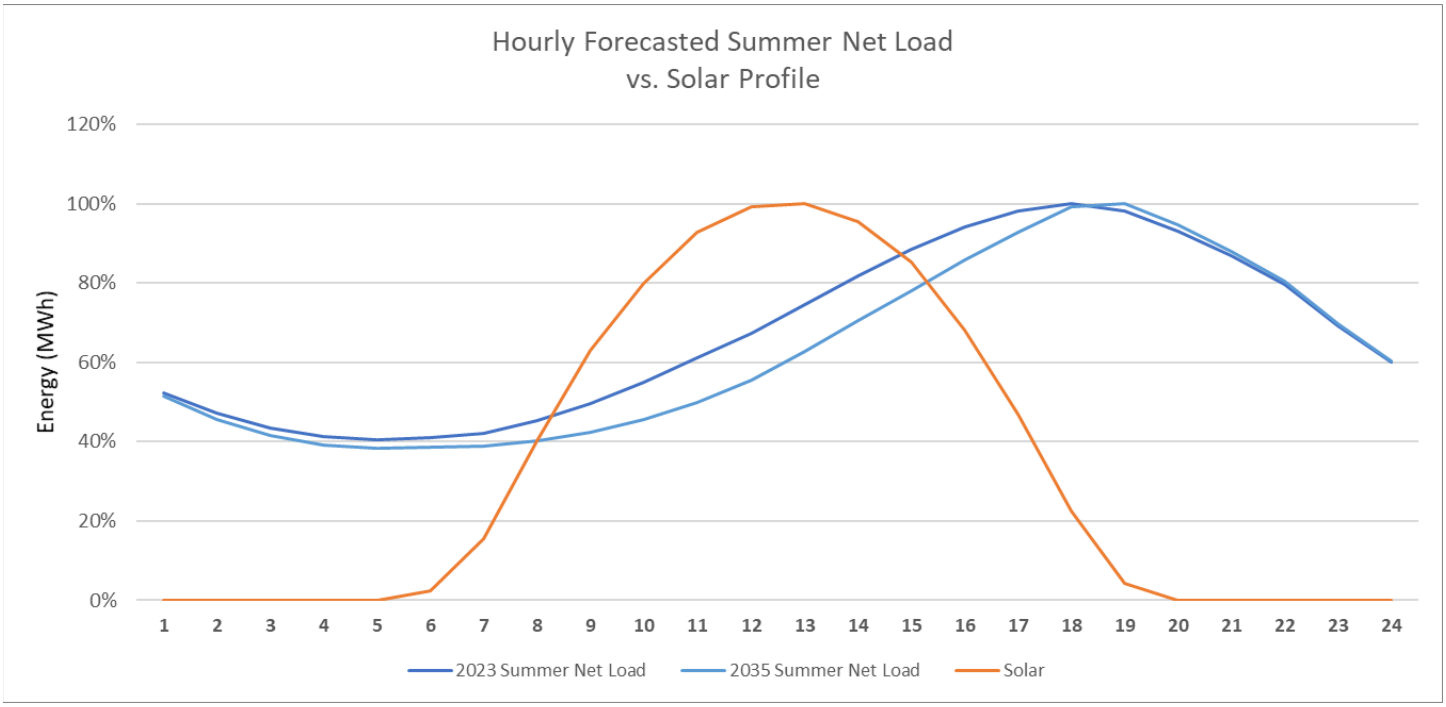


Figure 16: Solar Coincident Load

Roseville's 1-in-2 peak demand forecast for 2023-2035 is shown in Figure 17 for the three scenarios. Each scenario is expected to increase slightly, around one percent per year.

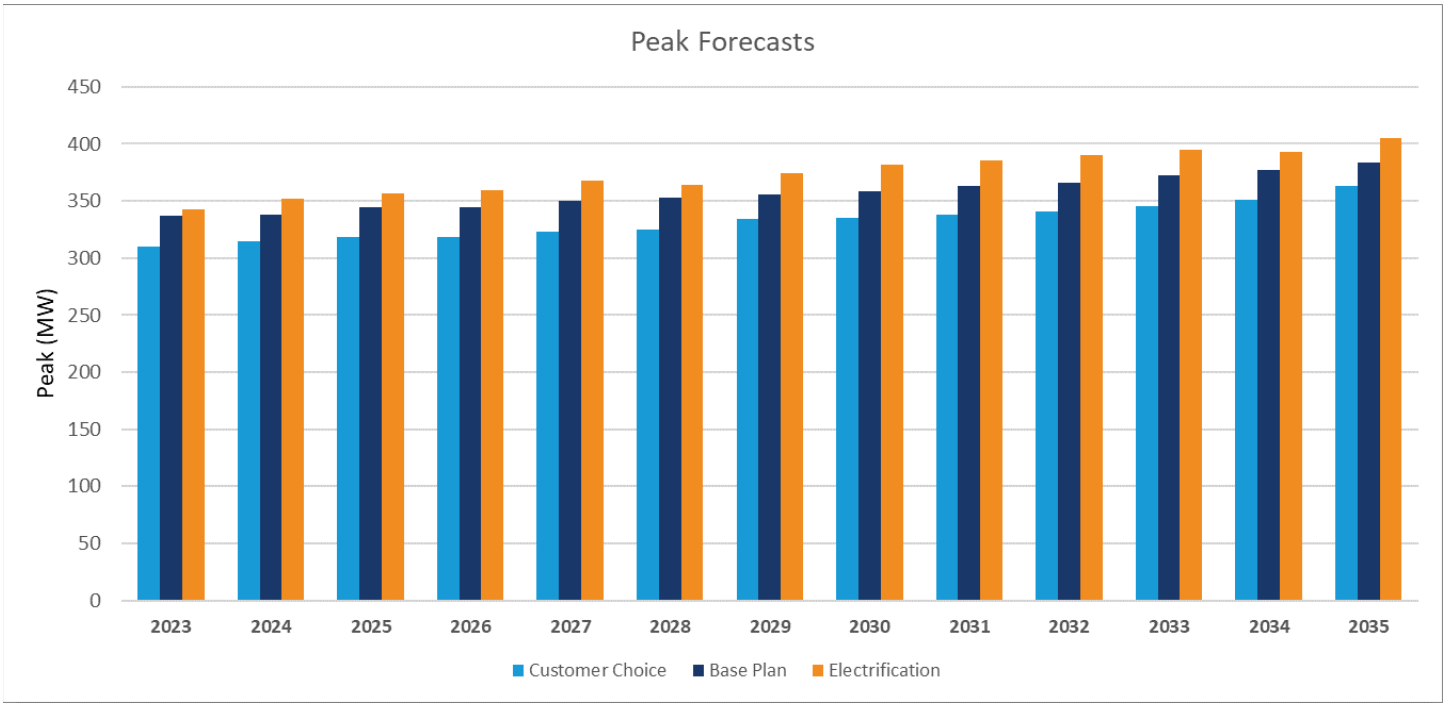


Figure17: Peak Forecast for Base Plan, Customer Choice, and Electrification

5.1 Customer Side

Roseville's load is an aggregate of the 66,000 customers. The load depends on the factors discussed above, including certain technologies discussed in more detail below.

5.1.1 Technologies that Decrease Load

In 2019, California was ranked 50th in the nation for per capita energy consumption, being only behind Rhode Island.[19] This is partly due to California's long-standing EE policy and milder climate.

As discussed in section 3.3, Roseville prioritizes EE and continuously analyzes its program offerings and their cost-effectiveness.

In addition to EE, customer side rooftop solar, also known as DG, reduces Roseville's load. Roseville tracks each installation and since 2021, Roseville customers have installed approximately 32.72 MW of solar rooftop capacity. Rooftop solar cannot be counted toward Roseville's RPS requirements. In the past ten years, Roseville has provided more than $10 million in rebates for solar, which ended after the requirements of SB 1[20] and the California Solar Initiative[21] were met. In addition, Roseville developed the "Your Trusted Solar Advisor" program.[22] This program provides customers with comprehensive information to support their rooftop solar decision, including the general process, permitting, and interconnections. Behind-the-meter solar is a key driver in not only Roseville's load forecast but also other system impacts discussed later in this IRP. Roseville has approximately 6,900 residential customers with rooftop solar, nearly 10% of all Roseville residents. Approximately 75 commercial customers also have systems ranging from 3 kW to 1,300 kW.

[19] https://www.eia.gov/state/rankings/?sid=CA#series/12
[20] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB1
[21] http://www.gosolarcalifornia.ca.gov/csi/index.php
[22] https://www.roseville.ca.us/cms/One.aspx?portalId=7964922&pageId=8893146

Noted in Figure 18, there is an uptick in residential installations in 2021 mainly attributed to the ZNE requirement, where all new residential construction must produce as much renewable energy as it consumes over the course of a year.

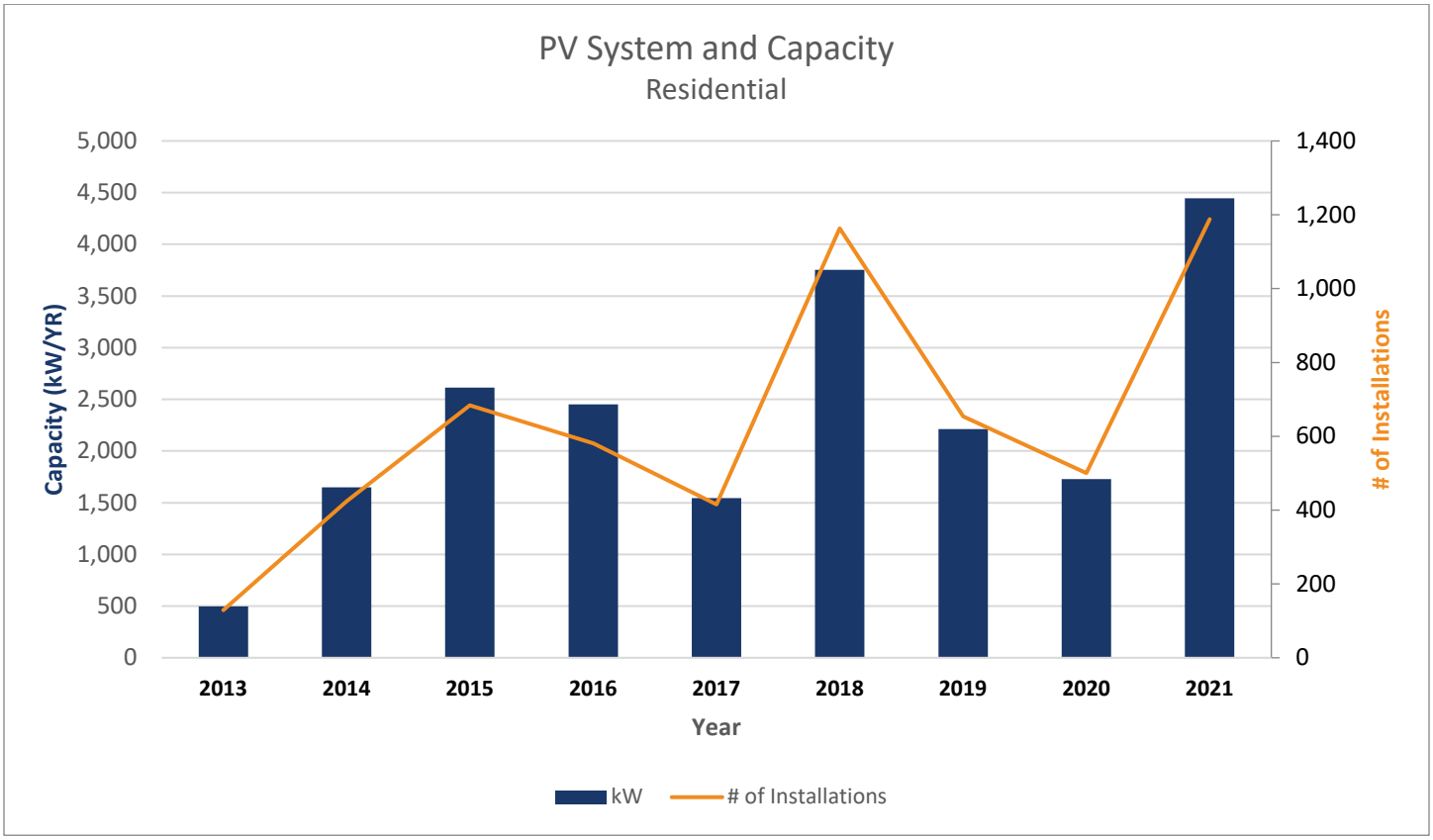


Figure 18: Residential Solar Installation and Capacity by Year

Commercial installations have historically been erratic year-to-year due to fewer yet larger installations. From 2013 through 2021, annual installations have ranged from one to twenty. While the number of installations is low, the capacity per installation varies widely depending on the size of the customer's facilities. For example, in 2015, one large commercial customer installed a 990 kW solar system. In contrast, the average home installation is two to three kW. Figure 19 is Roseville's historical annual commercial solar installations (right axis) and the amount of capacity in kW (left axis).

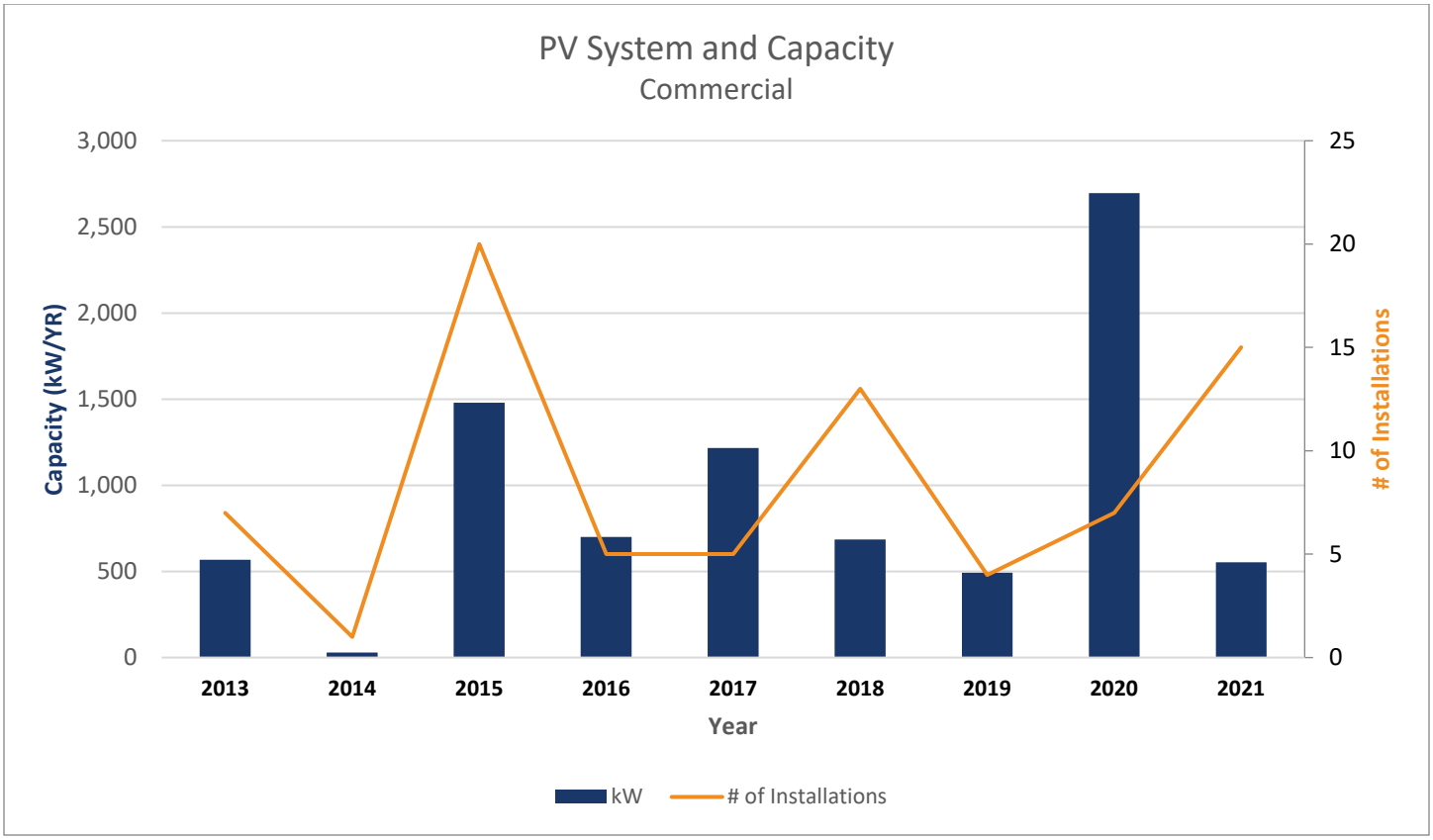


Figure 19: Commercial Solar Installation and Capacity by Year

Locationally, installations began on the west side of Roseville, where new development occurred.

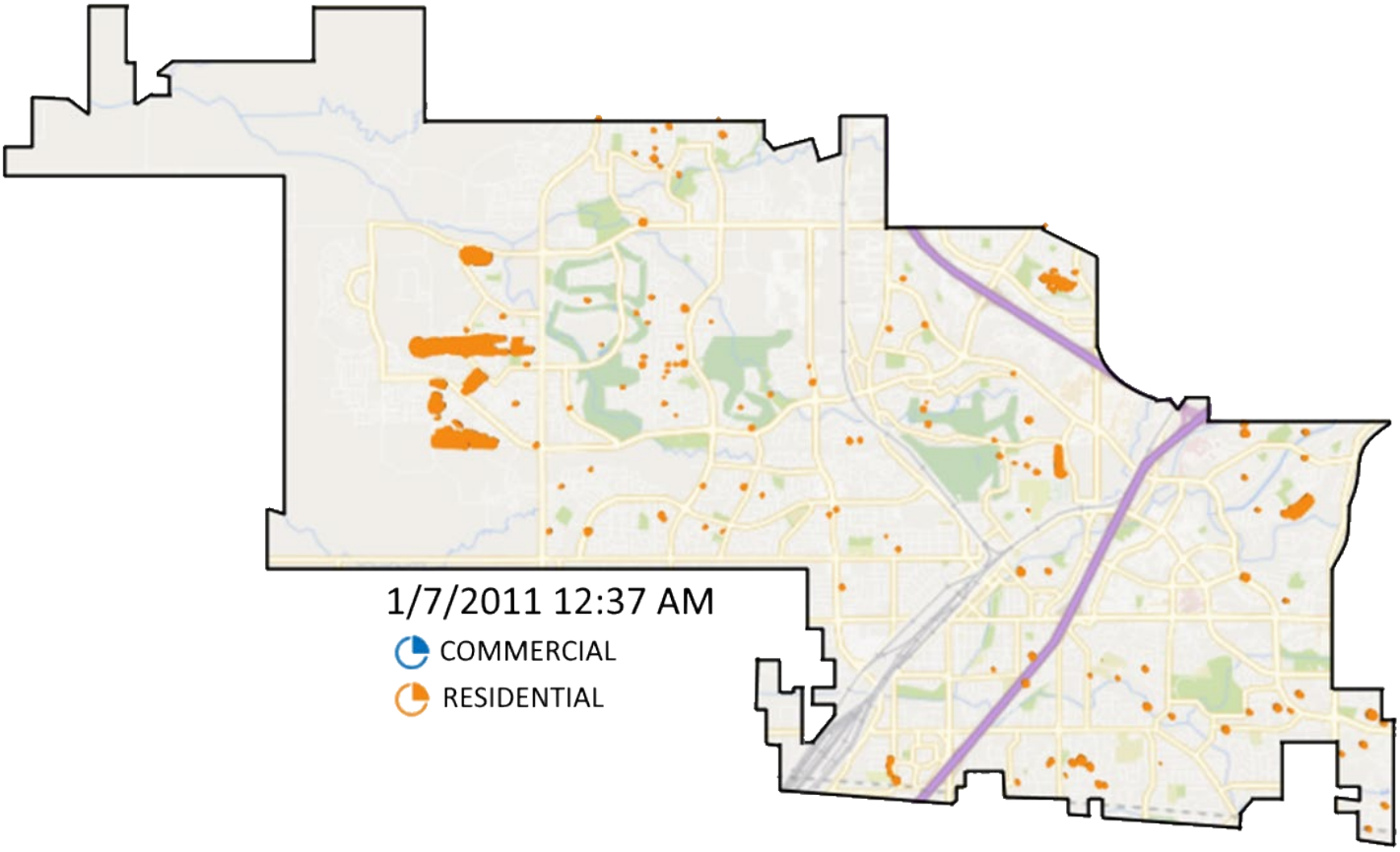


Figure 20: Residential and Commercial Solar Installations as of January 2011

Fast forwarding to the end of 2021, the behind-the-meter solar installations drastically increased. There are now large commercial installations in the mid to eastern portion of town. The residential are more diverse, with the main focus being on the newer developments in the west. As noted earlier, the trend will continue with the ZNE requirement in new builds.

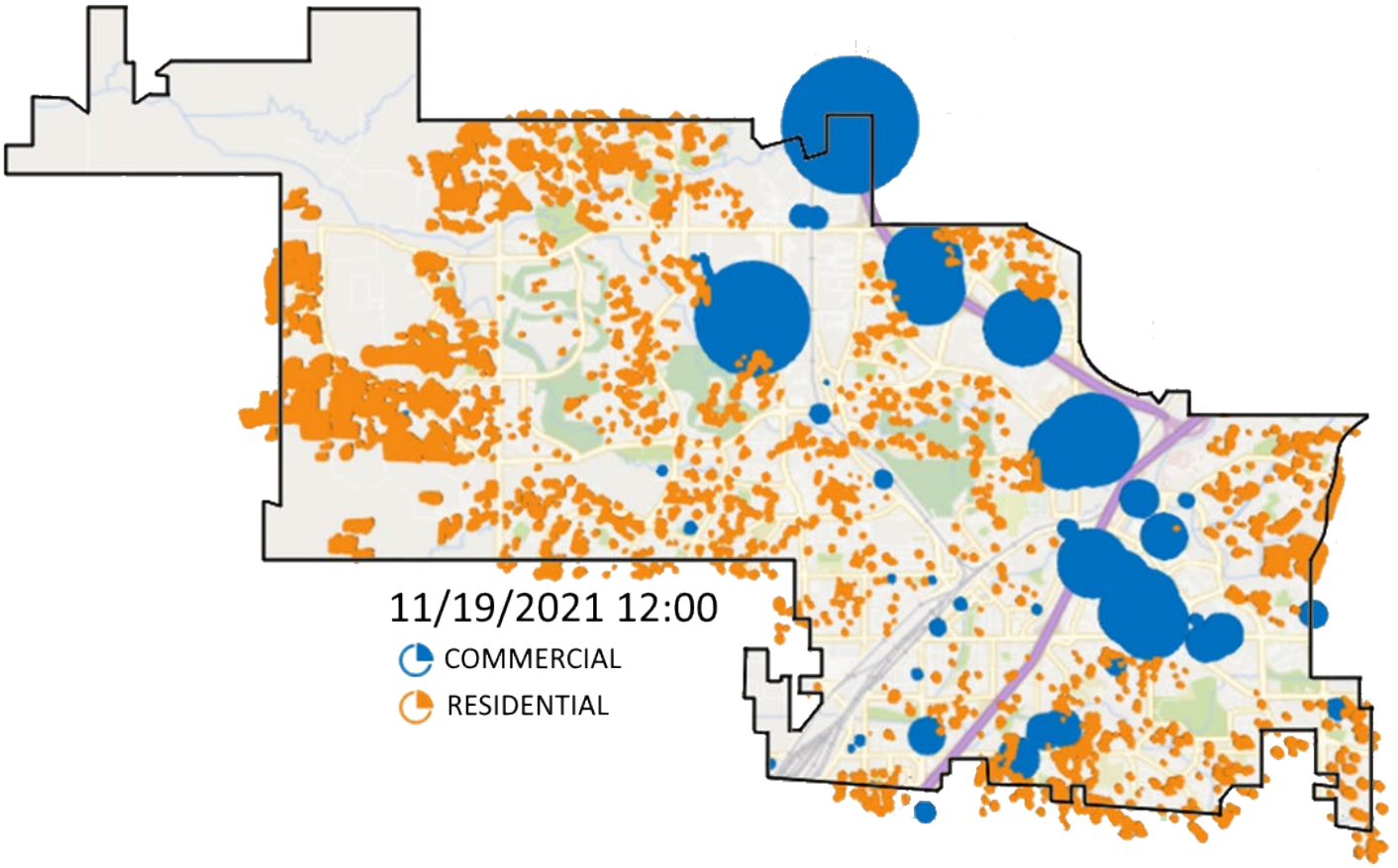


Figure 21: Residential and Commercial Solar Installations as of November 2021

Behind the meter solar reduces Roseville's load. The greater the install capacity is, the greater the effect, which is visualized in Figure 22. Figure 22 shows the average hourly load and the estimated rooftop solar generation for the year. In 2011, the installed capacity was three MW, and there are timeframes, most notably March 2011, where the orange load line is affected by the dark blue. By 2021, the annual rate of installed capacity tripled and further affects the load at times the solar generates. Not only does it lower the load, but it also increases the slope and how steep the line is right after the generation begins to fall. This creates a larger evening ramp, which requires other types of generation or storage to follow to support the grid. As more rooftop solar is installed, a more pronounced effect will occur.

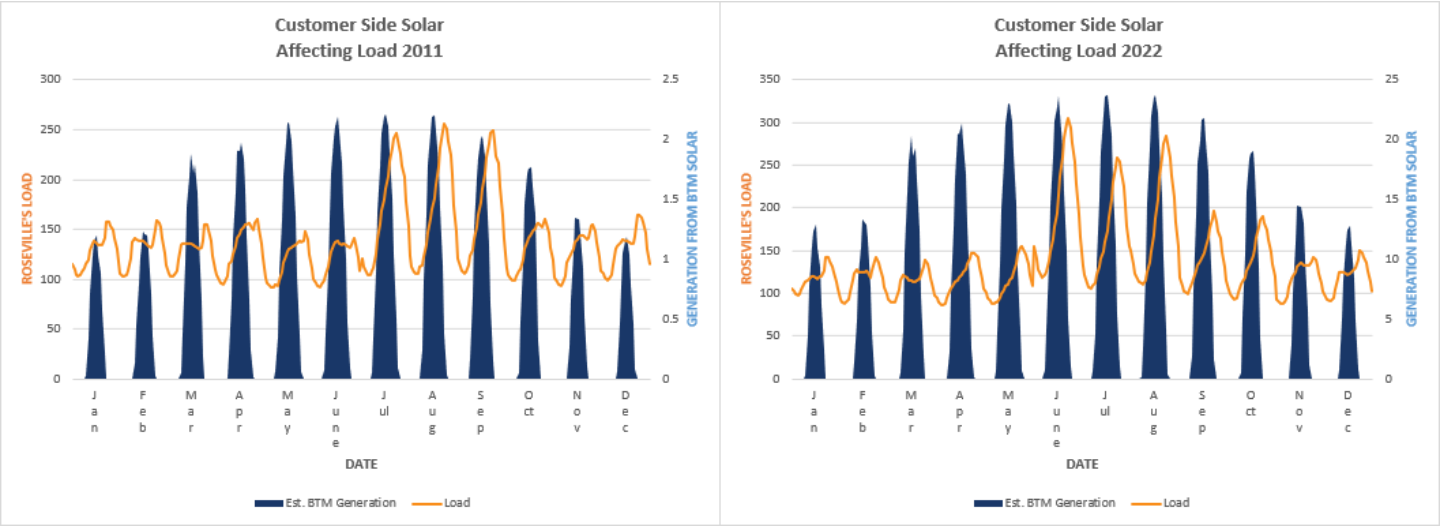


Figure22: Customer Side Solar Affecting Load in 2011 and 2022

The California wholesale market energy price has responded to more grid-scale and rooftop solar on the system. Figure 23 shows Roseville's installed capacity compared to market prices at a large California hub, NP15. During the production times of rooftop solar, the value of market energy declines, which can be visualized by the orange line dipping when the blue area is present. Right after the solar generation falls, pricing increases at a drastic rate.

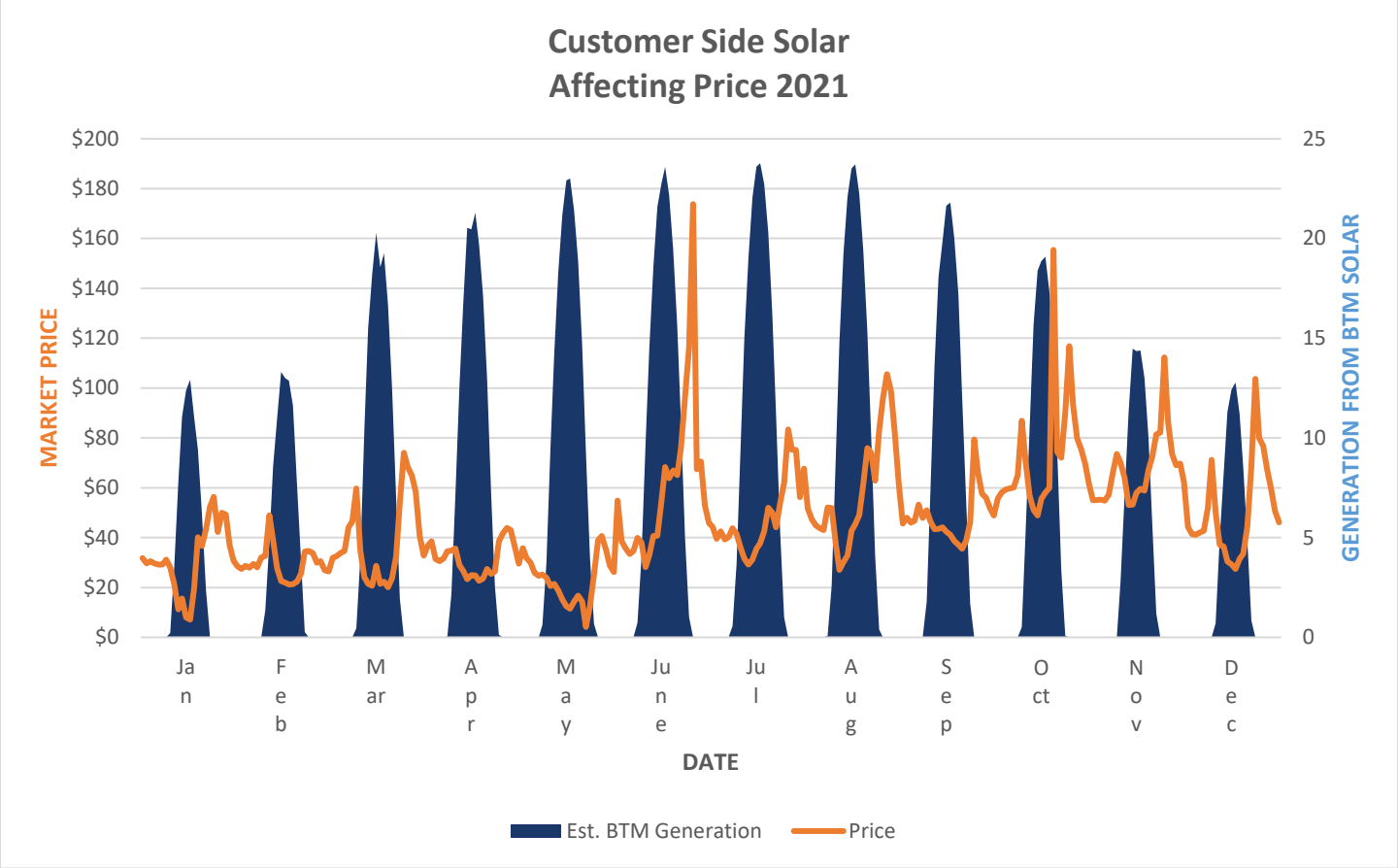


Figure 23: Customer Side Solar Affecting Market Price

5.1.2 Technologies that Increase Load

On the contrary, efforts to decarbonize the transportation sector and homes are increasing customer load. The electrification of homes, water and space heating, cooking, as well as, the attraction of EVs are two areas that have been gaining traction in recent years due to available technology, reducing GHG, and lowering customers' overall bills.

California's transportation system consists of a vast network of more than 175,000 miles of roads and highways. Roseville is ideally located at the intersection of Interstate 80 and State Route 65, enabling its residents access to metropolitan job centers and outlying rural communities access to Roseville's premium shopping, services, and other amenities. Additionally, Roseville is mid-way between the San Francisco Bay Area and Lake Tahoe. With Roseville being a central shopping and commuting hub, as well as an ideal location for tourists to layover, eat, and charge their EVs on their way to other destinations makes for a premium charging location. Figure 24 shows the currently available public chargers in Roseville's service territory and Figure 25 shows the known private chargers.

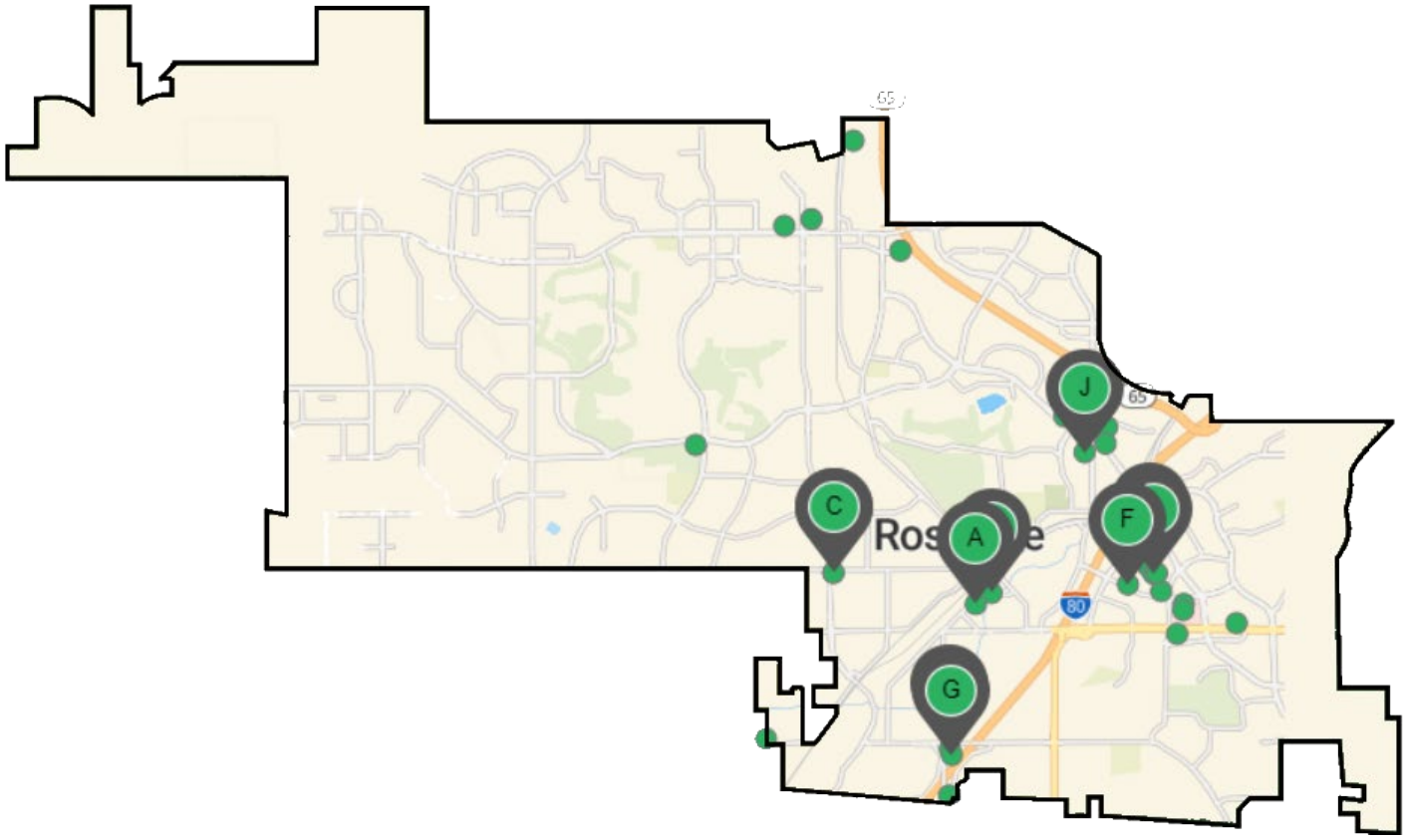


Figure 24: Public Charging Stations

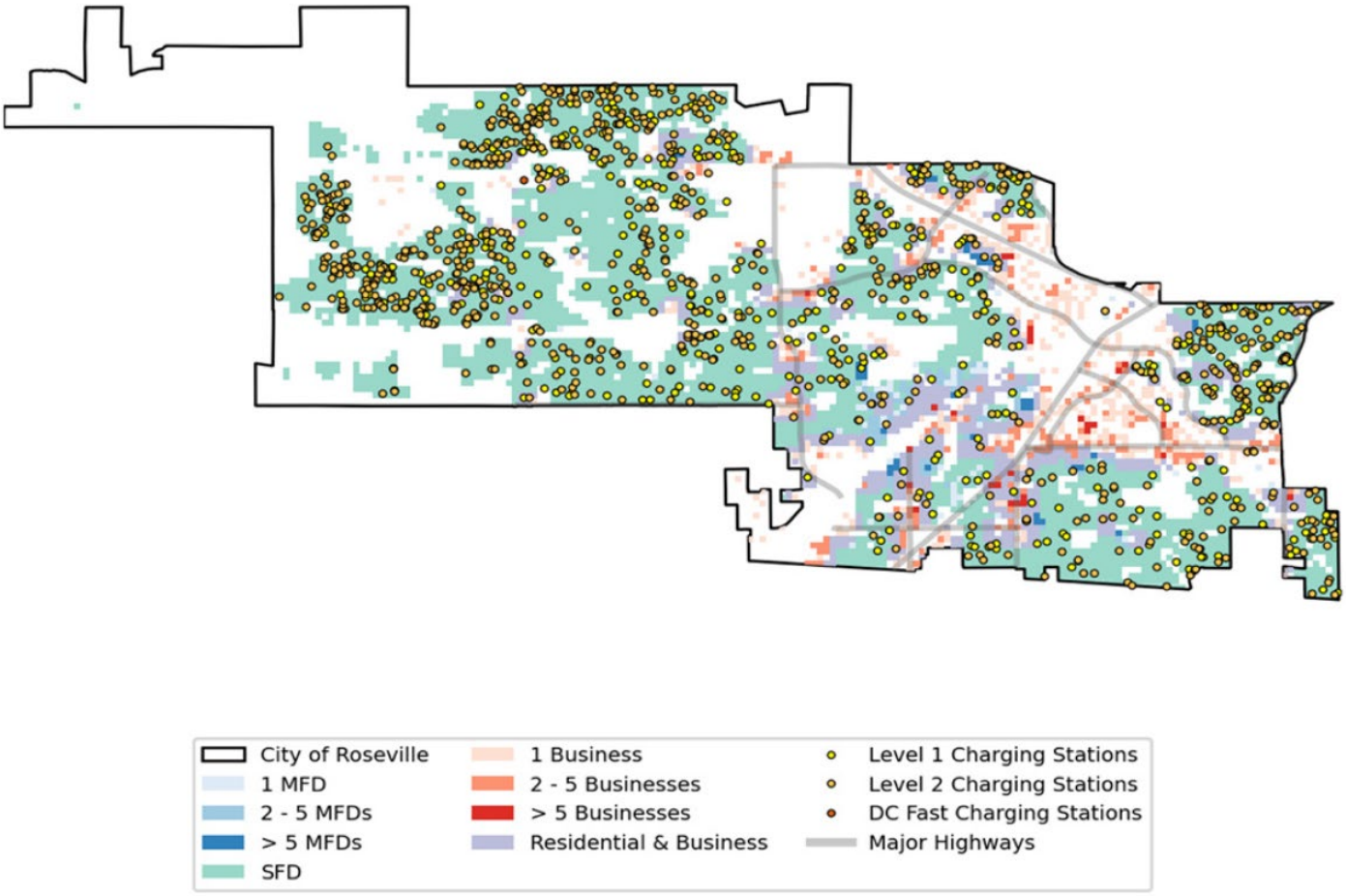


Figure25: Private Charging Stations by Charger Type (Source: Latest AECOM EV Report)

The majority of private chargers in Roseville have been installed in residential areas, with the majority being Level 2. This is consistent with state trends. To date, no private DCFC chargers have been installed.

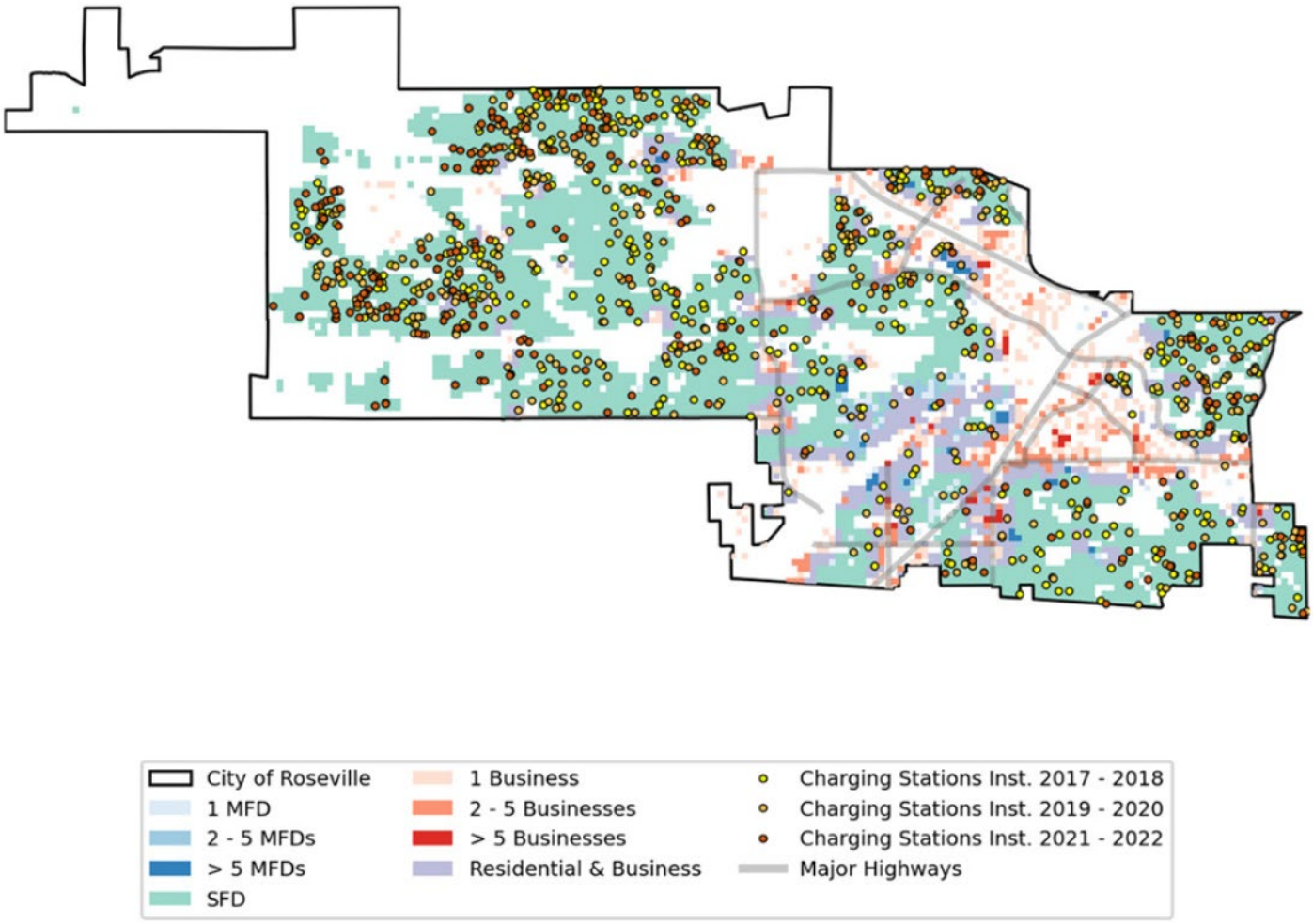


Figure 26: Private Charging Stations by Installation Year (Source: Latest AECOM EV Report)

Figure 26 illustrates significant growth in private chargers in Roseville, with the majority of the dots being red, indicating an installation date of 2021-2022.

EVs could prove to be an opportunity to leverage Roseville's infrastructure by expanding the rate base, redistributing load, and lowering customer costs. There is concern EVs can strain the system as the numbers grow and the time needed to charge decreases. Figure 27 emphasizes the trend of charge time decreasing. This requires more power in less time and will require proper planning both from a power supply and distribution level. AMI can be a part of the solution by enabling the design of charging rates that optimize charging times and reduce variability, benefiting both customers and the grid. An example is illustrated in Figure 28, where the charge time does not occur during times when the grid is most strained in the peak hours.

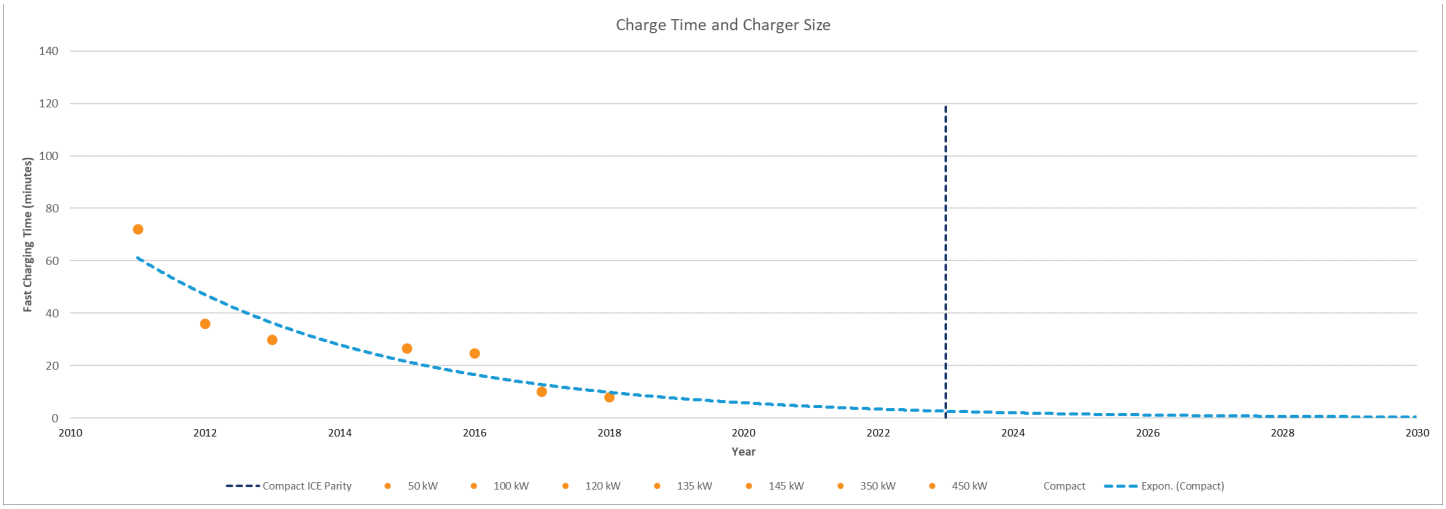


Figure 27: Trend in DCFC Technology Recharge Time

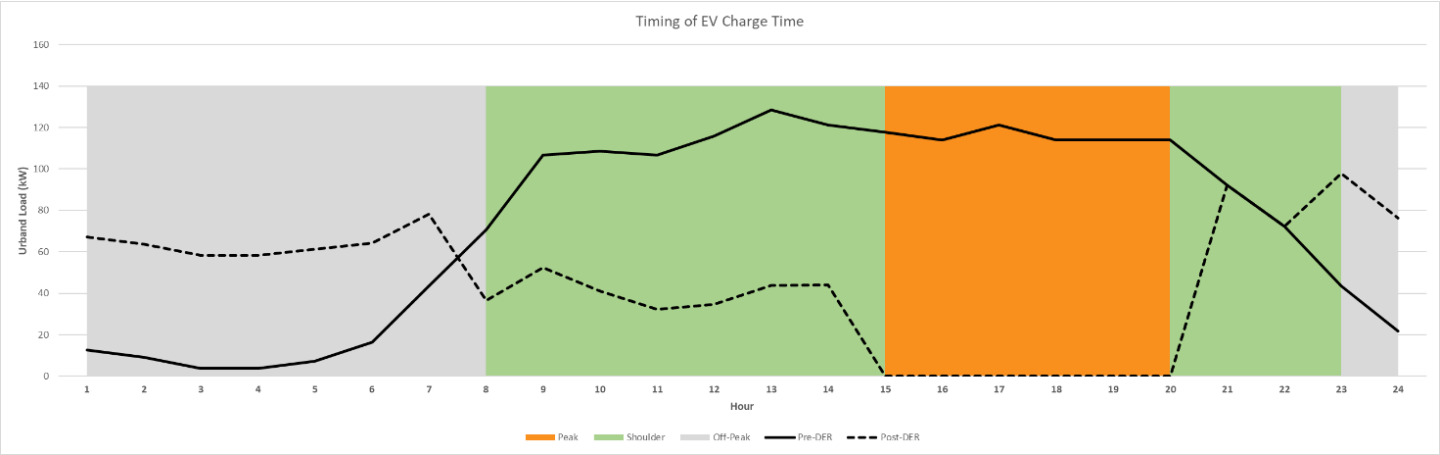


Figure 28: Optimized EV Load Profile

To help EV adoption, Roseville offers education, in-person and virtual outreach, and rebates for both residential and commercial customers. The education includes an advisor, available EVs and chargers, dealerships offering EVs, and decision-making tools, such as cost calculators and cost estimates. Roseville's low rates incentivize EVs because it costs less for customers to charge their car. The deployment of AMI is underway and is needed to provide EV rates accurately. Research on the proper rate and third-party data collection tools is being discussed internally.

California Department of Motor Vehicles (DMV) data from 2011-2021 shows rapid growth in Roseville's EV population. For this IRP, Roseville contracted with EV experts AECOM and Energeia to provide the following EV forecasts using their uptake model. The uptake model forecasts the adoption of EVs by segment based on policy, model availability, and financial drivers. Segments are defined as passenger vehicles, light, medium, and heavy-duty trucks, buses, and motorcycles. The Base Plan, Electrification, and Customer Choice each have their own assumptions outlined in Table six that drive the adoption levels that affect Roseville's load.

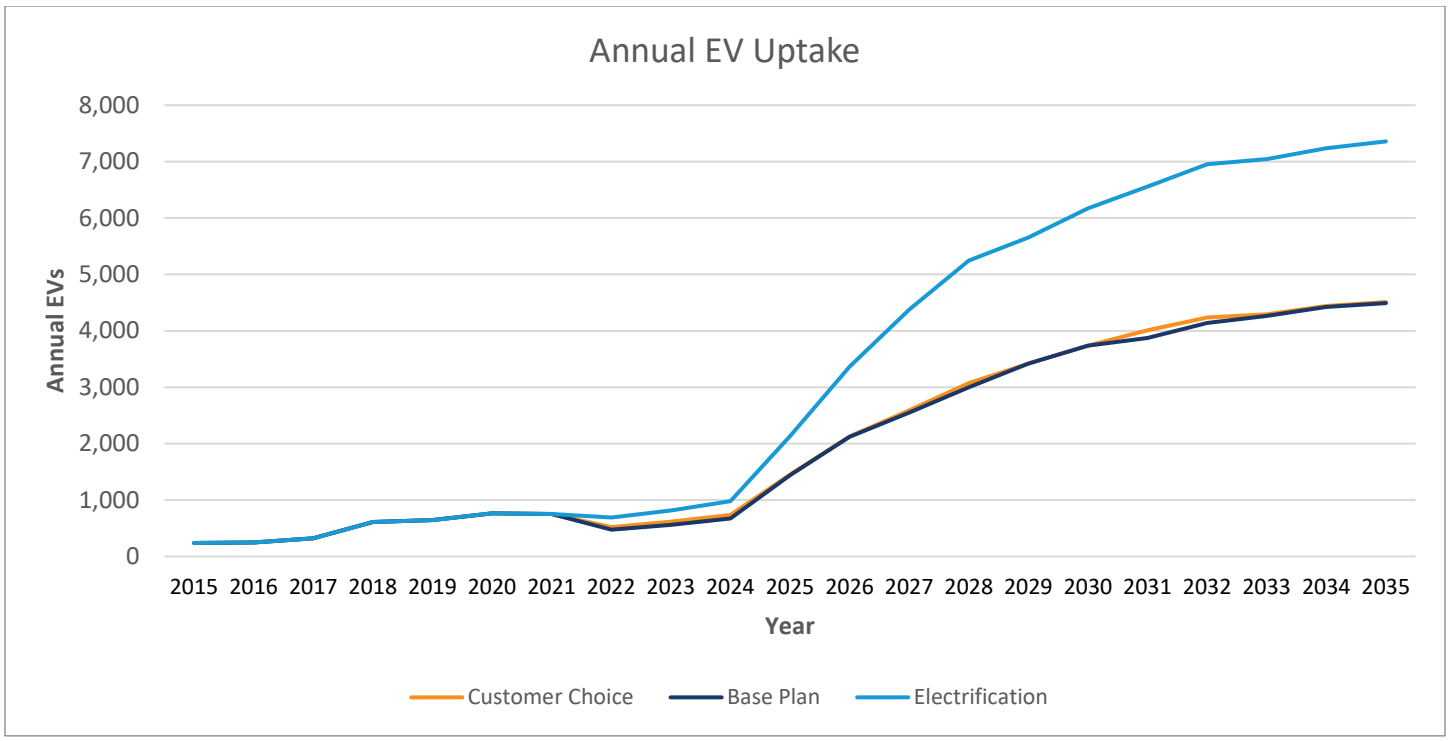


Figure 29: Annual EV Uptake

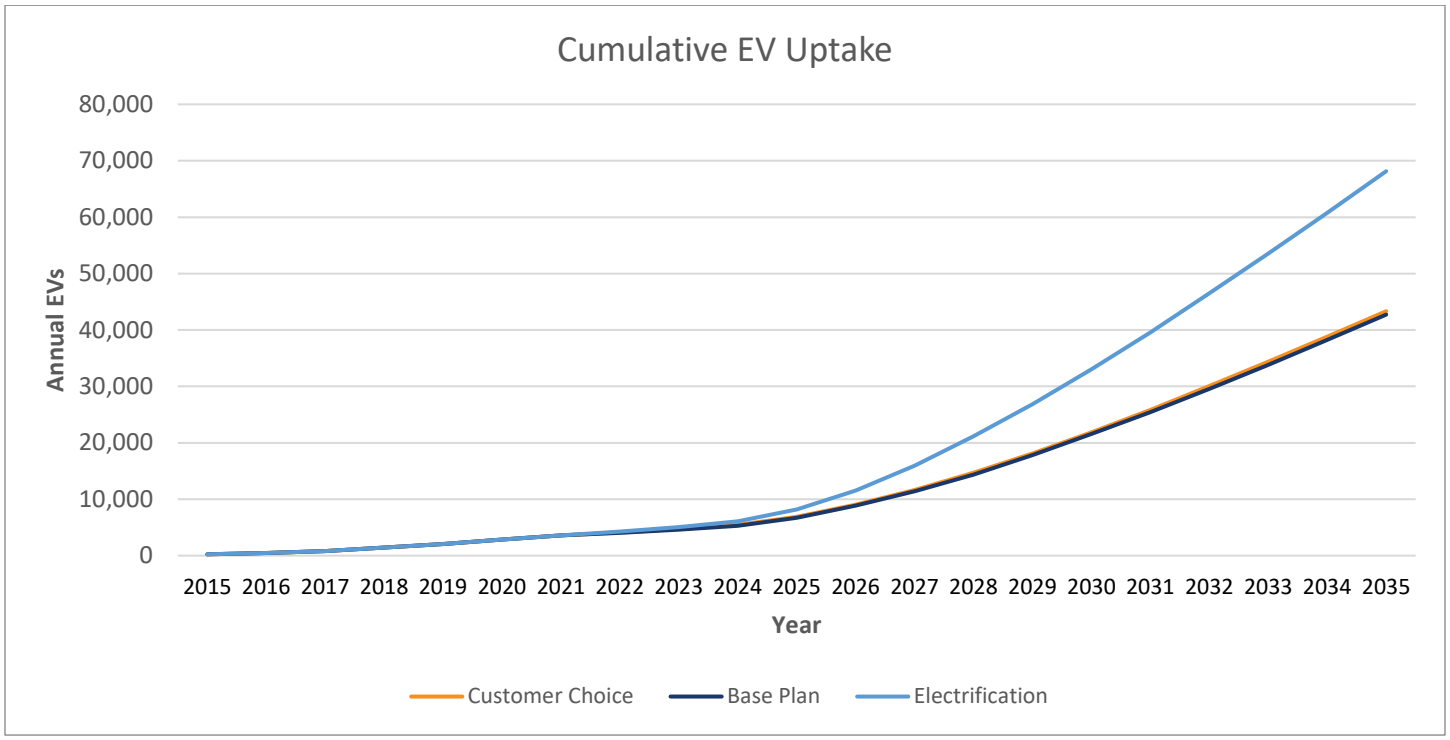


Figure 30: Cumulative EV Uptake

Table 6: EV Uptake Scenario Drivers

	BASE PLAN	ELECTRIFICATION	CUSTOMER CHOICE
Uptake Scenario Drivers			
PEV Model Availability	Research	25% Higher	Research
PEV Vehicle Price Parity	8-Year	3-Year	8-Year
Government/Utility Rebates	Current	50% Higher	Current
Oil / Gasoline/ Diesel Costs	Research	25% Higher	Research
Electricity Costs	Current	25% Lower	50% Lower with behind-the-meter
Public EV Supply Equipment Availability	60% Availability	100% Availability	60% Availability
COVID-19 Impacts	5-Year	3-Year	5-Year

In addition to the overall impact, more granular studies were conducted to provide distribution impacts and potential solutions and opportunities with the goal of promoting EVs while minimizing Roseville's assets and rates.

This incremental load will increase Roseville's direct GHG emissions and result in an added compliance cost. In contrast, the transportation sector will see a larger incremental emissions drop, providing a community wide net GHG reduction. Unfortunately, Roseville will not receive compliance credit from CARB for its contributions in supporting EVs and the greater GHG reductions. Figure 31 estimates the net GHG reductions and increased GHG to Roseville based on the uptake model.

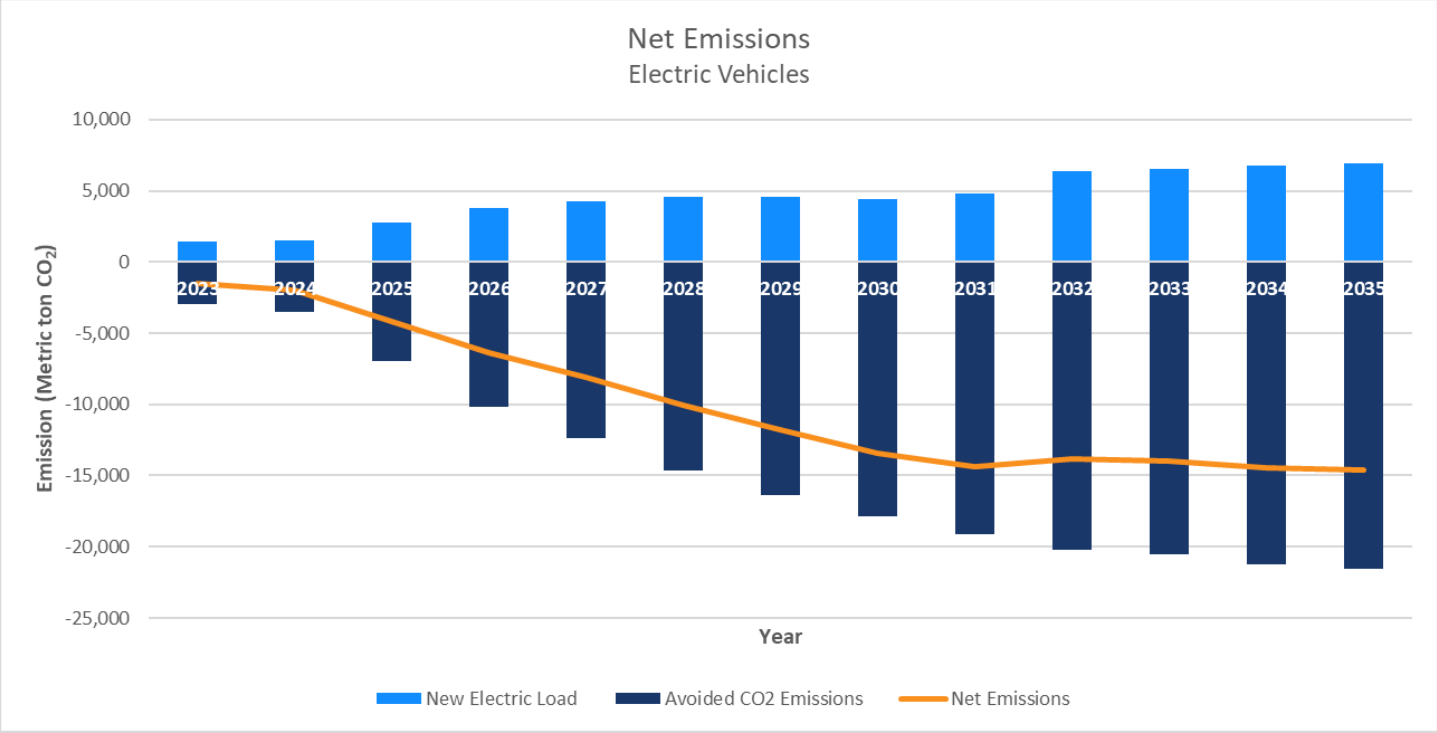


Figure 31: GHG Generation, Transportation, and Net CO_2 Emissions

5.2 Summer Heat

Like many surrounding areas, Roseville has experienced higher than normal temperatures that continue to trend upward. With Roseville being a summer peaking utility, where the load is the highest in the summer months, increased temperatures begin to play a factor in capacity and energy requirements. The past twelve years of data show the average daily temperature in the summer has increased by around four degrees and the maximum daily temperature has increased by five degrees (Figure 32). This past September had record breaking temperatures of 108-113°F.

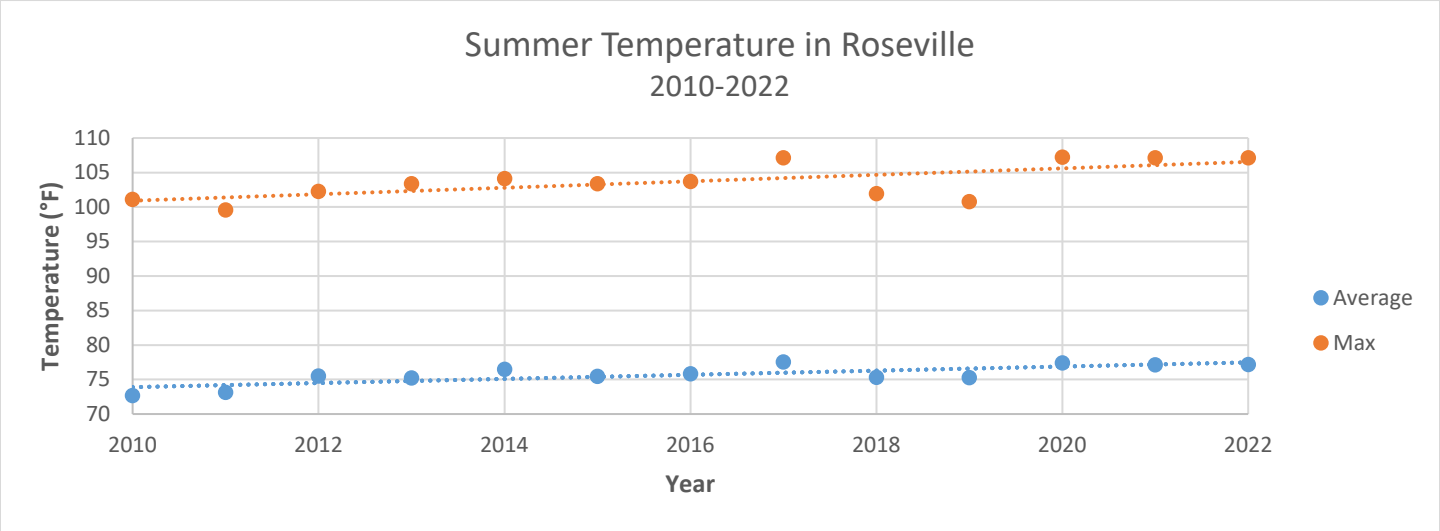


Figure 32: Average and Maximum Summer Temperatures in Roseville from 2010-2021

The trend across California shows similar information, noting that over time, the number of heatwaves has increased, lasted longer, and is hotter.

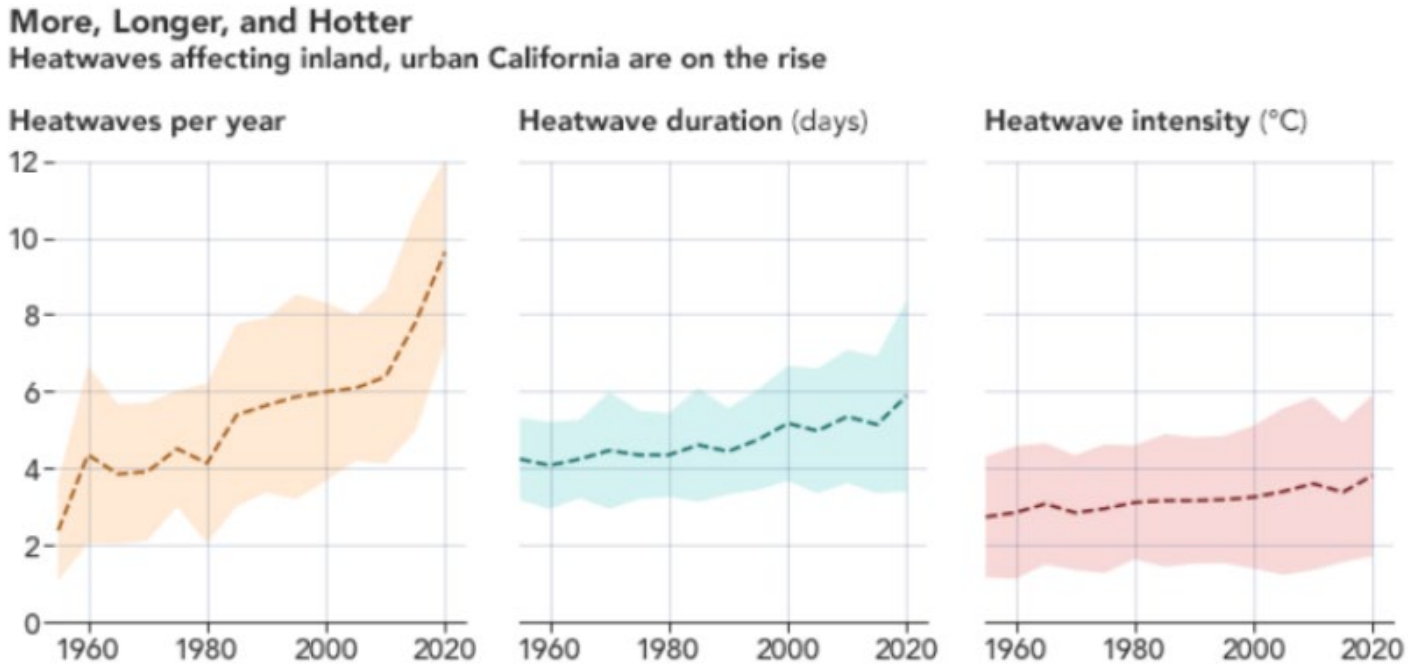


Figure 33: California Heat Trends[23]

5.3 Advanced Meter Infrastructure/Time-of-Use

TOU rates help incentivize customers to use energy at varying, more optimal times. Roseville is in the process of installing AMI for the ability to understand, structure, and record TOU rates. Roseville's AMI project has a targeted release of approximately 1,500 devices (including both water and electric devices) in a controlled environment from December 2022 through April 2023. Upon successful completion of the Beta Phase, the AMI project will enter into the Full Deployment Phase beginning May 2023 and will run for approximately twelve months. In addition, AMI enhances customer service by:

- **Equitable rates**: AMI enables Roseville to develop efficient and equitable rate structures.
- **Customer empowerment**: AMI enables communication with customers, which may incentivize EE and DR for the grid and customer benefits.
- **Renewable integration**: AMI provides the system granularity to integrate significant amounts of distributed energy resources into utility transmission and distribution systems.

Roseville, driven by changing grid characteristics, is engaging solutions that can integrate grid information from various platforms. This effort includes the development of a technology roadmap to leverage the AMI capabilities for the benefit of Roseville's customers. These capabilities include the following reliability supporting functions:

- Remote monitoring and control of distribution equipment (switches, reclosers, regulators, capacitor banks, dynamic VAR compensators, and faulted circuit indicators).

[23] https://earthobservatory.nasa.gov/images/147256/california-heatwave-fits-a-trend

- Asset health monitoring (transformers in particular, but also circuit breakers and protection and control systems).
- Network modeling and analysis (typically power flow, voltage, and faulted circuit analysis).
- Outage management (including automatic outage notification, fault locating, restoration, and verification).
- Dispatch and control of distributed resources (especially solar, emergency back-up generators, onsite customer generation, and in some cases, micro wind and battery storage).
- Voltage optimization (optimizing service entrance voltage to improve system efficiency).
- Real-time/dynamic equipment rating (especially circuits, substation getaways, and transformers).
- Failure prediction (especially in substation and distribution transformers).
- Fault analysis (especially the identification of momentary outages and high-impedance faults).

AMI is expected to provide an opportunity to evaluate non-conventional resources. This will enable Roseville to expand DSM offerings in the areas of EVs, DG, and advanced EE and DR programs. This approach will enable Roseville to implement diverse solutions for flexibility needs. Roseville's technology roadmap will include a comprehensive and proactive strategy to enable solutions for customer to grid benefits.

5.4 Net Peak

DER and EE[24] can aid in reducing the net peak. Roseville partnered with Roseville's Environmental Utilities on a callable DR program that allows the Dry Creek and Pleasant Grove wastewater treatment plants to go into backup generation. Together, the plants provide 4 MW and are only used during grid emergencies. These plants are only used when the grid is strained and not for economic reasons. This DR program was used during the heatwave from September 6th to 9th. In addition, a noticeable drop of 3% was also realized from the California Office of Emergency Services' "amber alert" sent to all Californians. Roseville plans on launching a customer program contracting with EnergyHub to have up to 6 MW of dispatchable DR through compatible thermostats, including ecobee, Nest, Emerson, and Honeywell. Roseville will incentivize customers to sign up for the program in the form of bill or rate credits. It will be used in a way that customers should notice little to no difference in comfort. The program will meet reliability needs and since less efficient generating units are used during constrained events, it will also reduce emissions.

[24] See section 3.3 for EE net peak values.

6 Existing Resources

6.1 Balancing Authority

A Balancing Authority Area (BAA) is an area where electricity supply and demand is balanced. Figure 34 shows the BAAs in California. As shown, the largest BAA is the CAISO. Roseville is a member of the Balancing Authority of Northern California (BANC). BANC became operational on May 1, 2011, and consists of the Sacramento Municipal Utility District (SMUD), Modesto Irrigation District (MID), Roseville, the City of Redding (Redding), the City of Shasta Lake, and the Trinity Public Utility District. With a peak demand of approximately 4,900MW, BANC is California's third-largest balancing authority area and the sixteenth largest in the Western Electric Coordinating Council (WECC) area. BANC serves 763,000 retail customers and includes more than 1,700 miles of high voltage transmission lines. BANC's footprint extends from the Oregon border to Modesto and from Sacramento to the Sierra. The territory also includes the Western Area Power Administration's (WAPA) transmission grid and the United States Bureau of Reclamations' CVP hydroelectric resources. BANC consists of the California Oregon Transmission Project (COTP), as well as the systems of its members. Roseville accounts for about 7% of the total BANC member load.

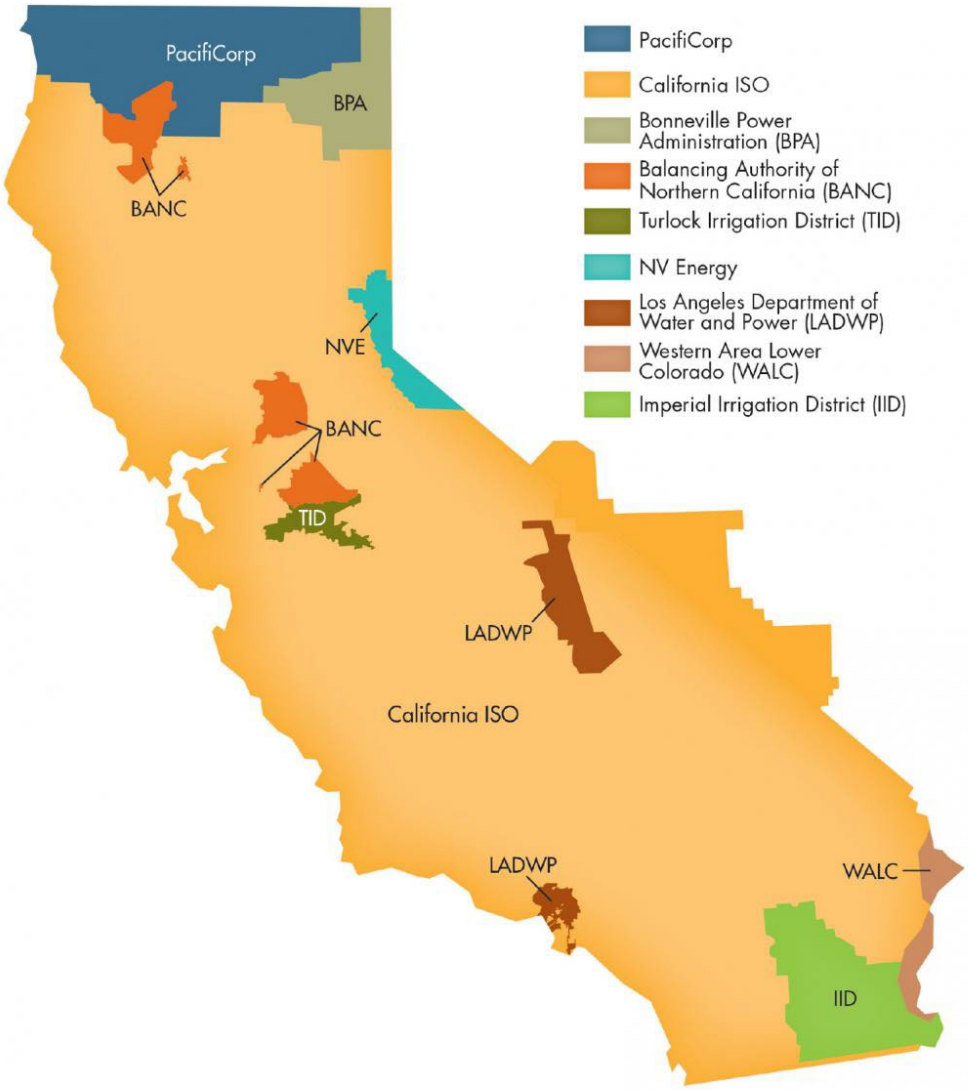


Figure 34: California BAAs

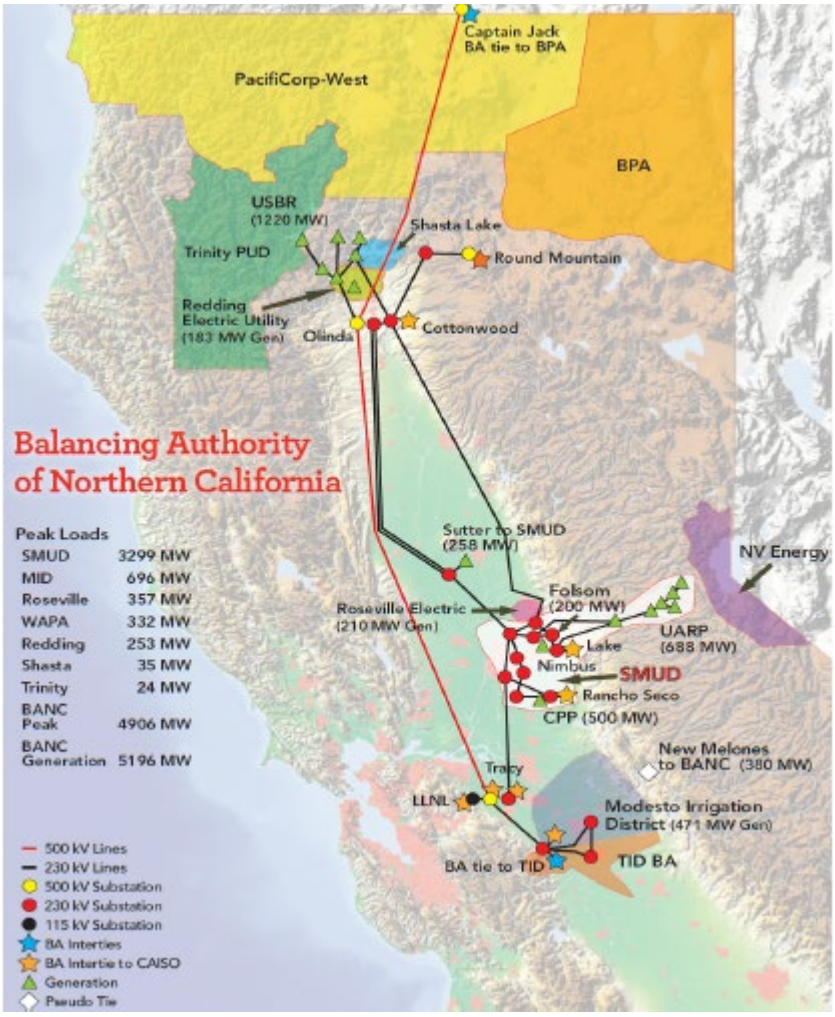


Figure 35: Geographical Map of BANC's System

WAPA operates as a contract-based sub-balancing authority within the BANC BAA. BAA responsibilities and costs are divided between BANC and WAPA, each passing their share of responsibilities and costs to their customers, including Roseville.

6.2 Transmission

6.2.1 Bulk Electric System

High voltage transmission lines at or above 100 kV are considered part of the Bulk Electric System (BES). Roseville's highest operating voltage is 60 kV; therefore, Roseville does not classify as part of the BES. However, Roseville does have contractual rights to use the BES to deliver generation to serve Roseville's load. This includes long-term transmission rights on transmission owned by WAPA, TANC, PacifiCorp, and short-term firm and non-firm transmission access procured as needed. There are governing boards that conduct annual contingency analysis and review studies in which Roseville is engaged and participates.

6.2.2 WAPA Network Integrated Transmission Service

Roseville's electrical system interconnects with WAPA's transmission system, which is part of the BANC BAA and interconnects with the CAISO BAA. Roseville imports all the electricity needs not met by internal generation over the WAPA transmission system through the Network Integrated Transmission Service (NITS) agreement.

This agreement provides electricity imports from various delivery points on the WAPA system into the Roseville electric system at the Roseville, also known as Berry, and Fiddyment substation. Roseville pays a proportionate load ratio share of WAPA's cost for operating and maintaining the system. Since 2012, the transmission rate has averaged $2.12/MWh, which is nearly one-seventh the cost of transmission service in CAISO and escalates at a lower rate. The current contract expires on December 31, 2024, with an expectation of renewing. Renewal is done through the Open Access Same-Time Information System (OASIS), which requires one year lead time.

Figure 36: WAPA's NITS Transmission Line and Substations

6.2.3 Pacific Northwest Transmission

The Transmission Agency of Northern California (TANC) is a Joint Power Agency (JPA) established by a group of POUs in 1984 with the initial purpose of planning, designing, and constructing the COTP. The COTP is a 340 mile long, 1,600 MW, 500 kV line that ties Southern Oregon and Central California. Today the membership includes fifteen POUs, including Roseville, and one rural electric cooperative. Roseville is entitled to 2.1119% of TANC's share of the COTP's transfer capability (approximately 29.35 MW). In return, Roseville has agreed to pay 2.295% of the construction costs of the COTP, including debt service, and 2.313% of TANC's COTP operating and maintenance expenses. Roseville's share of annual debt service continues until 2039. In 2018, Roseville purchased an additional 50 MW of firm point-to-point transmission rights from PacifiCorp, totaling 79.35 MW of transfer capability from the Pacific Northwest. This procurement was recently extended to include another five years.

6.3 Distribution System

Roseville's distribution system is directly connected to the WAPA transmission system. WAPA's 230 kV system serves much of the western United States. The Interconnection Agreement (IA) defines the points of interconnection between WAPA transmission assets (230 kV) and Roseville's distribution assets (60 kV and below) at two receiving stations, Roseville and Fiddyment. Power is then transmitted to distribution substations through the city's 60 kV network. At the distribution substations, the voltage is further stepped down to 12 kV by the substation transformers, where it is distributed primarily underground to nearby developments. From the distribution substations, 12 kV main feeders are installed to supply load. The 12 kV feeders are mainly installed in underground duct banks. The voltage is further reduced to the standard application voltages by distribution transformers located near the customer's premises.

Roseville has a robust distribution system, with approximately 91 percent of distribution feeders being underground and relatively short in length. Compared to other utilities in similar territories, the frequency and duration of an outage in Roseville are low. Two industry accepted benchmarks for outage reporting include:

- **System Average Interruption Frequency Index (SAIFI)**: Index of frequency of outages calculated as the total number of customer interruptions divided by the total number of customers served.
- **System Average Interruption Duration Index (SAIDI)**: Measurement of the duration of outages calculated as the sum of all customer interruption durations divided by the total number of customers served.

Roseville's five-year average (2018-2022) SAIFI and SAIDI indexes are shown in Figure 37.

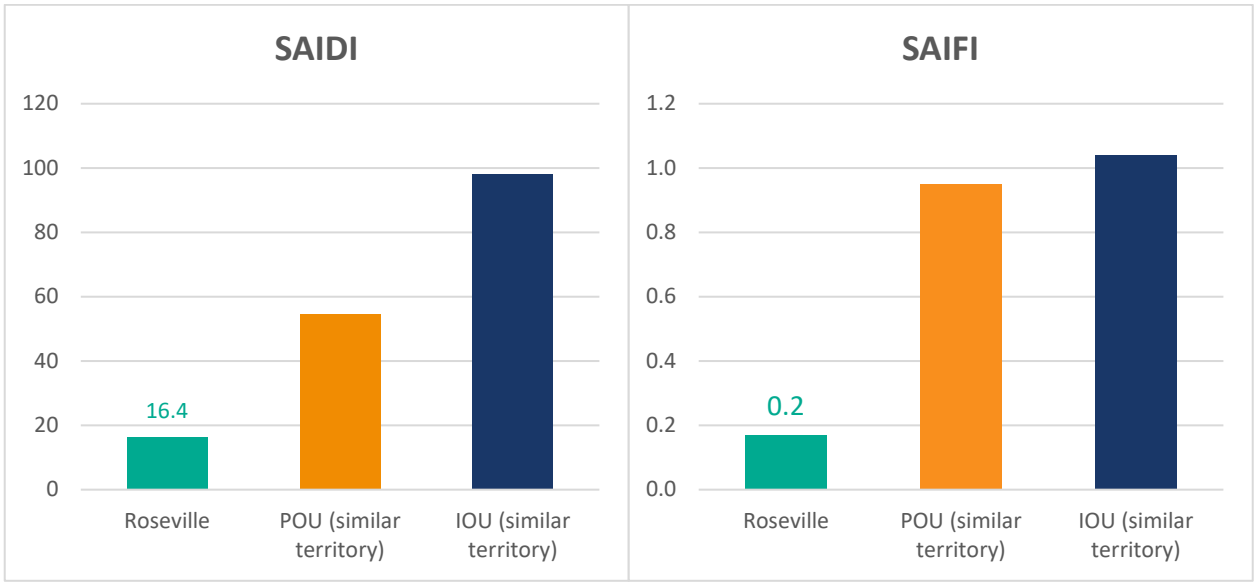


Figure 37: SAIFI and SAIDI Indices

Roseville's five-year average SAIDI is 16.4, representing an average outage duration of 16.4 minutes. Roseville's five-year average SAIFI is 0.17, meaning an average Roseville customer experiences an outage of 0.17 days per year, or once every 5.9 years.

Roseville's distribution engineers annually perform a comprehensive distribution planning study. This plan is the culmination of a variety of efforts aimed at best serving Roseville's customers by balancing a safe and reliable operation of the power delivery system with affordable rates. Activities feeding into the development of this plan are:

- **60 kV Transformer loss contingency analysis**: This study simulates the systematic removal of each of the system's twenty-three 60/12 kV transformers and determines if customer load can be readily transferred to other transformers in the system. Projects are put in the plan for those instances where the load cannot be readily transferred or where moving the load results in system overloads. These projects may include cable upgrades, cable replacements, and other 12 kV system changes, such as new lines, switches, transformers, etc. This comprehensive system-wide analysis is updated yearly to reflect any changes and load growth within the past year.
- **230 kV transformer loss contingency analysis**: This analysis uses network simulation tools to investigate the impact of the loss on the system's main power sources. These are the four 230/60 kV transformers and generation at the REP. The results of this study are used as input for 230 and 60 kV upgrade plans, such as adding lines or a new transformer.
- **60 kV line and breaker loss contingency analysis**: This analysis determines the effect of the loss of any single line or associated hardware. In those cases where two 60 kV lines are run on the same set of poles (double circuit line), the effect of the simultaneous loss of both lines is investigated. The results of this study are used to determine 60 kV system expansions.
- **60 and 12 kV fault studies**: These studies determine the amount of fault current (current flowing when a line is down, or equipment fails) available at various locations throughout the system. This information is used to determine the rating of circuit breakers throughout the system. Fault studies are run as needed, triggered by significant system changes. Over the past few years, fault current levels have risen significantly due to an increase in WAPA's network capacity.
- **Asset condition assessment**: Determines the condition of assets and likely end-of-life by historical failure rates, failure trends, field observations, manufacturer data, equipment loading, and age.
- **Light Detection and Ranging (LIDAR) survey**: This survey determines overhead line spacing and conductor separation. Increased loads heat the lines, causing them to sag. Sagging can cause issues with ground clearance. LIDAR is also helpful with vegetation management, ensuring the lines are clear of surrounding vegetation.
- **Load growth projection**: Data from the city's Planning Department, along with information and historical experience is combined to predict likely load growth trends in various parts of the city.
- **Distributed generation impact analysis**: Data pertaining to distributed generation (predominantly customer rooftop solar) is examined to determine how DG affects system peak loading and how it impacts voltage control at the feeder.

By combining information from the various simulations and studies outlined above, Roseville engineers determine the new construction and rehabilitation work that must be completed in order to provide service to new customers and maintain system reliability. This planning methodology provides high reliability and balances infrastructure costs to best meet the customer's needs.

As presented in section 5.1.1 of this IRP, high levels of DER penetration are expected on Roseville's system, particularly roof-top DG solar. Roseville has employed a systematic interconnection process to ensure that customer-owned behind-the-meter resources do not cause adverse impacts on the distribution system. For commercial DG solar systems larger than ten kW, distribution engineers review single-line diagrams; for commercial systems under ten kW, no engineering review is required, with the interconnection application processed by administrative staff.

To date, distribution engineers have not identified any notable impacts or concerns from Photovoltaic (PV) or EV on Roseville's distribution system or substantial reduction in distribution line losses or improvements in power quality. Due to the robust design of Roseville's distribution feeders, future load scenarios show Roseville does not anticipate feeder-level impacts until DG solar penetration reaches at least 40-50 percent of the feeder

peak load. As DER penetration increases, Roseville engineers will continue to utilize complex modeling for distribution system impact studies for incremental installations. Additionally, Roseville's new AMI system will provide increased visibility into the distribution system's performance and localized DER impacts and enable technology to mitigate the distribution system impacts.

6.4 Power Supply

Roseville's generation supply is either wholly owned by Roseville, partially owned via Joint Power Authorities (JPAs), or purchased bilaterally. As shown below in Table seven and Figure 38, Roseville has a diverse portfolio that includes thermal, geothermal, and large and small hydro. Additional resources like solar and wind are contracted where Roseville receives the renewable credit. Under the current retail sales forecast, Roseville has sufficient contracted RPS eligible energy for compliance through 2026.

In addition to resource diversity, Roseville has locational diversity. Roseville's owned generation, the REP and RPP2, are interconnected to the distribution system, providing energy as well as local and system reliability support. Outside of Roseville's territory, several generation projects are licensed and operated by the NCPA. NCPA members jointly own these projects and include various projects located in the CAISO BAA. In response to the Governor's July 30, 2021, Emergency Proclamation, two General Electric TM2500s were installed and interconnected at the REP. The California Department of Water Resources (CDWR) owns both units until the end of the term, where Roseville has the option to purchase them.

In total, Roseville has approximately 320 MW of owned generating resources and long-term contracts. The remaining needs are purchased from the market bilaterally on a forward basis.

Table 7: Roseville's Resources and Attributes

RESOURCE SPECIFICATIONS					ATTRIBUTES				
RESOURCE NAME	FUEL TYPE	TYPE	BAA	NAMEPLATE CAPACITY	ENERGY	CAPACITY	RENEWABLE	GHG FREE	ANCILLARY
REP	Natural Gas	Own	BANC	168 MW	Yes	Yes	No	No	Yes
RPP2	Natural Gas	Own	BANC	48 MW	Yes	Yes	No	No	Yes
WAPA Base Res	Large & Small Hydro	PPA | 4.85% BR	BANC	54 MW	Yes	Yes	Partial	Yes	Yes
Geothermal	Geothermal	PPA | 7.88%	CAISO	8.8 MW	Yes	Yes	Yes	Yes	Yes
STIG (CT2)	Natural Gas	PPA | 36.5%	CAISO	18 MW	Yes	Yes	No	No	Yes
Calaveras	Large & Small Hydro	PPA | 12.0%	CAISO	31 MW	Yes	Yes	Partial	Yes	Yes
South Feather	Large & Small Hydro	PPA | 16.5%	CAISO	20 MW	Yes	Yes	Partial	Yes	Yes
Market Purchase	Varies	-	BANC, COB & CAISO	-					

No
Partial
Yes

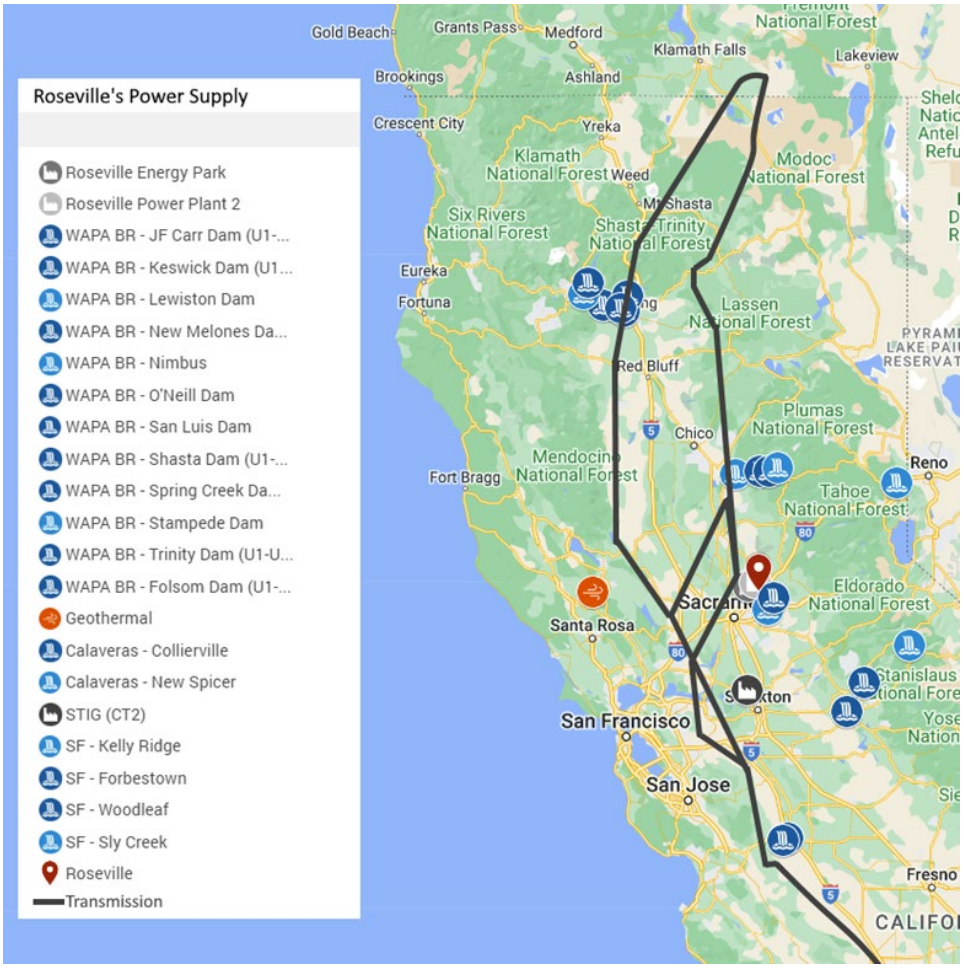


Figure 38: Roseville's Resource Type and Location

Roseville owns and operates a combined cycle power plant and two peaking units within the City and has contractual rights to a peaking unit owned and operated by NCPA that is located in the CAISO BAA.

Roseville Energy Park

The REP is owned and operated by Roseville. REP is a Combined Cycle Generator Turbine capable of 120 MW base load and up to 168 MW when duct fired. REP is a highly efficient natural gas plant. The REP is comprised of two Siemens SGT 800 combustion turbine units and a Siemens SST 900 steam turbine. REP utilizes duct firing within the Heat Recovery Steam. The plant has been in commercial operation since October 2007 and serves as an intermediate load resource for Roseville's power needs. In 2021, REP underwent an A+ upgrade, improving efficiency, lowering the lower operating level, and increasing the full output level. REP is directly connected to Roseville's distribution system, which supports local reliability and provides ancillary services.

Roseville Power Plant 2

RRP2 consists of two simple cycle General Electric Frame-5 Combustion Turbines (CTs) that Roseville purchased from NCPA on September 1, 2010. On that date, Roseville took ownership of two of the five units in the NCPA Combustion Turbine No. 1 Project portfolio, in which Roseville had previously been a project participant. The CTs were purchased to provide local capacity and reserves for Roseville.

The two units each provide 24 MW of capacity for a total of 48 MW. RPP2 is a high heat rate plant. As such, the plant is primarily utilized as a peaking capacity resource, providing energy during peak load. RPP2 is constrained in the number of permitted hours it can run. The daily constraint is 25 combined unit hours with an annual total of 900 combined unit hours.

STIG

NCPA's Combustion Turbine Project No. 2, more commonly known as STIG, is a 49.9 MW steam-injected natural gas turbine generator located in Lodi, which is in the CAISO BAA. STIG's operating range is 35 – 49.9 MW, providing 14.9 MW of ramping capacity. With rights to 36.5% of the output, Roseville receives 18 MW of capacity, 6 MW of ramping capacity, and varying amounts of energy. The energy depends on natural gas and electric market prices and with STIG having a heat rate between REP and RPP2, it primarily serves as a capacity resource and is dispatched against very high market prices. Additionally, like Roseville's other thermal assets,

STIG has a GHG allowance obligation which impacts the economics of its operations. The age and type of unit have made it challenging to find parts and vendors who can repair and maintain the unit.

TM2500

In response to Governor Newsom's Proclamation for the State of Emergency in July 2021, the California Department of Water Resources (CDWR) partnered with Roseville to site two natural gas generators at the REP facility to help meet California's energy requirements during the summer months. Roseville provides the site, interconnection, and dispatches the units when instructed. CDWR owns and maintains the units. The generators are General Electric TM2500s, which have a capacity of approximately 30 MWs each and were installed and interconnected to Roseville's distribution system in just two months.

General Electric states the units can use up to a 75% hydrogen blend, which could help provide a bridge for the increasing carbon-free requirements.

Roseville has contract rights to hydro generation for CVP Base Resource power that is delivered by WAPA, and has contractual rights to the Calaveras hydroelectric project, as well as the South Feather Project. The WAPA Base Resource is in the BANC and Calaveras and South Feather are in the CAISO. NCPA owns and operates Calaveras and has a PPA with the South Feather Water and Power Agency that owns and operates South Feather.

WAPA Base Resource

The CVP includes hydroelectric resources owned and operated by the USBR. The majority of the project is considered large hydro, which are hydroelectric power plants with a capacity rating greater than 30 MW. Large hydro is not regarded as renewable and is ineligible for California's RPS compliance. There are three plants (Lewiston, Nimbus, and Stampede) below the 30 MW threshold and qualify as renewable. These account for about 1% of the total output. WAPA markets the Federal power to qualifying agencies. Roseville is a Base Resource customer under the current contract from 2005 through 2024 and is entitled to 4.85333% of the CVP Base Resource output. Roseville has already renegotiated a new contract beginning in 2025 with an expected allocation of 4.75626%. In an average year, the Base Resource product provides Roseville with approximately 54 MW of capacity during peak summer months and 155 gigawatt-hours (GWh) of annual energy. The amount of capacity and energy supplied in a specific year depends on many factors, including current year hydrology, water storage conditions, environmental flow requirements, first preference customer usage (Calaveras Public Power Agency, Sierra Conservation Center, Trinity Public Utilities District, and Tuolumne Public Power Agency), and energy consumption for CVP project uses, such as water pumping.

Base Resource includes WAPA transmission service and is delivered at the Roseville and Fiddyment substations. With the benefit of 4.85333% of the project's output, Roseville pays 4.85333% of the Power Revenue Requirement (PRR). The PRR includes Operations and Maintenance (O&M) costs, capital repayment, and other costs and revenues for the operations of the CVP.

As party to the Base Resource contract, and in addition to the PRR, Roseville is required to pay 4.85333% of the power customer portion of the restoration fund obligation created by the Central Valley Project Improvement

Act (CVPIA). The purpose of the CVPIA is to protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River basins of California. Restoration charges are determined by the USBR and are now linked to the water contractor's actual receipts.

Calaveras

NCPA's Calaveras project includes Collierville and New Spicer, which combined have a total capacity of 252.8 MW. Collierville is 246 MW and thus is classified as large hydro, making it ineligible as a renewable resource under the California RPS. New Spicer is a small hydro plant eligible as a grandfathered renewable resource with a 6 MW nameplate capacity. In an average year, 4% of the Calaveras output is eligible renewable generation. Roseville has a 12% share, providing 31 MW of capacity and 72 GWh of energy in an average year. Calaveras is located on the Stanislaus River in Calaveras County and is interconnected to the CAISO BAA.

South Feather

In an effort to transition to an even cleaner portfolio and provide additional capacity and dispatchable energy, Roseville purchased from NCPA a 16.5% allocation of the 123 MW South Feather project. South Feather includes four hydro powerhouses, all located in Butte County near Oroville and interconnected to the CAISO BAA. Kelly Ridge (13 MW) and Sly Creek (13 MW) are both eligible renewable resources. Forbestown (41 MW) and Woodleaf (60 MW) are above the 30 MW threshold, so they are not considered renewable but provide carbon-free energy. The project provides Roseville 20 MW and, in an average year, provides 57 GWh, with around 20% being eligible renewable. In exchange, Roseville pays a fixed capacity and energy price.

NCPA operates two geothermal plants in Sonoma and Lake Counties with a combined nameplate capacity of 165 MW. Roseville has a 7.88% entitlement share in the NCPA Geothermal Project and is obligated to pay a like percentage of all of the debt service and operating costs. Traditionally, geothermal plants experience a decline in the steam field, which gradually reduces both the capacity and energy from the project, but continued upgrades and efficiency improvements have kept the output nearly consistent. Currently, the total output of the plants is about 101.3 MW, of which Roseville receives a total of about 9 MW of capacity and 61 GWh of annual energy. These plants are located in the CAISO BAA and Roseville can use this resource, just like other owned plants in the CAISO BAA, for exporting energy into BANC to meet Roseville's load. This resource is a qualifying renewable resource under California's RPS.

In addition to the NCPA Geothermal project and the portion of WAPA CVP qualifying renewables, Calaveras qualifying resources, and South Feather qualifying resources, Roseville has several contracts for renewable energy. These include contracts for wind and solar.

6.5 Markets

Roseville utilizes market energy and capacity purchases to fill any forecasted deficits or leverages economic energy opportunities. Roseville's portfolio approach includes utilizing the 320 MW of owned and long-term contract resources, mid-term firm energy purchases, and short-term market purchases for capacity and energy. Roseville has a robust internal trading, hedging, and credit policy that are followed and constantly evaluating the needs and rebalancing the portfolio as market conditions shift and evolve. In addition, a Resource Adequacy (RA) strategy aids in procuring and selling additional capacity to the market. When capacity is sold to the market, it monetizes the value, saves the customers of Roseville money, and provides reliability to the California market.

6.5.1 Bilateral

The bilateral market is still available, but there is less participation, especially on the day-ahead and hour-ahead timeframes due to the EIM expanding its footprint. This trend of less bilateral participation is expected to continue to decline as CAISO implements its enhanced day-ahead market (EDAM). EDAM is expected to be finalized in late 2023, and its first participants could go live as soon as 2026. It is expected many of the EIM participants will eventually join EDAM.

6.5.2 Energy Imbalance Market

Roseville successfully entered the CAISO voluntary EIM in March 2021 as part of the BANC's phase two effort, which also included BANC members MID, Redding, and WAPA (SMUD joined as part of phase one in 2019). There are currently twenty-two participants in EIM. The purpose of the EIM is to expand the footprint in real-time to economically utilize generation to meet changing grid conditions at fifteen and five-minute intervals. This is accomplished by CAISO's full network model that includes topology and system characteristics to determine the optimal economic decision while supporting renewable growth.

Figure 39: Western EIM Participants as of 2022

In order to participate in the EIM, the following resource sufficiency tests must be met at the BAA (BANC) level:

- **Balancing Test**: Loads and resources are balanced within 1% prior to the operating hour.
- **Bid Range Capacity Test**: Sufficient bids are available to meet positive and negative imbalances between the base schedules and the CAISO load forecast.
- **Flexible Ramping Test**: Resource ramp capacity is available to meet both flex up and down requirements. The ramp requirement is the load variability due to the load forecast error, Variable Energy Resources (VER) forecast changes, and historical assessment of ramping needs.
- **Feasibility Test**: Ensures that there are no transmission violations in the DA and RT market.

If the test is not met, the BAA cannot participate until all four tests pass. BANC has only had one hour where it was locked out of the EIM and quickly made adjustments to regain participation.

Roseville has realized a net benefit from joining the EIM. An average month, including bid cost recovery is around $300k.

6.5.3 Extended Day-Ahead Market

The CAISO's EDAM is a continuation of the EIM that extends into the day ahead. EDAM's goal is to improve market efficiency by using day-ahead unit commitment and scheduling. Conceptually EDAM should improve economics by optimizing unit commitment in the day-ahead across a larger footprint, providing operational and capacity benefits. In addition, EDAM should improve reliability by providing confidence in transfers and improving operational coordination. EDAM should also reduce GHG emissions by allowing greater integration of renewables. EDAM is voluntary, with an expectation to go live in 2026. Roseville has been following the EDAM developments, continues to evaluate, and is expecting to proceed if the BANC benefits and costs study shows value for the BAA and its members.

7 System and Local Reliability

The reliability finding of this IRP is that growing intermittency from DG drives increasing needs for flexible and responsive resources. California's AB 32 and SB 100 were a landmark shift in state energy policy, resulting in the rapid implementation of large quantities of grid-scale renewable energy technologies. The rapid adoption of grid-scale solar and policies subsidizing solar have helped drive cost reductions in solar equipment and made residential solar more attractive to Roseville's customers, further accelerating solar energy growth. Wind and solar resources have provided significant environmental and air quality benefits but have created ramping and flexibility challenges due to their intermittent nature.

7.1 Capacity

California has experienced capacity constraints with increased peaks, the recent drought, and natural gas plant retirements. To mitigate capacity shortfalls, the CAISO and the CPUC are taking a two pronged approach that includes increasing the planning standards so utilities must have greater levels of capacity and reassessing various generation technologies to ensure their Effective Load Carrying Capacity (ELCC) is aligned with their ability to output when needed.

Roseville is not under the jurisdiction of the CPUC or the CAISO, therefore, does not have a prescriptive RA obligation. However, Roseville does have peak capacity needs and plans for it using the capacity guidelines developed by BANC. Roseville has resources that reside in BANC and the CAISO. The CAISO located resources meet the CAISO RA program requirements as well as BANC's guidelines.

Figure 40 shows Roseville's capacity and reserve capacity requirements for 2023-2035. To increase reliability, Roseville adopted new procurement targets that increased the flat 15% reserve margin to 15% in the shoulder

months (October - April) and 17.5% in the summer months (May – September) when in the current year and 20% reserve margin in the summer months when more than a year out. The driver behind the decision was to enhance reliability and, with the higher reserve percentages, account for the variability in near-term weather.

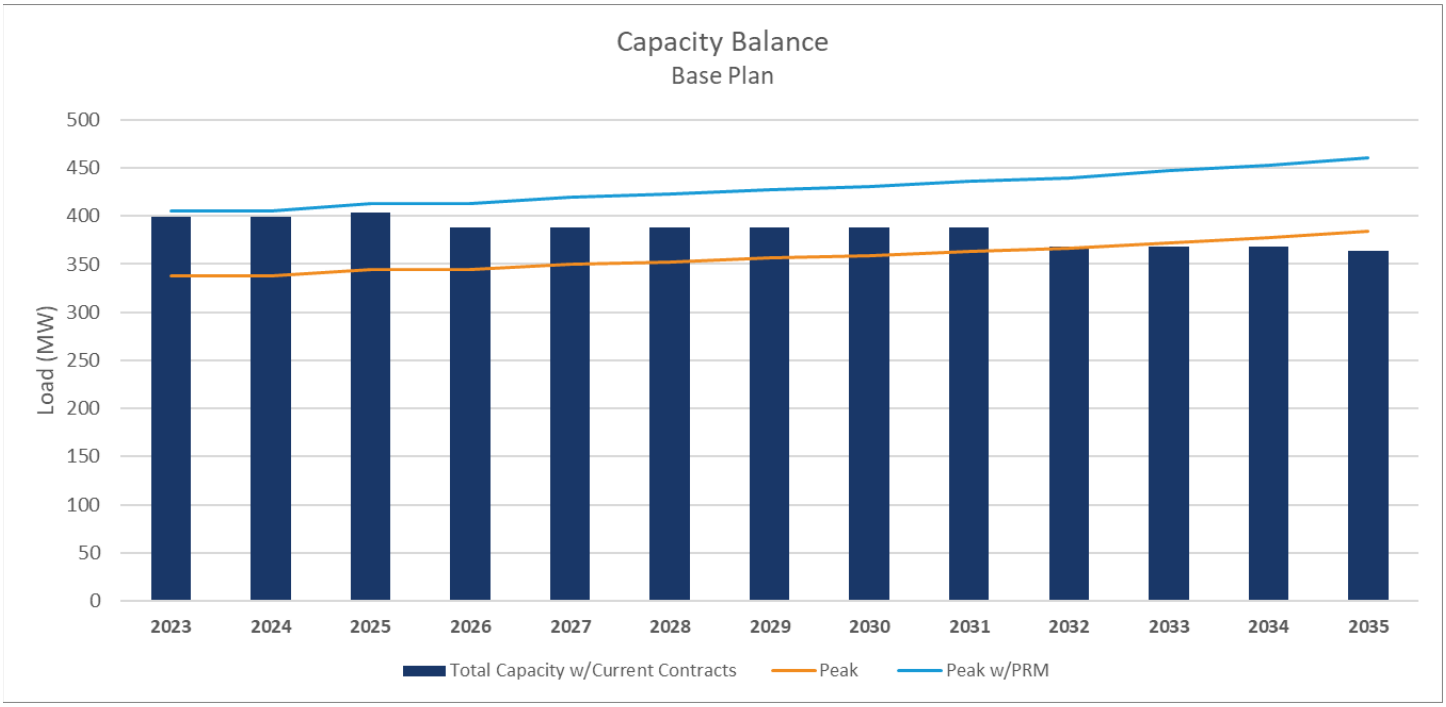


Figure 40: Peak Capacity and PRM with Current Resource Stack

As illustrated in Figure 40, Roseville is just short of meeting the new, higher peak Planning Reserve Margin (PRM) in the near-term but is expected to lose capacity in 2025, creating a PRM shortfall. By 2035, up to nearly 100 MW of capacity is needed to meet the PRM.

At the monthly level, we show that barring any outages, the majority of the months' baseline requirements are met with the current resource stack. However, when including the PRM, which is good utility practice, Roseville's portfolio shows a shortfall from June to September. In order to reduce customer rates, Roseville monetizes surplus capacity by selling it to the market during periods when Roseville does not need it.

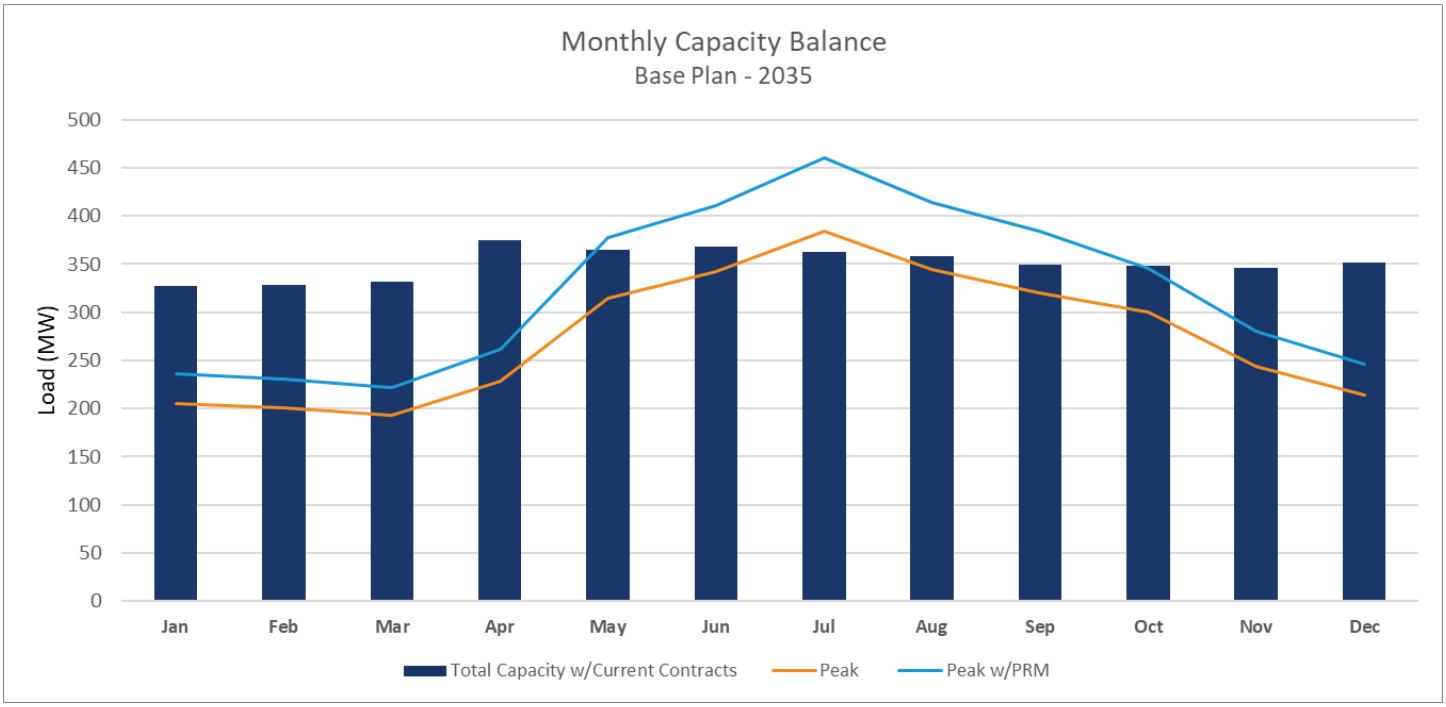


Figure 41: Monthly Peak Capacity and PRM with Current Resource Stack in 2035

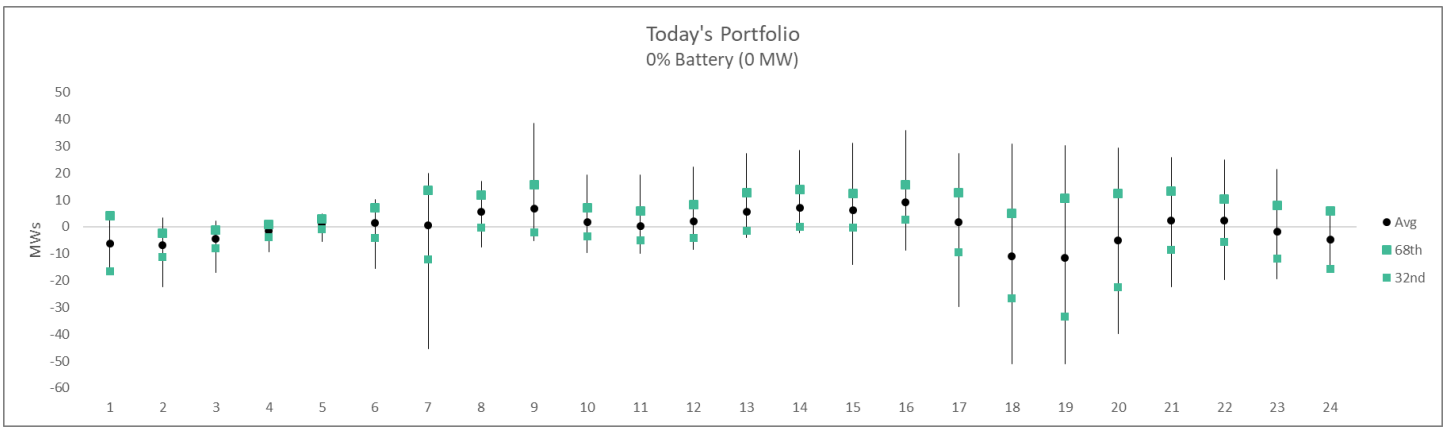
Section nine outlines portfolio options and analysis to meet this need.

7.2 Ramping Requirements

Noted in the previous section, Roseville's distribution system has a sizable number of rooftop solar systems, which have been further accelerated due to the implementation of ZNE home standards.

To quantify the intermittency and flexibility challenges, Roseville developed a robust model that includes the hourly load forecast and the current resource mix with the optionality to add scalable generic twelve-month by twenty-four-hour generation profiles for all resources studied in this IRP. Inputting the load scenarios and resource side portfolios, the model calculates an average flex ramp requirement along with some statistics around the minimum, maximum, and standard deviations. The values do not account for interruptions or unforeseen, out of the normal circumstances, like outages, intermittent cloud cover, and abrupt changes in the wind.

As shown in Figure 42, there are timeframes with sizable hourly ramping requirements. For hour ending nineteen, on average, 11 MW of flex down is required to meet Roseville's need. In other words, a controllable resource (battery, thermal unit, or hydroelectric) has to move 11 MW down in one hour daily to meet expected needs. The maximum down movement seen for that same hour is 51 MW. In order to keep reliability high and cost low, the proper resources will need to be layered in to not compound the issue. This model was utilized to guide resource portfolios that suited customers' load requirements and generation profiles.



		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Today's Portfolio	Max		3.3	2.3	2.3	4.8	10.1	19.9	16.9	**38.4**	19.4	19.4	22.3	27.4	28.6	31.3	35.8	27.4	30.9	30.3	29.3	25.9	24.8	21.4	
	Avg	-6.2	-6.9	-4.6	-1.4	1.0	1.5	0.6	5.6	6.9	1.7	0.3	2.0	5.5	6.9	6.0	**9.1**	1.6	-10.9	**-11.5**	-5.1	2.4	2.3	-2.0	-4.8
	Min		-22.4	-17.1	-9.4	-5.5	-15.5	-45.4	-7.4	-5.2	-9.7	-9.9	-8.5	-4.1	-2.3	-14.1	-8.8	-29.8	-50.9	**-51.0**	-39.9	-22.5	-19.7	-19.3	
	1 SD	10.3	4.4	3.3	2.4	**2.0**	5.6	12.9	6.0	8.9	5.3	5.6	6.3	7.1	6.9	6.4	6.4	11.2	15.8	**22.0**	17.4	10.9	8.1	9.9	10.8

Figure 42: Ramp Rates under Today's Portfolio and Expected Load Forecast

Roseville's Interconnected Operations Agreement (IOA) with WAPA provides for an intra-hour deviation band of +/-10 MW. This band serves as a regulating capacity for Roseville and other WAPA interconnected customers. There is no financial settlement for deviations within the band. If outside of the band, there is a financial settlement.

A future challenge is the impact of larger and more frequent changes driven by DG growth on both Roseville and the greater WAPA system. There is currently no formal definition in the IOA with WAPA for problematic intra-hourly excursions, but general terms exist for Significant Operational Change[25]. For the purpose of this section, Roseville assumes problematic deviations would risk a Significant Operational Change.

[25] Significant Operational Change is defined as '"any operational change proposed by a party that could reasonably be expected to significantly affect the other party's electric power system or control area or any action taken by the control area operator which may cause a significant change in the way a party operates or must operate its electric power system or control area or the points of interconnection between the parties."

8 Demonstration of Need

Roseville's key challenges over the IRP planning horizon are meeting its RPS requirements, carbon-free requirements, having sufficient and appropriate reliable capacity to meet the peak, ramping, and flexibility needs, while keeping rates affordable. In choosing solutions, Roseville must consider the regulatory uncertainties to ensure long-term resourcing decisions are durable and without regrets.

Surveying Roseville's customers, the collective preferences were towards reliability and affordability. A low carbon footprint was important but tertiary. Our customers' preference was to meet compliance but not exceed.

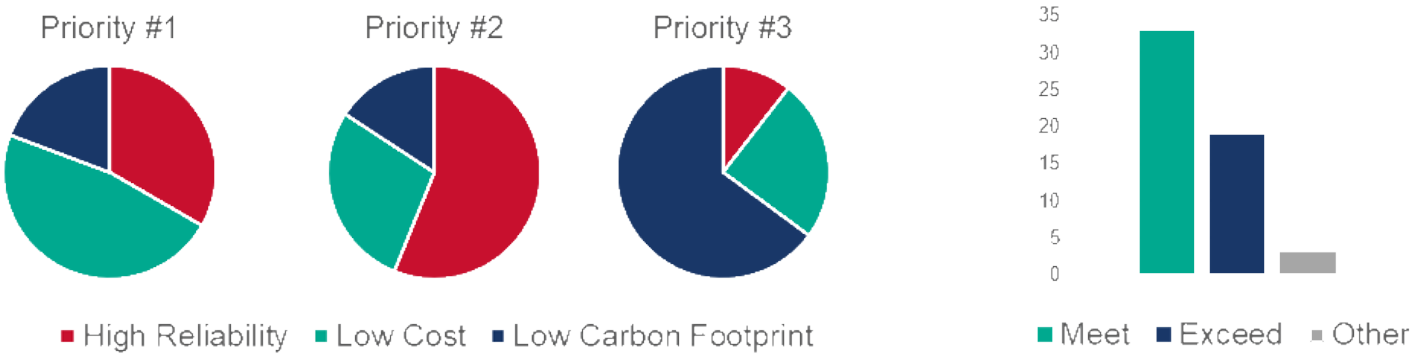


Figure 43: IRP Public Survey Results

8.1 Renewable Energy Requirements

As noted earlier, California continually increases the renewable energy requirement, the latest milestone being the passage of SB 100. SB 100 requires electric utilities to be 60% renewable by 2030 and carbon-free by 2045. SB 1020 requires interim targets. Roseville's IRP will ensure it is on track to plan for and procure "at least 60 percent eligible renewable energy resources by 2030." As requested by the Guidelines, Figure 44 assesses Roseville's renewable energy obligation, procurement, and need on an annual basis. Each year has soft targets, with hard caps on the Compliance Period (CP). The known CPs are listed in Table eight.

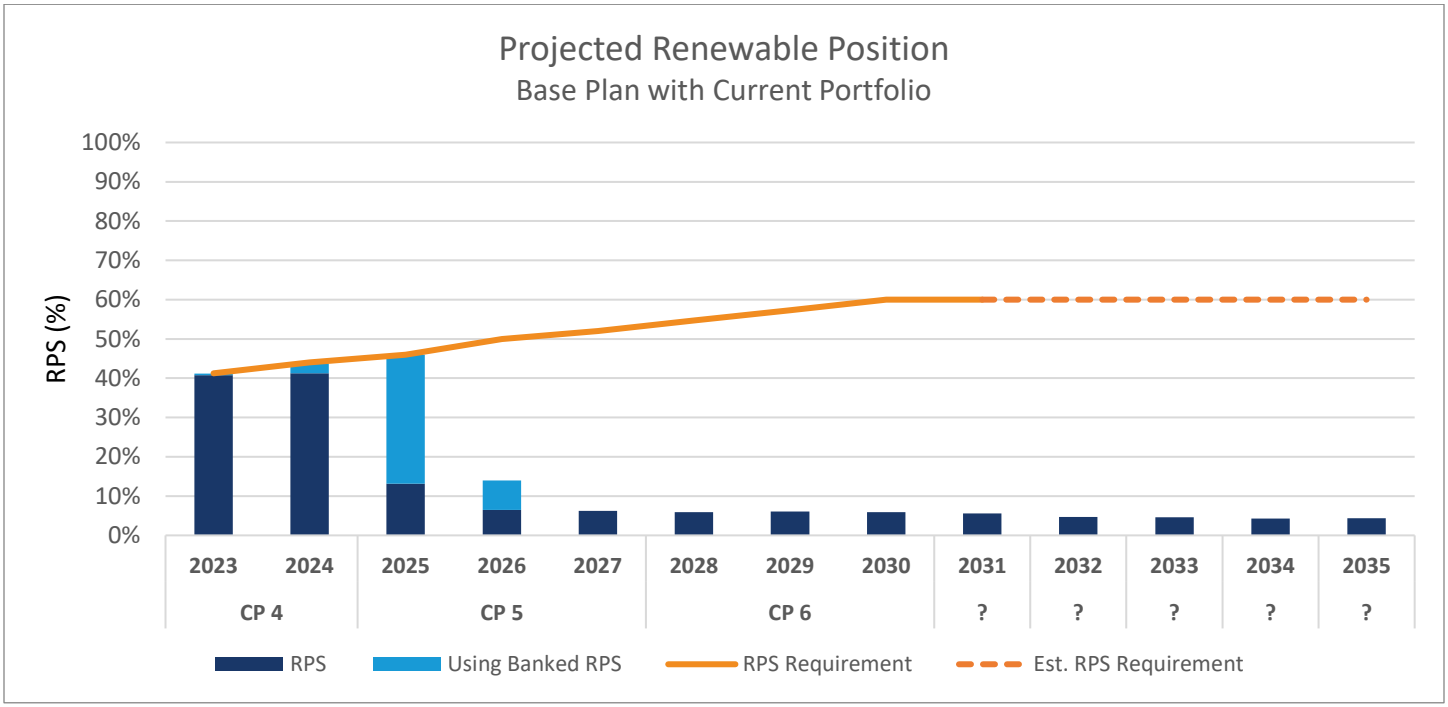


Figure 44: Projected Renewable Position with Current Portfolio

Table 8: RPS Compliance Periods with Years and Minimum Procurement

…	COMPLIANCE PERIOD 4				COMPLIANCE PERIOD 5			COMPLIANCE PERIOD 6			…
…	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	…
	35.75%	38.5%	41.25%	44%	46%	50%	52%	54.67%	57.33%	60%	

Figure 44 illustrates that Roseville has contracted sufficient RPS eligible resources to meet its projected RPS obligation through 2025, which is in CP 5. The majority of Roseville's current RPS contracts end in 2024. Therefore, a number of previously procured, or banked, Renewable Energy Credits (REC)[26] will be applied toward the CP 5 obligation. As shown, Roseville is short in CP 5 and CP 6; therefore, Roseville will need to procure additional RECs. All studied resource portfolios (100% Solar, Solar, Wind, and Balanced) meet the RPS requirement under SB 100.

The forecasted RPS procurement obligation (Table eight) is the minimum procurement needed to meet the procurement requirements for each compliance period. The forecasted procurement target for each compliance period is based on annual retail sales and the POU's established RPS annual soft targets.

Roseville's procurement targets were adjusted to reflect an RPS provision that allows POUs to omit self-generation from the retail sales, lowering the RPS requirement. Specifically, PUC Section 3201(cc) defines retail sales as "sales of electricity by a POU… This does not include energy consumption by a POU, electricity used by a POU for water pumping, or electricity produced for onsite consumption (self-generation)." In contrast, for power source disclosure, PUC section 194(2)(B) defines retail sales as… "total retail sales." Another provision is

[26] Each REC represents the green and environmental attributes of 1 MWh of renewable energy.

grandfather RECs; however, Roseville has no historical pre-2011 procurement carryover. Roseville does have excess procurement from recent CPs, utility-owned, or contracted resources.

Roseville has included its RPS Procurement Plan (Appendix C) and Enforcement Plan (Appendix D) in accordance with PUC section 399.30(a)(2).

8.2 Greenhouse Gas Requirements

CARB's Scoping Plan (reference section 3.2) outlined the GHG emission targets for the state and various economic sectors, including the electric utility sector. The electric sector is responsible for implementing efforts to achieve a sector total in 2030 of 38 MMT CO_2e and 35 MMT CO_2e in 2032.

Similar to RPS, Roseville will need to procure more carbon-free resources to meet the increased requirements. Although Roseville has a clean portfolio, it will not be enough to meet future standards.

Roseville's Low Cost Plan provides an energy mix on the trajectory to meet its share of utility GHG emission reductions. Over the IRP planning period, Roseville's addition of renewable resources, Northwest transmission, specified hydro resources, and demand-side resources are expected to keep Roseville below the known emission target. Figure 45 illustrates Roseville's projected portfolio emissions through 2035. Future changes by CARB targets will be analyzed and addressed in future Roseville IRPs.

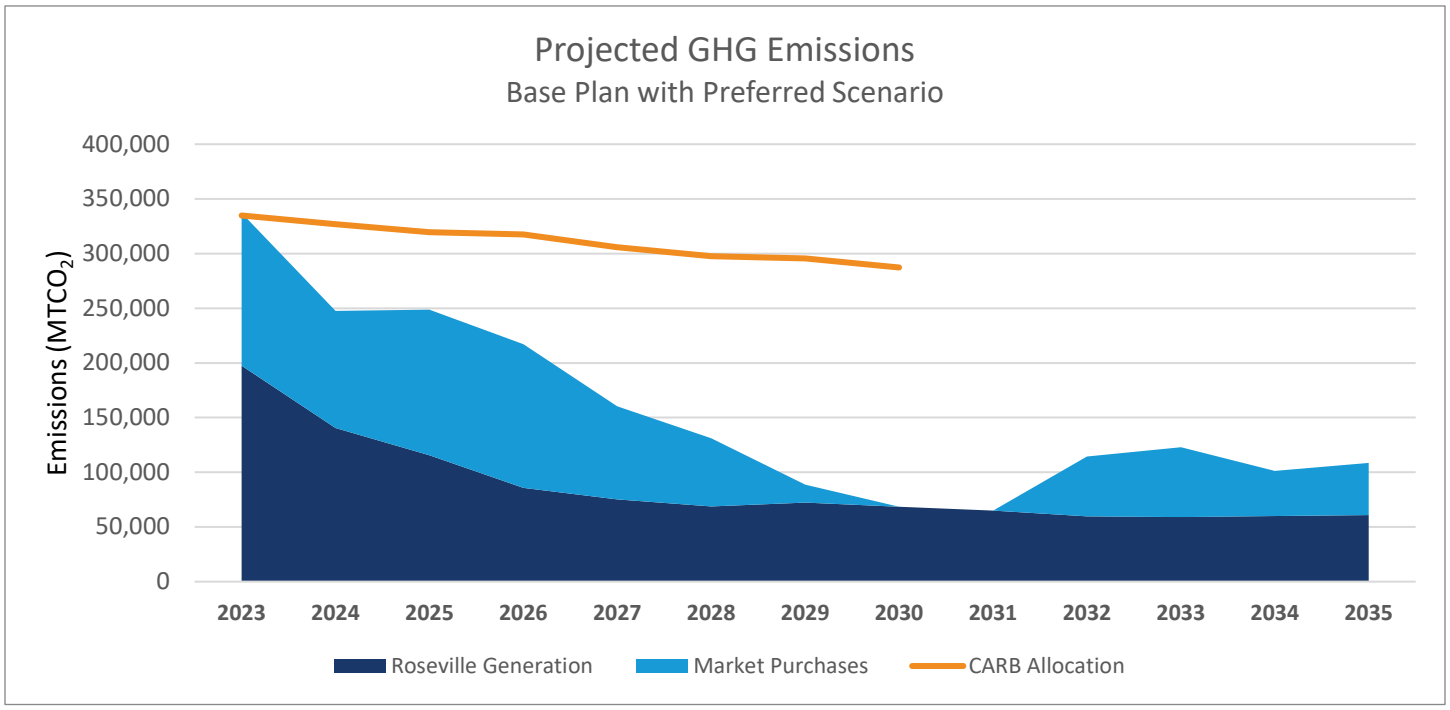


Figure 45: Roseville's GHG Emissions

Roseville does not serve disadvantaged communities as identified in the California Communities Environmental Health Screening Tool (CalEnviro).[27] A disadvantaged community is defined as an area scoring in the top 25 percentile. Many factors result in the overall score, one being low income, which Roseville has. Roseville is focused on ensuring that those customers are not unduly burdened by rising energy costs while still receiving the benefit of reduced local emissions.

[27] https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40

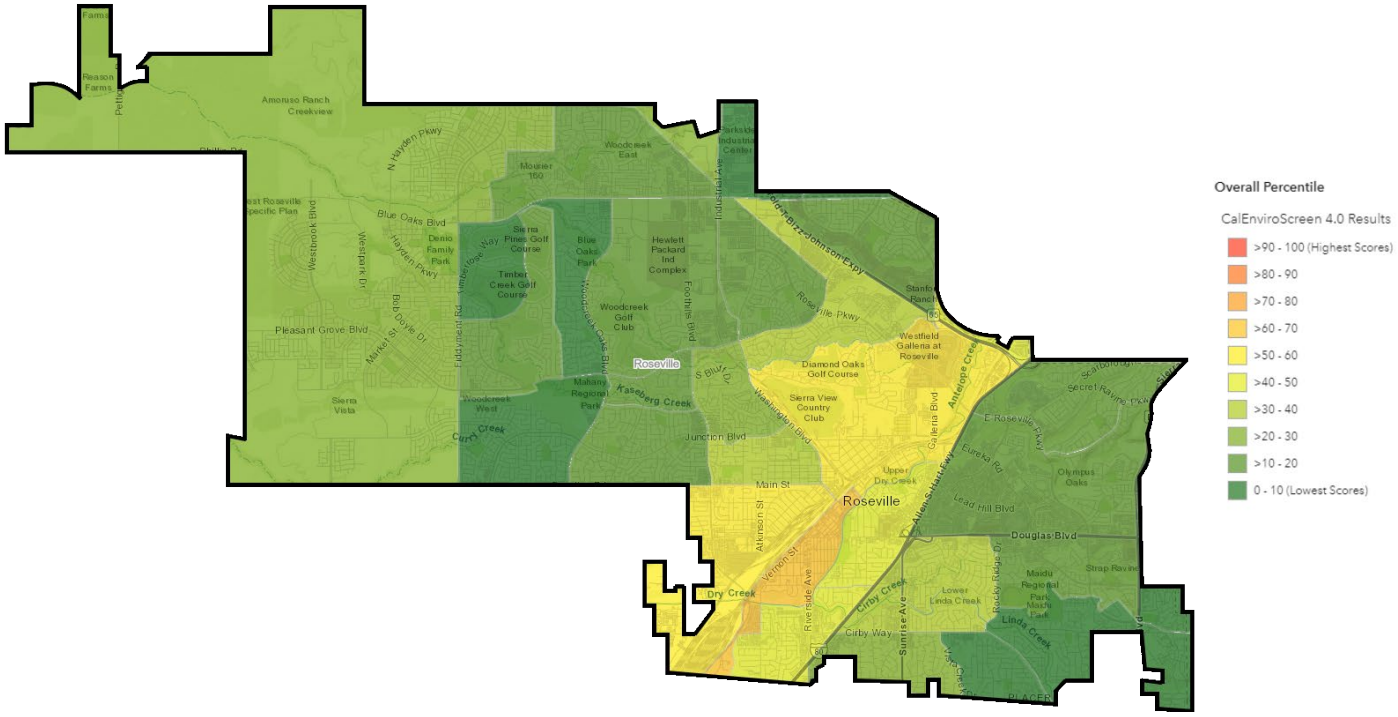


Figure 46: CalEnviro: Map of Disadvantage Communities

Roseville provides its residents with several programs designed to reduce their energy bills, such as shade trees, fans, sunscreen, window replacement, HVAC tune-ups, HVAC and smart thermostats, electric homes, and the bright ideas rebate programs. Roseville also provides a wealth of resources for customers to further reduce their energy bills, including EE workshops, energy consumption audits, and information guides for saving energy.

In addition, some proceeds from Roseville's sales of its directly allocated GHG allowances have been allocated for the benefit of low-income customers. Specifically, proceeds have been used to fund increased bill credits, no-cost EE retrofits for low-income homeowners, and no-cost EE retrofits for multi-family housing such as apartments.

9 Portfolio Evaluation and Results

9.1 Assumptions

A long-term energy market price forecast was developed and addressed in section 4.2.2 to serve as a basis for portfolio analysis. The modeling accounted for all known State and Federal policy regulations and statutes, as well as, expected commodity supply and price trends. The western grid will be in constant evolution over the next few decades to achieve the emission reduction requirements, EE, and EV goals, all the while dealing with increasing intermittent generation.

9.2 Adopted Scenario

To meet the increasing requirements while keeping reliability and rates affordable, a collection of resource portfolios were studied. Multiple resources comprise a portfolio, with selected technologies covered in Appendix B. All portfolios meet today's RPS and GHG compliance targets. The portfolios studied and modeled include:

1. **100% Solar**[28]: All new renewable resources are utility-scale solar.
2. **Solar**: The majority of the new resources, around 70% of the total capacity, is solar. Geothermal, hydro, and wind had similar newly installed capacities.
3. **Wind**: Similar to the Solar portfolio. The difference being wind is the new majority installed resource.
4. **Balanced**: The resource capacity is more equally divided between solar, wind, geothermal, and hydro.

Table 9: Annual Capacity Installation for Each Studied Portfolio

SUMMARY SCENARIOS - BASE PLAN													
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
100% Solar		SOLAR: 25			SOLAR: 75	SOLAR: 80	SOLAR: 40	SOLAR: 20			SOLAR: 40	SOLAR: 10	
Solar		SOLAR: 25			HYDRO: 20	SOLAR: 100	NC WIND: 25			GEO: 10			SOLAR: 15
Wind		SOLAR: 25			HYDRO: 20	NC WIND: 75	SC WIND: 10			GEO: 5			SC WIND: 10
Balanced		SOLAR: 25		GEO: 10	HYDRO: 20	NC WIND: 20	WIND: 10,SOLAR: 25	GEO: 10	NC WIND: 10		HYDRO: 10		

Each resource has an average generation profile, capacity factor, and annual levelized cost of energy. The different load scenarios (Base Plan, Customer Choice, and Electrification) require different sizing and timing of resources. Roseville used a consistent approach of installing generation when needed and building towards a sustainable position by 2035 to meet future requirements. For average generation, the following monthly twenty-four generic resource profiles were used. The shade indicates the times the resource will generate; the darker the shade, the higher the generation. For instance, the solar begins around 7-8 AM and continues some months into 7 PM, with the greatest generation between 11-2 PM.

[28] Under the Base Plan, 290 MW of solar is required. Typically, utility solar requires 6 acres per MW. 290 MW would require 1,740 acres or 2.7 square miles. For reference, Roseville is 44 square miles. That is 4.5% of Roseville covered in solar panels. This is conservative analysis as it does not account for peak or when we need energy, just total annual energy.

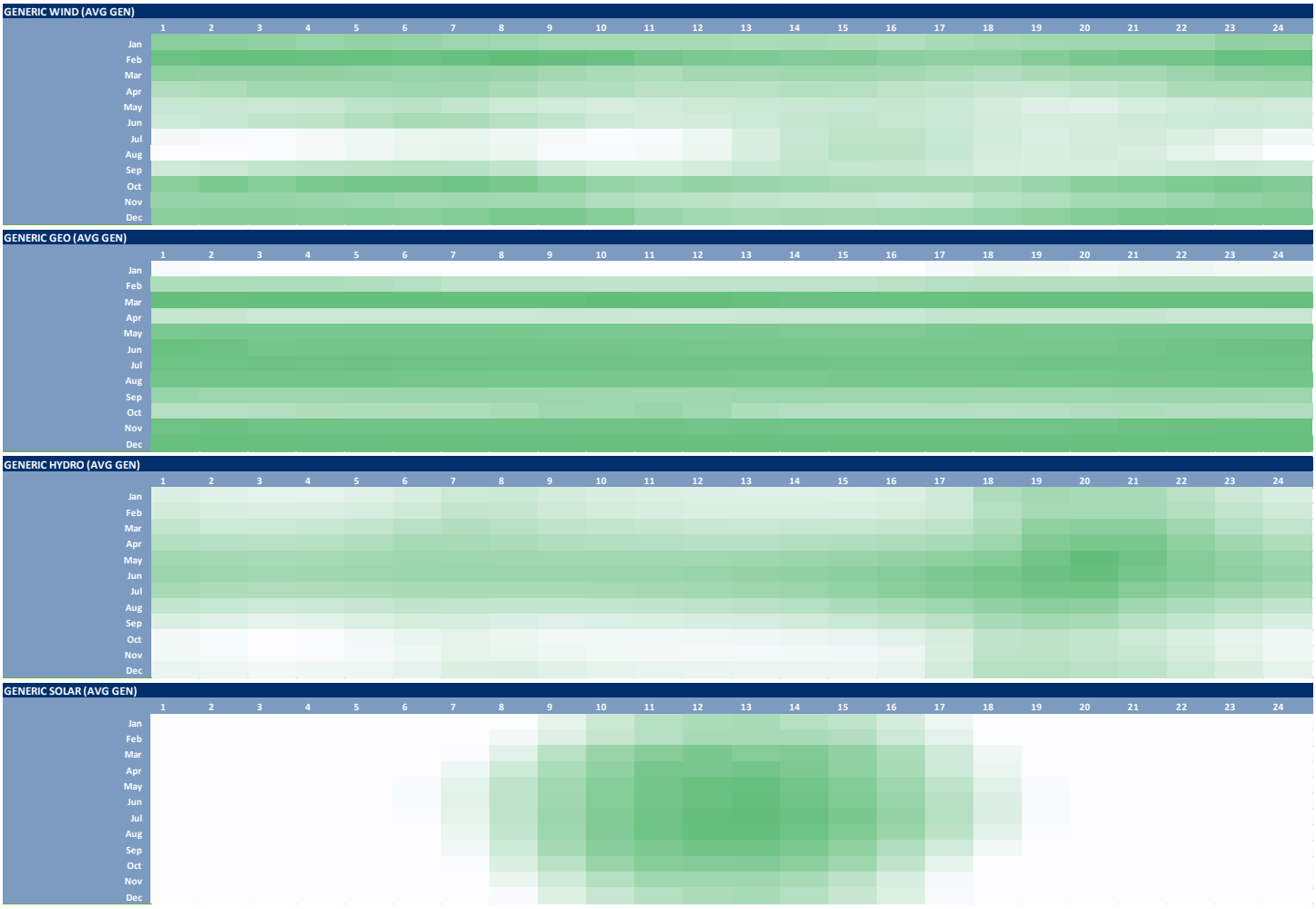


Figure 47: Generic Generation Profiles for Various Resources

The levelized costs were determined from a variety of sources, including actual quotes, recent projects, and available published forecasts from sources like the CEC and Lazard.

Table 10: Levelized Cost of Energy for Various Resources

LEVELIZED COST OF ENERGY												
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Battery ($/kW-mo)	$$	$$$	$$$	$$	$$	$$	$$	$$	$$	$	$	$
Geothermal	$$	$$	$$	$$	$$	$$	$$	$$	$$	$$	$$	$$
Hydro – Large	$$	$$	$$	$$	$$	$$	$$	$$	$$	$$	$$	$$
Hydro – Small	$$	$$	$$	$$	$$	$$	$$	$$	$$	$$	$$	$$
Onshore Wind	$	$	$	$	$	$	$	$	$	$$	$$	$$
Off-shore Wind	$$$	$$$	$$$	$$$	$$$	$$$	$$$	$$$	$$$	$$$	$$$	$$$
Utility Scale Solar	$	$	$	$	$	$	$	$	$	$	$	$
Green Hydrogen ($/mmbtu)							$$$$	$$$$	$$$$	$$$$	$$$$	$$$$

The capacity factor, degradation, and capacity of each studied resource is summarized in Table eleven.

Table 11: Capacity Factor, Degradation, and Capacity of Studied Resources

RESOURCE	CAPACITY FACTOR (%)	DEGRADATION (%/yr)	CAPACITY (MW)
Battery	100%	2.6%	Pmax
Geothermal	85%	2.0%	Pmax
Hydro – Large	90%	0%	Pmax
Hydro – Small	90%	0%	Pmax
Onshore Wind	47%	0%	0 (if paired w/battery, Pmax of battery is used)
Offshore Wind	47%	0%	0 (if paired w/battery, Pmax of battery is used)
Solar PV	28%	1.0%	0 (if paired w/battery, Pmax of battery is used)

Each load scenario and portfolio were scored on the same basis considering the customers' priorities.

These include the overall portfolio cost (section 9.3) and the risk. Regulatory changes significantly impact the portfolios and typically result in fewer options, which impacts rates. To account for the likelihood of certain measures passing and the effect it could have on cost, a qualitative cost risk was also assessed.

Reliability is another primary objective of the IRP. Reliability was scored by assessing the energy production profile, ensuring needs were met with minimal times of over-generation, assessing capacity positions, and the flexible capabilities within each portfolio. In addition, high penetrations of location-based resources like wind and geothermal lowered the reliability due to a lack of geographic diversity, which limits the ability to bring the attributes home in the event of transmission derates, fires, possible congestion, etc.

Resource technology diversity was also evaluated as it allows some shielding or smoothing when events change. Lastly, renewable and carbon-free goals were also considered.

9.2.1 Existing Resources and Strategies

Roseville's portfolio of existing resources were evaluated based on forecasted needs and portfolio fit in the future environment. Some of Roseville's resources and contracts will face critical decisions during this study period, including resource retirement, upgrades, and contract extension, specified below.

Roseville Energy Park

REP is an important resource for Roseville to support local reliability, capacity needs, and serve as an economic hedge against rising market prices. Roseville primarily schedules and dispatches the plant economically to meet its peak capacity and energy requirements versus market opportunities. REP is also used for reliability needs (e.g., voltage support, transformer contingencies) and operating reserves (ancillary services). Model results forecast REP generation based on economic dispatch and estimate 200 GWh/Year from 2023-2035. The generation reduces each year due to market pricing and California's renewable and carbon reduction goals.

REP is a flexible, highly efficient generation asset, capable of ramping up and down quickly to support renewable integration and allow participation in markets like the EIM and EDAM. The market need for greater flexibility will lead to Roseville maintaining REP. The main challenge will be running a natural gas unit in a state with zero-emission mandates. REP has a list of possible upgrades, two of which were studied. The installation of an electric boiler and inlet chillers. The electric boiler would act as energy storage where heat from REP can be stored and utilized to pre-heat the plant, save natural gas, and reduce the potential of thermal damage cycling. Under current operations, the electric boiler was determined to be uneconomical.

The inlet chiller cools the air entering the units, allowing more capacity when temperatures are elevated in the summer months. Modeling results showed the inlet chillers are economical strictly from a capacity standpoint at $10/kW-mo; however, there are better-suited projects that can provide capacity, energy, ancillary services, and carbon-free benefits.

Without REP, Roseville will have difficulty containing costs and meeting reliability.

Roseville Power Plant 2

RPP2 serves as a peaking resource. Similar to historical operations, model results show that RPP2 will run infrequently. While RPP2's energy value is low, the capacity value is high. RPP2 has no debt service and low O&M costs, resulting in a lower capacity cost than the market replacement. RPP2 is interconnected to Roseville's distribution system, which supports local reliability and provides ancillary services. Its ability to quickly start and generate at full load within 20 minutes providing support during contingency events is critical for reliability.

One of the key risks considered in this IRP is RPP2's age and reliability state. RPP2 has legacy components that were replaced and upgraded to increase the plants' start reliability. RPP2 CT2 has generator damage. With forecasted increasing market capacity costs, RPP2 underwent a comprehensive reliability study to determine cost effective upgrades to improve the reliability of these older units. The upgrades included the inspection of both generators and repair of CT2 and other major mechanical components. CT1's maintenance was deferred for further investigation. Roseville expects to continue to invest in RPP2 due to its importance in meeting peak demands and assisting with BAA reliability and stability.

STIG

STIG serves as a peaking resource. The STIG plant is located in the CAISO and is a capacity resource for Roseville to export from CAISO to load in BANC.

The STIG unit is LM 5000 technology, a unit with low market penetration, few spare parts available, and with increasing risk of lack of maintenance support due to service providers no longer being available. NCPA

participating members, including Roseville, are evaluating STIG as it nears the end of its debt service in 2026. NCPA will be performing an investigation into the benefits, costs, and risks of decommissioning the current unit or doing a complete repowering with a state-of-the-art LM 6000 unit. Initial findings indicate that decommissioning costs will be a significant factor due to the estimated high expense.

STIG's value resides in the capacity of the unit. This capacity helps meet Roseville's summer needs and, when not needed in the shoulder months, is often sold to help lower costs. Ideally, Roseville prefers the unit to be in service until the debt ends but also realizes there are challenges with the lack of parts and service. Roseville is researching options of repowering the unit, but realizes that the existing portfolio already includes other, more efficient, thermal units that reside within the BANC BAA.

WAPA Base Resource

Roseville's Base Resource share provides 155 GWh in an average year, which serves an estimated 13% of Roseville's energy needs. The majority of the generation is in the summer timeframe, which aligns with Roseville's needs. With twelve powerhouses located throughout the central valley, the resource provides plant and location diversity. Base Resource also provides capacity and helps meet capacity requirements. This carbon-free resource displaces an estimated 66,000 MT of CO_2 emissions annually from Roseville's portfolio, hedging against carbon allowance costs. This resource also provides around 1% (1.5 GWhs) of eligible renewable credits from the three small hydroelectric plants.

The amount of capacity and energy supplied in a specific year depends on many factors, including current year hydrology, water storage conditions, environmental flow requirements, first preference customer usage (Calaveras Public Power Agency, Sierra Conservation Center, Trinity Public Utilities District, and Tuolumne Public Power Agency), and energy consumption for CVP project uses, such as water pumping. Hydrology also plays a factor in market prices; typically, when hydrology is low, market prices are elevated.

Roseville has committed to extend the Base Resource contract beginning January 1, 2025. The new contract is very similar to the existing one with a few major changes. These changes include a term of thirty years, the optionality to begin a termination process following a rate adjustment or new rate schedule, and WAPA having the right to alter their business practices. Roseville has the option to exit six months before the contract start date and the new Base Resource allocation is expected to be reduced by two percent to 4.756%. There is an opportunity to increase Roseville's Base Resource allocation if a new customer chooses not to join or if an existing customer reduces or terminates their contract.

The WAPA Base Resource is a critical asset moving forward, providing reliable, carbon-free, low cost power. Now that the CVPIA costs are linked to water contractor's receipts, the all in rate is lower and less volatile. The concern comes from monthly and annual fluctuations in generation.

Calaveras Hydro

The Calaveras project includes two hydroelectric powerhouses, New Spicer (6 MW) and Collierville (247 MW). Calaveras supports Roseville's peak capacity needs, is a carbon-free hedge against market energy, and provides around four percent of eligible renewables. Additionally, Calaveras is a highly flexible hydro project providing several benefits to Roseville. The fast start and fast ramping capability enables the resource to provide ancillary services, including regulation. While very flexible, this unit is in the CAISO BAA and does not serve Roseville's system flexibility needs, unless brought home using the high wheeling access charge; however, it can function as a hedge of Roseville's ancillary service requirements. Roseville may also use the capacity of this resource by exporting into BANC to serve Roseville's load. Model results show Calaveras will operate at an estimated 66 GWh in an average year, serving ~6% of Roseville's energy needs. Calaveras displaces an estimated 28,000 MT of CO_2 emissions annually from Roseville's portfolio.

Calavera's debt service is paid off in 2032 when its FERC license expires. The re-licensing process will begin in the mid-2020s. Re-licensing costs and requirements will be a key consideration moving forward with Calaveras, as this asset also provides flexible, carbon-free power.

South Feather

South Feather includes four hydroelectric powerhouses, Forbestown (41 MW), Kelly Ridge (13 MW), Sly Creek (13 MW), and Woodleaf (60 MW). South Feather has the same attributes as Calaveras noted above and is located in the CAISO BAA. Model results show South Feather operating at an estimated 57 GWh, with around 20% being eligible renewable. The energy serves ~5% of Roseville's energy needs. The PPA expires at the end of 2031.

South Feather is a critical resource that provides renewable and carbon-free energy and ancillary services that provide reliability.

Geothermal Project

The NCPA Geothermal Project is located in the CAISO BAA and serves Roseville in energy, peak capacity, and eligible renewables. The Geothermal Project is forecasted to provide five percent of Roseville's energy needs.

A risk to geothermal generation is the fuel. Steamfield production is expected to decline over time, resulting in declining capacity and generation. NCPA has continued to make upgrades and efficiency improvements to limit the degradation. Another risk is the continued addition of solar energy, causing negative midday prices. With geothermal being a baseload unit, it reduces plant economics. To mitigate negative pricing, battery storage is being analyzed to charge during the low priced hours and export under higher priced hours while maintaining renewable and carbon-free attributes.

Transmission

Transmission is vital to move the power from the source to the sink. Roseville's current WAPA contracts provide a low-cost solution compared to the majority of California load-serving entities in the CAISO territory. The route to the Pacific Northwest allows imports of low and carbon-free energy and a hedge to NP15 pricing.

Roseville will continue to contract with WAPA and the Pacific Northwest to keep transmission costs low and less volatile and provide energy options.

9.3 Portfolio Cost and Risks

Power Supply portfolio costs are a significant portion of Roseville Electric's overall budget and can contain the most volatility. Having a portfolio that limits costs and risk is a top priority.

Various load scenarios and resource portfolios were analyzed for cost and risk. The cost only includes power supply's variable expense. It does not include the fixed portion or other department expenses. The variable cost is determined by meeting load, which is dependent on the expected levelized cost of the resources, its fuel costs, O&M if applicable, generation profile, capacity benefits, and market pricing. The 100% Solar profile has the lowest cost; however, to be reliable, it requires additional resources, like battery storage. Once battery costs are factored in to enhance the capacity value and ramping capabilities to the necessary level, the 100% Solar portfolio becomes the highest cost portfolio shown by the dashed dark blue line. It's important to note that batteries only provide support during their charge window. The typical charge window is four hours; therefore, batteries cannot support an event that lasts longer than the four hour window. This would increase Roseville's exposure during sustained high-heat days, such as when Roseville hit its all-time peak on

September 6th, 2022. Additionally, the state of charge, or the maximum and minimum the battery can operate limits its usable range.

Factoring in batteries, the Wind and the Balanced portfolios had the least cost, which is still estimated to be more expensive than today's portfolio.[29]

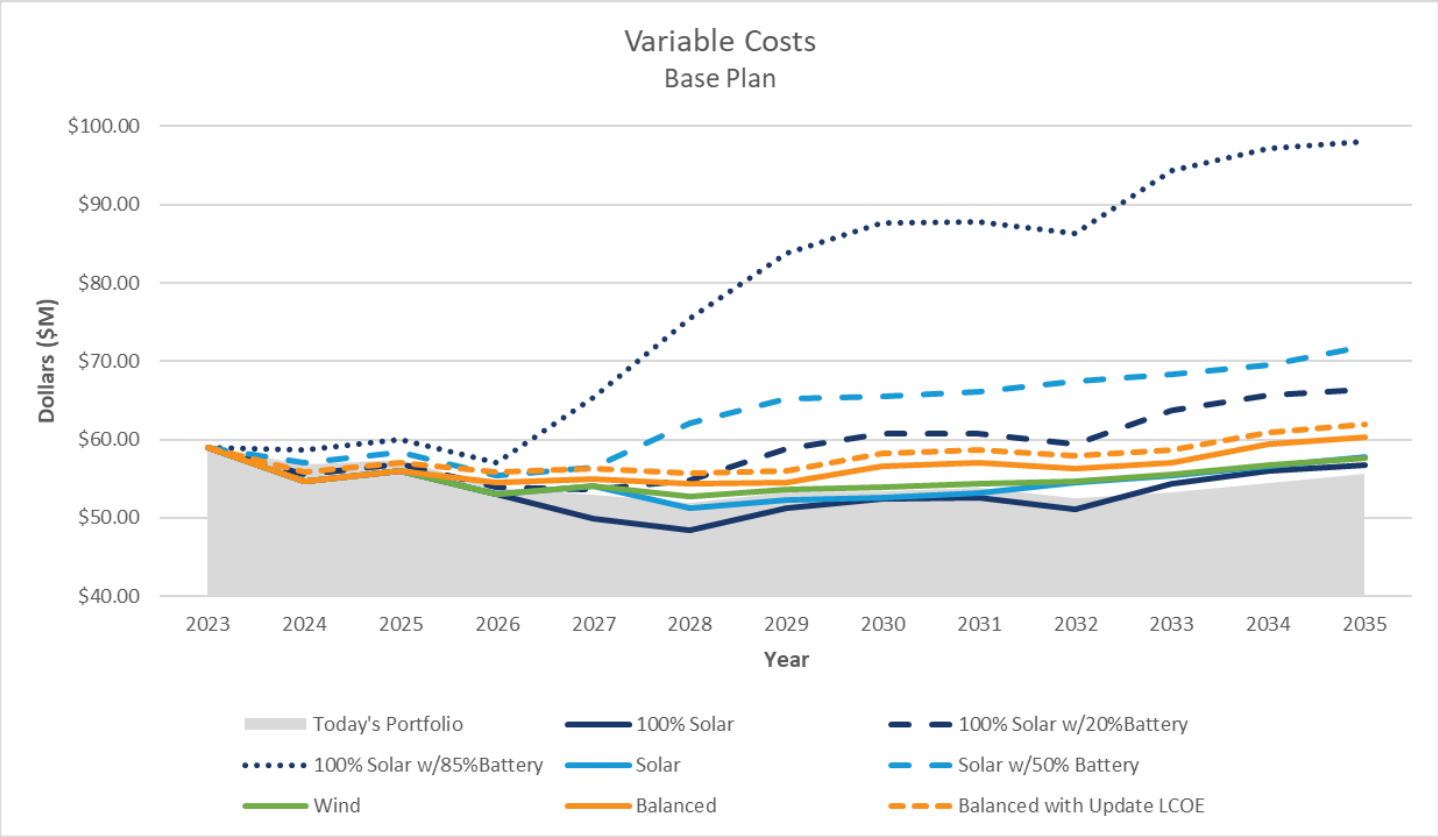


Figure 48: Variable Cost

Converting the above variable cost to an average residential customer,[30] the all-in-rate of today's portfolio would be $0.16/kWh. The 100% Solar scenario would require, at minimum, an approximate ten percent increase in variable costs, and about five percent in total costs. If batteries were included to meet the required reliability it would result in an approximate doubling in variable costs, and overall, a 50% increase in utility rates. With batteries being a key driver to the overall cost, it's essential to only procure what is needed when needed. Using the best available market data as of Q4 2022, the Low Cost Plan or Balanced had between a seven and twelve percent increase cumulatively over the planning horizon. In other words, a one-time rate increase is expected to cover the increased cost.

[29] Today's portfolio does not meet the compliance requirements.
[30] An average residential customer uses 800 kWh per month.

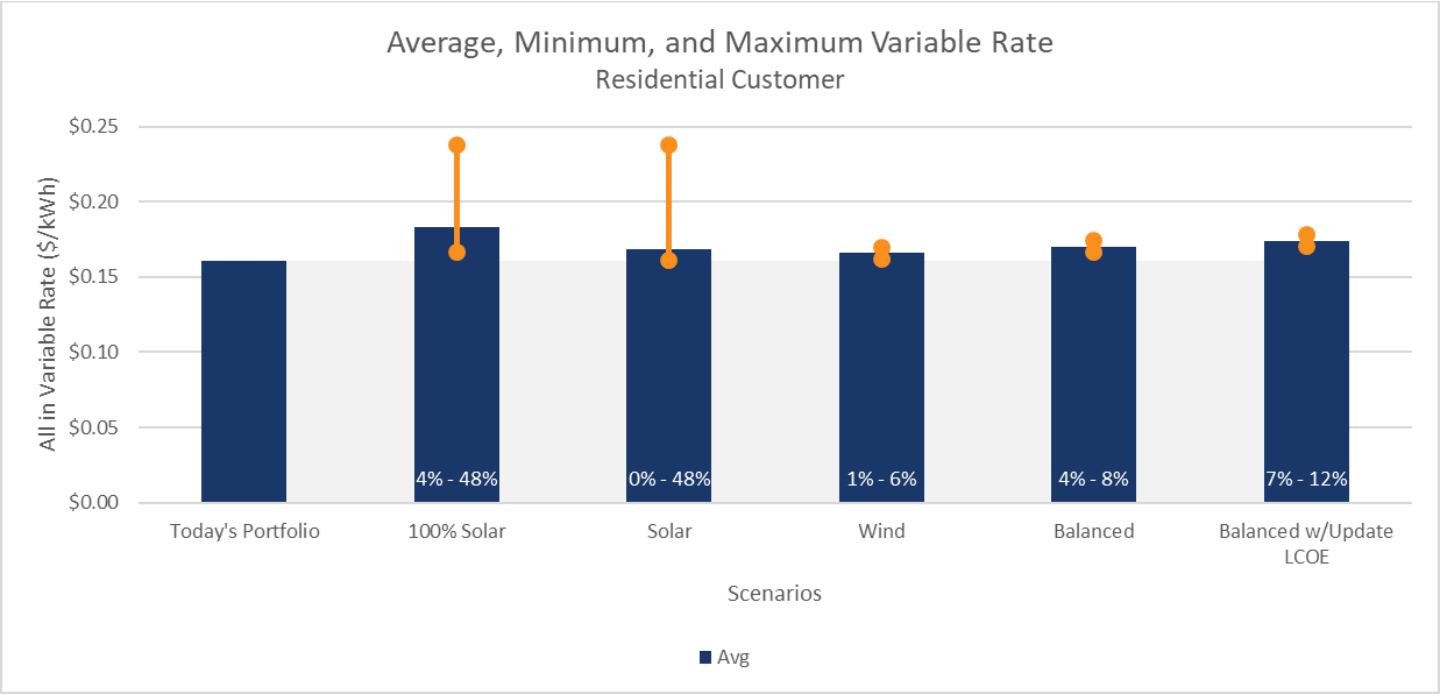


Figure 49: Average, Minimum, and Maximum Variable Rate for Residential Customers

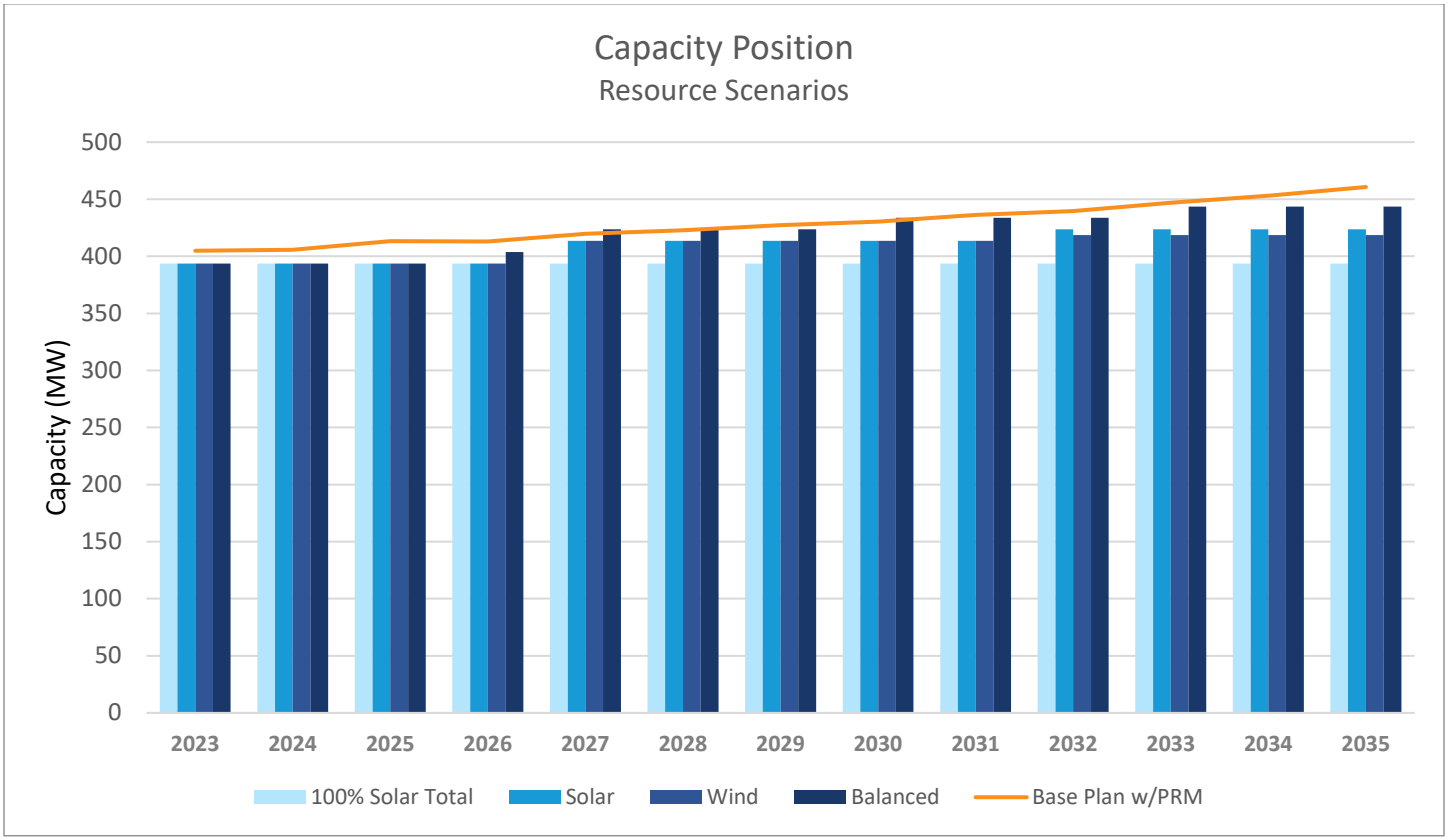
Just like other utilities, Roseville participates in market purchases. The key is to find resources that meet load with little to no over and under generation because this reduces the amount of energy bought and sold on the market.

There is a risk that the market price will increase from the expected forward prices, which is determined by applying the spread between the expected market price and one standard deviation in pricing for times when market purchases are necessary to meet the load. Each load scenario is shown, where Customer Choice has the least risk because of the lowest load, and Electrification is the highest. The 100% Solar had the most significant annual risk under each load scenario. The Least Cost Plan and Wind portfolio had the lowest yearly cost risk under all scenarios.

Figure 50: Cost Risk of Various Portfolios

9.4 Capacity

Capacity is fundamental to ensure reliability by having enough resources to meet the peak need. Figure 51 shows the expected load at 120% planning reserve margin (orange line) and the various portfolios. The Low Cost Plan best meets the capacity needs across the study horizon.



NET	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
100% Solar	11	12	20	19	26	29	34	37	43	46	53	59	67
Solar	11	12	20	19	6	9	14	17	23	16	23	29	37
Wind	11	12	20	19	6	9	14	17	23	21	28	34	42
Balanced	11	12	20	9	0	0	4	0	3	6	3	9	17

Figure 51: Capacity Position across Portfolios

During the 2022 September heatwave, the CAISO had ten consecutive days of Flex Alerts in an attempt to lower the demand on the grid. Roseville reached a new peak of 371 MW on September 6th, which was the day the CAISO issued a press release advising customers to expect rotating power outages. As noted by Figure 52, Roseville's current resources performed well and even assisted the greater California grid, shown by the column of resources being above the load line. This represents excess power was pushed to the CAISO.

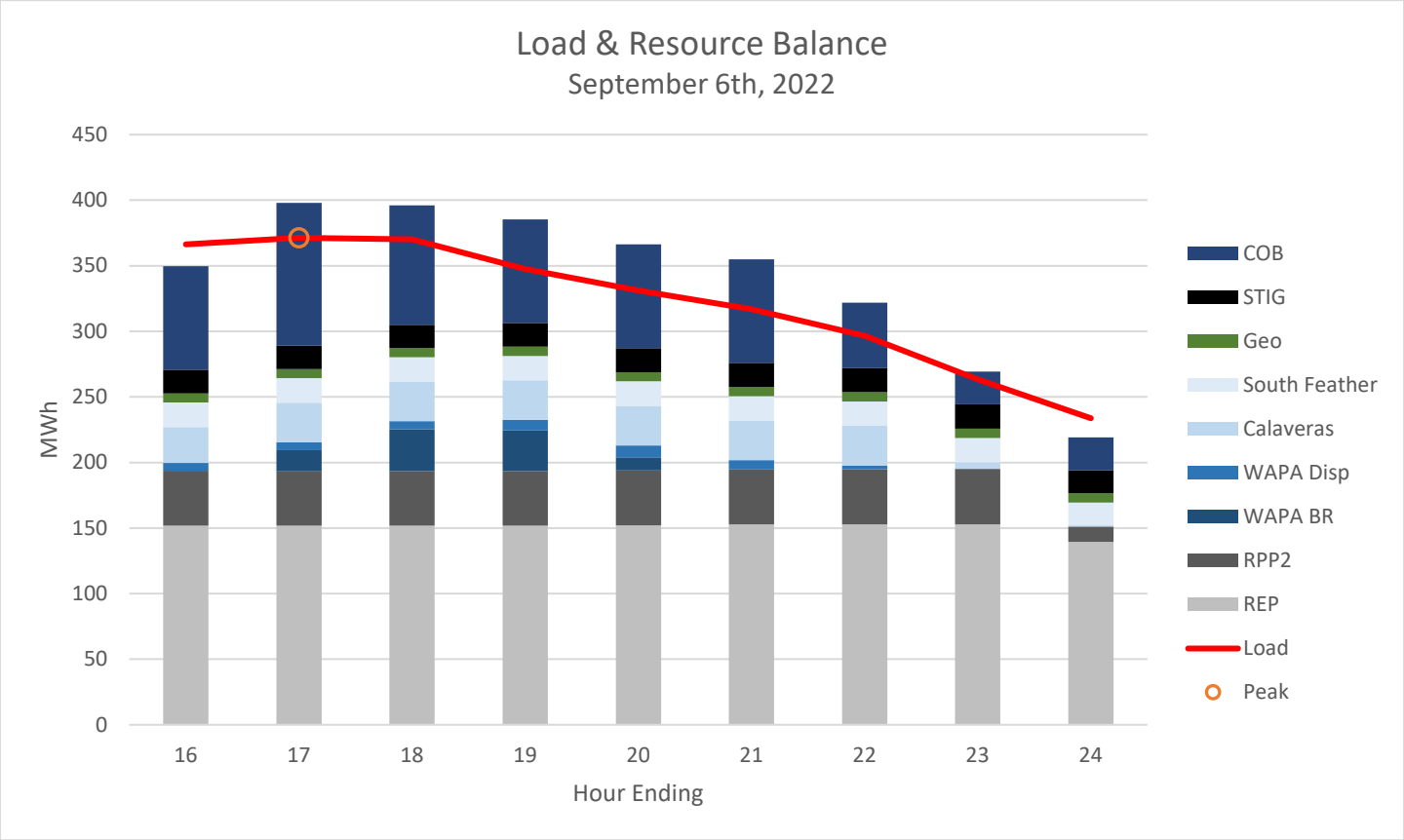


Figure 52: Load and Resource Balance on September 6, 2022

By 2035, Roseville will lose some resources, which will be replaced by the resource mix in the studied portfolios. Evaluating the same event but in 2035 with the studied portfolios, the 100% Solar and Solar portfolios show a shortfall for a few hours, whereas the Wind and Balanced portfolios met all hours of the load. During the 2022 event, it was very challenging to purchase power, so being short would cause rotating outages. If long, you could aid the greater California grid and, in this case, be compensated as high as $2,000/MWh (the 2022 CAISO market cap price). The Wind and Balanced portfolios in that same nine-hour window would have made just under $1M. This actual event shows not only the importance from a reliability standpoint but also from an affordability standpoint.

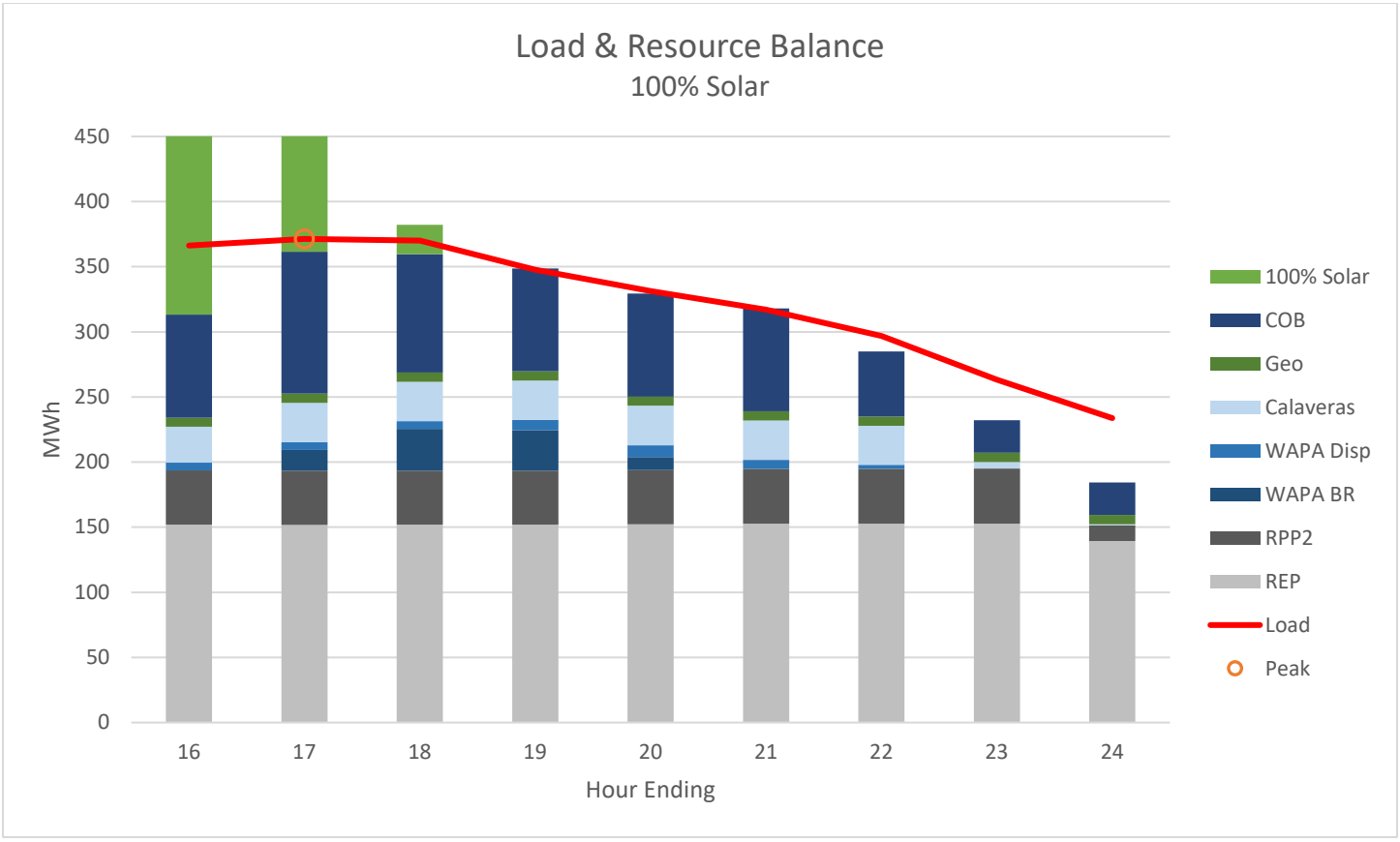


Figure 53: Load and Resource Balance on September 6, 2022, using the 100% Solar Portfolio

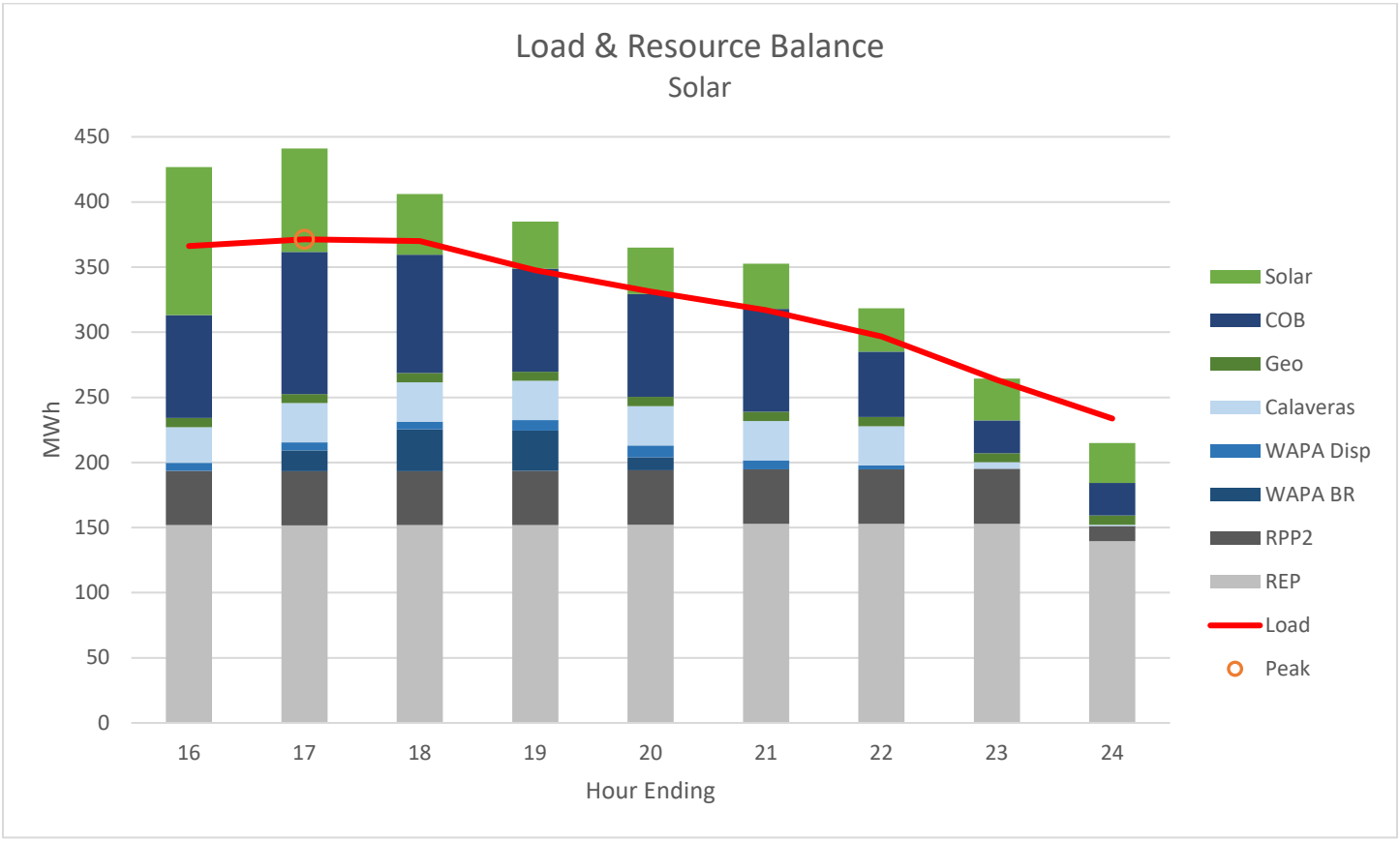


Figure 54: Load and Resource Balance on September 6, 2022, using the Solar Portfolio

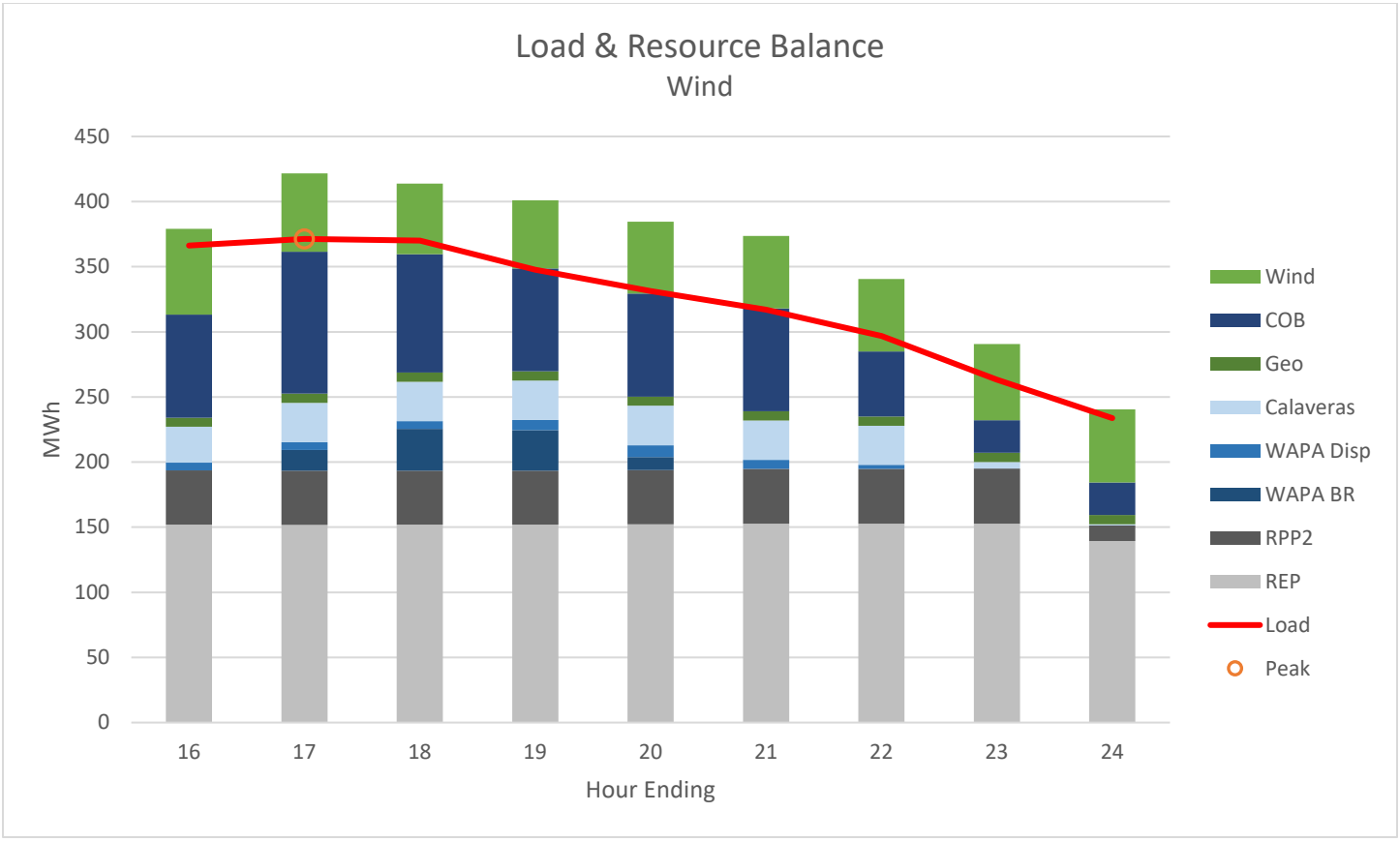


Figure 55: Load and Resource Balance on September 6, 2022, using the Wind Portfolio

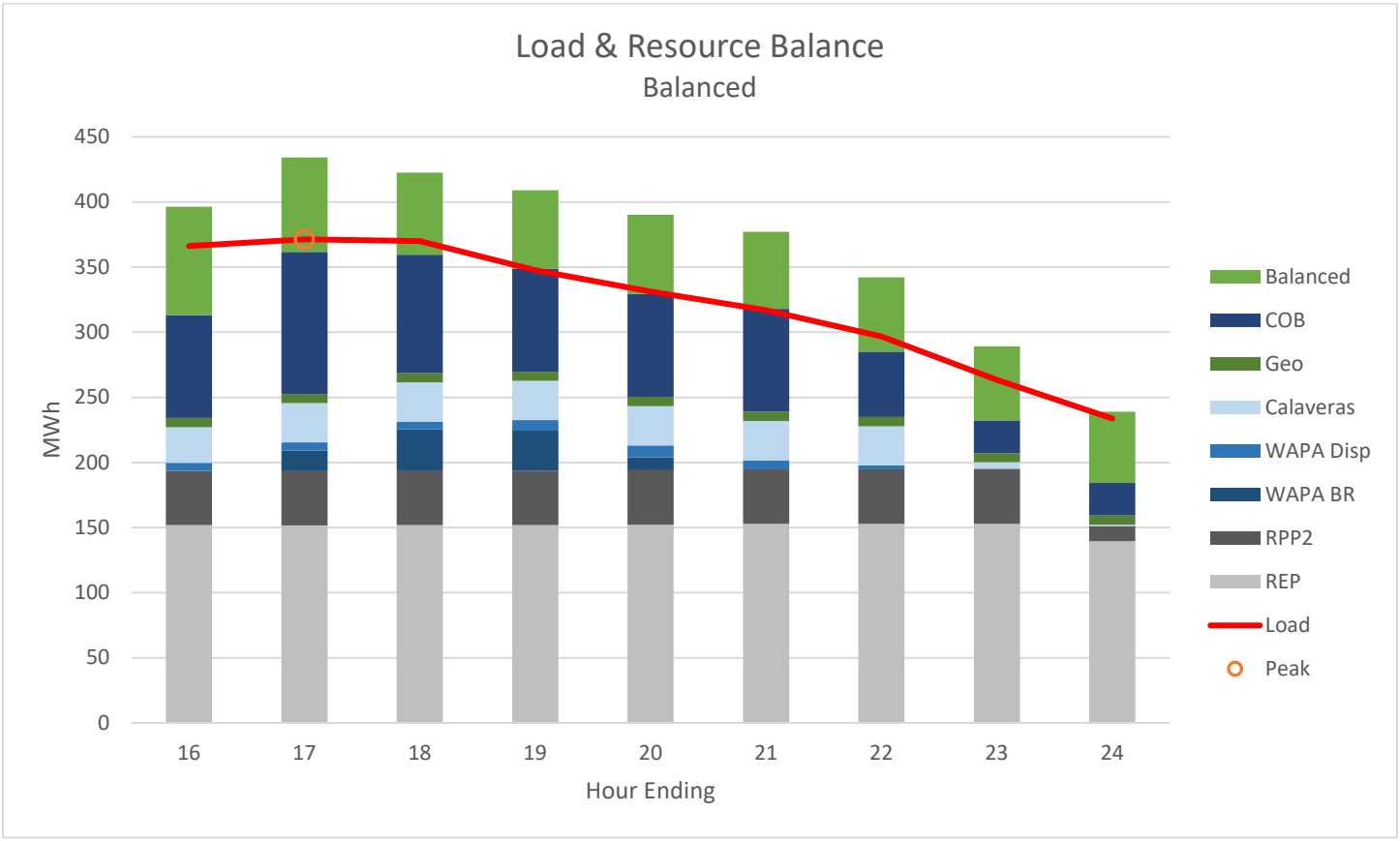


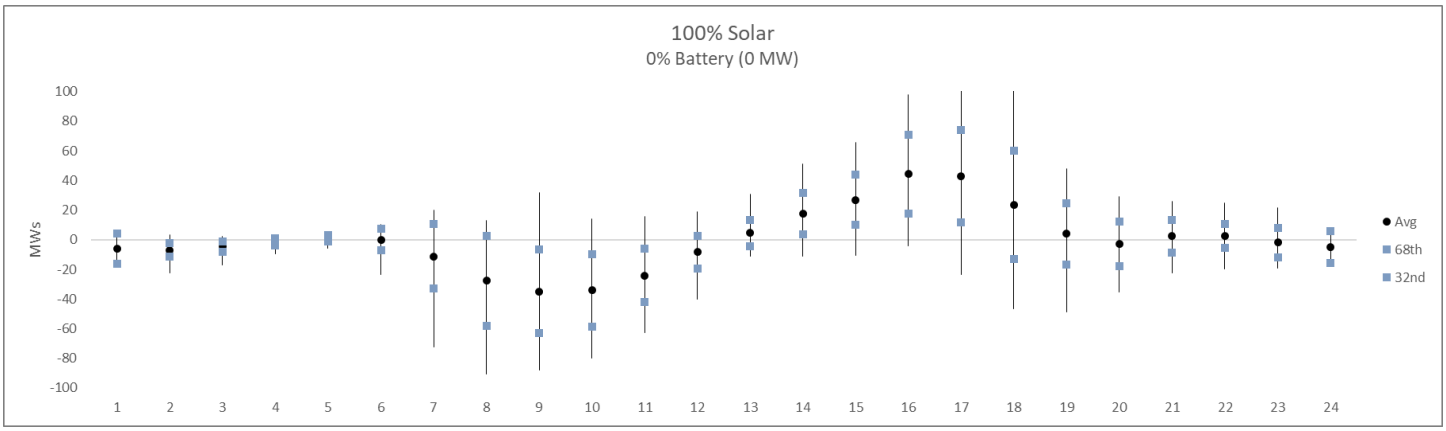
Figure 56: Load and Resource Balance on September 6, 2022, using the Balanced Portfolio

9.5 Flex Ramp Requirement

All resources are dependent on the fuel source. Intermittent resources only generate when the sun is shining, or the wind is blowing. When these resources are not generating, other resources must balance the load and fill the need. This can cause flex ramp requirements, where resources that respond quickly are needed. In order to ensure the reliability of the changing resource mix, flex ramps were studied.

Under certain portfolios, there is a real concern in meeting some of the hours. For 100% Solar, hour ending sixteen, on average, requires 44 MW of upward flexibility. In other words, a fast, controllable resource, like a battery, thermal, or hydro, has to move 44 MW in one hour daily to meet the expected need. In the next hour, another 43 MW of flex up is required. For this portfolio, the immense need is due to a large amount of solar generation falling off at or near the same time.

This is a real concern both for reliability and cost, as you need other resources available, positioned correctly, and ready to move. Economically it also creates challenges, either procuring expensive batteries or having units on standby and available. In addition, there will be extra wear and tear from cycling the alternative resources. To protect the longevity of batteries, a typical contract includes a limitation on the number of cycles per day, most being a maximum of one. In addition, a minimum you can draw the battery down and a maximum state of charge which are below the rated amount.



100% Solar		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Max		3.3	2.3	2.3	4.8	10.1	19.9	13.1	32.0	14.2	15.8	18.8	30.5	51.1	65.8	97.7	102.7	**109.6**	48.0	29.3	25.9	24.8	21.4	
	Avg	-6.2	-6.9	-4.6	-1.4	1.0	0.0	-11.3	-27.7	**-34.9**	-34.0	-24.2	-8.3	4.5	17.5	26.9	**44.2**	43.0	23.5	3.9	-2.9	2.4	2.3	-2.0	-4.8
	Min		-22.4	-17.1	-9.4	-5.5	-23.7	-72.4	**-90.9**	-88.1	-79.9	-62.5	-40.3	-11.1	-11.0	-10.8	-4.1	-23.7	-46.7	-49.0	-35.3	-22.5	-19.7	-19.3	
	1 SD	10.3	4.4	3.3	2.4	**2.0**	7.2	21.9	30.4	28.4	24.5	17.9	11.1	8.7	13.9	16.9	26.4	31.2	**36.4**	20.8	15.0	10.9	8.1	9.9	10.8

Figure 57: Flex Ramp for 100% Solar Portfolio with No Batteries

Another way to visualize the movement is by studying all 8,760 hours in a year and noticing the quick upward and downward movement.

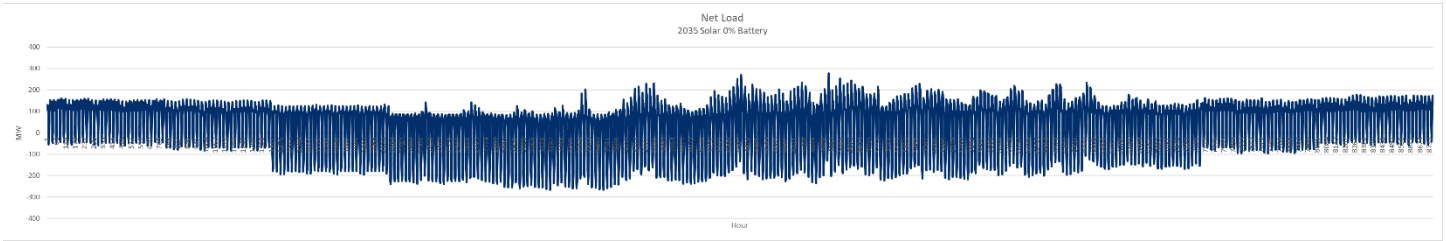
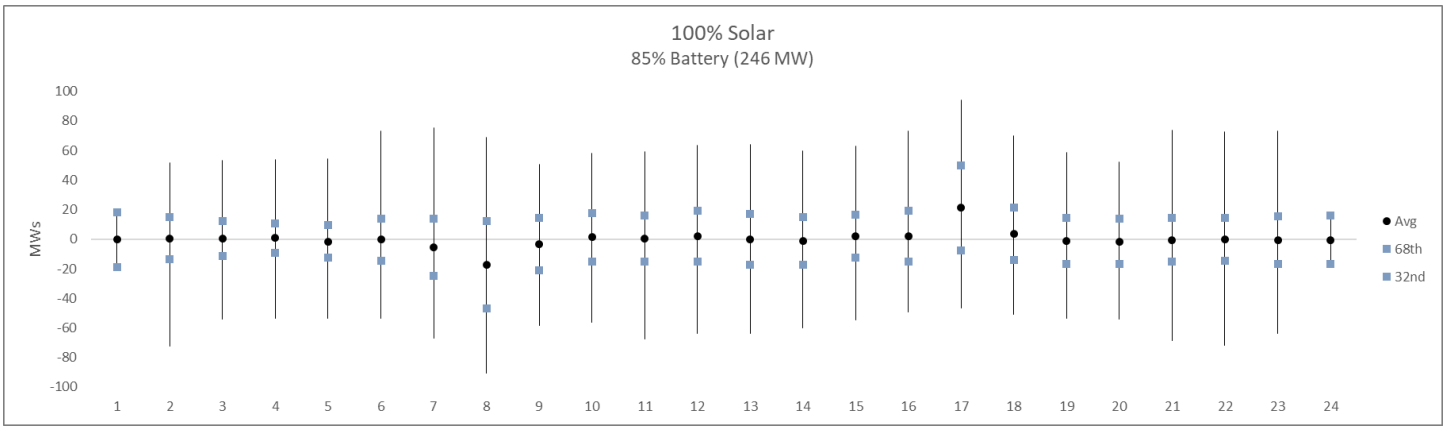


Figure 58: Hourly 2035 Net Load for 100% Solar Portfolio with No Batteries

In order to have an equivalent flex requirement, the 100% Solar portfolio would need 246 MW of batteries. Batteries add significant cost, as noted earlier in section 9.3.



		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
100% Solar	Max		51.8	53.4	53.8	54.2	73.1	75.3	68.7	50.8	58.0	59.4	63.8	64.0	60.0	63.2	73.2	**94.0**	69.9	58.5	52.3	74.0	72.6	73.4	
	Avg	-0.2	0.5	0.3	0.7	-1.5	-0.3	-5.5	**-17.4**	-3.5	1.4	0.2	2.2	-0.3	-1.1	2.0	2.1	**21.1**	3.8	-1.2	-1.6	-0.4	-0.1	-0.7	-0.5
	Min		-72.7	-54.3	-53.8	-53.7	-53.5	-66.9	**-90.9**	-58.5	-56.3	-67.4	-63.9	-63.7	-59.9	-54.8	-49.3	-46.5	-50.8	-53.7	-54.2	-68.5	-71.7	-63.7	
	1 SD	18.6	14.3	12.0	**9.9**	11.2	14.4	19.1	**29.5**	17.6	16.3	15.6	17.2	17.2	16.2	14.7	17.1	**28.9**	17.7	15.5	15.4	14.6	14.7	16.0	16.5

Figure 59: Flex Ramp for 100% Solar Portfolio with Equivalent Ramping

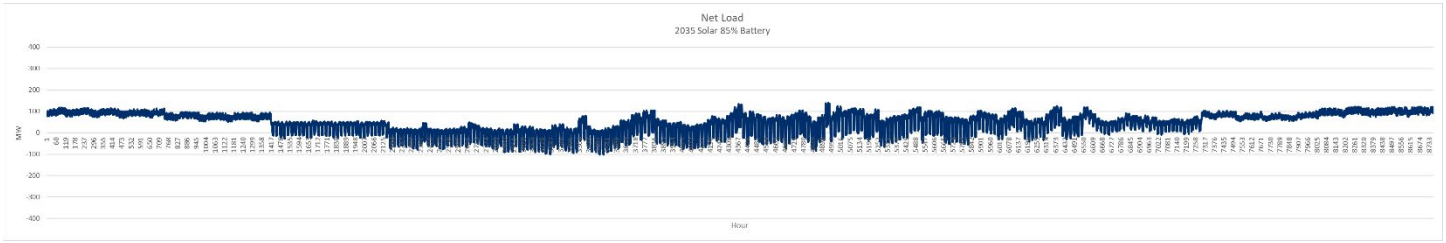
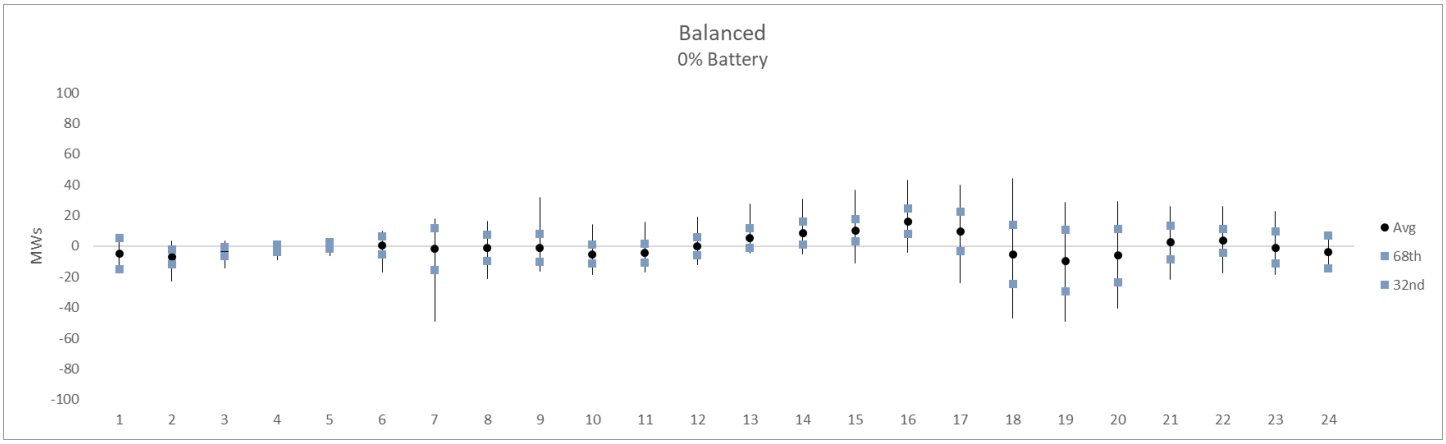


Figure 60: Hourly 2035 Net Load for 100% Solar Portfolio with 246 MW of Batteries

Other resource portfolios showed fewer requirements depending on the generation profiles. For example, with the same load scenario and analyzing the Balanced portfolio, the largest average hourly flex requirement is 16 MW or 40% less than the 100% Solar.



		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Balanced	Max		3.3	3.6	3.4	5.2	9.9	17.6	16.2	32.0	14.2	15.8	18.8	27.5	30.5	36.4	43.2	40.1	**43.9**	28.8	29.3	25.9	26.1	22.6	
	Avg	-4.9	-7.0	-3.6	-1.1	0.6	0.5	-1.9	-1.1	-1.2	-5.3	-4.4	-0.2	5.3	8.3	10.2	**16.2**	9.6	-5.4	**-9.6**	-6.2	2.4	3.6	-1.0	-3.7
	Min		-22.8	-14.4	-9.1	-6.0	-17.0	-49.1	-20.9	-16.1	-18.6	-16.8	-12.2	-4.5	-5.3	-10.8	-4.1	-23.7	-46.7	**-49.2**	-40.5	-21.8	-17.3	-18.6	
	1 SD	10.3	4.6	3.0	2.4	**2.1**	5.8	13.6	8.4	9.0	6.1	6.1	5.9	6.4	7.4	7.3	8.4	12.8	19.2	**20.2**	17.4	10.8	7.7	10.4	10.7

Figure 61: Flex Ramp for the Balanced Portfolio with No Batteries

The hourly generation portrays a similar outcome where the upward and downward flexibility is less drastic and more manageable.

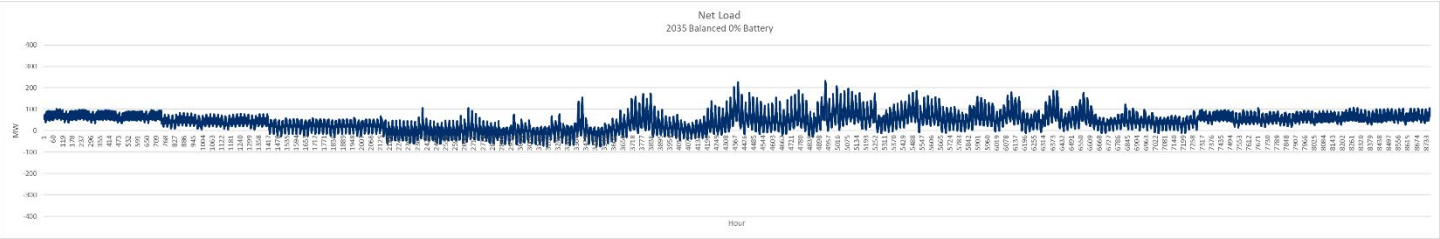


Figure 62: Hourly 2035 Net Load for the Balanced Portfolio with No Batteries

9.6 Diversity

Diversity helps limit risk both locationally and by resource technology. Hydro, wind, and geothermal are location dependent; these resources must be located by the fuel source. Locational diversity is important to limit impacts such as wildfires, transmission line outages, clouds, and weather events. Resource diversity hedge against generation profile, market pricing, and regulatory changes. It's essential not to be reliant on only a few resources. On an energy basis, the Low Cost Plan (Balanced) and Wind portfolio are diverse.

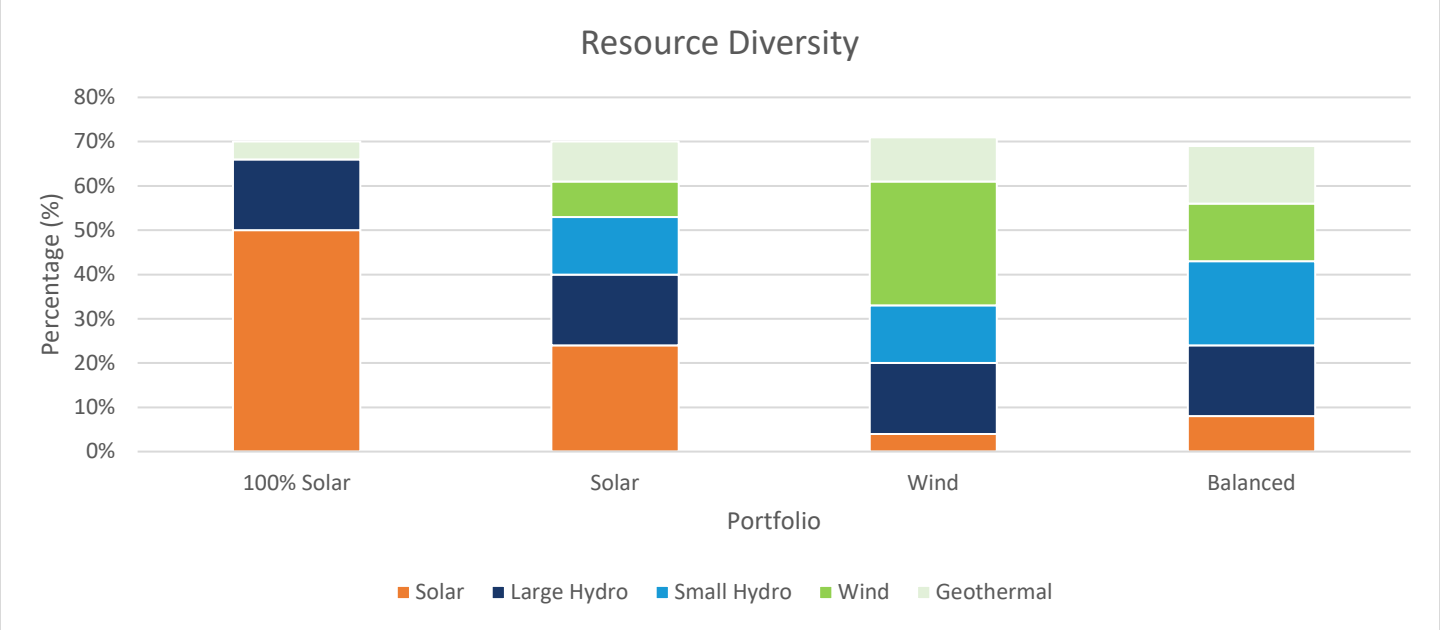


Figure 63: Resource Diversity Across Each Portfolio

Hydro resources are subject to the available fuel, which depends on various factors, such as storage levels, precipitation, snowpack, flood control, and water supply operations. There are risks, so additional runs and scenarios were studied to better understand the exposure.

If fuel levels are low, it can affect capacity and carbon-free generation. There can be instances where additional capacity needs to be purchased to meet proper planning reserves, which increases the cost of serving our customers. The lower generation can affect the renewable position, which can cause an increase in GHG emissions. The reduction is dependent on the year and assumed low hydro amount. Using one standard deviation, the low hydro scenario for the Low Cost Plan had, on average, a ten percent reduction in renewables. If the replacement energy is purchased on the market from non-specified brown energy, it will increase GHG costs but is still expected to be under the current estimates for allowances.

Low hydro also increases the cost and risk. The risk increases are due to more market involvement, estimated at $500k annually. Cost increases are at least $1.75M a year. Market rates will increase when hydro is low, which the modeling does not accurately reflect.

9.7 Green Attributes

All studied portfolios will meet the current RPS and GHG mandates. The analysis backed into the SB 100 renewable requirement and with more renewables, the portfolio is more carbon-free, meeting the latest CARB allowances.[31]

The green scenario had a blend of lower emission gas, either green hydrogen or renewable natural gas, coming online in 2030 with 100% by 2035 outlined in section 4.2.1. Although this may not currently be feasible, the scenario gives insight into the emission profile and estimated cost. The conservative cost of being green ten years earlier than required is over $15M annually, equating to $150M from 2035-2045. This cost excludes potential upgrades of the gas transportation system and/or thermal units.

Environmental compliance is expected to be the largest cost risk to Roseville over the planning period. The carbon allowance market has the potential to increase considerably from the base case market scenario.

[31] Allowance allocations after 2030 are unknown.

10 Conclusion

Roseville's portfolio will need to undergo significant change to meet future requirements. The Low Cost Plan meets our customers' needs and performs best across various load scenarios, providing the primary goals of reliability and affordability while meeting compliance.

The Low Cost Plan best meets all reliability requirements, including capacity, energy, flex, and diversity. The portfolio meets capacity needs and allows for load growth. In addition, it provides the energy requirements on an annual and hourly basis having a combination of resources that match Roseville's load profile. The diverse portfolio allows protection for a changing future with a combination of intermittent and controllable dispatchable resources.

Cost was another key priority of the IRP. With the rapid transformation of required renewable and carbon-free resources, costs are expected to increase. The Low Cost Plan best protects against market pricing and future changes to regulations by having a diverse, flexible portfolio; however, it cannot mitigate all risks. It was identified that batteries, while useful, only provide hours of benefits and are expensive. The Low Cost Plan is expected to increase rates by at least seven to twelve percent over the planning horizon to 2035. Flexibility will be essential to address uncertainties related to limited supply availability, prevailing technology, or timing, which may result in higher rate pressure.

Compliance was also an important factor with our customers wanting to meet and not exceed the current mandates. The Low Cost Plan provides a roadmap to meet both the renewable and carbon-free mandates.

In summary, the IRP analyzed many portfolios under a variety of load conditions. The following key initiatives noted in the Executive Summary will ensure we continue to deliver reliable and sustainable electric service to our community while managing upward pressure to our customers' rates. Those include the assessment of electricity needs, regulatory compliance, resource portfolio, renewable energy integration, cost analysis, reliability and grid stability, and public input.

Developing and designing a portfolio that performs well under all scenarios was the intent of this IRP. This IRP provides a roadmap of what is required, the timing, size, cost, insight on reliability, and risks. As projects become available, Roseville can take action because the needs are known.

An example of what the Low Cost Plan under the expected load could look like. As stated before, the technology, timing, and sizing may not be available; therefore, it is critical to have flexibility in the plan. It's also important to note that the plan and the actual procurement can look different.

The Low Cost Plan under the expected load:

- 2024: 25 MW of Solar
- 2026: 10 MW of Geothermal
- 2027: 20 MW of Hydro
- 2028: 20 MW of Wind
- 2029: 10 MW of Wind and 25 MW of Solar
- 2030: 10 MW of Geothermal
- 2031: 10 MW of Wind
- 2033: 10 MW of Hydro

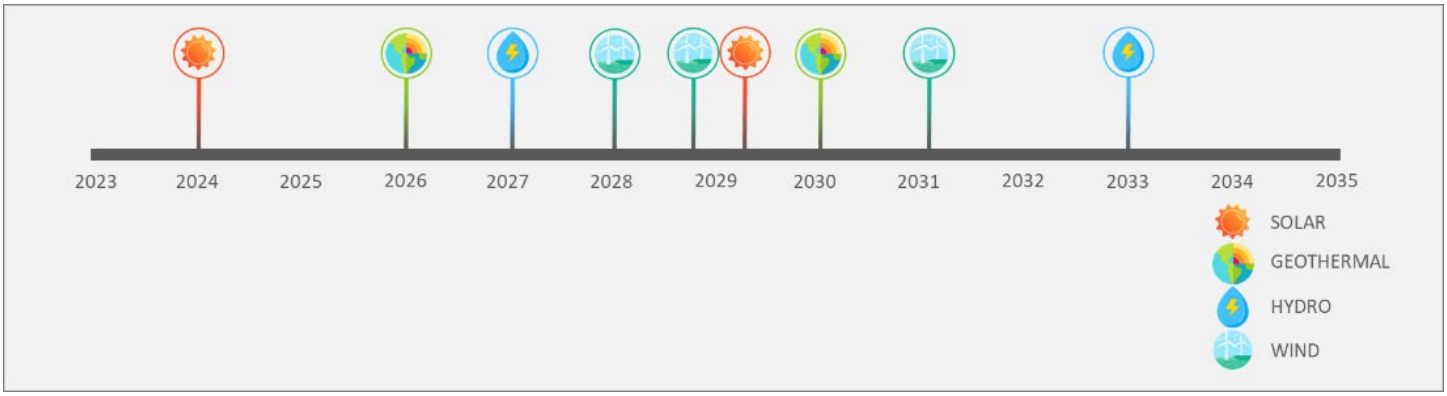


Figure 64: The Low Cost Plan under the Expected Load

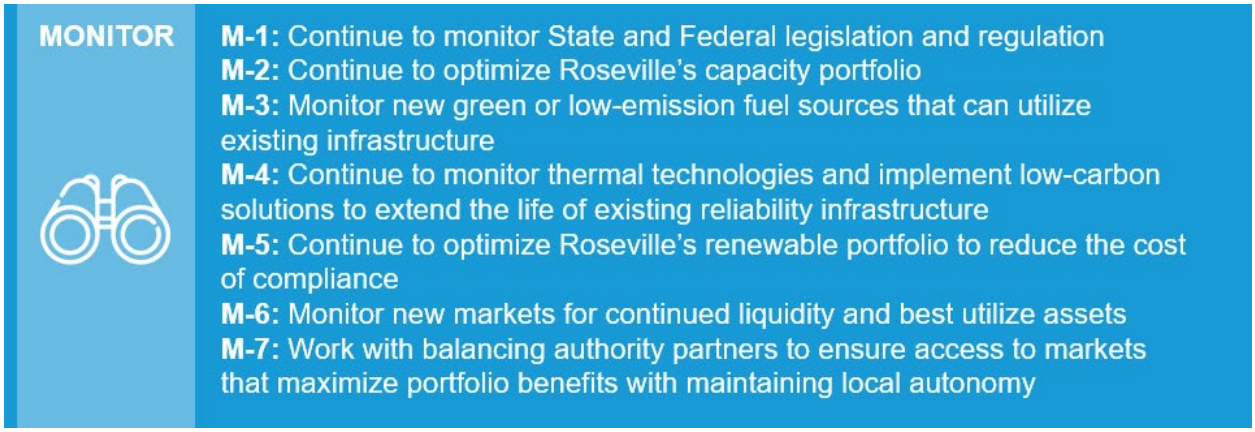
It's important to note the future will change. Roseville's needs, mandates, markets, market price, and project costs will all evolve. Therefore, flexibility, along with biennial updates are recommended.

In addition to the timing of new renewable resources, Roseville should do the following actions.

ACTION

A-1: Pursue additional hydro resources as they become available
A-2: Extend current hydro resource agreement(s)
A-3: Pursue opportunities to increase Roseville's available import capacity
A-4: Engage in forums impacting PG&E's natural gas transportation costs
A-5: Utilize AMI data to assess new programs and enhance system operations
A-6: Develop and implement a broader load reduction programs to aid during emergency grid conditions
A-7: Pursue the development of local generating resources
A-8: Continue to conduct maintenance on generation units and upgrades to the distribution system to account for increased, more volatile loads

The future continues to evolve; therefore, Roseville should monitor the following:



And explore:

Doing all three actions will position Roseville today and into the future. This IRP provides a clear direction and is today's plan for moving forward. Procurement can look different due to a variety of factors, most being outside of Roseville's control. It is important to have a degree of flexibility to adapt to the evolving energy landscape and allow for possible adjustments. Each procurement will be presented to the City Council for consideration. Roseville Electric will provide public updates on the progress, successes, and new challenges over the implementation period of this IRP.

Appendix A – Acronyms

AAEE	Additional Achievable Energy Efficiency
AB	Assembly Bill
AC	Alternating Current
AMI	Advanced Metering Infrastructure
BAA	Balancing Authority Area
BANC	Balancing Authority of Northern California
BTU	British Thermal Unit
CAISO	California Independent System Operator
CARB	California Air Resources Board
CCA	California Carbon Allowance
CEC	California Energy Commission
COB	California Oregon Border
COTP	California Oregon Transmission Project
CP	Compliance Period
CPUC	California Public Utilities Commission
CRAT	Capacity Resource Accounting Table
CT	Combustion Turbine
CT2	Combustion Turbine 2 (STIG)
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CDWR	California Department of Water Resources
DER	Distributed Energy Resource
DG	Distributed Generation
DMV	Department of Motor Vehicles
DR	Demand Response
DSM	Demand-Side Management
EBS	Energy Book System
EBT	Energy Balance Table
EE	Energy Efficiency
EDAM	Energy Day-Ahead Market
EIM	Energy Imbalance Market
ELCC	Effective Load Carrying Capability
EPRI	Electric Power Resource Institute

EV	Electric Vehicle
HLH	Heavy Load Hours (6:00 – 21:59)
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse Gas
GEAT	GHG Emission Accounting Table
GW	Gigawatt
GWh	Gigawatt-hour
HE	Hour Ending
HVAC	Heating, Ventilation, and Air Conditioning
IA	Interconnection Agreement
ICE	Intercontinental Exchange
IEPR	Integrated Energy Policy Report
IOA	Interconnection Operations Agreement
IPP	Independent Power Producer
IRP	Integrated Resource Plan
kW	Kilowatt
kWh	Kilowatt-hour
kV	Kilovolt
LCOE	Levelized Cost of Energy
LIDAR	Light Detection and Ranging
LLH	Light Load Hours (22:00 – 5:59)
Low Cost Plan	Portfolio that best meets all the needs. Also known as the 'Balanced' portfolio
MID	Modesto Irrigation District
MMBTU	Million BTUs
MW	Megawatt
MWh	Megawatt Hour
NCPA	Northern California Power Agency
NITS	Network Integrated Transmission Service
NP15	Northern California Path 15
NREL	National Renewable Energy Laboratory
O&M	Operations and Maintenance
PG&E	Pacific Gas and Electric
Pmax	Maximum Power
Pmin	Minimum Power
POU	Publicly Owned Utility

PPA	Power Purchase Agreement
PRR	Power Revenue Requirement
PUC	Public Utilities Code
PV	Photovoltaic
RA	Resource Adequacy
REC	Renewable Energy Credits
REP	Roseville Energy Park
RPP2	Roseville Power Plant 2
RPS	Renewable Portfolio Standard
RPT	RPS Procurement Table
SAE	Statistically Adjusted End-Use
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SB	Senate Bill
SMUD	Sacramento Municipal Utility District
STIG	Steam Injected Natural Gas Turbine
TANC	Transmission Agency of Northern California
TE	Transportation Electrification
TOU	Time-Of-Use
USBR	United States Bureau of Reclamation
VER	Variable Energy Resource
VOM	Variable Operations Maintenance
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
ZNE	Zero-Net Energy

Appendix B – Resource Options

There are a variety of technologies that produce energy, all of which have their advantages and disadvantages. Not all available resources were evaluated due to California's requirements, Roseville's size, location, need, risk, and preference to use technologies that are vetted with a history of performance and ability to interconnect to Roseville's load. The narrowed down resources are summarized in Figure 65.

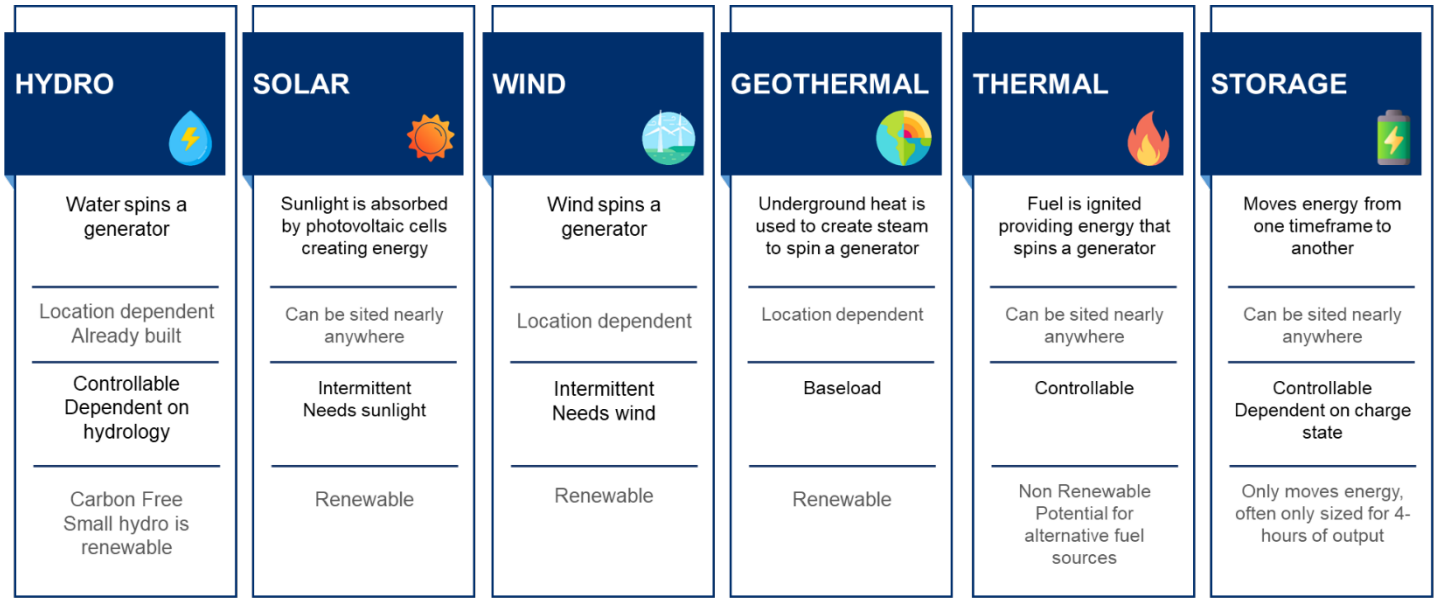


Figure 65: Summary of the Resource Options Studied

To estimate indicative PPA pricing, an annual Levelized Cost of Energy (LCOE) was developed. For more details, see section 9.2. Each technology was modeled assuming the representative project would come online between 2023 and 2035. Current conservation and EE programs, as outlined in this document, were assumed to continue, and are incorporated into the demand forecast.

Thermal

Although natural gas fueled generation technologies produce GHG emissions, these resources can provide firm capacity and have dispatchable characteristics, which balance the grid by offsetting the intermittent operating profiles of renewable resources and meet Roseville's energy needs.

With the opportunity for Roseville to purchase the TM2500 units from DWR at a negotiated depreciated rate and in Roseville's service territory, these were the only studied natural gas units. These units provide the ability to use renewable natural gas and a high blend of hydrogen. Having the ability to use hydrogen extends their useful life since they are able to run under the current state requirements.

Renewable natural gas is significantly more expensive than natural gas and difficult to scale, with most producers being small, typically under 3,000 dth/day. There are competing markets, such as vehicle fuels, and the current demand greatly exceeds supply. In addition, there can be challenges in establishing a physical pathway, as illustrated in Figure 66.

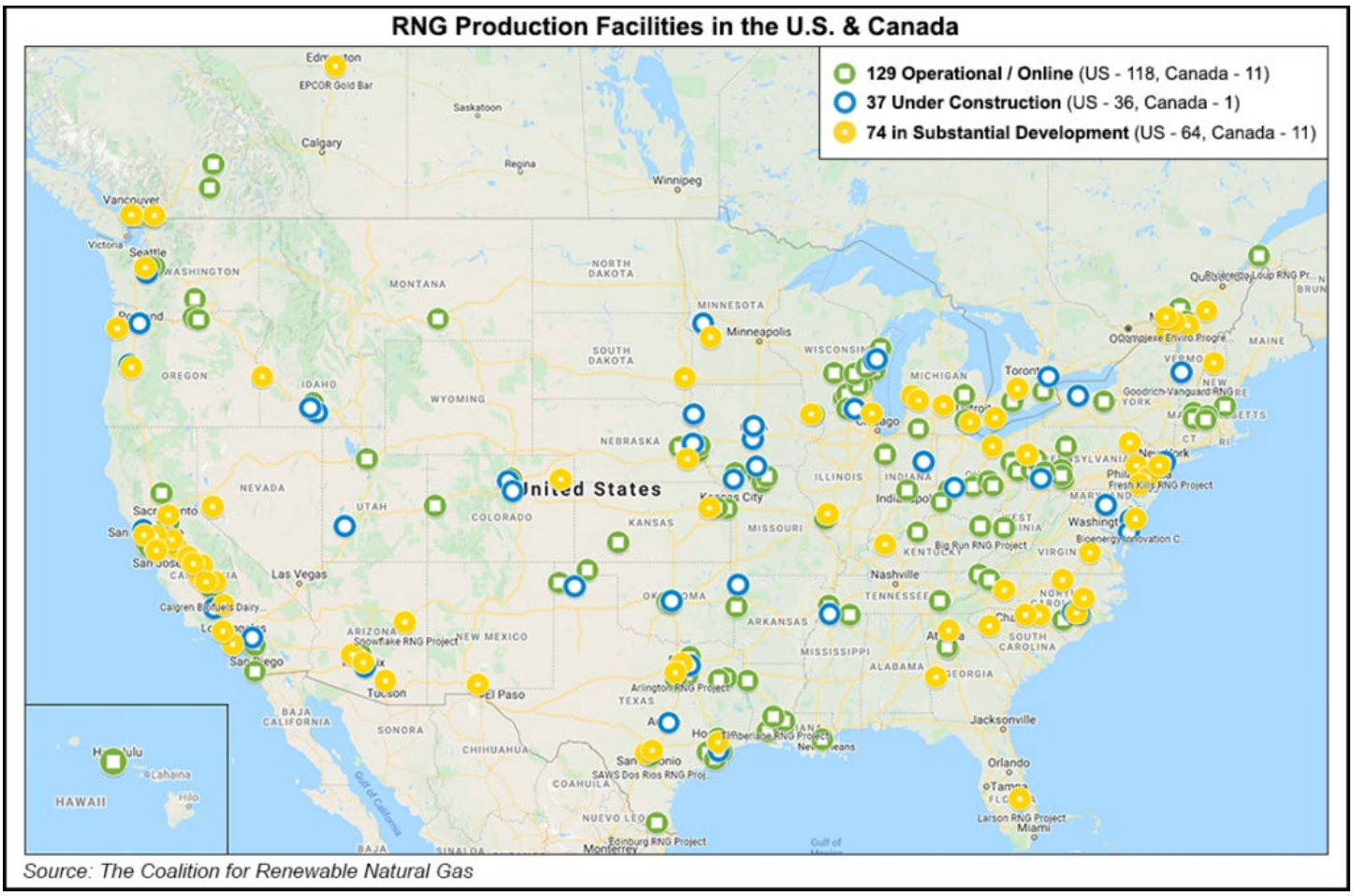


Figure 66: Locations of Renewable Natural Gas Facilities in 2020

Multiple classifications of hydrogen distinguish the energy that is put into the electrolysis process. Yellow hydrogen is created from nuclear energy. Both gray and blue are created using fossil fuels, with blue involving carbon capture and storage. Renewables create green hydrogen. Figure 67 shows the US hydrogen hub applicants as of April 2023. One thing to note is there are few options on the west coast.

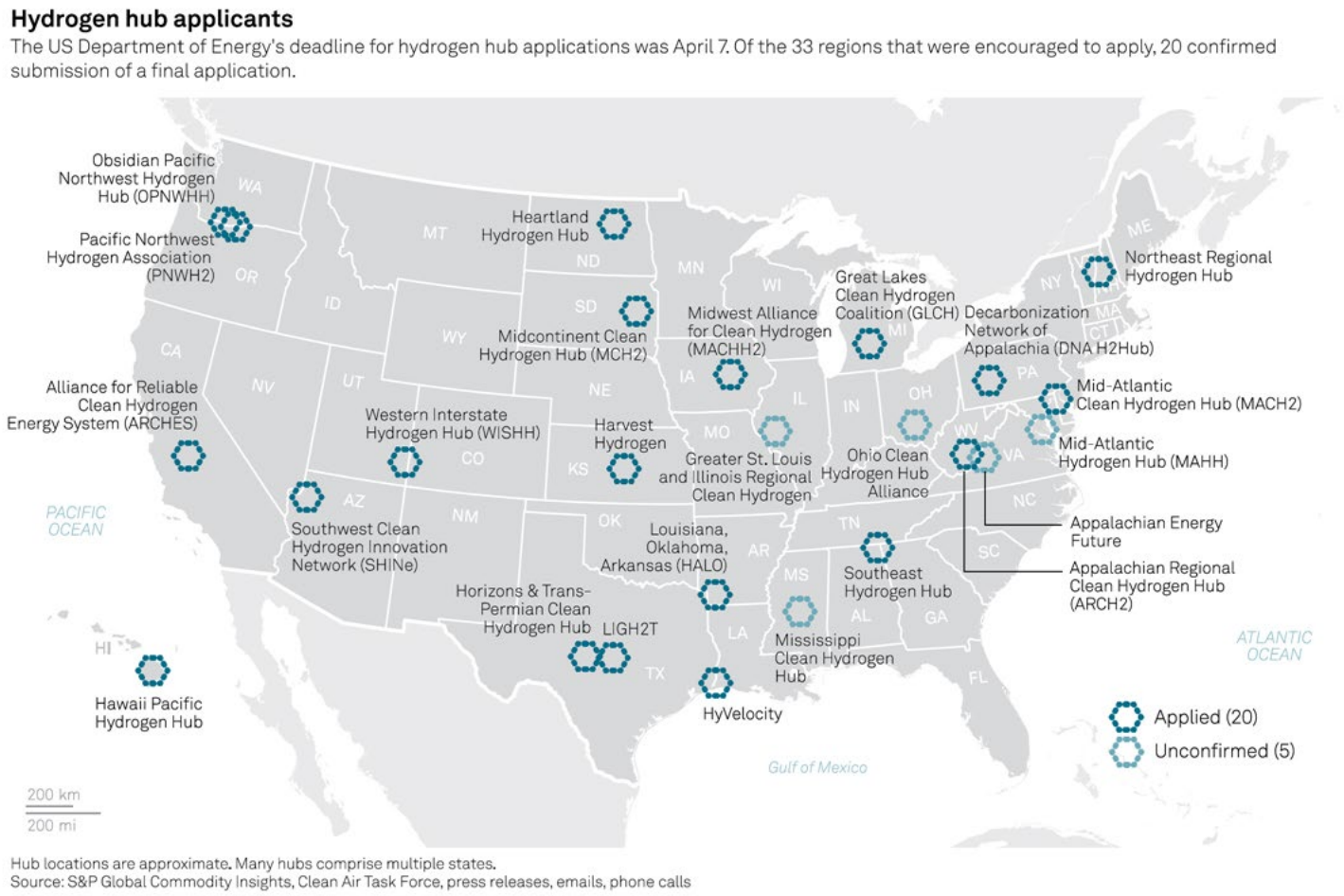


Figure 67: Hydrogen Hubs

Hydroelectric

All hydroelectric resources are considered carbon-free; however, if the plant is above 30 MW, by California statute, it is not considered renewable. Hydro resources are flexible, capable of mitigating intermittency, and offer a variety of ancillary services. New hydro resources will not likely be built in California due to the capital cost, permitting challenges, and environmental concerns.

All hydro resources evaluated are assumed to be existing resources where the off-taker(s) contract expired. This can cause challenges for the exact timing of need, but having a plan provides flexibility. The generation profile will be dependent on location; therefore, the analysis utilized an average hourly profile based on many plants in and around California.

Utility-Scale Solar

Utility-scale solar is a renewable resource, is not as location dependent, and typically has an attractive LCOE. Solar is intermittent and only produces when there is sunlight, which can cause challenges for balancing the grid. New projects are often packaged with storage, which aids in balancing, but increases the expense.

All utility-scale solar projects were assumed to be single-axis. The solar production for each location was modeled using the NREL's PVWatts[32] calculator. The inverter loading ratio (ratio of module capacity to inverter capacity) was assumed to be 1.2. The capacity factor was calculated based on the Alternating Current (AC)

[32] https://pvwatts.nrel.gov/

project capacity. Additionally, the long-term degradation of the systems was assumed to be 0.7 percent per year. A US map of the solar irradiance shows Roseville's area at 5.00 – 5.25 kW/m/Day.

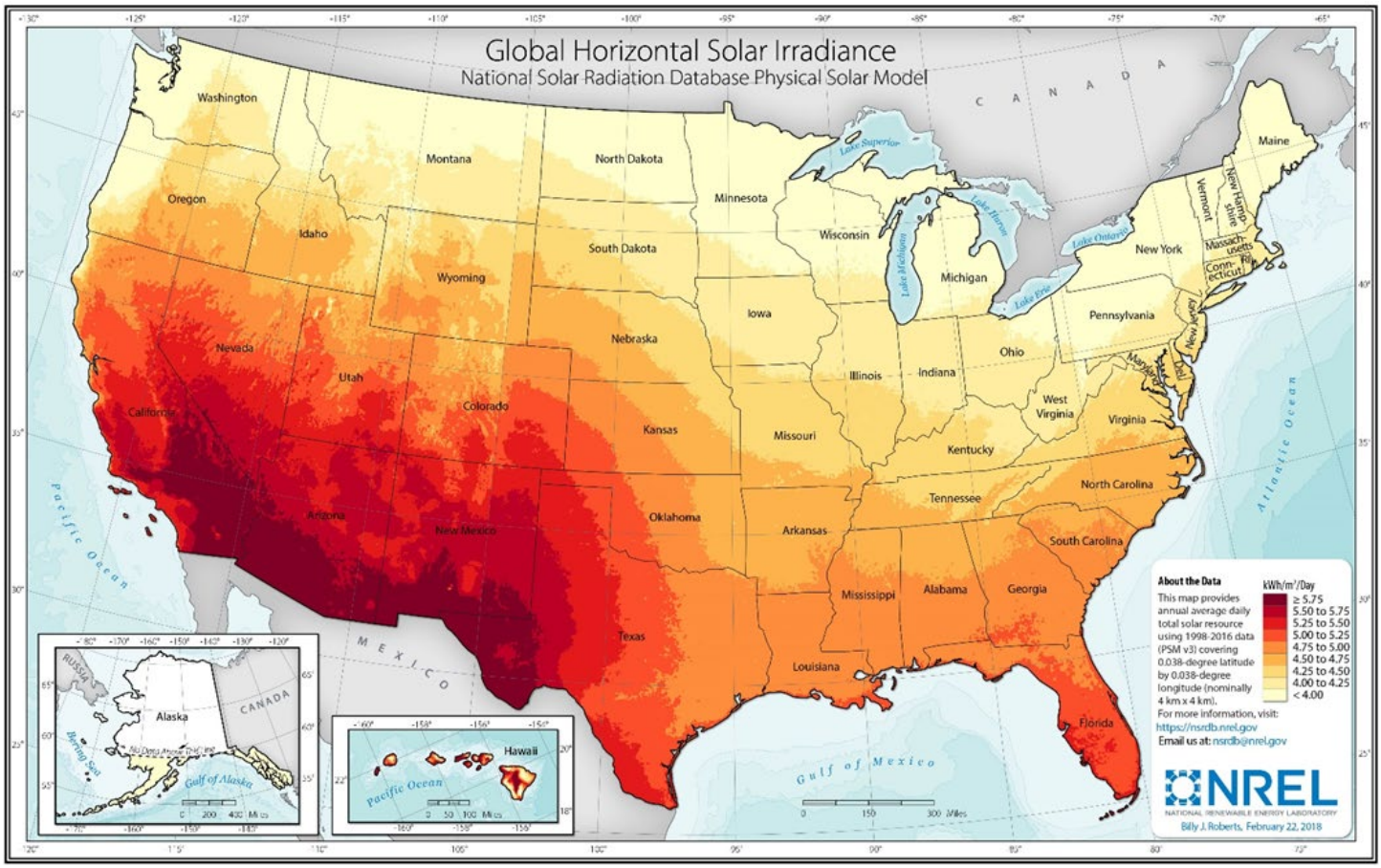


Figure 68: Solar Irradiance in the United States

Federal Investment Tax Credit

Federal tax incentive programs are available to third-party developers, lowering the project's overall cost to incentivize development. These tax incentives reduce the net effective cost of renewable energy to power purchasers such as Roseville. Therefore, the analysis assumed Roseville would obtain energy from renewable facilities through a Power Purchase Agreement (PPA) structure with a third-party Independent Power Producer (IPP).

The Federal Investment Tax Credit (ITC) was established by the Energy Policy Act of 2005. Since the inception of this credit, there have been several extensions. The original tax credit was 30% for both Residential and Commercial. In 2015, Congress extended the Federal ITC; however, it was subject to a phase-out schedule. In December 2020, Congress passed another extension, which was subsequently nullified with the passage of the Inflation Reduction Act (IRA) of 2022.

The IRA directed unprecedented levels of funding support, approximately $400 billion in federal incentives for clean energy technology development. The vast majority of the funding is realized through two major tax credits: The ITC and The Production Tax Credit (PTC).

The ITC is designed to reduce renewable projects' upfront capital investment costs, including equipment, installation, and interconnection costs. It is a one-time credit to reduce Capital Expenditures. The PTC

generates a tax credit based on the actual output of the unit and is volumetric in nature. As a project produces more, the benefit is greater.

The IRA included many changes to the ITC and PTC. One of the most impactful was the inclusion of standalone energy storage systems. In the past, in order for a storage system to qualify for the ITC, it had to be paired with renewable technology and had to be charged by that resource at least 75% of the time. With the IRA, that is no longer the case. Standalone storage systems can now qualify for the ITC, the consequences of which will incentivize the development of this technology across the country.

The ITC and PTC now have a tiered credit system in which projects can receive additional incentives for meeting prevailing wage and apprenticeship requirements, as well as siting projects in low-income communities or in energy communities (areas that have been negatively impacted by the transition away from fossil fuels).

It is possible for a project that meets all of the criteria above to receive up to a 75% ITC. The Full Credit Rate assuming prevailing wage requirements are met with no bonuses, starts at 30%. For the PTC the Full Credit Rate with no bonuses is 2.6 cents/kWh, or $26/MWh; receiving as much as $32/MWh is possible. The ITC and PTC apply to projects that commence operation during or after 2022. The IRA does create a phase-out schedule that begins in 2034.

A simplified version of the Phase-Out Schedule for the ITC and PTC is shown below, assuming the Full Rate Credit rate of 30% for the ITC and $26/MWh for the PTC.

Table 12: Current ITC Schedule

ITC/PTC - IRA Phase Out Schedule		
Installation Year	ITC	PTC ($/MWh)
2022	*30%*	*$26*
2023	*30%*	*$26*
2024	*30%*	*$26*
2025	*30%*	*$26*
2026	*30%*	*$26*
2027	*30%*	*$26*
2028	*30%*	*$26*
2029	*30%*	*$26*
2030	*30%*	*$26*
2031	*30%*	*$26*
2032	*30%*	*$26*
2033	*30%*	*$26*
2034	*22.5%*	*$20*
2035	*15%*	*$13*
Beyond	*0%*	*$0*
**Assumes Full Rate Credit, all bonuses incentives are not included in this table*		

Utility-Scale Wind

Utility-scale wind is a renewable resource that is location based. These large turbines are sited in areas of high steady winds. Depending on the wind profile, the generation will vary both in production and timing. Actual project performance for both Northern and Southern California were derived to determine generation profiles and capacity factors. No degradation was assumed. Off-shore wind is gaining traction, but when compared to

on-shore, off-shore is in its infancy. One of the factors is the offshore wind LCOE is nearly double. The Federal Production Tax Credit (PTC), much like the ITC discussed above, was a driver for wind development, but that ended in September 2020. The US wind speed map shows optimal areas, which makes this resource dependent on transmission.

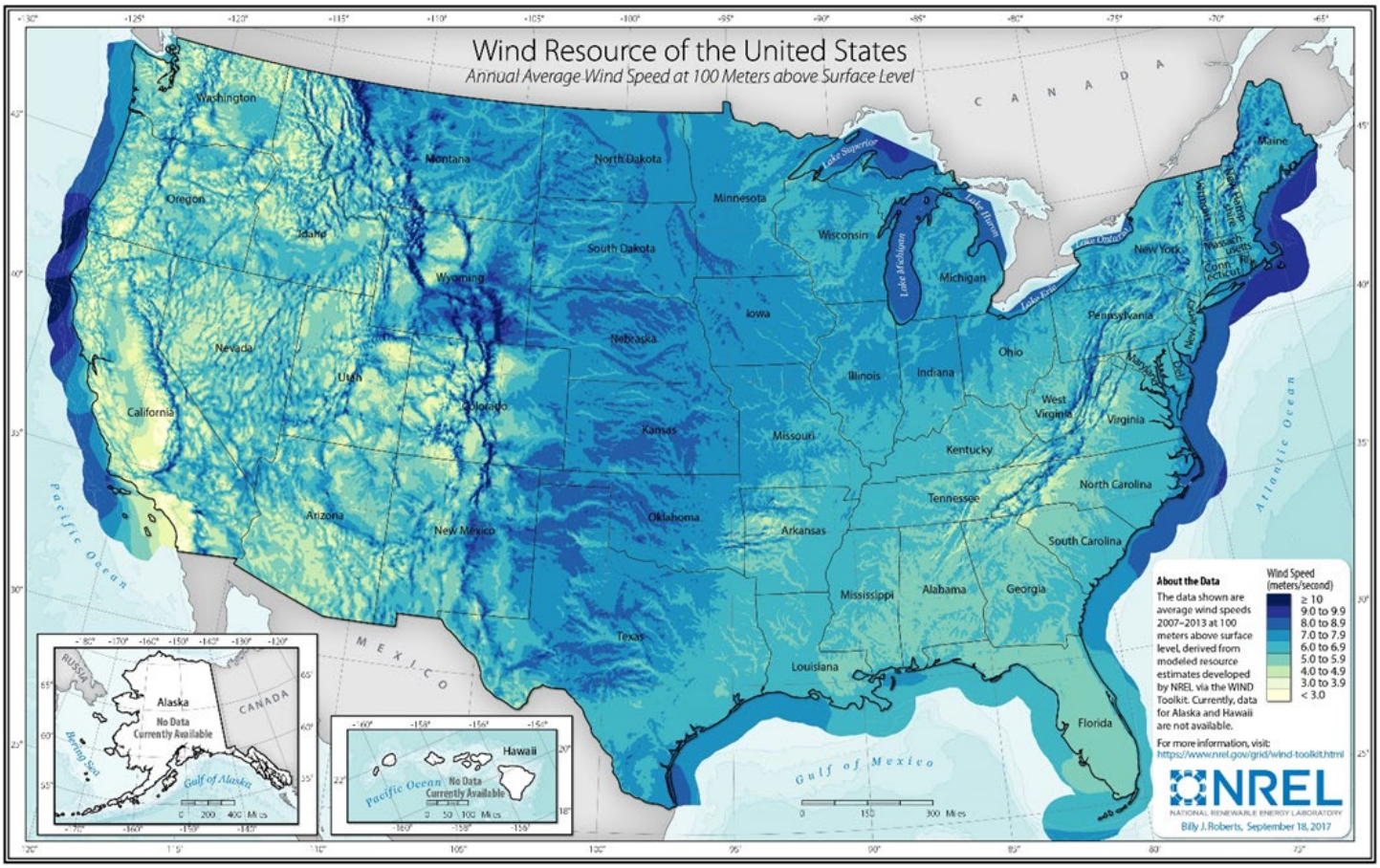


Figure 69: Average Wind Speed in the United States

Geothermal

Geothermal projects began in the early 1900s, with the geysers in Northern California being commissioned in the 1960s. Geothermal is location dependent and when compared to other renewables like solar and wind have a higher LCOE but is controllable with the ability to be dispatched. Generation profiles were derived from actual projects with a one percent degradation per year.

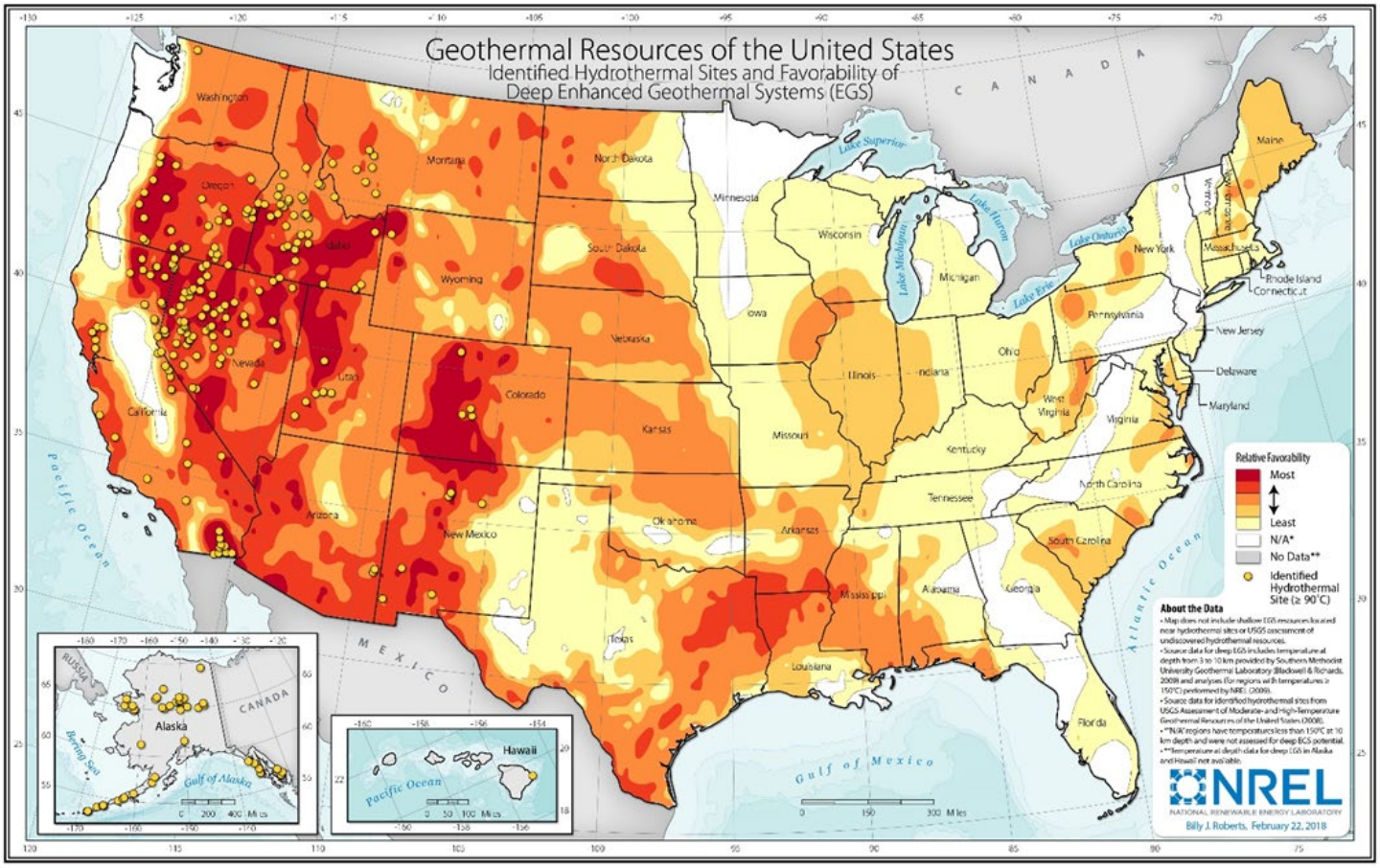


Figure 70: Geothermal Resources with Relative Feasibility in the United States

Market Purchase Options

Other alternatives to meeting capacity or energy needs are through direct ownership of a physical plant or through a long-term PPA or other contract structures. Options include obtaining Resource Adequacy (RA) contracts through the bilateral (direct negotiation) market or entering into energy procurement contracts. Either option allows the ability to contract for various tenors (for example, long, mid, or short-term contracts). The inherent disadvantage of relying on market purchases is pricing uncertainty and potential negative exposure to future market changes.

Bilateral market capacity prices vary by location, resource technology type, and timing of delivery. California is experiencing a capacity constraint due to many factors, including high summer heat, the drought, and a disruptive transition of natural gas plants retiring faster than an equivalent peak capacity capable renewables with batteries can replace them. Market prices have responded by drastically increasing and even becoming difficult to procure in months like August and September.

Energy Storage Applications

Energy storage is becoming more prevalent as it can provide many benefits. There are a variety of storage options and attributes, outlined below in Table 13.

Table 23: Summary of Storage Technologies and Characteristics

	Storage Duration	Round Trip Efficiency	Response Time	Key Component Cycle Life	System Design Life	Footprint	Capacity Fade	Ramp Rate	Geographic Dependency	Cost
Pumped Hydro Storage	12 h to 24 h	70% to 80%	1s to 5 mins	> 10,950	30 to 50 Yrs	Large	0	100% in seconds	Specific types of sites required and are known to be available in the region	$$
Gravity Storage	8 h to 12 h	80% to 90%	5 mins to 1h	> 10,950	15 to 30 Yrs	Large	0	30% to 100%	Specific types of sites required	$$$
Flywheel	8 h to 12 h	≤ 50%	1s to 5 mins	7,300 to 10,950	15 to 30 Yrs	Large	0	30% to 100%	Land required	$$
Compressed Air	4 h to 8 h	> 90%	< 1s	3,650 to 7,300	10 to 15 Yrs	Medium Small	20% to 30%	Instantaneous	Land required	$$
Sensible Heat Storage	8 h to 12 h	70% to 80%	< 1s	3,650 to 7,300	15 to 30 Yrs	Medium	0% to 10%	Instantaneous	Land required, and subject to operational conditions (temperatures, energy density, etc.)	$
Lithium-ion	12 h to 24 h	50% to 60%	1s to 5 mins	7,300 to 10,950	15 to 30 Yrs	Medium Large	0	100% in seconds	Land required	$$
Flow	12 h to 24 h	50% to 60%	5 mins to 1h	7,300 to 10,950	15 to 30 Yrs	Medium Large	0	100% in seconds	Specific types of sites required	$$

Depending on the location and how the storage is interconnected, the system can offer an array of benefits. Of interest to Roseville are:

- **Load Shifting**: Storage is charged with lower priced energy, which can help mitigate curtailment of excess renewable generation (when renewable generation exceeds demand) and the stored energy used at a later time (such as during evening ramping periods). Ultimately helping smooth and balance the load.
- **Energy Arbitrage**: If the storage is located outside of BANC, the most significant benefit is charging at low-priced hours and discharging at high-priced hours.
- **Peaking Supply**: The power output capacity of the storage can be used to meet capacity resource adequacy requirements and replace conventional peaking capacity to provide short-term power needs during periods of peak demand or provide resource adequacy to intermittent renewable resources.
- **Frequency Regulation and Voltage Support**: Frequency regulation and voltage support are required for the grid. A battery system can supply these attributes as long as it has a charge.
- **Spinning Reserve**: Another ancillary service is the ability to provide spinning reserve, which is typically served by conventional generation that must be kept online and synchronized to the grid in anticipation of a need. This ancillary service can be monetized or can avoid operating costs.
- **Firming of Intermittent Resources**: Storage can be utilized to firm energy production of a variable energy resource (such as solar or wind generation) and provide a more predictable energy profile to the grid.
- **Transmission/Distribution Upgrade Deferral**: Storage may offer a way to defer or avoid transmission and/or distribution upgrades. Some of the concepts being considered for BESS applications include:

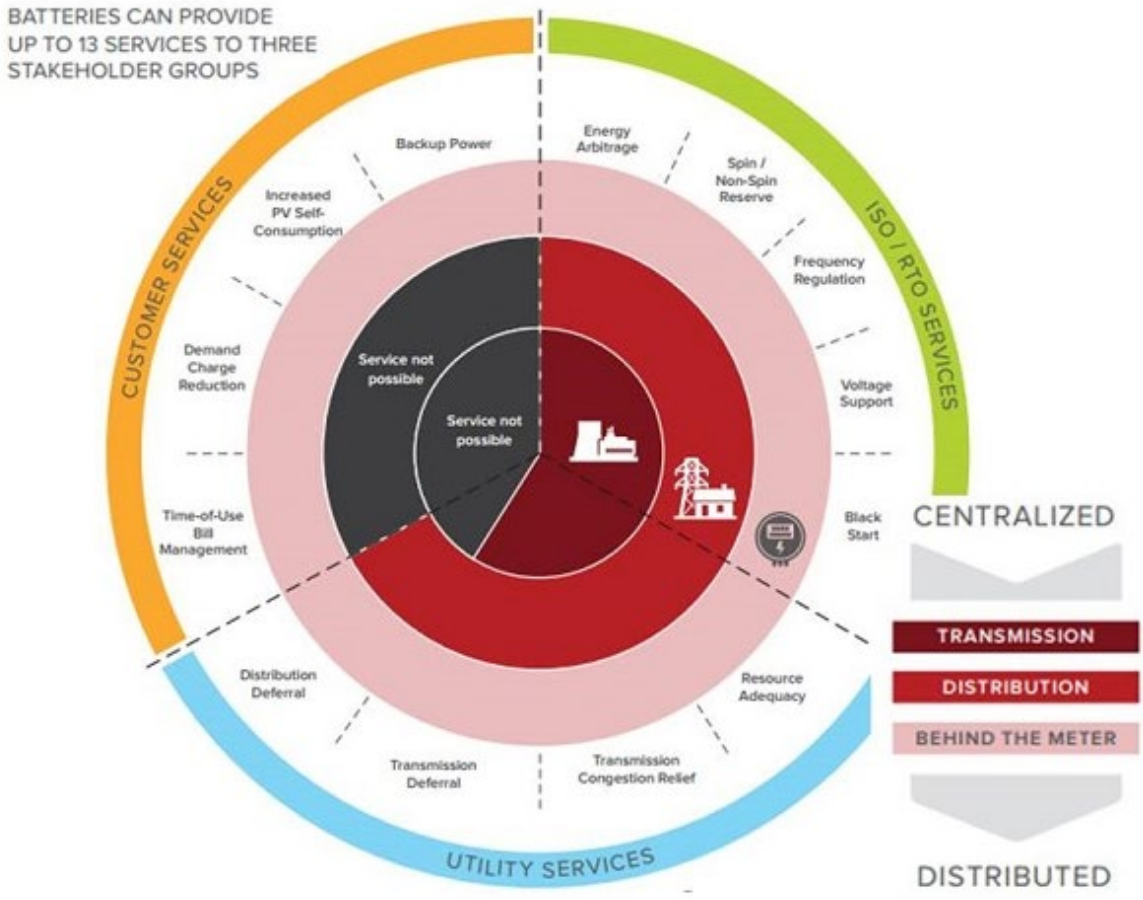


Figure 71: Stacked Benefits to Batteries

Storage applications are often selected for primary use in either power or energy applications. Power applications tend to be of shorter duration (approximately five minutes to one hour) with operational profiles involving frequent rapid responses or cycles. Energy applications generally require longer duration (approximately one hour or more).

The CEC has recommended that POU's consider the role of storage in addressing over generation of renewable energy when solar energy production exceeds local demand, which can occur during the daytime peak solar production periods. If the excess renewable energy is used to charge a storage system, the stored energy can be used during the evening ramping period, avoiding the greenhouse gas emissions that would otherwise be produced if the energy demand during the evening ramping period was met by energy produced from conventional thermal resources.

Because lithium-ion batteries are widely accepted as a proven technology for storage applications, a lithium-ion battery was chosen as the technology for this analysis. Table fourteen highlights the performance parameters used in the IRP analysis.

Table 34: Representative Performance Parameters for Lithium Ion Battery Systems

PARAMETER	Li-ION
Facility Capacity Power Rating, MW	5
Discharge Duration at Rated Capacity, hours	4
Facility Energy Rating, MWh[1]	20
Round-Trip Efficiency, percent	85
Estimated life, cycles	~5,000
Installed Levelized Capital Cost, $/kW-yr[2]	533
Fixed O&M Costs, $/kW-yr	20
Variable O&M Costs, $/kWh (charge or discharge)	0.001 to 0.005

Notes:

1. The rating is based on the installed project size.
2. Battery cost scales with MWh, whereas the balance of plant and PCS costs tend to scale with power (MW). Because of this, installed costs tend to have a wide array of values.

Renewables Portfolio Standard Procurement Plan

October 2022

Roseville Electric
2090 Hilltop Circle
Roseville, California 95747-9704
Reliable Energy. Dependable Service.

Table of Contents

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1. Introduction

A Renewables Portfolio Standard (RPS) Procurement Plan is required by Senate Bill (SB) X1-2 (Simitian, Stats. 2011, 1st Ex. Session, Ch. 1), the "California Renewable Energy Resources Act" and must be approved by the Roseville City Council. This document describes the RPS Procurement Plan of the City of Roseville (alternatively referred to as Roseville Electric), as required by the Public Utility Code section 399.30(a)(1) and (a)(2) and section 3205 of the California Energy Commission's (CEC or Commission) regulations for *Enforcement Procedures for the Renewables Portfolio Standard for Local Publicly Owned Electric Utilities* (RPS Guidelines), as enacted on July 12, 2021.

2. Notifications

Pursuant to Public Utilities Code section 399.30(f) and section 3205 of the RPS Guidelines, City Council's consideration of this RPS Procurement Plan will be posted using the standard City Council agenda posting process. Within 30 days of adoption by City Council, this RPS Procurement Plan will be sent to the CEC.

Pursuant to Public Utilities Code section 399.30(d) and section 3206 of the RPS Guidelines, this RPS Procurement Plan includes optional measures for adoption by the City Council. Optional measures must be adopted at a publicly noticed meeting prior to the end of the compliance period in which they will be used. All optional measures adopted must be sent to the CEC within 30 days of adoption.

3. Compliance Periods and Procurement Requirements

Public Utility Code section 399.30(b) and (c), section 399.15(b)(1) and (b)(2), and section 3204 of the RPS Guidelines mandate that state-defined renewable resources make up a specified percentage of each utility's retail sales with a current goal of 60% by 2030.

i. Compliance Period 4 is calendar years 2021 through 2024 and requires forty-four percent (44%) renewables by the end of the compliance period, applying the following formula:

$$\sum_{x=2021}^{2024} EP_x \geq .3575(RS_{2021}) + .385(RS_{2022}) + .4125(RS_{2023}) + .44(RS_{2024})$$

ii. Compliance Period 5 is calendar years 2025 through 2027 and requires fifty-two percent (52%) renewables by the end of the compliance period, applying the following formula:

$$\sum_{x=2025}^{2027} EP_x \geq .46(RS_{2025}) + .5(RS_{2026}) + .52(RS_{2027})$$

iii. Compliance Period 6 is calendar years 2028 through 2030 and requires sixty percent (60%) renewables by the end of the compliance period, applying the following formula:

$$\sum_{x=2028}^{2030} EP_x \geq .5467(RS_{2028}) + .5733(RS_{2029}) + .60(RS_{2030})$$

iv. Beginning in the compliance period starting in 2031, and subsequent compliance periods thereafter, there is a requirement to maintain the 60% renewable standard. The length of these compliance periods are to be established by the CEC.

Roseville shall demonstrate reasonable progress toward meeting the compliance period targets in each compliance period's included years. The following table summarizes the annual "soft" targets, but compliance is determined over the entire compliance period using the formulas above.

Compliance Period 4				Compliance Period 5			Compliance Period 6			Annually
2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031 and beyond
35.75%	38.5%	41.25%	44%	46%	50%	52%	54.67%	57.33%	60%	60%

Table 1. Renewables Portfolio Standard requirements for renewable energy

4. Portfolio Content Categories, Portfolio Balance Requirements, Long Term Procurement Requirements, and Exemptions and Adjustments

A. *Portfolio Content Categories*

In addition to meeting the renewable energy procurement target, the renewable energy must meet portfolio content category requirements as defined in Public Utilities Code section 399.16(b) and section 3203 of the RPS Guidelines; however, as defined in the Public Utilities Code section 399.16(d) renewable energy procured prior to June 1, 2010, is termed "grandfathered" and does not have to meet the category requirements. There are four categories of renewable energy, as follows:

Portfolio Content Category 1

i. Portfolio Content Category 1 electricity products must be procured bundled to be classified as Portfolio Content Category 1, and Roseville Electric may not resell the underlying electricity from the electricity product back to the eligible renewable energy resource from which the electricity product was procured. The electricity products must be generated by an eligible renewable energy resource that is interconnected to a transmission network within the WECC service territory. For purposes of this section 4.A, the first point of interconnection to the WECC transmission grid is the substation or other facility where generation tie lines from the eligible renewable energy resource interconnect to the network transmission grid. Portfolio Content Category 1 electricity products must also meet one of the following criteria:
    a. Electricity products must be generated by an eligible renewable energy resource that has its first point of interconnection within the metered boundaries of a California balancing authority area.
    b. Electricity products must be generated by an eligible renewable energy resource that has its first point of interconnection to an electricity distribution system used to serve end users within the metered boundaries of a California balancing authority area. For purposes of this section 4.A, the first point of interconnection to an electricity distribution system is within the service area boundaries of a utility distribution company.
    c. Electricity products from the eligible renewable energy resource with a first point of interconnection outside the metered boundaries of a California balancing authority must be scheduled into a California balancing authority without substituting electricity from another source. For purposes of this section 4.A, electricity generated by the eligible renewable energy resource must be scheduled into a California balancing authority on an hourly or subhourly basis, and the City of Roseville's City Council or other authority, as delegated by the City of Roseville's City Council, must have approved an agreement, before the electricity is generated, to schedule the electricity from the eligible renewable energy resource into the California balancing authority on an hourly or subhourly basis. If there is a difference between the amount of electricity generated within an hour and the amount of electricity scheduled into a California balancing authority within that same hour, only the lesser of the two amounts shall be classified as Portfolio Content Category 1.
    d. Electricity products must be subject to an agreement between a California balancing authority and the balancing authority in which the eligible renewable energy resource is located, executed before the product is generated, to dynamically transfer electricity from the eligible renewable energy resource into the California balancing authority area. For purposes of this section 4.A, electricity generated by the eligible renewable energy resource shall be scheduled into a California balancing authority area on an hourly or subhourly basis.

ii. Electricity products originally qualifying in Portfolio Content Category 1 and resold must meet the following criteria to remain in Portfolio Content Category 1:
    a. The original contract for procurement of the electricity products meets one of the criteria in section 4.A.i.a-d.
    b. The resale contract transfers only electricity and RECs that have not yet been generated prior to the effective date of the resale contract.
    c. The electricity and associated RECs must be transferred by the resale contract to the ultimate buyer, and the electricity must be transferred in real time.
    d. For those electricity products that satisfy section 4.A.i.c, the original hourly or subhourly schedule is maintained, and the criteria of section 4.A.ii.a-c are met.

iii. Electricity products originally qualifying in Portfolio Content Category 1 and resold that do not meet the criteria of section 4.A.ii.a-d shall not be counted in Portfolio Content Category 1.

Portfolio Content Category 2

iv. Portfolio Content Category 2 (PCC2) electricity products must be generated by an eligible renewable energy resource that is interconnected to a transmission network within the WECC service territory, and the electricity must be matched with incremental electricity that is scheduled into a California balancing authority.

v. Additionally, PCC2 products must be procured bundled and must meet all of the following criteria:
   a. The first point of interconnection to the WECC transmission grid for both the eligible renewable energy resource and the resource providing the incremental electricity must be located outside the metered boundaries of a California balancing authority area.
   b. The incremental electricity used to match the electricity from the eligible renewable energy resource must be incremental to Roseville Electric. For purposes of this section 4.A, "incremental electricity" means electricity that is generated by a resource located outside the metered boundaries of a California balancing authority area and that is not in the portfolio of Roseville Electric prior to the date the contract or ownership agreement for the electricity products from the eligible renewable energy resource, with which the incremental electricity is being matched, is executed by Roseville Electric.
   c. The contract or ownership agreement for the incremental electricity is executed by Roseville Electric, at the same time or after the contract or ownership agreement for the electricity products from the eligible renewable energy resource is executed.
   d. The incremental electricity must be scheduled into the California balancing authority within the same calendar year as the electricity from the eligible renewable energy resource is generated.
   e. The electricity from the eligible renewable energy resource must be available to be procured by Roseville Electric and may not be sold back to that resource.

vi. Electricity products originally qualifying in Portfolio Content Category 2 and resold must meet the following criteria to remain in Portfolio Content Category 2:
   a. The original contract for procurement of the electricity products meets the criteria of section 4.A.v.a-e.
   b. The resale contract transfers only electricity and RECs that have not yet been generated prior to the effective date of the resale contract.
   c. The resale contract transfers the original arrangement for incremental electricity, including the source and quantity for the incremental electricity.
   d. The resale contract retains the scheduling of the incremental electricity into the California balancing authority as set out in the original transaction.
   e. The transaction provides incremental electricity for the Publicly Owned Utility (POU) claiming the transaction for RPS compliance, Roseville Electric.
   f. The incremental electricity is scheduled into the California balancing authority.

vii. Electricity products originally qualifying in Portfolio Content Category 2 and resold that do not meet the criteria above must be counted in Portfolio Content Category 3.

Portfolio Content Category 3

viii. All unbundled renewable energy credits and other electricity products procured from eligible renewable energy resources located within the WECC transmission grid that do not meet the requirements of either Portfolio Content Category 1 or Portfolio Content Category 2 fall within Portfolio Content Category 3.

Portfolio Content Category 0

ix. Grandfathered Resources (also referred to as PCC0) include any contract or ownership agreement originally executed prior to June 1, 2010, and the electricity product is associated with generation from an eligible renewable energy resource that met the Commission's RPS eligibility requirements that were in effect when the original procurement contract or ownership agreement was executed by Roseville Electric.

a. Except as provided in the following sections b and c, the electricity product shall count in full toward the RPS procurement requirements, subject to the following:
   i. If the associated REC is retired within 36 months of the date the electricity product is generated, the electricity product will count toward the RPS procurement targets.
   ii. The electricity product will not be classified within another portfolio content category and will not count toward the portfolio balance requirements in the following section B.
   iii. Electricity products associated with contracts of less than 10 years will not be subtracted when calculating excess procurement in section 7.A.
b. If contract amendments or modifications after June 1, 2010, increase nameplate capacity or expected quantities of annual generation, increase the term of the contract except as provided section c below, or substitute a different eligible renewable energy resource, only the MWhs or resources procured prior to June 1, 2010, shall count in full toward the RPS procurement targets. The remaining procurement must be classified into a portfolio content category and follow the portfolio balance requirements in accordance with the following section B.
c. The term of such procurement contract may be extended if the initial term of the contract specified a procurement commitment of 15 years or more.

B. *Portfolio Balance Requirements*

In meeting the RPS procurement requirements identified in section 3 of this RPS Procurement Plan, Roseville shall also be subject to the portfolio balance requirements. Public Resources Code section 399.16(c)(1) and (c)(2) and section 3204 of the RPS Guidelines identify minimum procurement requirements for PCC1 and maximum procurement requirements for PCC3 in each compliance period. Renewable energy that is classified as "grandfathered" is not subject to these portfolio balance requirements. The following table summarizes the portfolio balance requirements for renewable energy that is not grandfathered.

Product Content Category	**Compliance Period 1** **2011 - 2013**	**Compliance Period 2** **2014 - 2016**	**Compliance Period 3** **2017 – 2020**
PCC1 (Minimum)	50%	65%	75%

PCC2 (No Direct Restriction)	n/a	n/a	n/a
PCC3 (Maximum)	25%	15%	10%
The balance requirements starting in 2021 and thereafter are the same as for Compliance Period 3.			

Table 2. Renewables Portfolio Standard portfolio balance requirements

C. *Long Term Contract Requirement*

i. In meeting the RPS procurement requirements identified in section 3 of this RPS Procurement Plan, Roseville shall also be subject to long-term contract requirements. Consistent with Public Resources Code section 399.13(b), Roseville Electric may enter into a combination of long- and short-term contracts for electricity and associated renewable energy credits.

ii. For the compliance period beginning January 1, 2021, and each compliance period thereafter, at least 65 percent of the electricity products applied toward the RPS procurement target shall be from long-term procurement. The numerical expression of this requirement is:

$$LTx = 0.65\ (RPSx)$$

LTx = Electricity products applied toward the RPS procurement target for compliance period X that must meet the criteria of long-term procurement provided in section 3204 (d)(2)

RPSx = The RPS procurement target calculated in section 3204 (a) for compliance period X or, if less than the target, the sum of electricity products retired and any excess procurement pursuant to section 3206 (a)(1) or historic carryover pursuant to section 3206 (a)(5) that Roseville Electric has applied to the target, subject to the Portfolio Content Category 3 limit for compliance period X

a. If Roseville Electric qualifies for a special exemption or adjustment in accordance with section 4.D of this plan (Exemptions and Adjustments), the 65 percent requirement will be assessed on the quantity of electricity products necessary to satisfy the RPS procurement target resulting from the exemption or adjustment.

iii. Electricity products will be classified as long-term or short-term based on the contracts, ownership, or ownership agreements through which they are procured. For the purpose of this section 4.C, long-term procurement refers to procurement from long-term contracts, ownership, or ownership agreements, subject to the following:

a. A long-term contract is defined as Roseville Electric's contract to procure a nonzero quantity of electricity products from an RPS-certified facility for a duration of at least 10 continuous years, consistent with section 4.C.ii.b and 4.C.ii.c.

b. A long-term contract includes the following contract structures:

   i. A jointly negotiated contract to procure electricity products from one or more RPS-certified facilities, if the procurement duration for each facility is at least 10 continuous years and each POU procures electricity products for at least 10 continuous years. For purposes of this subdivision, a jointly negotiated contract includes the following:

      1. A joint contract executed by at least two POUs with the RPS-certified facility.

2. A contract executed by a joint powers agency or third party supplier acting on behalf of at least two POUs with the RPS-certified facility, if all participating POUs are identified in the contract with the facility or in a correlated agreement with the joint powers agency or third party supplier.
3. Separate contracts executed by two or more POUs with the same RPS-certified facility, where each of the separate contracts, as originally executed, expressly identifies the other POU(s) and specifies the ability of the identified POUs to adjust their relative share of the output of the RPS-certified facility to the other POU(s). If the separate contracts are amended to expressly identify the other POU and specify the ability of the POUs to adjust their relative share of the output of the RPS-certified facility, the contract shall be considered long-term only if each POU's procurement duration from the date of the contract amendment is at least 10 continuous years.

ii. Roseville Electric's contract or resale agreement with a joint powers agency or third-party supplier if both of the following are satisfied:
1. Roseville Electric's contract or resale agreement with the joint powers agency or third-party supplier has a duration of at least 10 continuous years.
2. The RPS-certified facility or facilities supplying the electricity products in the long-term contract are owned by the joint powers agency or third-party supplier or are subject to a long-term contract with a remaining duration of at least 10 continuous years, and Roseville Electric, or the joint powers agency or third-party supplier or other party on Roseville Electric's behalf, can submit documentation demonstrating this.
3. Roseville Electric's contract or resale agreement with a third-party supplier where, over the contract term, the electricity products provided can change from one bundled portfolio content category to a different bundled portfolio content category or from one bundled portfolio content category to multiple bundled portfolio content categories, or from multiple bundled portfolio content categories to fewer bundled portfolio content categories, as long as the contract satisfies all other applicable requirements of this section.
4. Notwithstanding section 4.C.iii.b.ii.3, Roseville Electric's ownership agreement or a contract between Roseville Electric and the Western Area Power Administration or the federal government as part of the federal Central Valley Project, including an extension or renewal of a contract between Roseville Electric and the Western Area Power Administration or the federal government as part of the federal Central Valley Project that renews or extends the existing contract as contemplated under the administration of the contract in effect on January 1, 2015, or included in the Western Area Power Administration's Power Marketing Plan.

c. Long-term contracts executed on or after July 1, 2020, shall additionally satisfy the requirements of section 4.C.iii.c.i-iii. Contracts executed prior to July 1, 2020, are not required to meet the requirements of section 4.C.iii.c.i-iii for the term of the contract in effect as of July 1, 2020. With the exception of extensions or renewals of contracts meeting the criteria of section 4.C.iii.b.ii.4, contracts executed prior to July 1, 2020, that are amended on or after July 1, 2020, where the amendment modifies the duration, quantity, pricing, or other provision that materially relates to the contract's classification as long-term, shall additionally satisfy all of the requirements of section 4.C.iii.c.i-iii.
i. Reasonably consistent contracted-for quantities. For purposes of this section 4.C.iii.c, Roseville Electric's contract and any associated underlying contract(s) shall specify reasonably consistent procurement quantities over the term of the contract, as provided in section 4.C.iii.c.i.1-4:
1. For a contract that specifies the contracted-for quantities on an annual basis, the contracted-for annual quantities vary no more than 33 percent above or below the average annual quantity for the entire contract term, except as provided in section

4.C.iii.c.i.4. If Roseville Electric has contracted for a share of facility output, the variation shall be assessed based on differences in the contracted-for share.

2. Notwithstanding section 4.C.iii.c.i.1, for a contract to procure only electricity products meeting the criteria of Portfolio Content Category 3, reasonably consistent procurement quantities means the average contracted-for procurement quantities vary by no more than 33 percent between any two adjacent compliance periods, except as provided in section 4.C.iii.c.i.4.
3. For long-term contracts meeting the criteria of section 4.C.iii.b.i, the aggregate quantities in a jointly negotiated contract shall be the basis for assessing reasonably consistent contracted-for quantities.
4. Notwithstanding section 4.C.iii.c.i.1-2, reasonably consistent contracted-for quantities include procurement quantities that vary by more than 33 percent or procurement quantities specified on a compliance period basis, if Roseville Electric demonstrates the contract represents a procurement commitment consistent with the purposes of the long-term procurement requirement. This demonstration shall be satisfied if Roseville Electric shows that the contracted-for procurement quantities are associated with one of the following:
    a. At the time of contract execution, the eligible renewable energy resource is already committed to a different entity during the individual year(s) in which the variation exceeds 33 percent and Roseville Electric's commitment supports the development of a new eligible renewable energy resource or the improvement of an existing eligible renewable energy resource.
    b. At the time of contract execution, Roseville Electric had identified a forecasted reduction in retail sales associated with the anticipated loss of specific customer accounts or local industry or Roseville Electric had identified a forecasted increase in generation from other eligible renewable energy resources that will achieve commercial operation during the contract term.
    c. The variation during the individual year(s) is associated with expected maintenance, repair, construction, or other modification of the eligible renewable energy resource.
    d. The variation is associated with anticipated transmission constraints.
    e. The variation is associated with Roseville Electric taking over the share or purchases from another buyer for the same eligible renewable energy resource when that other buyer's contract term ends.
    f. The variation is only associated with Roseville Electric procuring increasing quantities or shares from the same eligible renewable energy resource over the term of the contract.
    g. Roseville Electric otherwise demonstrates that the variation supports the financing of the new eligible renewable energy resource or improvements of the existing eligible renewable energy resource, or is otherwise consistent with the purposes of the long-term procurement requirement.
5. Notwithstanding the requirements specified in section 4.C.iii.a-c, a contract that specifies a contracted-for quantity of zero during any year of the initial 10-year term of a long-term contract may still qualify as long-term if Roseville Electric demonstrates that the contract meets one of the conditions specified in section 4.C.iii.c.i.4 and the contract term includes at least 10 total years with nonzero contracted-for procurement quantities. Under such circumstances, the "first 10 continuous years of the contract term" in section 4.C.iii.c.ii and 4.C.iii.c.iii shall refer to the first 10 years of the contract with nonzero contracted-for procurement quantities.

ii. No-cost, early termination. The contract does not include early termination provisions that allow the purchasing entity, Roseville Electric, to unilaterally terminate the contract without

cause and without incurring a penalty, fee or other form of liquidated damages under the contract during the first 10 continuous years of the contract term, except as specified in section 4.C.iii.c.ii.1-2.

1. The early termination provisions prohibited by this section 4.C.iii.c.ii do not preclude the purchasing entity, Roseville Electric, from terminating the contract because of, or including early termination provisions concerning, any the following:
    a. The seller's default or other nonperformance under the contract.
    b. A force majeure event that prevents the seller from performing its obligations or complying with a condition of the contract. A force majeure event includes any act or occurrence that delays or prevents the seller from timely performing an obligation under the contract or complying with a conditions required under the contract if such act or event is beyond the reasonable control of and without fault or negligence of the seller.
    c. Mutual agreement of the purchasing entity and seller.
    d. A facility associated with the contract ceases to be an eligible renewable energy resource, ceases to comply with the Emissions Performance Standard pursuant to section 2903 (b) in the California Code of Regulations, ceases to provide environmental attributes, or ceases to provide resource adequacy attributes due to the occurrence of a change in law, and in any of these circumstances the seller is unable to remedy the loss of any of these attributes as such obligation is limited under the terms of the contract.
    e. The Commission determines that a facility associated with the contract does not qualify as an eligible renewable energy resource for reasons other than a change in law.
    f. A change in ownership of the seller.
    g. Facilitating a sale of the eligible renewable energy resource under the contract to the purchasing POU, Roseville Electric.
2. This section 4.C.iii.c.ii does not prohibit early termination provisions where the purchasing POU, Roseville Electric submits information to the Commission that demonstrates the contract, notwithstanding any early termination provisions, secures a procurement commitment of at least 10 continuous years for Roseville Electric consistent with the purposes of the long-term procurement requirement, including supporting long-term planning and market stability, and investments in the development of new eligible renewable energy resources or improvements to existing eligible renewable energy resources.

iii. Notwithstanding section 4.C.iii.c.i and 4.C.iii.c.ii, a long-term contract does not include a contract that contains no specified output share or quantities of procurement or minimum pricing terms, such that the express intent of the parties to the contract is to individually negotiate the price and quantity terms in any year within the first 10 continuous years of the contract term, and neither party has an obligation to procure or sell any quantity during any such individual year.

d. A short-term contract is defined as a contract to procure electricity products for a duration of fewer than 10 continuous years or a contract that does not meet the criteria of section 4.C.iii.a-c.
e. The duration of a contract shall be measured from the contract start date until the contract end date, except as specified in section 4.C.iii.e.i-iii. The duration shall be deemed continuous if the contract specifies nonzero procurement quantities on an annual or compliance period basis, or a combination of both, for the contract term, except as provided in section 4.C.iii.c.i.5. The contract start date may occur before, on, or after January 1, 2021.
    i. If electricity products are procured under a long-term contract that has been amended to extend the end date of the contract, the electricity products procured under the amendment shall be classified as long-term, except as provided in section 4.C.iii.l.

ii. If electricity products are procured under a short-term contract that has been amended to extend the end date of the contract, the duration of the amended contract will be measured from the amendment execution date until the amendment end date. If the amended contract duration is at least 10 continuous years and the amended contract otherwise satisfies the requirements of a long-term contract, procurement from the amended contract shall be classified as long-term as of the month and year of the amendment execution date.
iii. If electricity products are procured under a long-term contract that has been amended or terminated early such that the contract duration is no longer at least 10 continuous years, only the electricity products procured prior to the amendment execution date or termination notice may be classified as long-term.

f. Procurement from an ownership agreement shall be classified as long-term, unless the agreement specifies that the ownership duration is for a period of less than 10 continuous years. Procurement from an ownership agreement that specifies the ownership duration is for a period of fewer than 10 continuous years shall be classified as short-term.
g. Electricity products procured in excess of the quantity that Roseville Electric is obligated to procure under a long-term contract shall be treated as a new agreement for the additional quantities, except where the additional quantities are from the same RPS-certified facility or facilities and where the potential for Roseville Electric to procure the additional quantities is identified in the long-term contract, in which case the additional quantities shall be treated as part of the long-term contract. Additional quantities that are treated as part of the long-term contract pursuant to this section 4.C.iii.g shall not be used to adjust the annual average quantity of the contract for purposes of section 4.C.iii.c.i.
h. Electricity products classified as Portfolio Content Category 2 under the requirements of section 4.A shall count toward the long-term procurement requirement of this section 4.C if the electricity products are procured under a long-term contract subject to section 4.C.i-iii or an ownership agreement subject to section 4.C.iii.f, even if the matching incremental electricity is not associated with a long-term contract or an ownership agreement.
i. Notwithstanding the requirements for underlying contracts in section 4.C.iii.a-c, electricity products classified as Portfolio Content Category 3 under the requirements of section 4.A shall be classified as long-term, subject to the maximum limit for Portfolio Content Category 3 calculated in section 3, if Roseville Electric procures them through a contract that has a duration of at least 10 continuous years and Roseville Electric's own contract meets the requirements of section 4.C.iii.a-c, or Roseville Electric procures the electricity products through its ownership or ownership agreement.
j. Electricity products that meet the criteria of section 4.A.ix shall be classified as long-term without regard to the requirements of section 4.C.iii.a-g.
k. Excess procurement that was accrued in accordance with the requirements of section 7.A.ii and applied to the RPS procurement target for a compliance period beginning on or after January 1, 2021, shall be classified as long-term without regard to the requirements of section 4.C.iii.a-g.
l. For purposes of this section 4.C, amendments, assignments, or modifications of long-term contracts or ownership agreements other than as specified in section 4.C.iii.e will be treated as follows:
    i. Amendments or modifications that increase the expected quantities or allocation of generation under the original contract or ownership agreement resulting from efficiency improvements or an expansion of the RPS-certified facility generating the procured electricity products shall be treated as part of the original long-term contract or ownership agreement.
    ii. Amendments or modifications that result in an increase in expected quantities or allocation of generation due to contractual changes other than those provided in section 4.C.iii.l.i, shall be treated as new agreements for the increase in expected quantities or allocation of generation, unless the increase was specified in the original long-term contract or ownership agreement.

iii. Amendments or modifications that substitute a different eligible renewable energy resource shall be treated as new agreements for procurement of generation associated with the substitute eligible renewable energy resource unless the following conditions are satisfied:
    1. The original long-term contract or ownership agreement specifies the ability to add or substitute eligible renewable energy resources.
    2. Any eligible renewable energy resources added to or substituted in the long-term contract or ownership agreement are owned by the seller or are subject to a long-term contract in its original term or an extension that has a remaining duration of at least 10 continuous years.
    3. Notwithstanding section 4.C.iii.I.iii.1-2, replacement energy procured from another RPS-certified facility, as allowed by the original long-term contract, shall be considered part of the original long-term contract if Roseville Electric can submit information demonstrating that the need for replacement energy occurred because the RPS-certified facility specified in the original long-term contract did not perform as the contract required.
        a. For purposes of this section 4.C.iii.I.iii.3, "replacement energy" means electricity products provided by a seller to Roseville Electric pursuant to the terms of a long-term contract to offset the failure of an RPS-certified facility to provide the amount of electricity products otherwise guaranteed under the contract. Replacement energy does not include energy provided to offset a failure of the seller to provide the guaranteed electricity products due to the sale of the guaranteed electricity products to another entity.

iv. Amendments, assignments, or modifications of a jointly negotiated long-term contract or joint ownership agreement that reallocate electricity products among the identified joint parties shall be treated as part of the original long-term contract or ownership agreement.

v. Assignments of long-term contracts, whereby a retail seller or Roseville Electric assigns the remaining portion of its procurement obligations under a long-term contract to a second POU, shall be treated as a long-term contract, provided the assignment maintains the commitment to procure the same type and quantity electricity products from the RPS-certified facility and the duration of the assignment is at least 10 years.

D. *Exemptions and Adjustments*

Per section 3204(b)(11) of the RPS Guidelines, Roseville Electric owns a qualifying (in other words, that satisfies the criteria of Public Utilities Code section 399.33(a)) gas-fired power plant, and may reduce the amount of eligible renewable energy resources that it procures for a compliance period beginning January 1, 2025, subject to the following:

i. The qualifying gas-fired power plant must be operating at or below a 20 percent capacity factor on an annual average during the compliance period in order to reduce the RPS procurement target for the compliance period.
    a. For purposes of this section 4.D, the capacity factor on an annual average during the compliance period is calculated as the total annual generation produced by the power plant divided by the total annual generation the power plant could have produced that year if it had operated at nameplate capacity for the entire year.

    The numerical expression to determine the capacity factor on an annual average during the compliance period is:

$$((G_{X1} \div C_{X1}) + (G_{X2} \div C_{X2}) + (G_{X3} \div C_{X3}))/3$$

G_X = Quantity of generation from a gas-fired power plant for year X of the compliance period

C_X = Quantity of generation that the gas-fired power plant could have produced for year X if it had operated at nameplate capacity for the entire year

ii. Additional procurement of eligible renewable energy resources or zero-carbon resources resulted in the power plant operating at, or below, a 20 percent capacity factor on an annual average during the compliance period.

iii. Roseville Electric has attempted to mitigate against the reduction of generation to below 20 percent of the qualifying gas-fired power plant's total capacity by attempting to sell the power plant or attempting to sell the generation from the power plant to the extent it is practicable and does not result in resource shuffling.[33]

iv. Roseville Electric has procured eligible renewable energy resources equal to at least 45 percent of its retail sales by December 31, 2027, 50 percent by 2030, and 50 percent for each three-year multiyear compliance period thereafter, and reasonable progress in each of the intervening years of these compliance periods.

The numerical expression of this requirement for the compliance period beginning January 1, 2025, ending December 31, 2027, is:

$$(EP_{2025} + EP_{2026} + EP_{2027}) = 0.4167\ (RS_{2025}) + 0.4333\ (RS_{2026}) + 0.4500\ (RS_{2027})$$

The numerical expression of this requirement for the compliance period beginning January 1, 2028, ending December 31, 2030, is:

$$(EP_{2028} + EP_{2029} + EP_{2030}) = 0.4667\ (RS_{2028}) + 0.4833\ (RS_{2029}) + 0.5000\ (RS_{2030})$$

The numerical expression of this requirement for the three-year compliance period beginning January 1, 2031, and subsequent three-year compliance periods is:

$$(EP_{X1} + EP_{X2} + EP_{X3}) = 0.5000\ (RS_{X1}) + 0.5000\ (RS_{X2}) + 0.5000\ (RS_{X3})$$

EP_X = Electricity products applied to the specified year X toward the RPS procurement target for the compliance period containing year X. This may include electricity products retired for and applied to year X, subject to the Portfolio Content Category 3 limit calculated in section 3204 (c) of the RPS

[33] "Resource Shuffling" means any plan, scheme, or artifice undertaken by a First Deliverer of Electricity to substitute electricity deliveries from sources with relatively lower emissions for electricity deliveries from sources with relatively higher emissions to reduce its emissions compliance obligation. Resource shuffling does not include substitution of electricity deliveries from sources with relatively lower emissions for electricity deliveries from sources with relatively higher emissions resources when the substitution occurs pursuant to the conditions listed in section 95852(b)(2)(A) of the California Code of Regulations.

Guidelines, and excess procurement pursuant to section 3206 (a)(1) and historic carryover pursuant to section 3206 (a)(5) that the City of Roseville has applied to year X.

RS_X = Retail sales made by the City of Roseville for the specified year X

v. If Roseville Electric satisfies the conditions of sections 4.D.i-iv, it may reduce its procurement target for the compliance period calculated in section 4.D.iv by the difference between the gas-fired power plant's actual generation for the compliance period and the amount of generation it could have produced if it had operated at a 20 percent capacity factor on an annual average during the compliance period.

vi. The reduction of the procurement target will be calculated using the quantity of qualifying gas-fired generation as reported in accordance with section 3207 (m) of the RPS Guidelines.

vii. This procurement requirement reduction shall be available only until December 31 of the calendar year during which the qualifying gas-fired power plant's original term of bonded indebtedness expires.

viii. RPS procurement requirements deficits incurred by Roseville Electric in any compliance period shall not be added to the RPS procurement requirements of Roseville Electric in a future compliance period.

ix. In addition to the applicable reporting requirements in section 3207 (a)-(d) of the RPS Guidelines, starting with the compliance period beginning January 1, 2025, if the City of Roseville reduces its procurement target pursuant to section 3204 (b)(11), it shall submit to the Commission, by the deadline for
annual reports specified in section 3207 (c) for the final year of each compliance period, the following information:

a. The quantity, in MWh, of generation from a qualifying gas-fired power plant for each year of the compliance period.
b. Documentation demonstrating that the qualifying gas-fired power plant meets the criteria of Public Utilities Code section 399.33 (a). This documentation may include, but is not limited to: findings adopted by the City of Roseville's City Council, adopted city council resolutions, proof of facility ownership, financial records, compliance filings, and/or wage schedules or other such documents for facility employees.
c. The nameplate capacity of the facility and the City of Roseville's calculation of the facility's capacity factor for each year of the compliance period based on the facility's annual generation for that year.
d. Documentation demonstrating the City of Roseville's efforts to sell the qualifying gas-fired power plant or gas-fired power plant generation to mitigate against the reduction of generation below a 20 percent capacity factor.
e. Documentation demonstrating that additional procurement of eligible renewable energy resources or zero-carbon generation resources resulted in the power plant operating at, or below, a 20 percent capacity factor on an average annual basis during the compliance period.
f. Any additional documentation requested by the Commission necessary to determine whether the City of Roseville meets the criteria specified in Public Utilities Code section 399.33 (a) and satisfied the requirements of section 3204 (b)(11) of the RPS Guidelines.

5. Plan for Roseville's RPS Requirement

A. *Procurement/Retirement Strategy*

The City of Roseville Electric Utility (Roseville Electric, or Roseville) plans to pursue a procurement strategy that maximizes flexibility and allows for retirement and banking of excess renewable energy credits (REC). This strategy will allow Roseville Electric to bank excess eligible RECs and apply them to future compliance periods.

Because RECs must be retired within three years of being created, the only way to "bank" an eligible REC for longer periods is to take advantage of the excess procurement optional compliance measure identified later in this document (section 7.A.).

B. *Grandfathered and "Other" Resources not Subject to Portfolio Balance Requirements*

Roseville Electric entered into several contracts prior to June 1, 2010, which makes them PCC0 resources ("other") that are not subject to the portfolio balance requirements. "Other" resources are defined as those from pre-June 1, 2010, contracts that meet the current RPS requirements, but did not meet the RPS "rules in place" at the time the contract was signed. The following list describes Roseville's grandfathered resources and "other" resources not subject to the portfolio balance requirements.

i. Roseville has a contract with the Western Area Power Administration (WAPA) for a share of the output of the Central Valley Project Base Resource, located in California. A portion of this project is small hydro which qualifies as renewable.
ii. Roseville has a contract with Northern California Power Agency for 12% of the Calaveras hydro project, which includes the 6 MW New Spicer power plant located in California. The energy from the New Spicer plant qualifies as renewable.
iii. Roseville has contracts with Northern California Power Agency for a combined total of 7.883% of the Geothermal projects output. The projects have a total capacity of 220 MW and are located in California. The energy from these projects qualify as renewable.

C. *Portfolio Content Category Resources*

In general, PCC1 renewable energy is the most expensive and PCC3 is the least expensive, with PCC2 prices falling in between PCC1 and PCC3 prices. To meet the RPS requirements in the most cost effective way and minimize costs to ratepayers, PCC3 energy should be maximized in order to minimize the amount of PCC1 needed, with the balance met by PCC2 energy.

In September 2012, Roseville entered into a contract with the City of Santa Clara to procure PCC1 energy and RECs.

In July 2013, Roseville entered into a contract with Lost Hills Solar, LLC and Blackwell Solar, LLC to procure PCC1 energy and RECs.

In September 2014, Roseville entered into a contract with Iberdrola Renewables, LLC, to procure PCC1, PCC2, and PCC3 energy and/or RECs.

In March 2015, Roseville entered into a contract with Powerex, Inc., to procure PCC1 energy and RECs.

In February 2021, Roseville extended the Base Resource contract with Western Area Power Administration to continue to procure PCC1 energy and RECs.

In December 2021, Roseville entered into a contract with South Feather Water and Power Agency via NCPA to procure PCC1 energy and RECs.

With the above contracts, Roseville has contracted for sufficient renewables to meet Roseville's RPS obligations through the year 2024 under the sixty percent (60%) by 2030 RPS standard.

6. Procurement Process

Pursuant to Public Utilities Code section 399.30(n), in all manners regarding compliance with the RPS, the City of Roseville shall retain exclusive control and discretion over both of the following:

i. The mix of eligible renewable energy resources procured by the utility and those additional generation resources procured by the utility for purposes of ensuring resource adequacy and reliability.
ii. The reasonable costs incurred by the utility for eligible renewable energy resources owned by the utility.

The Power Supply section regularly analyzes the City of Roseville's RPS procurement needs. Portfolio supply and demand are assessed. If needed, a solicitation for renewable energy is conducted. Generally, the best offers of each PCC and generator type are identified and short-listed. These offers are the first to be considered. Offers received outside the solicitation process are only considered if they are competitive with the most recent solicitation short-listed offers.

Offers are evaluated for:

i. Direct and indirect costs, including but not limited to: contract price of energy and REC, plus transmission and integration costs
ii. Risk, including but not limited to: cost risk, credit risk, deliverability risk, regulatory risk, and project viability
iii. Portfolio fit (including, but not limited to, such factors as timing, quantity, and PCC type)

Offers are pursued and contracts are negotiated within the cost limitations for expenditures, set in section 7 of this RPS Procurement Plan.

Pursuant to Public Utilities Code section 399.21(a)(7) and section 3202 of the RPS Guidelines, all RECs will be retired within 36 months from the initial date of generation of the associated electricity.

7. Optional Measures

Specific optional measures are allowed pursuant to Public Utilities Code section 399.30(d) and section 3206 of the RPS Guidelines. Measures must be adopted by City Council prior to the end of the compliance period in which they will be used. The City of Roseville is adopting the following optional measures as part of this RPS Procurement Plan. The City of Roseville will submit the rules or rule revisions adopted under section 3206 of the RPS Guidelines to the Commission within 30 calendar days after adoption. The rules or rule revisions shall be submitted along with all reports, analyses, findings, and any other information upon which the City of Roseville relied in adopting the rule or rule revision.

A. *Excess Procurement*

Pursuant to Public Utilities Code section 399.30(d) and section 399.13(a)(4)(B) and section 3206(a)(1) of the RPS Guidelines, the City of Roseville shall be allowed to apply excess procurement in one compliance period to subsequent compliance periods as long as the following conditions are met:

i. If the City of Roseville has applied sufficient electricity products to satisfy its RPS procurement requirements of the compliance period, without using other optional compliance measures (delay of timely compliance, cost limitations, portfolio balance requirement reduction);

ii. Excess procurement accrual will be subject to the following limitations for the Compliance Periods beginning January 1, 2011, through December 31, 2020:
   a. Electricity products that meet the criteria of section 3202 (a)(1) or section 3202 (a)(3), and are classified in Portfolio Content Category 3 may not be accrued as excess procurement.
   b. Electricity products that meet the criteria of section 3202 (a)(1) and that exceed the maximum limit for Portfolio Content Category 3 for the compliance period, as specified in section 3204 (c), must be subtracted from the calculation of accrued excess procurement.
   c. Electricity products procured under contracts of less than 10 years in duration in accordance with section 3206 (a)(1)(C)4. shall be subtracted from the calculation of accrued excess procurement, unless the electricity product meets the criteria in section 3202 (a)(2).
   d. For purposes of calculating accrued excess procurement for the compliance periods beginning January 1, 2011, through December 31, 2020, if electricity products are procured under a contract that has been amended to extend the term, the duration of the amended contract will be calculated from the original contract execution date to the amended contract end date. If electricity products are procured under a contract of less than 10 years in duration that has been amended to extend the total term to at least 10 years in duration, then electricity products generated as of the month and year in which the contract amendment occurs will be eligible to qualify as excess procurement.

iii. Excess procurement accrual will be subject to the following limitations for the compliance periods beginning on or after January 1, 2021:
   a. Electricity products that meet the criteria of section 3202 (a)(1) or section 3202 (a)(3), and are classified in Portfolio Content Category 2 or Portfolio Content Category 3, may not be accrued as excess procurement;
   b. Electricity products that meet the criteria of section 3202 (a)(1) and that exceed the maximum limit for Portfolio Content Category 3 for the compliance period, as specified in section 3204 (c), must be subtracted from the calculation of accrued excess procurement.

iv. Excess procurement may be accrued no earlier than January 1, 2011.

v. Electricity products accrued as excess procurement may be applied toward any future compliance periods, except as specified below:
    a. Electricity products accrued in accordance with section 3206 (a)(1)(C) that are classified in Portfolio Content Category 2 may not be applied toward the RPS procurement requirements of a compliance period beginning on or after January 1, 2028.

vi. Excess procurement for each compliance period starting January 1, 2021 shall be calculated using the following formula as specified in the RPS Guidelines, section 3206(a)(1):

$$Excess\ Procurement_x = EP_x - (RPS_x - B_x) - (S3_x + STC_x)$$

EP_x = *Electricity Products retired for the compliance period x*

RPS_x = *The RPS procurement target calculated in section 3204 (a) for compliance period X or, if greater than the target, the amount of electricity products applied toward the target. This may include electricity products retired for compliance period X, excess procurement accrued in a prior compliance period, or historic carryover pursuant to section 3206 (a)(5), that the City of Roseville has applied toward the target.*

B_x = *Any excess procurement accrued in a prior compliance period or historic carryover pursuant to section 3206 (a)(5) that the City of Roseville applied toward the RPS procurement target calculated in section 3204 (a) for compliance period X*

$S3_x$ = *Any remaining retired electricity products that meet the criteria of section 3202 (a)(1) or section 3202 (a)(3), and the definition of Portfolio Content Category 3*

STC_x = *Any remaining retired electricity products that meet the criteria of section 3202 (a)(1) or section 3202 (a)(3), and are associated with contracts less than 10 years in duration in accordance with section 3206 (a)(1)(C)4*

B. *Delay of Timely Compliance*

Pursuant to Public Utilities Code section 399.30(d)(2)(A) and section 399.15(b)(5) and section 3206(a)(2) of the RPS Guidelines, the City of Roseville shall adopt rules allowing it to determine that conditions beyond the control of the City of Roseville exist to delay timely compliance with RPS procurement requirements, as defined in section 3204. Roseville's adopted rules shall limit the determination to one or more of the causes for delay specified in section 3206 (a)(2)(A)1.-4. The City of Roseville's determination shall include information showing that it would have met its RPS procurement requirements but for the cause(s) of delay:

i. There is inadequate transmission capacity to allow sufficient electricity to be delivered from eligible renewable energy resources, or proposed eligible renewable energy resource projects, to the extent applicable, using the current operational protocols of the balancing authority in which the City of Roseville operates. If the City of Roseville at the time of the determination owns transmission or has transmission rights, it shall include in its determination information showing how the inadequate transmission capacity delayed timely compliance and:
    a. That the City of Roseville has undertaken all reasonable measures under its control and consistent with its obligations under local, state, and federal laws and regulations, to develop and construct new transmission lines or upgrades to existing lines intended to transmit electricity generated by eligible renewable energy resources in light of its expectation for cost recovery.

b. That the City of Roseville has taken all reasonable operational measures to maximize cost-effective purchases of electricity from eligible renewable energy resources in advance of transmission availability.

ii. Permitting, interconnection, or other circumstances have delayed procured eligible renewable energy resource projects, or there is an insufficient supply of eligible renewable energy resources available to the City of Roseville. The City of Roseville will include in its determination information showing how the permitting, interconnection, or other circumstances caused delayed projects or insufficient supply and that the City of Roseville:
   a. Prudently managed portfolio risks, including, but not limited to, holding solicitations for RPS-eligible resources with outreach to market participants and relying on a sufficient number of viable projects to achieve RPS procurement requirements.
   b. Sought to develop either its own eligible renewable energy resources, transmission to interconnect to eligible renewable energy resources, or energy storage used to integrate eligible renewable energy resources.
   c. If the cause for delay or insufficient supply was foreseeable, procured an appropriate minimum margin of procurement above the level necessary to comply with the RPS to compensate for foreseeable delays or insufficient supply. The City of Roseville's determination shall identify the minimum margin of procurement that the City of Roseville deemed appropriate to compensate for foreseeable delays or insufficient supply.
   d. Taken reasonable measures to procure cost-effective distributed generation and allowable unbundled RECs.

iii. Unanticipated curtailment of eligible renewable energy resources, if the delay of timely compliance would not result in an increase in greenhouse gas emissions. The City of Roseville's determination shall include information showing that unanticipated curtailment of eligible renewable energy resources delayed timely compliance and did not result in an increase in greenhouse gas emissions.

iv. Unanticipated increase in retail sales due to "transportation electrification," as defined in Public Utilities Code section 237.5. The City of Roseville's determination shall include information showing that it considered the following:
   a. Whether transportation electrification significantly exceeded forecasts in the City of Roseville's service territory based on the best and most recently available information available to it. Transportation electrification forecasts may include, but are not limited to, information filed with the State Air Resources Board, the Commission, or another state agency, forecasts in the City of Roseville's integrated resource plan developed pursuant to Public Utilities Code section 9621, or other forecasts developed or approved by the City of Roseville.
   b. Whether the City of Roseville has taken reasonable measures to procure sufficient resources to account for unanticipated increases in retail sales due to transportation electrification.

Pursuant to Public Utilities Code section 399.15(b)(9) and section 3204(e) of the RPS Guidelines, in no event shall a deficit associated with the compliance period be added to a future compliance period.

C. *Cost Limitations for Expenditures*

Pursuant to Public Utilities Code section 399.30(d)(2)(B) and section 399.15(c) and section 3206(a)(3) of the RPS Guidelines, the City of Roseville shall adopt rules for cost limitations on the procurement expenditures used to comply with its RPS procurement requirements. The adopted cost limitation rules shall be set at a level

that the City of Roseville has determined will prevent disproportionate rate impacts. When applying procurement expenditures under its adopted cost limitation rule, the City of Roseville shall apply only those types of procurement expenditures that are permitted under the adopted cost limitation rule. Adopted cost limitation rules shall include planned actions to be taken in the event the projected cost of meeting the RPS procurement requirements exceeds the cost limitation. Such actions may include, but are not limited to, refraining from entering into new contracts or constructing facilities for eligible renewable energy resources beyond the quantity that can be procured within the cost limitation.

D. *Portfolio Balance Requirement Reduction*

Pursuant to Public Utilities Code section 399.16(e) and section 3206(a)(4) of the RPS Guidelines, the City of Roseville shall adopt rules that allow for the reduction of the portfolio balance requirement for Portfolio Content Category 1 for a specific compliance period consistent with Public Utilities Code section 399.16 (e). In applying this provision, the City of Roseville will consider all of the following:

i. The need to reduce the portfolio balance requirements for Portfolio Content Category 1 must have resulted because of conditions beyond the control of the City of Roseville as provided in the Delay of Timely Compliance section.
ii. A reduction of the portfolio balance requirement for Portfolio Content Category 1 below 65 percent, will not be considered consistent with Public Utilities Code section 399.16 (e).
iii. The City of Roseville, when reducing its portfolio balance requirements for Portfolio Content Category 1, will adopt these changes at a publicly noticed meeting, and will include this information in an updated renewable energy resources procurement plan submitted to the Commission. The notice to consider the portfolio balance requirement reduction and the procurement plan must include the following information:
    a. The compliance period for which the reduction may be adopted.
    b. The level to which the City of Roseville has reduced the requirement.
    c. An explanation of how the needed reduction resulted from conditions beyond the control of the City of Roseville as provided in the Delay of Timely Compliance section.

E. *Invoking Optional Measures*

Roseville Electric plans to invoke the Excess Procurement provision as described in section 7.A. of this plan, and may invoke other optional measures as needed.

8. Reporting

Pursuant to section 3207 of the RPS Guidelines, the City of Roseville shall submit annual and compliance period reports to the CEC as identified below.

A. *Annual Reports*

By July 1 of each year, the City of Roseville shall submit an annual report to the CEC that includes the information in sections i. through iv. below for the prior calendar year. The format for the annual report shall be specified by the Commission, but the information contained in the annual report may be combined with other existing reports that contain the same information and are also supplied to the Commission. If the

annual report refers to information provided to the Commission through existing reports, the annual report shall reference the information by identifying the name, submittal date, and page number of the existing report. The annual report shall include an attestation, signed by an authorized agent of the City of Roseville, affirming that the information provided in the report is true and correct. The following shall be included in the report:

i. Identifying information, including: POU name, contact name, mailing address, phone number, and email address.
ii. RPS annual progress information for the prior calendar year, including:
    a. Amount of retail sales to end-use customers, in MWh, and projected retail sales for the current compliance period.
    b. Amount of procured electricity products retired, in MWh, and total projected electricity products retired for the current compliance period.
    c. Western Renewable Energy Generation Information System (WREGIS) compliance report for procurement claims in the prior calendar year. For any procurement claims not tracked through WREGIS as permitted by the RPS Guidelines, the City of Roseville shall report procurement claims using the process specified in the RPS Guidelines.
    d. An initial, nonbinding classification of retired electricity products qualifying for each portfolio content category or qualifying to count in full in accordance with section 3202 (a)(2) of the RPS Guidelines.
    e. An initial, nonbinding classification of retired electricity products qualifying as long-term or short-term in accordance with section 3204 (d) of the RPS Guidelines.
    f. Information and supporting contract documentation for each of the eligible renewable energy resources with which the City of Roseville has executed contracts or ownership agreements during the prior year, including but not limited to the contracted amount of MWh or the contracted percentage of the resource's total output, if applicable; resource fuel type; the execution date of the procurement contract or ownership agreement; the contract or ownership agreement start date; the duration of the procurement contract or ownership agreement in accordance with section 3204 (d) of the RPS Guidelines; the anticipated portfolio content category classification(s) for the electricity products procured through the contract or ownership agreement; the anticipated long-term or short-term classification for the electricity products procured through the contract or ownership agreement; the seller's name, if the resource is not owned by the City of Roseville; a summary of the resource names and identification numbers; and for long-term contracts, information on how the contract meets the requirements of section 3204 (d) of the RPS Guidelines, including the associated page numbers in the contract where the terms can be located, subject to the following subsections:
        (A) Upon request from Commission staff, if the City of Roseville has a long-term contract pursuant to section 3204 (d)(2)(B)2 of the RPS Guidelines, it shall submit documentation showing that the underlying contract(s) meet the requirements of section 3204 (d)(2)(A)-(C) of the RPS Guidelines. For contracts executed prior to July 1, 2020, this documentation may include excerpted contract information, an attestation by the third-party supplier regarding the underlying contract duration or ownership of the RPS-certified facility or facilities, or both.
        (B) Documentation demonstrating a long-term contract meets the requirements of section 3204 (d)(2)(A)-(C) of the RPS Guidelines may be submitted directly to the Commission by the third-party supplier or another party on the City of Roseville's behalf. The documentation may include an attestation by the City of Roseville that the contract with

the RPS-certified facility or facilities meets the requirements of section 3204 (d)(2)(A)-(C) of the RPS Guidelines. An attestation may be submitted only if the City of Roseville possesses records to support the accuracy of the information to which it attests and the City of Roseville agrees to make such records available to the Commission upon request in the event of an audit or investigation.

g. Documentation demonstrating the portfolio content category classification and long-term or short-term classification claimed for all of the City of Roseville's procured electricity products during the prior year. This documentation may include contract information, if not previously submitted; interconnection agreements; NERC e-Tag data; scheduling agreements; and firming and shaping agreements.
h. A description of any modifications to contracts, ownership, or ownership agreements previously reviewed and evaluated by the Commission from which the City of Roseville intends to claim long-term procurement, including, but not limited to, changes to contract duration, procurement quantities, addition or substitution of resources or fuel, reallocation between parties of a jointly negotiated contract, and efficiency improvements or facility expansions that change procured generation. The City of Roseville's explanation shall include documentation supporting the modifications.
i. A description of any identified issues that occurred that have the potential to delay timely compliance with the RPS procurement requirements defined in section 3204 of the RPS Guidelines, and planned actions to minimize the delay of timely compliance. Such issues may include, but are not limited to, inadequate transmission to allow for procurement to be delivered from eligible renewable energy resources, permitting, interconnection, or other circumstances that have delayed the procurement from eligible renewable energy resources, unanticipated curtailment of a contracted or owned eligible renewable energy resource, and higher-than-expected costs for the procurement or development of eligible renewable energy resources.
j. A description of the energy consumption by the City of Roseville, including any electricity used by the City of Roseville for water pumping, or any other electricity procured by the City of Roseville for purposes other than supplying its retail sales. The description shall include the purpose of this consumption, the annual amount in MWh associated with the consumption or other end-use, and whether the consumption or other end-use was excluded from the City of Roseville's retail sales.

iii. Actions taken by the City of Roseville in the prior calendar year and planned to be taken in the current calendar year demonstrating reasonable progress toward meeting its RPS procurement requirements. The information reported shall include:

a. Solicitations released to solicit bid for contracts to procure electricity products from eligible renewable energy resources to satisfy the City of Roseville's RPS procurement requirements.
b. Solicitations released to solicit bid for ownership agreements for eligible renewable energy resources to satisfy the City of Roseville's RPS procurement requirements.
c. Actions taken to develop eligible renewable energy resources to satisfy the City of Roseville's RPS procurement requirements, including initiating environmental studies, completing environmental studies, acquiring interests in land for facility siting or transmission, filing applications for facility or transmission siting permits, and receiving approval for facility or transmission siting permits.
d. Interconnection requests filed for eligible renewable energy resources to satisfy the City of Roseville's RPS procurement requirements.

e. Interconnection agreements negotiated and executed for eligible renewable energy resources to satisfy the City of Roseville's RPS procurement requirements.
f. Transmission-related agreements negotiated and executed to transmit electricity products procured from eligible renewable energy resources to satisfy the City of Roseville's RPS procurement requirements.
g. Other planning activities to procure electricity products from eligible renewable energy resources.

iv. The City of Roseville shall include a description of all actions planned in the current calendar year to demonstrate progress towards achieving its RPS procurement requirements, as specified in the prior section.

B. *Compliance Period Reports*

At the end of each Compliance period, the City of Roseville shall submit to the CEC a compliance report that provides the following information for the applicable compliance period:

i. The City of Roseville's RPS procurement target for the compliance period, in MWh.
ii. The amount of draft verified procurement retired, in MWh, for the compliance period that the City of Roseville applies toward the RPS procurement requirements for the compliance period. The City of Roseville shall report the amount of draft verified procurement applied from each portfolio content category or meeting the criteria of section 3202 (a)(2) of the RPS Guidelines. For each portfolio content category, the City of Roseville shall additionally report the amount from each category that is classified as long-term or short-term.
iii. The amount of excess procurement, in MWh, accrued in previous compliance periods, if any, and historic carryover, if any, that the City of Roseville is applying to the RPS procurement target for the compliance period. The City of Roseville shall report the amount of excess procurement applied from each portfolio content category or that meets the criteria of section 3202 (a)(2) of the RPS Guidelines or historic carryover. For each portfolio content category, the City of Roseville shall additionally report the amount that is classified as long-term or short-term.
iv. The amount of excess procurement, in MWh, accrued for the compliance period, if any, that may be applied toward future compliance periods, as determined by applying the calculation in section 3206 (a)(1)(H) or section 3206 (a)(1)(I)6 of the RPS Guidelines, as applicable. The City of Roseville shall report the amount of accrued excess procurement from each portfolio content category or meeting the criteria of section 3202 (a)(2) of the RPS Guidelines. For each portfolio content category, the City of Roseville shall additionally report the amount that is classified as long-term or short-term.
v. If a City of Roseville's compliance report indicates that the City of Roseville's RPS procurement requirements were not met, the City of Roseville shall submit copies of its renewable energy resource procurement plan(s) and enforcement program(s) in effect during the compliance period, if not previously submitted to the Commission, and provide documentation to justify the application of any optional compliance measures adopted by the City of Roseville in accordance with section 3206 and 3207(d)(5) of the RPS Guidelines. The documentation shall include all reports, analyses, proposed findings, and any other information upon which the City of Roseville relied in applying the measure, as well as the amount of the shortfall each optional compliance measure is intended to satisfy.

Renewables Portfolio Standard Enforcement Program

October 2022

Roseville Electric
2090 Hilltop Circle
Roseville, California 95747-9704
Reliable Energy. Dependable Service.

1. The City of Roseville shall have a program for the enforcement of a Renewables Portfolio Standard (RPS) program, which shall include all of the provisions set forth herein and shall be known as the City's "RPS Enforcement Program";

2. The RPS Enforcement Program shall be effective January 1, 2012;

3. The City of Roseville shall provide notice regarding new or updated enforcement programs. The enforcement program must be adopted at a publicly noticed meeting offering all interested parties an opportunity to comment.

   A. If the enforcement program is modified or amended, no less than 10 calendar days notice shall be given to the public before any meeting is held to make a substantive change to the enforcement program;

4. Annually, the Director of City's Electric Utility shall cause to be reviewed, the City's RPS Procurement Plan to determine compliance with the RPS Enforcement Program;

5. Annual review of the RPS Procurement Plan shall include consideration of each of the following elements:

   A. By December 31, 2021:

      - Ensure that the City is making reasonable progress toward meeting the December 31, 2024, compliance obligation of forty-four percent (44%) of retail sales with eligible renewable resources, consistent with the RPS Procurement Plan.

   B. By December 31, 2022:

      - Ensure that the City is making reasonable progress toward meeting the December 31, 2024, compliance obligation of forty-four percent (44%) of retail sales with eligible renewable resources, consistent with the RPS Procurement Plan.

   C. By December 31, 2023:

      - Ensure that the City is making reasonable progress toward meeting the December 31, 2024, compliance obligation of forty-four percent (44%) of retail sales with eligible renewable resources, consistent with the RPS Procurement Plan.

   D. By December 31, 2024 (end of Compliance Period 4):

      - Verify that the City procured sufficient electricity products to meet the sum of thirty-five point seventy-five percent (35.75%) of its 2021, thirty-eight point five percent (38.5%) of its 2022, forty-one point twenty-five percent (41.25%) of its 2023, and forty-four percent (44%) of its 2024 retail sales with eligible renewable resources from the specified Content Categories for the compliance period ending December 31, 2024, consistent with the RPS Procurement Plan;

- If targets are not met, the City shall direct Roseville Electric to:
    - Review the applicability of applying Excess Procurement from a previous Compliance Period consistent with the provisions of the RPS Procurement Plan,
    - Ensure that any Delay of Timely Compliance was compliant with the provisions in the RPS Procurement Plan,
    - Ensure that any Portfolio Balance Requirement Reduction was compliant with the provisions in the RPS Procurement Plan,
    - Review applicability and appropriateness of excusing performance based on the Cost Limitations on Expenditures provisions of the RPS Procurement Plan.

E. By December 31, 2025:

- Ensure that the City is making reasonable progress toward meeting the December 31, 2027, compliance obligation of fifty-two percent (52%) of retail sales with eligible renewable resources, consistent with the RPS Procurement Plan.

F. By December 31, 2026:

- Ensure that the City is making reasonable progress toward meeting the December 31, 2027, compliance obligation of fifty-two percent (52%) of retail sales with eligible renewable resources, consistent with the RPS Procurement Plan.

G. By December 31, 2027 (end of Compliance Period 5):

- Verify that the City procured sufficient electricity products to meet the sum of forty-six percent (46%) of its 2025, fifty percent (50%) of its 2026, and fifty-two percent (52%) of its 2027 retail sales with eligible renewable resources from the specified Content Categories for the compliance period ending December 31, 2027, consistent with the RPS Procurement Plan;
- If targets are not met, the City shall direct Roseville Electric to:
    - Review the applicability of applying Excess Procurement from a previous Compliance Period consistent with the provisions of the RPS Procurement Plan,
    - Ensure that any Delay of Timely Compliance was compliant with the provisions in the RPS Procurement Plan,
    - Ensure that any Portfolio Balance Requirement Reduction was compliant with the provisions in the RPS Procurement Plan,
    - Review applicability and appropriateness of excusing performance based on the Cost Limitations on Expenditures provisions of the RPS Procurement Plan.

H. By December 31, 2028:

- Ensure that the City is making reasonable progress toward meeting the December 31, 2030, compliance obligation of sixty percent (60%) of retail sales with eligible renewable resources, consistent with the RPS Procurement Plan.

I. By December 31, 2029:

- Ensure that the City is making reasonable progress toward meeting the December 31, 2030, compliance obligation of sixty percent (60%) of retail sales with eligible renewable resources, consistent with the RPS Procurement Plan.

J. By December 31, 2030 (end of Compliance Period 6):

- Verify that the City procured sufficient electricity products to meet the sum of fifty-four point sixty-seven percent (54.67%) of its 2028, fifty-seven point thirty-three percent (57.33%) of its 2029, and sixty percent (60%) of its 2030 retail sales with eligible renewable resources from the specified Content Categories for the compliance period ending December 31, 2030, consistent with the RPS Procurement Plan;
- If targets are not met, the City shall direct Roseville Electric to:
    - Review the applicability of applying Excess Procurement from a previous Compliance Period consistent with the provisions of the RPS Procurement Plan,
    - Ensure that any Delay of Timely Compliance was compliant with the provisions in the RPS Procurement Plan,
    - Ensure that any Portfolio Balance Requirement Reduction was compliant with the provisions in the RPS Procurement Plan,
    - Review applicability and appropriateness of excusing performance based on the Cost Limitations on Expenditures provisions of the RPS Procurement Plan.

O. By December 31, 2031 and annually thereafter:

- Verify that the City met sixty percent (60%) of retail sales with eligible renewable resources from the specified Content Categories, consistent with the RPS Procurement Plan;
- If targets are not met, the City shall direct Roseville Electric to:
    - Review the applicability of applying Excess Procurement from a previous Compliance Period consistent with the provisions of the RPS Procurement Plan,
    - Ensure that any Delay of Timely Compliance was compliant with the provisions in the RPS Procurement Plan,
    - Ensure that any Portfolio Balance Requirement Reduction was compliant with the provisions in the RPS Procurement Plan,
    - Review applicability and appropriateness of excusing performance based on the Cost Limitations on Expenditures provisions of the RPS Procurement Plan.

6. If it is determined that the City has failed to comply with the provisions of its RPS Procurement Plan, Roseville Electric shall take steps to correct any untimely compliance, including:

A. Review the City's RPS Procurement Plan to determine what changes, if any, are necessary to ensure compliance in the next Compliance Period;

B. Report regularly to the City Council regarding the progress being made toward meeting the compliance obligation for the next Compliance Period;

C. Report to the City Council regarding the status of meeting subsequent compliance targets, and all steps being taken to ensure that the obligation is timely met.

Appendix E – Standardized Tables

Admin Info

State of California
California Energy Commission

Standardized Reporting Tables for Public Owned Utility IRP Filing

Administrative Information

Form CEC 113 (May 2017)

Name of Publicly Owned Utility ("POU")	Roseville Electric
Name of Resource Planning Coordinator	Petra Wallace
Name of Scenario	2023 IRP - Base Case and Least Cost Plan

Persons who prepared Tables	**CRAT**	**Energy Balance Table**	**Emissions Table**	**RPS Table**	**Application for Confidentiality**
Name:	Brian Schinstock	Brian Schinstock	Brian Schinstock	Brian Schinstock	
Title:	Electric Resource Planner	Electric Resource Planner	Electric Resource Planner	Electric Resource Planner	
E-mail:	bschinstock@roseville.ca.us	bschinstock@roseville.ca.us	bschinstock@roseville.ca.us	bschinstock@roseville.ca.us	
Telephone:	916-746-1658	916-746-1658	916-746-1658	916-746-1658	
Address:	2090 Hilltop Circle	2090 Hilltop Circle	2090 Hilltop Circle	2090 Hilltop Circle	
Address 2:					
City:	Roseville	Roseville	Roseville	Roseville	
State:	CA	CA	CA	CA	
Zip:	9547	9547	9547	9547	
Date Completed:	11/8/2023	11/8/2023	11/8/2023	11/8/2023	
Date Updated:					
Back-up / Additional Contact Persons for Questions about these Tables (Optional):					
Name:	Petra Wallace	Petra Wallace	Petra Wallace	Petra Wallace	
Title:	Power Supply and Portfolio Administrator	Power Supply and Portfolio Administrator	Power Supply and Portfolio Administrator	Power Supply and Portfolio Administrator	
E-mail:	pwallace@roseville.ca.us	pwallace@roseville.ca.us	pwallace@roseville.ca.us	pwallace@roseville.ca.us	
Telephone:	916-774-5510	916-774-5510	916-774-5510	916-774-5510	
Address:	2090 Hilltop Circle	2090 Hilltop Circle	2090 Hilltop Circle	2090 Hilltop Circle	
Address 2:					
City:	Roseville	Roseville	Roseville	Roseville	
State:	CA	CA	CA	CA	
Zip:	9547	9547	9547	9547	

CRAT

State of California
California Energy Commission
Standardized Reporting Tables for Public Owned Utility IRP Filing
Capacity Resource Accounting Table
Form CEC 109 (May 2017)

Scenario Name:

Yellow fill relates to an application for confidentiality.
Data input by User are in dark green font.
Units = MW

	PEAK LOAD CALCULATIONS		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	Forecast Total Peak-Hour 1-in-2 Demand		357	341	335	345	348	346	337	338	344	344	350	352	356	359
2	[Customer-side solar: nameplate capacity]		19	21	25	29	40	46	54	59	63	68	72	75	79	82
2a	[Customer-side solar: peak hour output]	Items 2a to 5 are already incorporated in the load forecast.	2	3	3	4	5	6	6	7	8	8	7	6	6	6
3	[Peak load reduction due to thermal energy storage]															
4	[Light Duty PEV consumption in peak hour]															
5	Additional Achievable Energy Efficiency Savings on Peak															
6	Demand Response / Interruptible Programs on Peak		2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	**Managed Peak Demand (1-5-6)**		**355**	**339**	**333**	**343**	**346**	**344**	**335**	**336**	**342**	**342**	**348**	**350**	**354**	**357**
8	Planning Reserve Margin		53	51	50	51	52	52	50	50	51	51	52	53	53	53
9	Firm Sales Obligations															
10	**Total Peak Procurement Requirement (7+8+9)**		**408**	**390**	**383**	**394**	**398**	**395**	**386**	**386**	**394**	**393**	**400**	**403**	**407**	**410**

EXISTING AND PLANNED CAPACITY SUPPLY RESOURCES

Utility-Owned Generation and Storage (not RPS-eligible):

	[list resource by name]	Fuel	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
11a	Roseville Energy Park	Natural Gas	79	155	155	155	155	155	155	155	155	155	155	155	155	155
11b	Roseville Power Plant 2	Natural Gas	24	48	48	48	48	48	48	48	48	48	48	48	48	48

Long-Term Contracts (not RPS-eligible):

	[list contracts by name]	Fuel														
11h	Western Area Power Admin (Large)	Large Hydro	71	68	79	71	54	43	53	53	51	52	52	52	52	52
11i	Collierville	Large Hydro	49	34	33	35	30	32	31	31	31	31	31	31	31	31
11j	Forbestown (South Feather - Large)	Large Hydro	0	0	0	0	0	7	7	7	7	7	7	7	7	7
11k	Woodleaf (South Feather - Large)	Large Hydro	0	0	0	0	0	10	10	10	10	10	10	10	10	10
11l	Steam Injected Gas Turbine (STIG)	Natural Gas	18	18	18	18	18	18	18	18	18	18	0	0	0	0
11	**Total peak dependable capacity of existing and planned supply resources (not RPS-eligible) (sum of 11a...11n)**		**241**	**322**	**333**	**327**	**305**	**313**	**321**	**321**	**319**	**320**	**302**	**302**	**302**	**302**

Utility-Owned RPS-eligible Resources:

	[list resource by plant or unit]	Fuel														
12a	New Spicer Meadows	Small Hydroelectric	2	1	2	1	1	2	0	0	0	0	0	0	0	0
12b	Western Area Power Admin (Small)	Small Hydroelectric	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12c	Kelly Ridge (South Feather - Small)	Small Hydroelectric	0	0	0	0	2	2	2	2	2	2	2	2	2	2
12d	Sly Creek (South Feather - Small)	Small Hydroelectric	0	0	0	0	1	2	2	2	2	2	2	2	2	2
12e	Geo 1 and Geo 2	Geothermal	8	8	8	8	8	8	8	8	8	8	8	8	8	8
12f	Lost Hills	Solar PV	18	18	0	0	0	0	0	0	0	0	0	0	0	0
12g	Blackwell	Solar PV	11	11	0	0	0	0	0	0	0	0	0	0	0	0

Long-Term Contracts (RPS-eligible):

	[list contracts by name]															
12o																
12	**Total peak dependable capacity of existing and planned RPS-eligible resources (sum of 12a...12n)**		**40**	**40**	**11**	**10**	**13**	**15**	**14**	**14**	**14**	**14**	**14**	**14**	**14**	**14**
13	**Total peak dependable capacity of existing and planned supply resources (11+12)**		**281**	**362**	**344**	**337**	**318**	**327**	**335**	**335**	**333**	**334**	**316**	**316**	**316**	**316**

GENERIC ADDITIONS

NON-RPS ELIGIBLE RESOURCES:

	[list resource by name or description]	Fuel			2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
14a																
14	**Total peak dependable capacity of generic supply resources (not RPS-eligible)**				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

RPS-ELIGIBLE RESOURCES:

	[list resource by name or description]	Fuel														
15a	Generic New Wind	Wind	0	0	0	0	0	0	0	0	0	0	0	20	30	30
15b	Generic New Solar	Solar	0	0	0	0	0	0	0	25	25	25	25	25	50	50
15c	Generic New Geothermal	Geothermal	0	0	0	0	0	0	0	0	0	10	10	10	10	20
15d	Generic Hydro	Small Hydroelectric	0	0	0	0	0	0	0	0	0	0	20	20	20	20
15	**Total peak dependable capacity of generic RPS-eligible resources**				**0**	**0**	**0**	**0**	**0**	**25**	**25**	**35**	**55**	**75**	**110**	**120**
16	**Total peak dependable capacity of generic supply resources (14+15)**				**0**	**0**	**0**	**0**	**0**	**25**	**25**	**35**	**55**	**75**	**110**	**120**

CAPACITY BALANCE SUMMARY

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
17	**Total peak procurement requirement (from line 10)**	**408**	**390**	**383**	**394**	**398**	**395**	**386**	**386**	**394**	**393**	**400**	**403**	**407**	**410**
18	**Total peak dependable capacity of existing and planned supply resources (from line 13)**	**281**	**362**	**344**	**337**	**318**	**327**	**335**	**335**	**333**	**334**	**316**	**316**	**316**	**316**
19	**Current capacity surplus (shortfall) (18-17)**	**(127)**	**(28)**	**(39)**	**(57)**	**(80)**	**(68)**	**(51)**	**(51)**	**(61)**	**(59)**	**(84)**	**(87)**	**(91)**	**(94)**
20	**Total peak dependable capacity of generic supply resources (from line 16)**			**0**	**0**	**0**	**0**	**0**	**25**	**25**	**35**	**55**	**75**	**110**	**120**
21	**Planned capacity surplus/shortfall (shortfalls assumed to be met with short-term capacity purchases) (19+20)**	**(127)**	**(28)**	**(39)**	**(57)**	**(80)**	**(68)**	**(51)**	**(26)**	**(36)**	**(24)**	**(29)**	**(12)**	**19**	**26**

EBT

State of California
California Energy Commission
Standardized Reporting Tables for Public Owned Utility IRP Filing
Energy Balance Table
Form CEC 110 (May 2017)

Scenario Name: [redacted]

Units = MWh

Yellow fill relates to an application for confidentiality.

	NET ENERGY FOR LOAD CALCULATIONS	Historical Data 2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	Retail sales to end-use customers	1,206,280	1,157,772	1,139,551	1,150,655	1,147,628	1,161,135	1,154,732	1,151,626	1,165,985	1,165,929	1185043.342	1189674.786	1195917.815	1202234.589
2	Other loads	43,047	42,085	43,017	42,927	43,109	43,348	43,642	43,566	43,497	43,367	43269.02941	43211.97083	43176.58461	43057.24107
3	Unmanaged net energy for load	[redacted]													
4	Managed retail sales to end-use customers	1,157,215	1,112,202	1,091,760	1,108,458	1,107,550	1,134,457	1,153,360	1,167,150	1,112,723	1,112,553	1,130,047	1,134,256	1,139,967	1,145,668
5	Managed net energy for load	1,249,328	1,199,857	1,182,568	1,193,581	1,190,737	1,204,483	1,198,375	1,195,192	1,209,482	1,209,297	1,228,312	1,232,887	1,239,094	1,245,292
6	Firm Sales Obligations														
7	**Total net energy for load (5+6)**	**1,249,328**	**1,199,857**	**1,182,568**	**1,193,581**	**1,190,737**	**1,204,483**	**1,198,375**	**1,195,192**	**1,209,482**	**1,209,297**	**1,228,312**	**1,232,887**	**1,239,094**	**1,245,292**
8	[Customer-side solar generation]	23,300	30,107	43,309	51,141	70,781	80,872	94,871	103,298	111,164	118,505	125,373	131,768	137,760	143,366
9	[Light Duty PEV electricity consumption/procurement requirement]	3,127	4,051	5,042	6,094	7,184	8,302	9,439	10,583	11,732	12,878	14,023	15,163	16,300	17,432
10	[Other transportation electricity consumption/procurement requirement]														
11	[Other electrification/fuel substitution; consumption/procurement requirement]														

EXISTING AND PLANNED GENERATION RESOURCES

Utility-Owned Generation Resources (not RPS-eligible):

	[list resource by name]		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
12a	Roseville Energy Park	Natural Gas	24,707	251,337	292,469	307,853	511,649	115,050	461,365	328,358	269,781	200,230	175,826	160,334	169,031	159,755
12b	Roseville Power Plant 2	Natural Gas	1,438	2,981	1,648	2,505	10,438	307	8,656	5,500	4,778	3,267	2,846	2,598	2,946	2,777

Long-Term Contracts (not RPS-eligible):

	[list contracts by name]															
12h	Western Area Power Admin (Large)	Large Hydro	221,773	109,916	186,999	135,503	81,017	36,471	96,039	132,125	155,987	155,987	155,987	155,987	155,987	155,987
12i	Collerville	Large Hydro	126,109	45,299	112,747	37,035	22,518	31,874	15,700	63,313	63,313	63,313	63,313	63,313	63,313	63,313
12j	Forbestown (South Feather - Large)	Large Hydro	0	0	0	0	575	15,713	16,846	16,831	16,792	16,800	16,851	16,924	16,828	16,794
12k	Woodleaf (South Feather - Large)	Large Hydro	0	0	0	0	394	25,901	27,195	27,170	27,108	27,120	27,202	27,320	27,166	27,110
12l	Steam Injected Gas Turbine (STIG)	Natural Gas	4,391	4,678	4,513	13,091	11,153	43	3,498	2,152	1,979	0	0	0	0	0
12	**Total energy from existing and planned supply resources (not RPS-eligible) (sum of 12a...12n)**		**378,418**	**414,212**	**598,377**	**495,986**	**637,743**	**225,358**	**629,300**	**575,449**	**539,738**	**466,717**	**442,025**	**426,476**	**435,271**	**425,736**

Utility-Owned RPS-eligible Generation Resources:

	[list resource by plant or unit]															
13a																

Long-Term Contracts (RPS-eligible):

	[list contracts by name]															
13i	New Spicer Meadows	Small Hydroelectric	4,152	1,810	3,011	1,575	872	1,139	502	2,025	2,025	2,025	2,025	2,025	2,025	2,025
13j	Western Area Power Admin (Small)	Small Hydroelectric	4,584	4,181	4,795	3,474	2,077	935	2,401	3,303	3,900	3,900	3,900	3,900	3,900	3,900
13k	Kelly Ridge (South Feather - Small)	Small Hydroelectric	0	0	0	0	487	8,658	9,458	9,449	9,427	9,432	9,460	9,501	9,448	9,428
13l	Sly Creek (South Feather - Small)	Small Hydroelectric	0	0	0	0	25	3,667	3,818	3,814	3,806	3,807	3,819	3,835	3,814	3,806
13m	Geo 1 and Geo 2	Geothermal	60,889	63,403	51,690	58,165	61,866	19,034	53,985	54,664	50,172	52,570	51,647	48,212	49,885	48,578
13n	GeoSolar 1 & 2	Solar PV	235	145	320	320	320	320	320	320	320	320	320	320	320	320
13o	Geo OSL	Geothermal	1,109	1,533	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
13p	SVP	Mixed	50,000	50,000	50,000	50,000	50,000	50,000	0	0	0	0	0	0	0	0
13q	Lost Hills	Solar PV	55,468	56,742	505	501	497	495	490	486	0	0	0	0	0	0
13r	Blackwell	Solar PV	33,528	33,929	303	301	298	297	294	292	0	0	0	0	0	0
13s	Avangrid	Wind	103,664	174,571	137,788	137,788	210,000	210,000	260,000	260,000	0	0	0	0	0	0
13t	Powerex	Wind	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	0	0	0	0	0
13	**Total energy from RPS-eligible resources (sum of 13a...13n, and 13z)**		**388,628**	**461,314**	**324,612**	**328,324**	**402,642**	**370,745**	**407,468**	**410,554**	**145,850**	**73,254**	**72,371**	**68,993**	**70,592**	**69,257**
13z	**Undelivered RPS energy**															
14	**Total energy from existing and planned supply resources (12+13)**		**767,046**	**875,526**	**922,989**	**824,311**	**1,040,385**	**596,103**	**1,036,768**	**986,003**	**685,588**	**539,971**	**514,396**	**495,469**	**505,863**	**494,993**

GENERIC ADDITIONS

NON-RPS ELIGIBLE RESOURCES:

	[list resource by name or description]	[redacted]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
15a														
15	**Total energy from generic supply resources (not RPS-eligible)**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

RPS-ELIGIBLE RESOURCES:

	[list resource by name or description]		[redacted]													
16a	Generic Solar	Solar		0	0	0	0	0	60,223	59,723	59,018	58,416	57,814	117,532	116,332
16b	Generic Wind	Wind		0	0	0	0	0	0	0	0	0	82,258	126,317	125,973
16c	Generic Geothermal	Geothermal		0	0	0	0	0	0	0	74,506	73,200	71,532	70,040	143,053
16d	Generic Hydroelectric	Hydro		0	0	0	0	0	0	0	0	156,073	156,493	156,095	156,100
16	**Total energy from generic RPS-eligible resources**			**0**	**0**	**0**	**0**	**0**	**60,223**	**59,723**	**133,524**	**287,688**	**368,097**	**469,985**	**541,458**
17	**Total energy from generic supply resources (15+16)**			**0**	**0**	**0**	**0**	**0**	**60,223**	**59,723**	**133,524**	**287,688**	**368,097**	**469,985**	**541,458**
17z	**Total energy from RPS-eligible short-term contracts**														

ENERGY FROM SHORT-TERM PURCHASES

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
18	**Short term and spot market purchases:**	477,698	320,151	259,579	369,270	150,352	608,380	161,607	148,966	464,171	535,802	426,228	369,321	263,247	208,841

ENERGY BALANCE SUMMARY

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
19	**Total energy from supply resources (14+17+17z)**	**767,046**	**875,526**	**922,989**	**824,311**	**1,040,385**	**596,103**	**1,036,768**	**1,046,226**	**745,311**	**673,495**	**802,084**	**863,566**	**975,847**	**1,036,451**
19a	**Undelivered RPS energy (from 13z)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
20	**Short term and spot market purchases (from 18)**	**477,698**	**320,151**	**259,579**	**369,270**	**150,352**	**608,380**	**161,607**	**148,966**	**464,171**	**535,802**	**426,228**	**369,321**	**263,247**	**208,841**
21	**Total delivered energy (19-19a+20)**	**1,244,744**	**1,195,676**	**1,182,568**	**1,193,581**	**1,190,737**	**1,204,483**	**1,198,375**	**1,195,192**	**1,209,482**	**1,209,297**	**1,228,312**	**1,232,887**	**1,239,094**	**1,245,292**
22	**Total net energy for load (from 7)**	**1,249,328**	**1,199,857**	**1,182,568**	**1,193,581**	**1,190,737**	**1,204,483**	**1,198,375**	**1,195,192**	**1,209,482**	**1,209,297**	**1,228,312**	**1,232,887**	**1,239,094**	**1,245,292**
23	**Surplus/Shortfall (21-22)**	**(4,584)**	**(4,181)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

GEAT

State of California
California Energy Commission
Standardized Reporting Tables for Public Owned Utility IRP Filing
GHG Emissions Accounting Table
Form CEC 111 (May 2017)

Scenario Name:

Yellow fill relates to an application for confidentiality.

Emissions Intensity Units = mt CO2e/MWh
Yearly Emissions Total Units = Mmt CO2e

GHG EMISSIONS FROM EXISTING AND PLANNED SUPPLY

Utility-Owned Generation (not RPS-eligible):

	[list resource by name]	Emissions Intensity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1a	Roseville Energy Park	0.430	10,624	108,075	125,762	132,377	220,009	49,471	198,387	141,194	116,006	86,099	75,605	68,944	72,683	68,695
1b	Roseville Power Plant 2	0.800	1,150	2,385	1,318	2,004	8,350	245	6,925	4,400	3,822	2,614	2,277	2,078	2,357	2,222
	Long-Term Contracts (not RPS-eligible):															
	[list contracts by name]	Emissions Intensity														
1h	Steam Injected Gas Turbine (STIG)	0.4810	2,112	2,250	2,171	6,297	5,365	21	1,683	1,035	952	0	0	0	0	0
1	**Total GHG emissions of existing and planned supply resources (not RPS-eligible) (sum of 1a…1n)**		**13,886**	**112,710**	**129,251**	**140,677**	**233,724**	**49,738**	**206,994**	**146,629**	**120,780**	**88,713**	**77,882**	**71,022**	**75,040**	**70,916**
	Utility-Owned RPS-eligible Generation Resources:															
	[list resource by plant or unit]	Emissions Intensity														
2a																
	Long-Term Contracts (RPS-eligible):															
	[list contracts by name]	Emissions Intensity														
2h	New Spicer Meadows	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2i	Western Area Power Admin (Small)	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2j	Kelly Ridge (South Feather - Small)	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2k	Sly Creek (South Feather - Small)	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2l	Geo 1 and Geo 2	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2m	GeoSolar 1 & 2	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2n	Geo OSL	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2o	SVP	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2p	Lost Hills	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2q	Blackwell	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2r	Avangrid	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2s	Powerex	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	**Total GHG emissions from RPS-eligible resources (sum of 2a…2n)**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3	**Total GHG emissions from existing and planned supply resources (1+2)**		**13,886**	**112,710**	**129,251**	**140,677**	**233,724**	**49,738**	**206,994**	**146,629**	**120,780**	**88,713**	**77,882**	**71,022**	**75,040**	**70,916**

EMISSIONS FROM GENERIC ADDITIONS

NON-RPS ELIGIBLE RESOURCES:

	[list resource by name or description]	Emissions Intensity			2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
4a																
4	**Total GHG emissions from generic supply resources (not RPS-eligible)**				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	RPS-ELIGIBLE RESOURCES:															
	[list resource by name or description]	Emissions Intensity														
5a	Generic Solar	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5b	Generic Wind	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5c	Generic Geothermal	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5d	Generic Hydroelectric	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	**Total GHG emissions from generic RPS-eligible resources**				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
6	**Total GHG emissions from generic supply resources (4+5)**				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

GHG EMISSIONS OF SHORT TERM PURCHASES

		Emissions Intensity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
7	**Short term and spot market purchases:**	0.428	204,455	137,025	111,100	158,048	64,351	260,387	69,168	63,757	198,665	229,323	182,426	158,069	112,670	89,384

TOTAL GHG EMISSIONS

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
8	**Total GHG emissions to meet net energy for load (3+6+7)**	**218,341**	**249,735**	**240,351**	**298,725**	**298,075**	**310,124**	**276,162**	**210,386**	**319,445**	**318,036**	**260,308**	**229,091**	**187,710**	**160,300**

EMISSIONS ADJUSTMENTS

8a	**Undelivered RPS energy (MWh from EBT)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8b	**Firm Sales Obligations (MWh from EBT)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8c	**Total energy for emissions adjustment (8a+8b)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8d	**Emissions intensity (portfolio gas/short-term and spot market purchases)**														
8e	**Emissions adjustment (8Cx8D)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PORTFOLIO GHG EMISSIONS

8f	**Portfolio emissions (8-8e)**	218,341	249,735	240,351	298,725	298,075	310,124	276,162	210,386	319,445	318,036	260,308	229,091	187,710	160,300

GHG EMISSIONS IMPACT OF TRANSPORTATION ELECTRIFICATION

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
9	**GHG emissions reduction due to gasoline vehicle displacement by LD PEVs**							**2,936**	**3,523**	**6,939**	**10,163**	**12,382**	**14,676**	**16,343**	**17,842**
10	**GHG emissions increase due to LD PEV electricity loads**							**1,400**	**1,533**	**2,786**	**3,803**	**4,272**	**4,581**	**4,570**	**4,410**
11	**GHG emissions reduction due to fuel displacement - other transportation electrification**														
12	**GHG emissions increase due to increased electricity loads - other transportation electrification**														

RPT

	State of California																		
	California Energy Commission																		
	Standardized Reporting Tables for Public Owned Utility IRP Filing																		
	RPS Procurement Table																		
	Form CEC 112 (May 2017)																		
	Scenario Name:																		
		Beginning balances Start of 2017	**Units = MWh**																
			Compliance Period 3					**Compliance Period 4**					**Compliance Period 5**				**Compliance Period 6**		
	RPS ENERGY REQUIREMENT CALCULATIONS		**2017**	**2018**	**2019**	**2020**		**2021**	**2022**	**2023**	**2024**		**2025**	**2026**	**2027**		**2028**	**2029**	**2030**
1	(Managed) Retail sales to end-use customers (From EBT)		1,157,215	1,112,202	1,091,760	1,108,458		1,107,550	1,134,457	1,153,360	1,167,150		1,112,723	1,112,553	1,130,047		1,134,256	1,139,967	1,145,668
2	Green pricing program/hydro exclusion																		
3	Soft target (%)		27%	29%	31%	33%		36%	39%	41%	44%		46%	50%	52%		55%	57%	60%
4	Required procurement for compliance period		1,339,223					1,822,022					1,655,754				1,961,042		
	Category 0, 1 and 2 RECs																		
5	Excess balance/historic carryover at beginning/end of compliance period	208,166					481,822					464,629				46,211			
6	RPS-eligible energy procured (copied from EBT)		388,628	461,314	324,612	328,324		402,642	370,745	407,468	470,777		205,573	206,778	360,059		437,090	540,577	610,715
6A	Amount of energy applied to procurement obligation					1,339,223		458,720	449,596	407,468	506,238		205,573	206,778	1,243,404		437,090	540,577	983,375
7	Net purchases of Category 0, 1 and 2 RECs					110,000					153,198				464,926				376,449
7A	Carryover and REC purchases applied to procurement obligation																		
8	Net change in balance/carryover (6+7-6A-7A)		388,628	461,314	324,612	(900,899)		(56,078)	(78,851)	0	117,737		0	0	(418,419)		0	0	3,789
	Category 3 RECs																		
9	Excess balance/historic carryover at beginning/end of compliance period						0					0				0			
10	Net purchases of Category 3 RECs																		
11	Carryover and REC purchases applied to procurement obligation																		
12	Net change in REC balance/carryover		0	0	0	0		0	0	0	0		0	0	0		0	0	0
13	Total generation plus RECs (all Categories) applied to procurement requirement (6A + 7A + 11)		1,339,223					1,822,022					1,655,754				1,961,042		
14	Over/under procurement for compliance period (11 - 4)		0					0					0				0		

Appendix F – Requirements

Table fifteen is intended to guide the requirements to specific section(s); however, supplemental information is presented throughout the document.

Table 15: Requirements with Applicable Section(s)

EMISSIONS	
IRP REQUIREMENT	**SECTION(S)**
Renewable energy and zero-carbon resources supply 100% of electric retail sales to end-use customers by 2045	3.1, 3.2, 8.1, 8.2, 9.3, and 9.7
Meet greenhouse gas reduction targets established by CARB	3.2, 8.2, 9.3, and 9.7
Minimize localized air pollutants and other greenhouse gas emissions with early priority to disadvantaged communities	8.2
Consider electric vehicle integration strategy and programs	6.1.1
Include Renewable Procurement and Enforcement Plan	Appendix C and D
RATES	
IRP REQUIREMENT	**SECTION(S)**
Serve customers at fair and reasonable rates	9.3
Minimize impacts on the ratepayers	9.3
Rate design that supports transportation electrification	6.1.1 and 6.3
PROCUREMENT	
IRP REQUIREMENT	**SECTION(S)**
Address procurement in energy efficiency and demand resources that are cost-effective, reliable, and feasible	3.3 and 5.1.1
Consider energy storage	7.3
Address procurement in transportation electrification	6.1.1 and 9.5
Address diversified procurement portfolio of short-term electricity, long-term electricity, and demand response products	Executive Summary, 9, and the Conclusion
Address resource adequacy	5, 7.1, and 9.4
RELIABILITY	
IRP REQUIREMENT	**SECTION(S)**
Ensure system and local reliability	7, 9.4, and 9.5
Strengthen the diversity, sustainability, and resilience of the bulk transmission system	6.2.1 and 6.3

Enhance distribution systems and demand-side management	5.4
Consider energy efficiency and on peak demand response	3.3 and 5.4
Standardized Tables (CRAT, EBT, RPT, and GEAT)	Appendix E