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California ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

MEMORANDUM

TO: Docket 24-OPT-04

FROM: Staff

SUBJECT: Documents Included in the Record of Proceedings (January 1, 2026 – April 24, 2026)

DATE: April 28, 2026

I. Introduction

Public Resources Code section 25545.13 provides that a project filed with the California Energy Commission (CEC) under Public Resources Code section 25545.1 is deemed an environmental leadership development project and subject to expedited judicial review if, among other things, the CEC "prepares the record of proceedings concurrently with its review of the application and certifies the record of proceedings within five days of certification."

II. Record of Proceedings

California Code of Regulations, title 20, section 1208, requires that all documents submitted in any proceeding, whether by a party, committee, the commission, or any other individual or entity, be filed with the docket. California Code of Regulations, title 20, section 1880.5 further identifies the proceeding's docket as containing all the documents comprising the record of proceedings and meeting the requirements of Public Resources Code sections 21167.6(e) and 21186.

The attached documents are being added to the Record of Proceedings. In addition to these documents, the Staff Assessment includes a list of references at the end of each section that provides detailed citations and web links to documents staff relied on to develop the technical sections of the Staff Assessment. These linked documents are publicly available and part of Record of Proceedings. Attachments to documents that are in shapefile format, such as GIS or ERSI files, are not linked due to technical system limitations but are part of the record. These files are publicly available for review and can be accessed directly from the CEC upon request.

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CALIFORNIA ENERGY COMMISSION
DOCKET # 24-OPT-04
POTENTIA-VIRIDI

ADMINISTRATIVE RECORD
PART 2 - JANUARY 01, 2026 - APRIL 24, 2026

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17-Mar-2026	PSA_Tri-Valley-LA_Execution Version_251010 FINAL REDACTED.pdf	POVI 0003810	POVI 0003819
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2021 SB 100 Joint Agency Report

Achieving 100 Percent Clean Electricity in California: An Initial Assessment

Gavin Newsom, Governor
March 2021 | CEC-200-2021-001

POVI 0003399

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DISCLAIMER

Staff members of the California Energy Commission (CEC), California Public Utilities Commission (CPUC), and California Air Resources Board (CARB) prepared this report. As such, it does not necessarily represent the views of the CEC, the CPUC, or CARB, their employees, or the State of California. The CEC, CPUC, and CARB, the State of California, its employees, contractors and subcontractors make no warrant, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the uses of this information will not infringe upon privately owned rights. This report has not been approved or disapproved by the CEC, CPUC, nor CARB, nor have they passed upon the accuracy or adequacy of the information in this report.

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POVI 0003402

PREFACE

The SB 100 Joint Agencies

The California Energy Commission's primary functions include forecasting electricity and natural gas demand for state planning, siting and licensing thermal power plants 50 megawatts or greater, investing in energy innovation, setting the state's appliance and building energy efficiency standards, and planning for and directing state response to energy emergencies. The CEC also publishes the Integrated Energy Policy Report, which provides an assessment of major energy trends and issues facing California's electricity, natural gas, and transportation fuel sectors.

The California Public Utilities Commission regulates services and utilities, protects consumers, safeguards the environment, and assures Californians' access to safe and reliable utility infrastructure and services. The essential services regulated include electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies. The CPUC does resource planning for 80 percent of California's electric grid through the Integrated Resource Planning proceeding and implements programs such as the RPS, efficiency incentives, transportation electrification investments, customer solar, and building decarbonization.

The California Air Resources Board's mission is to promote and protect public health, welfare, and ecological resources through effective reduction of air pollutants while recognizing and considering effects on the economy. CARB is the lead agency for climate change programs and oversees all air pollution control efforts in California to attain and maintain health-based air quality standards.

POVI 0003403

The Climate Imperative

In 2020, Californians witnessed the impacts of climate change as never before. The state experienced its hottest August on record — the month ranked third hottest across the United States. On August 16, Death Valley, reported a high temperature of 130 degrees Fahrenheit. If verified, this would be the hottest August temperature ever recorded for the United States and among the hottest temperatures recorded on Earth. In September, Woodland Hills hit 121 degrees F, the hottest temperature ever recorded in Los Angeles County.

Along with record-breaking heat came a record-breaking fire season. The 2020 wildfire season was the largest in history, burning more than 4 million acres and shattering the previous record set in 2018. Five of the six largest wildfires in California history occurred in 2020 and the August Complex Fire was the single largest fire, having burned over 1 million acres. The 2020 fire season took 33 lives, and more than 10,400 structures were destroyed.

> ***"The debate is over around climate change. Just come to the state of California. Observe it with your own eyes"*** — Governor Newsom noted during a September 2020 press conference following a tour of the destruction of the North Complex Fire.

Without drastic mitigation measures, climate change-related events will continue to become more frequent, catastrophic, and costly. And the impacts are often disproportionately borne by the state's most vulnerable and disadvantaged populations.

California is only one piece of the climate solution. But as the fifth largest economy in the world, the state has an outsized role in demonstrating to other states and countries that a clean energy future is not only possible, but beneficial to the well-being of its residents and the economy. Moving to a clean electric grid is a foundational step that will unlock and support economywide opportunities to achieve carbon neutrality and address the most catastrophic impacts of climate change.

ABSTRACT

The *2021 SB 100 Joint Agency Report* (2021 Report) includes a review of the policy to provide 100 percent of electricity retail sales and state loads from renewable and zero-carbon resources in California by 2045. The report assesses various pathways to achieve the target and an initial assessment of costs and benefits. The report includes results from capacity expansion modeling and makes recommendations for further analysis and actions by the joint agencies.

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EXECUTIVE SUMMARY

Senate Bill 100 (SB 100)

The 100 Percent Clean Energy Act of 2018 (Senate Bill 100, De León, Chapter 312, Statutes of 2018) is a landmark policy that establishes a target for renewable and zero-carbon resources to supply 100 percent of retail sales and electricity procured to serve all state agencies by 2045. The bill also increases the state's Renewables Portfolio Standard (RPS) to 60 percent of retail sales by December 31, 2030 and requires all state agencies to incorporate these targets into their relevant planning.

The statute calls upon the California Public Utilities Commission (CPUC), California Energy Commission (CEC), and the California Air Resources Board (CARB) to use programs under existing statutes to achieve this policy and issue a joint policy report to the Legislature by January 1, 2021, and every four years thereafter. The report shall be completed as part of a public process and include specified information relating to policy implementation.

SB 100 is an Ongoing Effort

The analysis in the 2021 Senate Bill 100 Joint Agency Report (2021 Report) is intended to be a first step in an iterative and ongoing effort to assess barriers and opportunities to implementing the 100 percent clean electricity policy. This report includes system modeling to provide directional insights into what a 2045 portfolio of renewable and zero-carbon resources may look like, as well as the associated costs and resource build rates (the average amount of new generation required each year) required to achieve such a portfolio. The analysis builds on the modeling and assumptions used for CPUC's integrated resource planning and considers California's overarching priorities on energy, climate, equity, and public health.

Initial findings suggest that the goals of SB 100 are achievable, though opportunities remain to reduce overall system costs. This report presents various scenarios to meet the 100 percent clean electricity target with existing technologies, as well as alternative scenarios that explore additional factors. All these scenarios require additional analysis. The preliminary findings are intended to inform state planning and are not intended as a comprehensive nor prescriptive roadmap to 2045. As discussed in Chapter 4, future work will delve deeper into critical topics such as system reliability and land use and further address energy equity and workforce needs.

A robust public process informed the 2021 Report. The joint agencies held a year-long series of public workshops to solicit comments on the report's scope, analysis, and process. The agencies consulted with the California balancing authorities — which balance supply and demand and maintain electric frequency on the grid — as required by SB 100. The agencies also consulted with the Disadvantaged Communities Advisory Group, which consists of members from and representing disadvantaged communities and advises the CEC and CPUC on energy equity issues.

POVI 0003413

Moving to 100 Percent Clean Electricity

California has long led the nation and the world in setting ambitious renewable energy and climate policies, working toward a clean economy that is healthier and more just. The state now aims to achieve carbon neutrality by 2045 and net negative emissions thereafter

Decarbonizing the electric grid is imperative to achieve economywide carbon neutrality. The Renewables Portfolio Standard (RPS) has been a primary driver for increasing clean electricity generation, requiring the state's electric utilities to make renewable energy sources like solar and wind an ever-greater percentage of their power base. Although California is ahead of schedule in meeting its 33 percent renewable energy target by 2020 and on track to achieve 60 percent renewable energy by 2030, deep decarbonization of the electricity sector to meet climate change objectives will require continued transformational change in the state's electric system.

As California enters a new climate reality and moves toward a majority renewable grid, the state's planning processes likewise need to evolve to meet the needs of all Californians who depend on safe, affordable, and reliable electricity every day. Effectively integrating 100 percent renewable and zero-carbon electricity and achieving carbon neutrality in the state by 2045 will require rigorous analysis of implementation considerations, as well as coordinated planning across state agencies. While there remains work to do, achieving 100 clean electricity is a core pillar in the transition to a clean energy economy enjoyed by all Californians.

Benefits of 100 Percent Clean Electricity

In addition to serving as a central policy in the state's efforts to address climate change, successful implementation of SB 100 can benefit residents across the state by:

Improving Public Health

Implementing SB 100 is expected to reduce criteria air pollution emissions as renewable and zero-carbon resources replace fossil fuel in generating electricity. Today, more than 28 million Californians live in areas that exceed the federal health-based standards for ozone and fine particulate matter ($PM_{2.5}$). Disadvantaged communities (see glossary for definition) will reap the highest health benefits from the phaseout of fossil fuels in generating electricity; half of the state's natural gas power plants are in communities that rank among the 25 percent most disadvantaged.

The public health benefits are expected to grow substantially throughout the state as the transition from fossil fuels to clean electricity accelerates in transportation and buildings. Increased conversion of cars, trucks, and buses, as well as home appliances to electric technologies can improve health and reduce mortalities associated with air pollution across the state.

Advancing Energy Equity

The joint agencies are committed to ensuring the benefits of cleaner, more efficient energy are enjoyed by all Californians, including those in low-income and disadvantaged communities,

as well as tribal and rural communities. To ensure equitable outcomes, SB 100 will need to be implemented in ways that help these communities overcome barriers to clean energy, including:

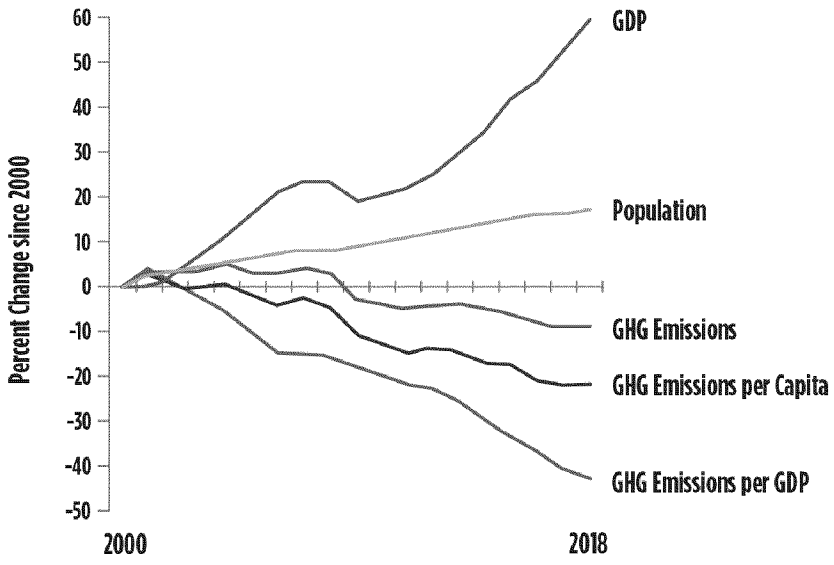
- Keeping electricity affordable, with an emphasis on vulnerable populations and households that pay a disproportionately high share of their household income on energy.
- Reducing air pollution from local power plants, particularly in communities that experience a disproportionate amount of air pollution.
- Strengthening communities' ability to function during power outages and enjoy reliable energy in a changing climate.
- Funding of training for high-quality jobs and careers in the growing clean energy industry.

Supporting a Clean Energy Economy

As a clean energy leader boasting one of the world's largest economies, California has shown that economic growth and environmental protection are not mutually exclusive. For decades, the state has reduced GHG emissions while growing its economy at a rate that has consistently outpaced the U.S. national average.

California's policies have spurred innovation and created markets for renewable energy, energy efficiency, energy storage, low-carbon fuels, and zero-emission vehicles. The state is a leader in patent registrations across all major clean technology (cleantech) categories and California's companies have received more than 50 percent of all U.S. venture capital investment in cleantech.

Figure 1: Statewide Trends of Emissions and Indicators (2000–2018)



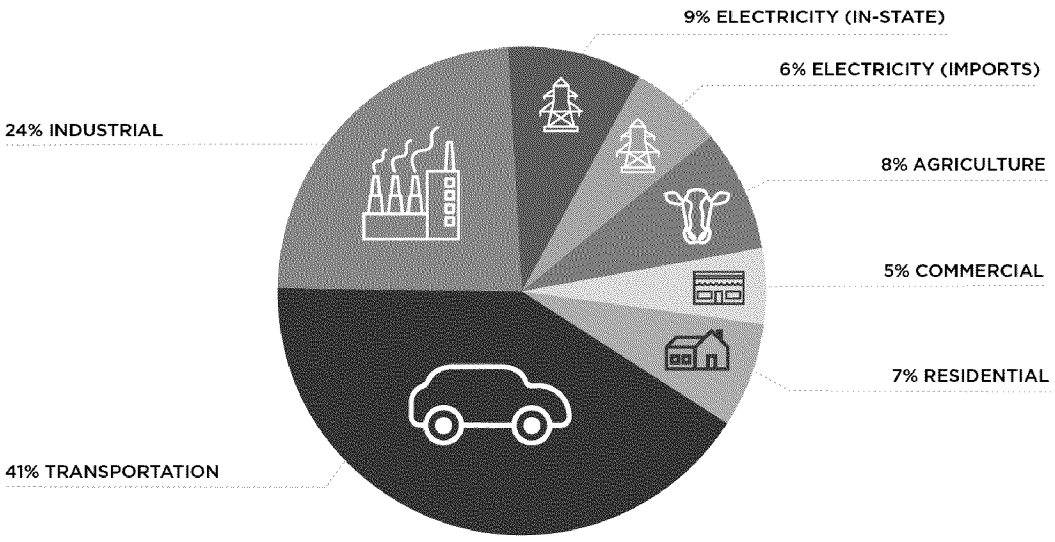
Source: CARB Emissions Inventory

As of 2020, California had more than 530,000 clean energy jobs, more than half the total energy-related jobs in the state. While the global COVID-19 pandemic has dramatically affected California's energy sector, clean energy jobs remain an important component of the state's economy. SB 100 provides an opportunity to create more high-quality clean energy jobs and increase diversity in the state's clean energy workforce.

A Cornerstone of California's Clean Energy Efforts

Successful implementation of SB 100 alone will not achieve statewide carbon neutrality, but it is pivotal to the success of California's climate-fighting efforts that collectively can reach the target. A clean electricity grid can serve as a backbone to support the decarbonization of transportation, buildings, and some industries. Together, with the electricity sector, these sectors account for 92 percent of the state's GHG emissions.

Figure 2: California GHG Emissions by Sector



Source: CARB Emissions Inventory

SB 100 sits within a portfolio of related key clean energy efforts to reduce climate and air pollution emissions while maintaining a reliable and affordable electric grid. These efforts include:

- **Transportation Electrification** — While the transportation sector remains among the state's biggest decarbonization challenges, California has already positioned itself as a leader in clean transportation with more than 566,000 zero-emission vehicles (ZEVs) on the road and nearly half of the total U.S. ZEV sales. Building on this success, Governor Gavin Newsom issued an executive order in September 2020 requiring all new passenger car and truck sales to be zero-emission by 2035. This transformation will require close coordination and planning across the electric and transportation sectors.
- **Building Decarbonization** — The construction of and conversion to zero-emission buildings has rapidly emerged as a key decarbonization strategy in recent years. State agencies are assessing pathways to reduce emissions from this important sector and considering implications of migrating more building energy uses, such as space and water heating, to the electric grid.
- **Energy Efficiency** — Prioritizing cost-effective energy efficiency measures remains critical as the state moves toward 100 percent clean electricity. Taking steps to reduce energy demand can offset the need for additional generation capacity, saving customers money while reducing land-use and other environmental impacts associated with the construction of new generation facilities.

- **Load Flexibility** — Load flexibility — the ability to shift electricity consumption to other parts of the day — is critical to supporting grid reliability, especially in a high-renewables future, and reducing the total cost of the electric system. The state has efforts underway to research and implement a variety of load flexibility applications.
- **Research and Innovation** — Given the urgency of achieving an electricity system powered by renewable and carbon-free electricity, continued prioritization of research and development of new and more cost-effective solutions is imperative. State agencies are also working to ensure these investments benefit all Californians.

2021 Report Analysis and Findings

The analysis for this report used the RESOLVE California model, a capacity expansion model developed by Energy and Environmental Economics, Inc. (E3). The RESOLVE model produces a least-cost resource portfolio, given policy and reliability constraints. The modeling inputs and assumptions build upon previous state efforts, including the CPUC's Integrated Resource Planning (IRP) 2045 Framing Study, and were informed through public and stakeholder comments.

The analysis examines estimated resource requirements and cost impacts of various SB 100 implementation pathways. Although capacity expansion is an important tool, it is just the first step in a series of modeling phases to develop reliable portfolios that meet all applicable policy objectives. Further analysis is needed to evaluate topics such as reliability and land use and better reflect equity, workforce, and additional planning and implementation considerations.

Modeled Scenarios

While the primary focus of this report is to analyze scenarios based on established cost and performance data and the joint agencies' interpretation of SB 100, the joint agencies recognize the importance of analyzing outcomes beyond these assumptions to support broader energy and climate planning and public health efforts. As such, scenarios are broken into two categories, "core scenarios" and "study scenarios," described below. A 60 percent RPS scenario was also modeled and used as a counterfactual, or reference baseline, to evaluate the impacts of the 100 percent clean electricity policy.

Core Scenarios

The "core scenarios," shown **Table 1**, modeled for the 2021 Report are consistent with the joint agencies' interpretation of the statute and include only commercialized technologies with publicly available cost and performance data.

Table 1: SB 100 Core Scenario Classification List

Scenario Classification	Scenario Description
SB 100 Core Scenario	Includes retail sales and state loads; high electrification demand; all candidate resources available
SB 100 Core, Demand Sensitivities	Change: demand scenarios or load shape
SB 100 Core, Resource Sensitivities	Change: candidate resource availability

Source: CEC, CPUC, and CARB. Developed by consensus

Study Scenarios

The "Study Scenarios," shown in **Table 2**, are exploratory analyses that examine outcomes outside the scope of the joint agencies' interpretation of the SB 100 policy. They are intended to provide additional information for consideration and support broader state energy, climate planning, and public health efforts. Study scenarios should not be interpreted as asserting the state's ability or intention to regulate beyond the interpreted scope of SB 100.

Table 2: Study Scenario Classification List

Scenario Classification	Scenario Description
Expanded Load Coverage	Adds storage and system losses to included loads; high electrification demand; all candidate resources available. Demand and resource sensitives were also analyzed.
No Combustion	No conventional combustion resources included (fossil and biomass based); retires all in-state combustion resources by 2045.
Zero Carbon Firm Resources	Adds generic zero carbon firm resources to candidate resources as a proxy for emerging zero-carbon technologies.
Accelerated Timelines	Accelerates 100% target to 2030, 2035, and 2040.

Source: CEC, CPUC, and CARB. Developed by consensus

Zero-Carbon Resources Modeled

SB 100 does not define "zero-carbon resources," and the state had no legal definition prior to the bill becoming law. For modeling, the joint agencies interpreted "zero-carbon resources" to mean energy resources that either qualify as "renewable" in the most recent Renewables Portfolio Standard (RPS) Eligibility Guidebook or generate zero greenhouse gas emissions on site.

Only commercialized technologies with vetted and publicly available cost and performance data and an anticipated pipeline of development were included for the core scenarios. Moreover, the joint agencies excluded energy resources from some or all scenarios if the use of these resources would have significant negative effects on public health or the environment or were otherwise at odds with state policies and priorities. Excluded technologies may be included in future SB 100 analyses if assessments change. Staff will update modeling as emerging technologies become commercialized.

Table 3 lists technologies that could meet the SB 100 criteria for renewable and zero-carbon resources, as interpreted by the joint agencies. The list is not prescriptive but rather used to evaluate potential SB 100 implementation strategies.

Table 3: Generation Technologies Included in Modeling

Technology	Eligibility Basis	Scenarios
Solar PV	RPS	Core and Study
Solar Thermal (existing only)	RPS	Core and Study
Onshore Wind	RPS	Core and Study
Offshore Wind	RPS	Core and Study
Geothermal	RPS	Core and Study
Bioenergy	RPS	Core and Study
Fuel Cells (using green hydrogen)	RPS	Core and Study
Small Hydro (existing only)	RPS	Core and Study
Large Hydro (existing only)	Zero-Carbon	Core and Study
Nuclear (existing only)	Zero-Carbon	Core and Study
Generic Firm Dispatchable Resource	Zero-Carbon	Study Only
Generic Firm Baseload Resource	Zero-Carbon	Study Only

Source: CEC, CPUC, and CARB. Developed by consensus

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Technologies that could meet the zero-emissions criteria but have other barriers to development were excluded from modeling for the reasons listed in **Table 4**.

Table 4: Considered Technologies Excluded From Modeling

Technology	Reason for Exclusion
New in-state nuclear	State effectively has a moratorium on new in-state nuclear power plants under the Warren-Alquist Act.
Drop-in renewable fuels (green hydrogen and biomethane)	Technology for synthetic drop-in renewable fuels not yet commercially available in California or inadequate cost and supply data for modeling or both. Inadequate supply potential for biomethane in the power sector.
Natural gas generation with carbon capture and sequestration	Lack of cost and performance data for 100 percent carbon capture.
Coal-fired generation with carbon capture and sequestration	Incompatible with the state's public health priorities and lack of cost and performance data for 100 percent carbon capture.
New small hydroelectric generation	Inadequate data on new capacity cost and resource availability for modeling purposes.
New concentrating solar power	Lack of proposed new development and high cost relative to other solar resources.
New large hydroelectric generation	Limited development feasibility at this time and environmental concerns.

Source: CEC, CPUC, and CARB joint agency consensus

Modeling Results

All scenarios modeled for the 2021 Report result in significant capacity additions. However, numerous factors affect the total resource need, overall system costs, and makeup of a 2045 resource portfolio. Select modeling results are shown below. For complete results, see Chapter 3.

Core Scenarios

SB 100 Core Scenario

Figure 3 shows cumulative capacity additions for the 60 percent RPS and SB 100 Core scenarios. The SB 100 Core scenario shows an approximate tripling of generation resources relative to today's installed capacity, which is driven by the conversion to clean electricity resources and growing electricity demand.

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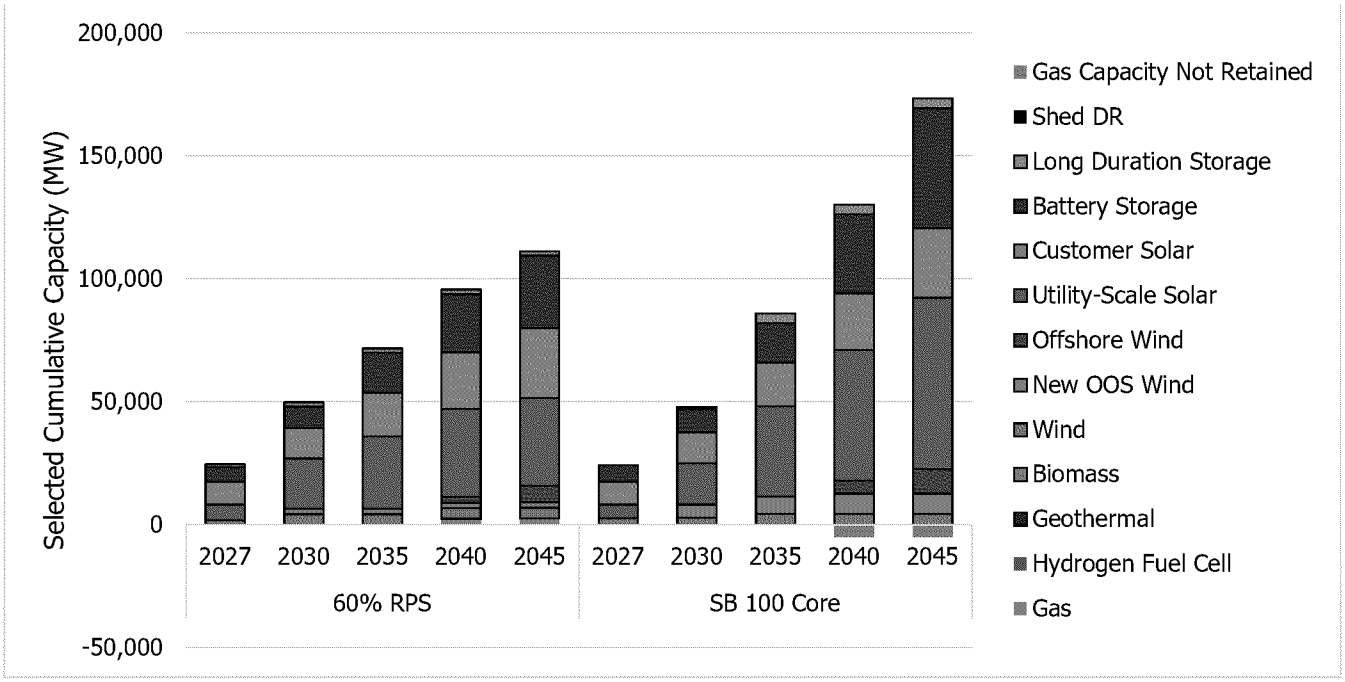
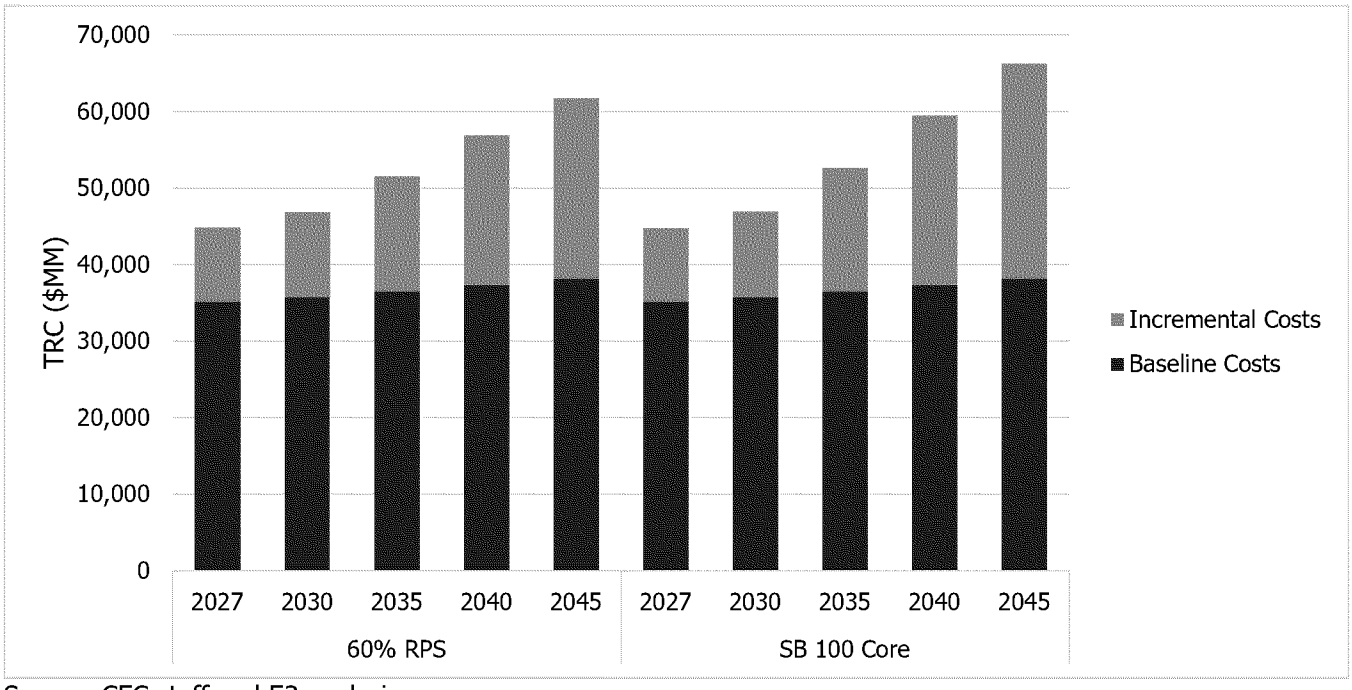
Figure 3: Cumulative Capacity Additions for SB 100 Core Scenario and 60 Percent RPS Reference Scenario



Source: CEC staff and E3 analysis

The SB 100 Core scenario results in nearly $4.5 billion in additional annual total resource cost (TRC) in 2045, or a 6 percent increase over the 60 percent RPS reference, as shown in **Figure 4**. Investments in renewables, storage and transmission constitute the primary differences in costs. All costs presented are directional and require further analysis.

Figure 4: Total Resource Cost of the 60 Percent RPS and SB 100 Core Scenarios

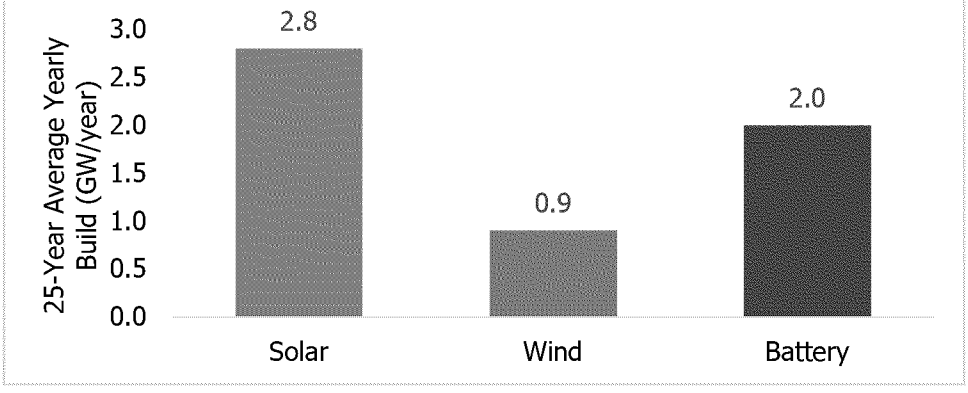


Source: CEC staff and E3 analysis

Given the magnitude of the capacity additions, the average build rates provide important implications for implementing the 100 percent clean electricity goal. Build rates can indicate whether there could be bottlenecks in supply-chain or regulatory and permitting processes, resulting in barriers to procurement of new clean energy generation.

Over the last decade, California has built on average 1 gigawatt (GW) of utility-scale solar and 300 MW of wind per year, with a maximum annual build of 2.7 GW of utility-scale solar and 1 GW of wind capacity. As shown in **Figure 5**, the SB 100 Core Scenario requires 25-year average build rates consistent with or greater than the single-year historical build rates.

Figure 5: Average Resource Build Rates for Solar, Wind and Batteries in the SB 100 Core High Electrification Scenario

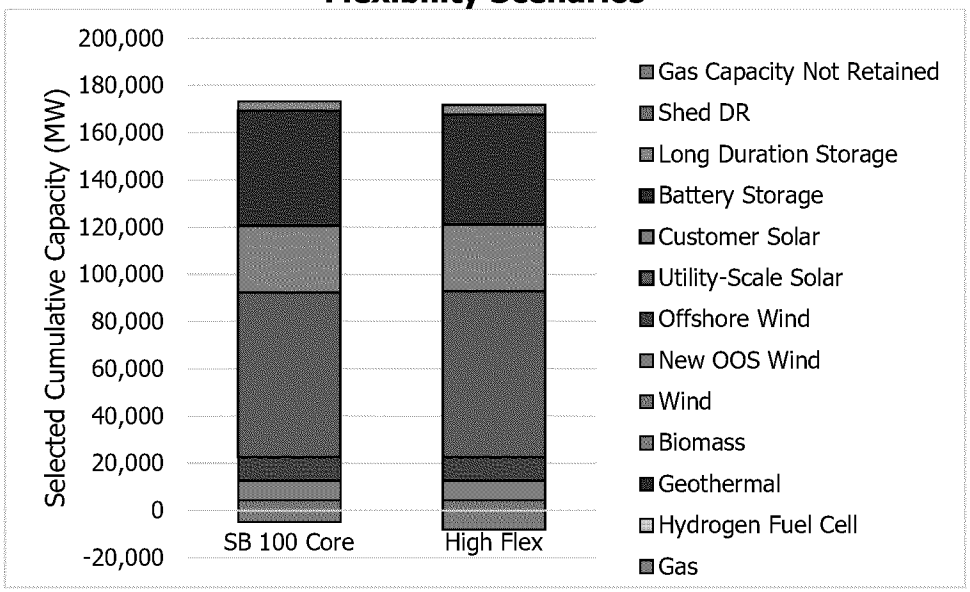


Source: CEC staff and E3 analysis

SB 100 Core: High Flexibility Scenario

The shape and flexibility of electricity loads can significantly impact cost and resource build. While RESOLVE cannot at this time explicitly model load flexibility, a high flexibility scenario was developed with a modified load shape and reduced resource adequacy requirement to represent a future with greater load flexibility. As shown in **Figure 6**, the High Flexibility Scenario results in 2.7 GW avoided battery storage build and a decrease in economic gas retention by 3.3 GW compared to the SB 100 Core Scenario, with the same annual electric energy demand. The High Flexibility Scenario also results in nearly $1 billion of annual supply cost savings in 2045, compared to the SB 100 Core Scenario.

Figure 6: Cumulative Capacity Additions in 2045 for the SB 100 Core and High Flexibility Scenarios



Source: CEC staff and E3 analysis

Study Scenarios

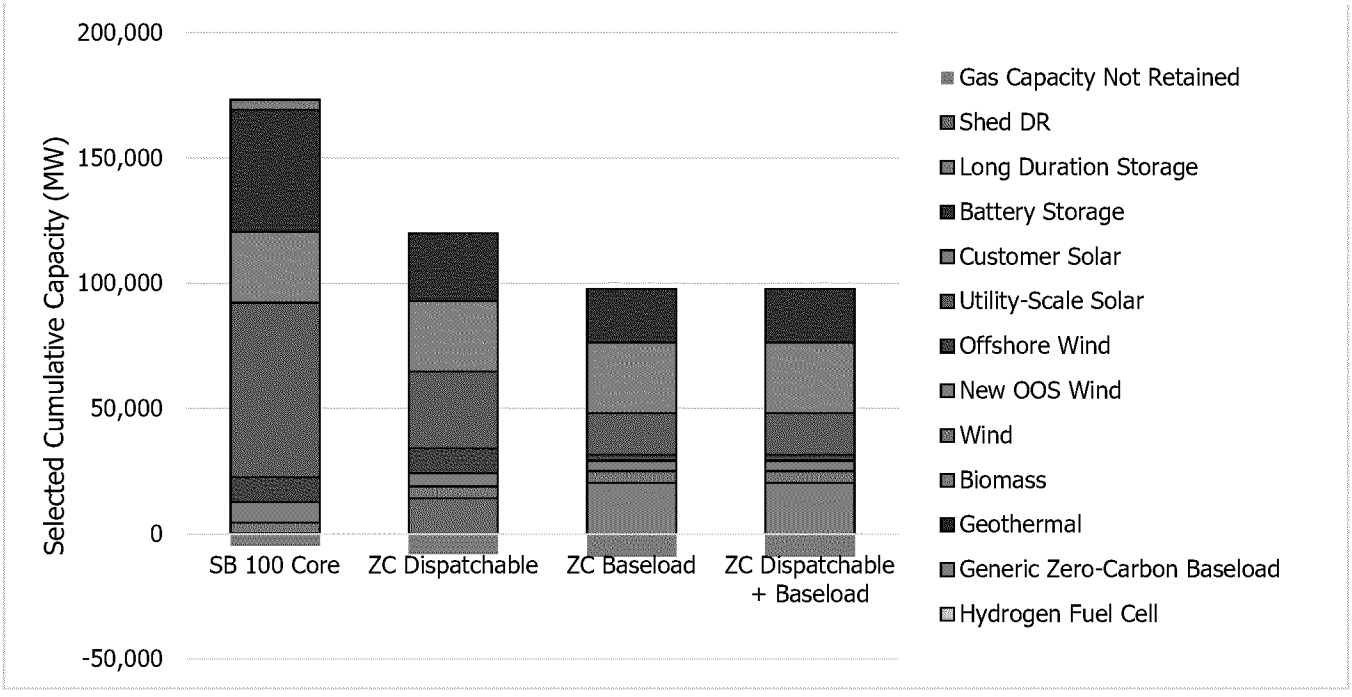
Study: Generic Zero-Carbon Firm Resources Scenario

A number of emerging zero-carbon technologies could play an important role in achieving the 100 percent renewable and zero-carbon electricity target. However, due to high uncertainty in the available cost and performance data of pre-commercialized technologies, some technologies were not included in the core scenarios. Instead, the joint agencies included study scenarios to begin to evaluate the potential impact of commercialization of cost-competitive, zero-carbon firm resources.

The "generic dispatchable" resource and "generic baseload" resource included in these scenarios could represent a wide variety of emerging technologies, such as natural gas with 100 percent carbon capture, 100 percent green hydrogen combustion, or other renewable fuels, if they are able to achieve the modeled cost profiles. The study scenarios could also indicate the effects of higher-cost existing resources achieving the modeled cost profiles.

In scenarios where either the generic dispatchable resource, generic baseload resource, or both are included as a candidate resource, the model selects about 15 GW of either or both resources in total, as shown in **Figure 7**. The inclusion of the lower-cost zero-carbon firm resources significantly lowers the utility-scale solar and battery storage selected in the model and reduces TRC in 2045 by $2 billion, or about 3 percent.

Figure 7: Cumulative Capacity Additions for the SB 100 Core and Generic Zero-Carbon Firm Resource Scenarios in 2045



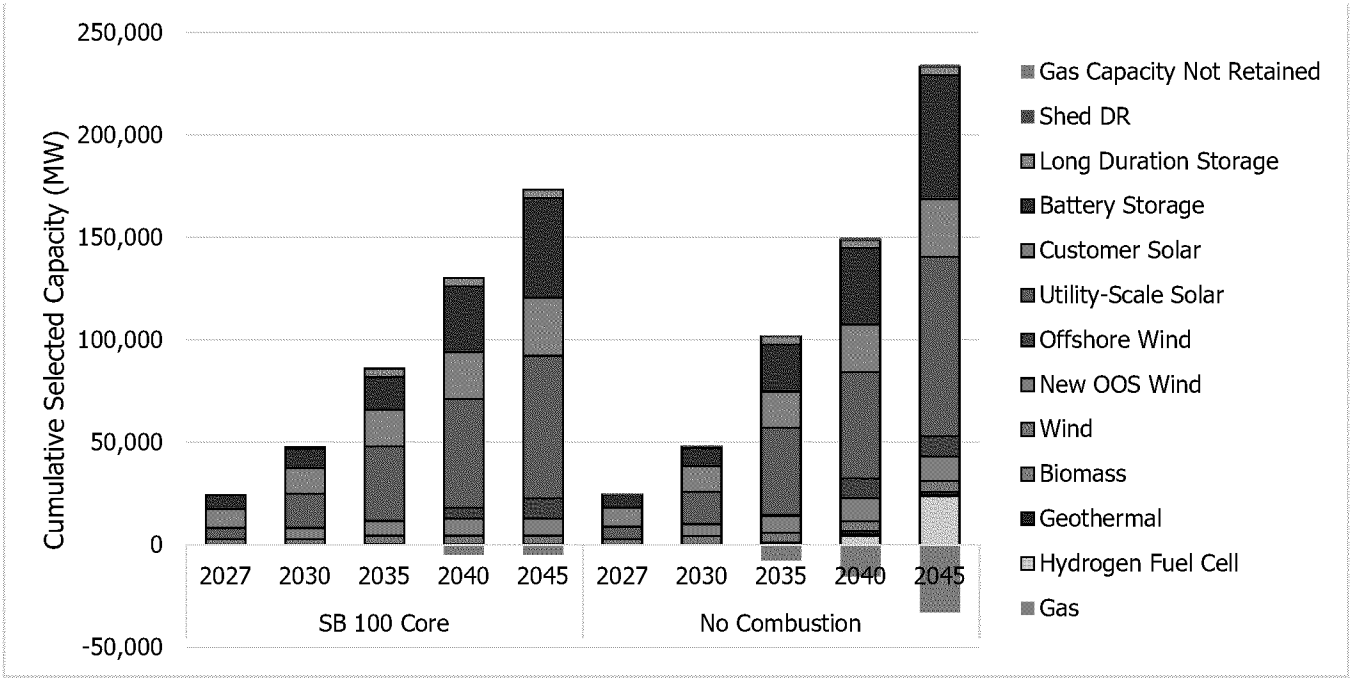
Source: CEC staff and E3 analysis

Study: No Combustion Scenario

SB 100 does not preclude combustion resources from being a part the state's resource portfolio. However, studying scenarios in which combustion resources are expressly retired can inform pathways to significantly reduce criteria pollutants and toxic air contaminants from electricity generation. To that end, the No Combustion Scenario retires all combustion resources by 2045, and no combustion resources are available as candidate resources.

With the retirement of all combustion resources, 61 GW of additional capacity is selected compared to the SB 100 Core Scenario, including 25 GW of hydrogen fuel cells, as shown in **Figure 8**. Given the significant capacity additions in the No Combustion Scenario, there is an increase annual TRC by $8 billion, or about 12 percent, compared to the SB 100 Core Scenario.

Figure 8: Cumulative Capacity Additions for the SB 100 Core and No Combustion Scenarios



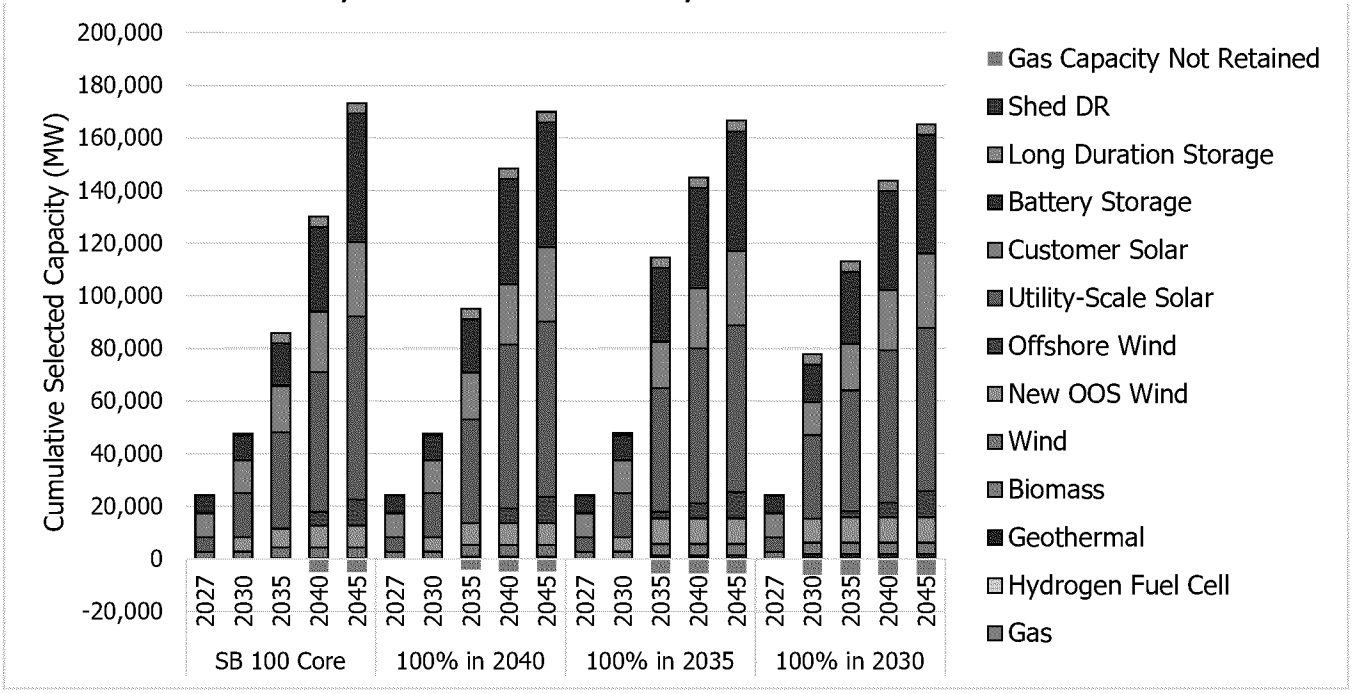
Source: CEC staff and E3 analysis

Study: Accelerated Timeline Scenarios

The final set of study scenarios examine the impacts of accelerating the 100 percent renewable and zero-carbon target to 2030, 2035, and 2040. Each accelerated timeline scenario shows a significant jump in resource build in the 100 percent target year, while the 2045 portfolio remains similar across scenarios, as shown in

Figure 9. The final set of study scenarios examine the impacts of accelerating the 100 percent renewable and zero-carbon target to 2030, 2035, and 2040. Each accelerated timeline scenario shows a significant jump in resource build in the 100 percent target year, while the 2045 portfolio remains similar across scenarios, as shown in **Figure 9**.

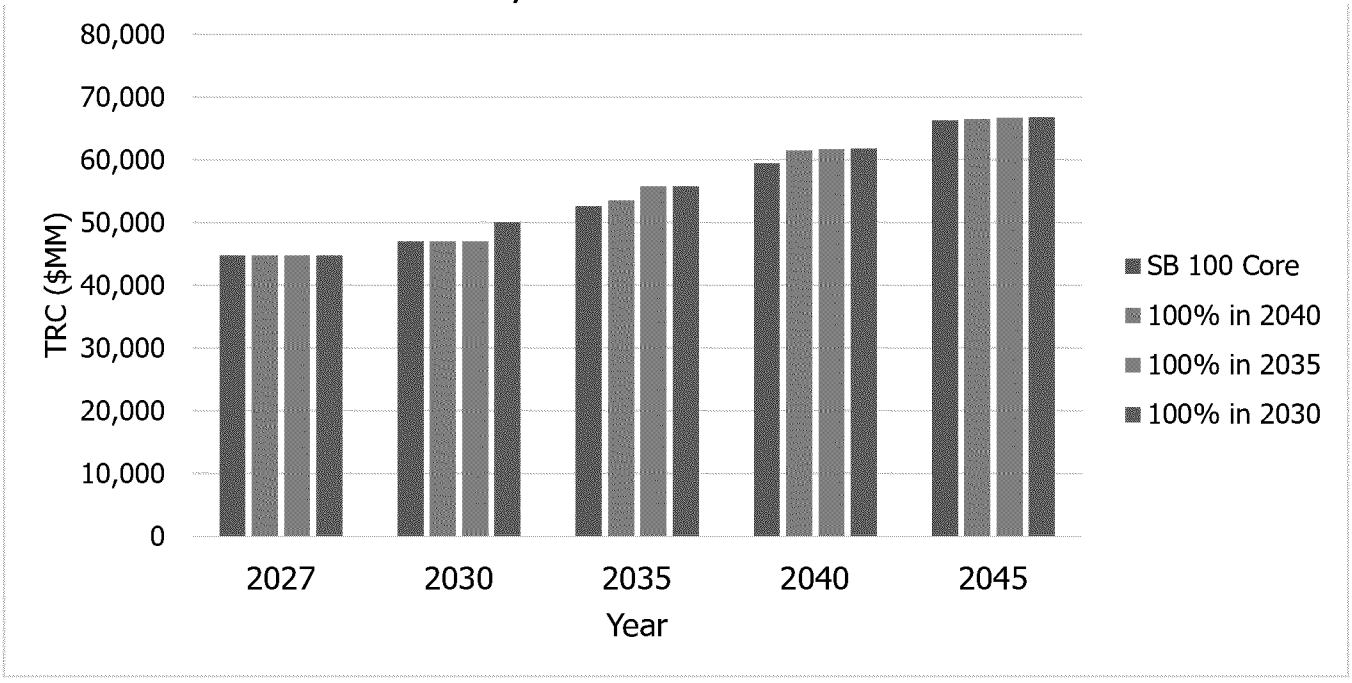
Figure 9: Cumulative Capacity Additions for the SB 100 Core (2045 SB 100), 100 Percent in 2040, 100 Percent in 2035, and 100 Percent in 2030 Scenarios



Source: CEC staff and E3 analysis

Each accelerated timeline scenario results in increased annual TRC compared to the SB 100 Core scenario for every modeled year except 2027, as shown in **Figure 10**. In general, the TRC shows a significant jump in the year the 100 percent target is set to be achieved. By 2045, the accelerated scenarios result in less than a 1 percent increase in TRC relative to the SB 100 Core scenario.

Figure 10: Total Resource Costs for the SB 100 Core, 100 Percent in 2040, 100 Percent in 2035, and 100 Percent in 2030 Scenarios



Source: CEC staff and E3 analysis

Key Takeaways From Modeling

1. SB 100 Is Achievable

Initial analysis demonstrates that SB 100 is technically achievable, though additional analysis is needed to evaluate reliability and other factors more comprehensively. The preliminary modeling in this report suggests the total resource cost of achieving SB 100 is about 6 percent higher than a 60 percent RPS future in 2045. This cost may be lower if the cost trends for renewables continue to fall faster than projections. Cost reductions and innovation in zero-carbon technologies, as well as load flexibility and energy storage development, can further reduce implementation costs.

- **Increased Resource Diversity Lowers Overall Costs**

  Resource portfolio diversity, both technological and geographical, generally lowers total resource costs. Nearly all out-of-state or offshore wind resources are selected when made available, and even a modest amount of load flexibility can reduce battery storage requirements, decrease gas capacity and lower total costs. If zero-carbon firm technologies can reach a cost of about $60/megawatt-hour (MWh), they could reduce system costs by an estimated $2 billion annually in 2045.

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- **Gas Capacity Is Retained for Reliability Needs, but Cost Reductions and Innovation in Zero-Carbon Firm Resources and Storage May Reduce Gas Capacity Needs**

  Natural gas capacity is the most economic option to provide capacity for reliability needs with current resource assumptions and demand scenarios. Cost reductions and innovation in zero-carbon firm resources and storage may reduce the amount of gas generation needed. Further analysis is needed to evaluate costs associated with maintaining an aging gas fleet operating in a high-renewables system.

2. Sustained Record-Setting Build Rates Will Be Required to Meet SB 100 in a High-Electrification Future

The need for a significant amount of new generation resources is driven by the 100 clean electricity target and increasing electricity demand to achieve economywide decarbonization. The projected record-setting resource development rates needed have implications for workforce needs, land-use planning, technology supply chains, and regulatory and permitting processes that must be considered for implementing SB 100 successfully.

3. Goals Beyond SB 100 May Be Achievable but Require Additional Analysis

The study scenarios are beyond the scope of SB 100. However, they provide directional insight to inform the state's energy and climate planning efforts and contribution toward environmental and public health goals.

Eliminating all in-state combustion resources results in a significant increase in the amount of storage and zero-carbon firm resources selected by the model to replace natural gas capacity. This scenario adds an estimated $8 billion to annual system costs in 2045 compared to the SB 100 Core scenario. Further analysis could identify public health benefits, particularly in disadvantaged communities where a disproportionate amount of combustion resources is located. This analysis may estimate the relative public health benefits along with the additional costs.

Accelerating the SB 100 timeline to achieve the 2045 target by 2030, 2035, or 2040 results in increased total resource costs and required additional capacity in the target year. All scenarios resulted in similar annual resource costs and resource portfolios by 2045.

4. Current SB 100 Analysis Is Directional, and Further Analysis Is Necessary

This analysis is the first step in an ongoing effort to evaluate and plan for the SB 100 policy. Further analysis is necessary to determine reliability of the portfolios, better capture the impact and value of resources that are either not represented or not well valued in the current modeling framework — including long-duration storage, hybrid resources, demand-side resources, load flexibility, and emerging technologies, such as green hydrogen and natural gas with 100 percent carbon capture and sequestration — as well as assess local community impacts.

Next Steps for Analysis

The analysis in the 2021 Report is intended to be a first step in an iterative and ongoing effort to assess barriers and opportunities to implementing the 100 percent clean energy policy. The modeling of this report provides directional insights into what a 2045 portfolio of renewable and zero-carbon resources may look like, as well as the associated costs and resource build requirements to achieve such a portfolio. Topics for additional assessment include:

- ***Reliability***: The joint agencies plan to evaluate resource portfolios developed in this report in a multistep process to ensure reliability for all hours of the year in line with state planning requirements while meeting clean energy and climate goals.
- ***Emerging Technologies and Innovation***: Future analyses will be updated to incorporate market trends and aim to better evaluate the potential impact of emerging resources, such as offshore wind, long-duration energy storage, green hydrogen technologies, and demand flexibility.
- ***Land-Use and Environmental Impacts:*** The joint agencies plan to review methods to include land-use impacts in system modeling and assess needs to update previous land use studies to reflect the increased resource requirements of SB 100.
- ***Non-Energy Benefits (NEBs) and Social Costs:*** Emerging cost analysis tools and methods may better integrate social costs and NEBs. Stakeholders recommended the joint agencies integrate at least the following NEBs and social costs into SB 100 planning:
    - Land-use impacts
    - Public health and air quality
    - Water supply and quality
    - Economic impacts
    - Resilience

Additional Considerations for Implementation

As the SB 100 scenarios are refined in the future, additional factors must be considered in planning for SB 100 implementation and coordination with complementary proceedings and programs:

- ***Equity:*** Steps must be taken to ensure equitable implementation of SB 100 and benefit communities in a meaningful and measurable way.
- ***Affordability:*** Meeting the 100 percent clean electricity target will likely require substantial new investments in the electric system, which may have impacts on electricity rates for consumers. Further analysis is required to better understand how these costs will be factored into rates that directly affect consumers.
- ***Safety:*** California is assessing how to address numerous new risks associated with electric and gas infrastructure and how to pay for needs including system maintenance, hardening, repurposing, upgrades, or retirement. State planners must incorporate

safety challenges in long-term planning and identify approaches to decarbonization that enhance public safety.

- ***Electric System Resilience:*** Cost-effective achievement of the 100 percent clean electricity target requires that investments in electricity generation and infrastructure consider climate change impacts. State agencies are also exploring options for clean backup power when there are disruptions to the grid.
- ***Addressing Barriers to Project Development:*** The analysis indicates that resources with lengthy permitting requirements and development times will be necessary, necessitating long lead-time planning. Stakeholders raised concerns about delays, which may need to be addressed to meet the SB 100 target.
- ***Collaboration Across Western States:*** There are opportunities for increased coordination and market development to ease importation and integration of additional renewable energy facilities and take advantage of the geographic diversity of loads and resources.

Recommendations

Following the results of the 2021 Report analysis and comments from stakeholders and the public, the joint agencies propose a number of key recommendations to support the implementation of SB 100 and inform long-term planning, which are summarized below.

Areas for Further Study in the 2025 SB 100 Report

1. **Perform a comprehensive reliability assessment as the next step in the modeling process.**

   Additional modeling is needed to evaluate whether the projected portfolios meet system reliability requirements. Projected portfolios can be adjusted as needed in an iterative process to ensure reliability requirements are met and inform the state's long-term system planning.

   The CEC and CPUC are assessing resource availability to complete this modeling ahead of the next report. The joint agencies will continue to consult with the California balancing authorities when developing the tools and metrics for this analysis.

2. **Continue to assess the role and impacts of emerging technologies and nongeneration resources.**

   Future analyses should be updated to reflect market trends, including changes in price, the commercialization of new technologies, and updates to total resource potential. Furthermore, the joint agencies should continue to evaluate and consider ways to better assess the impacts of less-proven technologies that could significantly impact a 2045 resource mix and total cost.

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3. **Analyze projected land-use impacts of scenarios and opportunities to reduce environmental impacts.**

   The CEC is developing tools to better assess the total land area required to implement SB 100, areas where new resources could be located, and relative environmental impacts. As state agencies work to better quantify the carbon stored in natural and working lands, these areas must also be incorporated into electricity land-use planning. Closer collaboration with other state agencies, tribal governments, local and regional jurisdictions, and stakeholders, to plan for development will be important to balance clean electric grid infrastructure needs with efforts to restore, conserve, and strengthen natural and working lands.

4. **Define and include social costs and non-energy benefits (NEBs) in future analyses.**

   The joint agencies will continue evaluating available modeling tools and metrics to capture non-energy benefits and social costs in future SB 100 analyses, including those for:

   - Land-use impacts
   - Public health and air quality
   - Water supply and quality
   - Economic impacts
   - Resilience

5. **Continue to study opportunities and impacts related to achieving the 100 percent clean electricity target before 2045.**

   The joint agencies plan to continue analysis of the 2030, 2035, and 2040 scenarios in future SB 100 report analyses.

Process and Engagement for SB 100 Reports

6. **Convene an annual joint agency SB 100 workshop in years between reports.**

   Hosting an annual workshop will support alignment between agencies on relevant topics and proceedings and enhance continuity between SB 100 reports. These workshops will also provide an opportunity for joint agency leadership and staff to hear from stakeholders and the public on topics related to SB 100 progress.

7. **Align future SB 100 planning with findings and outcomes from relevant state efforts.**

   The joint agencies aim to incorporate findings and outcomes from other relevant efforts in future SB 100 reports. Relevant efforts include:

   - The CEC's energy demand forecasts, including electrification trends and updates for extreme climate event planning.

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- Transmission planning and development.
- Reliability planning, including possible updates to resource adequacy requirements.
- Electric system resilience planning.
- Assessments from CPUC's Integrated Resource Planning, CEC's Integrated Energy Policy Report, and CARB's Scoping Plan.

8. **Consult with advisory groups to guide equitable planning and implementation.**

   The DACAG and other environmental justice, health, and equity stakeholders provided valuable input for this report. For the 2025 SB 100 Report, the joint agencies plan to continue and build upon this collaboration to help ensure SB 100-related efforts benefit all Californians.

9. **Retain and expand upon best practices for community outreach and accessibility.**

   The joint agencies worked to ensure broad access to the 2021 Report process by holding workshops across the state, conducting significant outreach by phone, email, and social media, and offering remote attendance options for all workshops. The agencies will retain these best practices for the 2025 SB 100 Report while exploring additional methods to maximize participation and access to meeting information and materials for California residents.

Supporting Achievement of the 100 Percent Target

10. **Continue state support for research and innovation in clean energy technologies.**

    Continued investments in research and innovation can accelerate technology performance and cost improvements that can make progress toward the SB 100 goal easier and faster and reduce costs to electricity ratepayers. California's research and innovation programs, including the Electric Program Investment Charge (EPIC), will continue to catalyze advancements to support the cost-effective implementation of SB 100. The state's ongoing collaboration with cleantech incubators, research labs, and private investment firms will be critical to leveraging state funding in innovation.

11. **Continue to prioritize energy efficiency and load flexibility to minimize total implementation costs.**

    Prioritizing cost-effective energy efficiency and load-flexibility measures remains critical as the state moves toward a 100 percent clean electricity future. Taking steps to reduce energy demand can offset the need for additional generation capacity, saving Californians money, while reducing land-use and other environmental impacts associated with the construction of new facilities.

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12. **Identify and address bottlenecks in project permitting and development.**

    Because SB 100 implementation is projected to require sustained record-setting construction rates, barriers to project development need to be addressed early and comprehensively. The CEC and CPUC should engage with stakeholders — including developers, utilities, balancing authorities, local governments, and community organizations — to better understand specific barriers and advance strategies to address them.

13. **Promote workforce development programs that focus on high-quality job creation.**

    Implementation of SB 100 creates a significant opportunity to support California companies, benefit local economies, and create family-sustaining jobs while optimizing climate outcomes. The joint agencies should continue collaborating with the California Workforce Development Board (CWDB) to identify strategies and best practices to support an equitable clean energy workforce and high-quality job creation, including findings from CWDB's 2020 report, Putting California on the High Road. The agencies should also seek the expertise of the DACAG workforce subcommittee.

CHAPTER 1: Background

Clean Energy Efforts Across the Nation

In 2018, California became the second state, after Hawaii, to establish a 100 percent clean electricity target. Today, 17 states, plus Washington D.C. and Puerto Rico, have adopted similar policies, along with more than 200 cities and counties.[1] More than one-third of Americans, or roughly 111 million residents, live in a state or community committed to 100 percent clean electricity.[2]

The SB 100 joint agencies engage with the other committed states and entities through the 100 Percent Clean Energy Collaborative, established by the Clean Energy States Alliance, to promote knowledge-sharing and updates on implementation efforts.

Decades of Climate Leadership

California has long led the nation and the world in setting ambitious renewable energy and climate policies, working toward a clean economy that is healthier and more just. The state became a global leader in climate policy with the passage of the California Global Warming Solutions Act of 2006,[3] which requires a reduction of statewide GHG emissions to 1990 levels by 2020.41F[4] California met the target four years early and continues to accelerate decarbonization economywide.

1 Clean Energy States Alliance. 100% Clean Energy Collaborative - Table of 100% Clean Energy States https://www.cesa.org/projects/100-clean-energy-collaborative/table-of-100-clean-energy-states/, and UCLA Luskin Center for Innovation. November 2019. *Progress Toward 100% Clean Energy in Cities and States Across the U.S.* https://innovation.luskin.ucla.edu/wp-content/uploads/2019/11/100-Clean-Energy-Progress-Report-UCLA-2.pdf.

2 Ibid.

3 California Global Warming Solutions Act of 2006 (Assembly Bill 32, Núñez, Chapter 488, Statutes of 2006).

4 For more information, see the link to the California Air Resources Board AB 32 Overview Webpage, http://www.arb.ca.gov/cc/ab32/ab32.htm.

Table 5: California's Key Greenhouse Gas Reduction Policies

Year	Policy	Description
2006	AB 32 (Núñez)	Reduce statewide GHG emissions to 1990 levels by 2020.
2006	SB 1368 (Perata)	Prohibits long-term investments in baseload power plants[5] with GHG emission rates higher than those of natural gas combined-cycle generation.
2015	SB 32 (Pavley)	Reduce statewide GHG emissions to 40 percent below 1990 levels by 2030.
2015, 2005	Executive orders B-30-15 and S-3-05	Reduce statewide GHG emissions to 80 percent below 1990 levels by 2050.
2018	Executive Order B-55-19	Achieve carbon neutrality no later than 2045 and maintain net negative emissions thereafter.

Source: CEC staff

Putting a Price on Carbon

California launched a Cap-and-Trade Program in 2012 to ensure its climate goals are achieved cost-effectively. It places a firm, declining cap on the largest sources of GHG emissions, such as large power plants, importers of electricity, industrial plants, and natural and transportation fuel suppliers.

The program covers 80 percent of the state's GHG emissions and creates a powerful economic incentive for significant investment in cleaner, more efficient technologies. Companies covered by the program have flexibility to reduce emissions onsite or use allowances bought at state-administered auctions or from another company with excess allowances. All covered entities in the Cap-and-Trade Program are subject to existing air quality permit limits for criteria and toxic air pollutants.

The California Climate Investments initiative spends the auction revenue on projects that further reduce greenhouse gas emissions, strengthen the economy, and improve public health and the environment. Cumulatively, the program has invested $6.3 billion in these projects.[6]

5 Those intended to run constantly at near capacity levels.

6 State of California - California Climate Investments Data Dashboard Web page https://www.caclimateinvestments.ca.gov/cci-data-dashboard.

Increasing Renewable Energy Generation

The Renewables Portfolio Standard (RPS), established by law in 2002,[7] has been a primary driver for increasing clean electricity generation. The law and subsequent amendments require the state's electric utilities to make renewables an ever-greater percentage of their power base. SB 100 expands the RPS and requires 60 percent of electricity retail sales to be met by eligible renewable resources by December 31, 2030.

The CPUC implements and administers RPS compliance for California's retail sellers of electricity, which include investor-owned utilities (IOUs), electric service providers (ESPs) and community choice aggregators (CCAs). The CEC oversees enforcement of RPS procurement requirements of public owned utilities (POUs) and is responsible for the certification of eligible renewable energy resources.

Eligible Renewable Energy Resources[8]

For RPS compliance, generation must be procured from certified facilities, which include:

- Solar
- Wind
- Geothermal
- Biomass, such as crop residues, forest waste, and landscape trimmings
- Biomethane from landfills and organic waste digesters
- Small hydroelectric
- Fuel cells using renewable fuel or qualifying hydrogen gas

State efforts have also supported rapid growth of the distributed solar industry. The California Solar Initiative of 2006[9] was particularly successful. The $3.4 billion, decade-long effort created a self-sustaining solar market. Thousands of home and business owners earned rebates by installing solar energy systems through the suite of incentives of the initiative.

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7 Senate Bill 1078 (Sher, Chapter 516, Statutes of 2002) created the RPS with an initial target of 20 percent renewable electricity by 2017, citing an opportunity to "promote stable electricity prices, protect public health, improve environmental quality, stimulate sustainable economic development, create new employment opportunities, and reduce reliance on imported fuels." The CPUC regulates RPS rules for California's retail sellers of electricity. The California Energy Commission (CEC) administers the certification of electrical generation facilities as eligible renewable energy resources and regulates RPS requirements for public owned utilities. For more information, see CPUC RPS Program website and CEC RPS Program website.

8 For more information see California Energy Commission. *Renewables Portfolio Standard Eligibility Guidebook, Ninth Edition (Revised)*. Publication Number: CEC-300-2016-006-ED9-CMF-REV. January 2017. https://efiling.energy.ca.gov/getdocument.aspx?tn=217317.

9 Senate Bill 1 (Murray, Chapter 132, Statutes of 2006), Senate Bill 1 (Murray, Chapter 132, Statutes of 2006).

In 2018, the CEC adopted a building energy efficiency code[10] requiring most new homes to have solar photovoltaic systems (or be powered by a solar array nearby) starting January 1, 2020. With continuing cost declines, solar is now cost-effective for new home construction across the state. In 2019, California reached the milestone of 1 million solar rooftop installations.[11]

Key Renewable Energy Policies

Table 6: Key Renewable Energy Legislation

Year	Policy	Description
2002	SB 1078 (Sher)	Established RPS program and target of 20 percent renewable energy in state's electricity mix by 2017
2006	SB 1 (Murray)	Codified California Solar Initiative, a $3.4 billion decade-long program to create a self-sustaining solar market
2006	SB 107 (Simitian)	Accelerated the 20 percent RPS target from 2017 to 2010
2011	SB X1-2 (Simitian)	Added RPS target of 33 percent by 2020
2015	SB 350 (De León)	Adds RPS target of 50 percent by 2030, a doubling of energy efficiency by 2030, and steps to ensure all Californians, including those in the most vulnerable communities, realize benefits of a clean energy economy
2018	SB 100 (De León)	Increases RPS mandate to 60 percent by 2030 and set a 2045 target for renewable and zero-carbon resources to supply 100 percent of retail sales and electricity procured for all state agencies.
2018	2019 Building Energy Efficiency Standards	Requires solar photovoltaic systems on new homes starting in 2020

Source: CEC staff and California Legislative Information

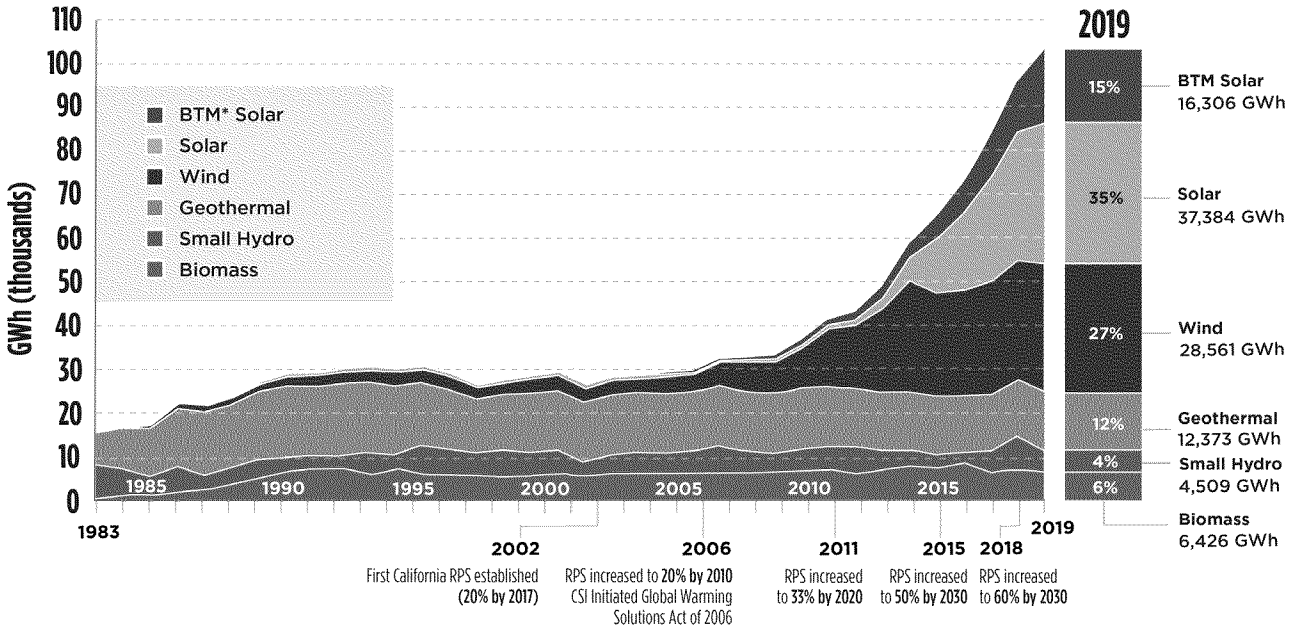
10 See CEC 2019 Building Energy Efficiency Standards Web page https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2019-building-energy-efficiency.

11 California Solar +_Storage Association, December 12, 2019. *California Celebrates Reaching One Million Solar Roofs Milestone; New Focus On "One Million Solar Batteries" Goal.* Link to article titled California Celebrates Reaching One Million Solar Roofs Milestone; New Focus On "One Million Solar Batteries" Goal https://calssa.org/press-releases/2019/12/12/california-celebrates-reaching-one-million-solar-roofs-milestone-new-focus-on-one-million-solar-batteries-goal.

The effects of these policies can be seen in

Figure 11. In the past five years, solar generation has increased more than 350 percent, and behind-the-meter (BTM) solar resources have more than doubled.

Figure 11: Total Renewable Generation Serving California Load by Resource Type



Source: CEC Tracking Progress – Renewable Energy, February 18, 2020, Link to CEC Tracking Progress – Renewable Energy, https://www.energy.ca.gov/sites/default/files/2019-12/renewable_ada.pdf.

Benefits of 100 Percent Clean Electricity

Improving Public Health

Statewide, more than 28 million Californians live in areas that exceed the federal health-based standards for ozone and fine particulate matter ($PM_{2.5}$).[12] Implementation of SB 100 is expected to reduce these emissions as renewable and zero-carbon resources replace fossil fuels in generating electricity. Prioritizing this transition in disadvantaged communities will reap the highest public health benefits. Today, half of the state's natural gas power plants are in communities that rank among the 25 percent most disadvantaged.[13]

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12 CARB. Workshop Discussion Draft: 2020 Mobile Source Strategy. September 30, 2020. https://ww2.arb.ca.gov/sites/default/files/2020-09/Workshop_Discussion_Draft_2020_Mobile_Source_Strategy.pdf.

13 Physicians, Scientists, and Engineers for Healthy Energy. Research brief: Natural gas power plants in California's disadvantaged communities. April 2017. https://www.psehealthyenergy.org/wp-content/uploads/2017/04/CA.EJ_.Gas_.Plants.pdf.

Public health benefits are expected to grow substantially throughout the state as the transition from fossil fuels to clean electricity accelerates in transportation and buildings. Cars, trucks, and buses are leading sources of air pollution in California. Research has shown that Latinos, African Americans, and low-income communities are exposed to substantially higher levels of vehicle pollutants than other demographic groups.[14]

Air pollution from heating and cooking with natural gas also poses a significant public health risk. Natural gas appliances emit several harmful air pollutants, including carbon monoxide, nitrogen oxides (NOx), particulate matter, and formaldehyde. Researchers with the UCLA Fielding School of Public Health recently explored the link between these appliances and various acute and chronic health effects, such as respiratory illness, cardiovascular disease, and premature death. They found that if all residential gas appliances in California were immediately replaced with clean electric alternatives, the reduction of outdoor NO_X and $PM_{2.5}$ would result in 354 fewer deaths over a year.[15]

The compound health effects of air pollution were recently highlighted when researchers at the Harvard University T. H. Chan School of Public Health found that higher levels of the tiny, dangerous $PM_{2.5}$ particles in air were associated with higher death rates from COVID-19.[16] Dr. Aaron Bernstein,[17] interim director at the school's Center for Climate, Health, and the Global Environment, said the findings are particularly important for people in poor neighborhoods and communities of color: "Higher death rates [from COVID-19 infection] that have been observed among the poor and people of color in the United States reflect existing health and economic inequalities that both contribute to, and result from, greater exposure to air pollution."[18]

Advancing Energy Equity

California's energy and environmental efforts focus on low-income and "disadvantaged communities," a state designation for low-income census tracts that suffer additional burdens, such as poor health, high unemployment and poor air or water quality. The joint agencies are committed to ensuring the benefits of cleaner, more efficient energy are enjoyed by all

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14 Union of Concerned Scientists. "Inequitable Exposure to Air Pollution from Vehicles in California (2019)" January 28, 2019. https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles-california-2019.

15 UCLA Fielding School of Public Health. *Effects of Residential Gas Appliances on Indoor and Outdoor Air Quality and Public Health in California*. April 2020. https://ucla.app.box.com/s/xyzt8jc1ixnetiv0269qe704wu0ihif7.

16 *Science Advances Magazine*. "Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis" Volume 6, No. 45, November 4, 2020. https://advances.sciencemag.org/content/6/45/eabd4049. More recently, CARB is funding two studies to examine the impacts of chronic air pollution exposure on the risk, progression, and severity of COVID-19.

17 Dr. Bernstein, an assistant professor at Harvard Medical School, was not involved in the study.

18 Harvard T. H. Chan School of Public Health, Coronavirus and Air Pollution Web page, https://www.hsph.harvard.edu/c-change/subtopics/coronavirus-and-pollution/.

Californians, including those in low-income and disadvantaged communities, as well as tribal and rural communities.

To ensure equitable outcomes,[19] SB 100 will need to be implemented in ways that help these communities overcome barriers to clean energy, including:

- Keeping electricity affordable, with an emphasis on vulnerable populations and households that pay a disproportionately high share of their household income on energy.
- Reducing air pollution from local power plants, particularly in communities that experience a disproportionate amount of air pollution.
- Strengthening their ability to function during power outages and enjoy reliable energy in a changing climate.
- Funding of training for high-quality jobs and careers in the growing clean-energy industry.

Disadvantaged Communities Advisory Group

The Clean Energy and Pollution Reduction Act of 2015 (SB 350) called for the formation of this group to ensure that disadvantaged communities, including tribal and rural communities, benefit from clean energy and pollution reduction initiatives. The 11-member group meets several times a year to review CEC and CPUC clean energy programs and policies. Members are either from or represent disadvantaged communities.

In 2018, the DACAG adopted an Equity Framework[20] that can serve as a guide for SB 100 program design, outreach, and workforce development efforts. During the development of this report, the group also formed a subcommittee focused on SB 100. The subcommittee and other environmental justice and equity organizations provide valuable insights on ways to ensure energy equity as the state advances toward a clean energy future.

Supporting a Clean Energy Economy

As a clean energy leader boasting one of the world's largest economies, California has shown that economic growth and environmental protection are not mutually exclusive. For decades,

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19 "Equity" is defined as reducing disparities between different populations. Environmental equity, then, is (at least in part) about ensuring disadvantaged populations have equitable access to clean energy and other "environmental goods/services." Economic equity in this clean energy context, would therefore aim to ensure disadvantaged workers have equitable access to high-quality clean energy jobs or careers.

20 Disadvantaged Communities Advisory Group, Equity Framework, https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/DAC%20AG%20Equity%20Framework%20(Revised).pdf.

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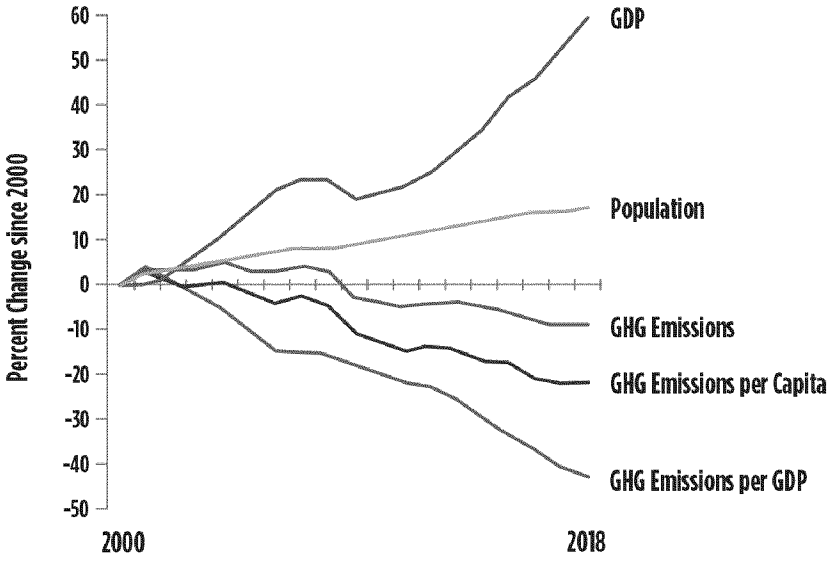
the state has reduced GHG emissions while growing its economy at a rate that has consistently outpaced the U.S. national average.[21]

Figure 12: Statewide Trends of Emissions and Indicators (2000–2018)



Source: CARB[22]

California's policies have spurred innovation and created markets for renewable energy, energy efficiency, energy storage, low-carbon fuels, and zero-emission vehicles. The state is a leader in patent registrations across all major clean technology (cleantech) categories, with 3.5 times more patents than the next highest state, Texas.[23] Patents in energy storage, a key technology to achieving SB 100 goals, increased more than 65 percent from 2017 to 2018.[24]

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21 Bureau of Economic Analysis. "Gross Domestic Product by State, 2nd Quarter 2020." Released October 2, 2020. https://www.bea.gov/data/gdp/gdp-state.

22 California Air Resources Board. GHG Emission Inventory Graphs https://ww2.arb.ca.gov/ghg-inventory-graphs.

23 Next10.org. 2019 California Green Energy Innovation Index, 11th Edition. October 2019. https://www.next10.org/sites/default/files/2019-10/2019-california-green-innovation-index-final.pdf.

24 Next10.org. 2019 California Green Energy Innovation Index, 11th Edition. October 2019. https://www.next10.org/sites/default/files/2019-10/2019-california-green-innovation-index-final.pdf.

In addition, California's companies have received more than 50 percent of all U.S. venture capital investment in cleantech.[25]

As of 2020, California had more than 530,000 clean energy jobs,[26] more than half of the total energy-related jobs in the state. The cleantech companies range from start-ups to large manufacturers in the fields of renewable energy, grid modernization, energy storage, energy efficiency, and clean vehicles.[27] Most of these jobs require workers skilled in the construction trades and crafts.[28] Examples include performing building energy retrofits, solar and wind system installation, electric vehicle charging equipment installation, and battery storage maintenance and repair.

The global COVID-19 pandemic has dramatically affected California's energy sector. The cleantech industry has suffered some of largest job losses since social distancing and other precautions took hold in March 2020. During the first three months, the clean energy workforce declined by 20 percent, roughly 110,000 jobs.[29] The latest available data shows jobs slowly increasing from June through October, yet net losses remained at more than 76,000 jobs.

A Cornerstone of California's Clean Energy Efforts

Successful implementation of SB 100 alone will not achieve statewide carbon neutrality, but it is a cornerstone of California's climate-fighting efforts that collectively can reach the target. A clean electricity grid can serve as a backbone to support the decarbonization of transportation, buildings, and some industries that, together with the electricity sector, account for 92 percent of the state's GHG emissions.

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25 Next10.org. *2020 California Green Energy Innovation Index, 12th Edition*. December 2019. https://www.next10.org/sites/default/files/2020-12/2020-california-green-innovation-index-final_0.pdf.

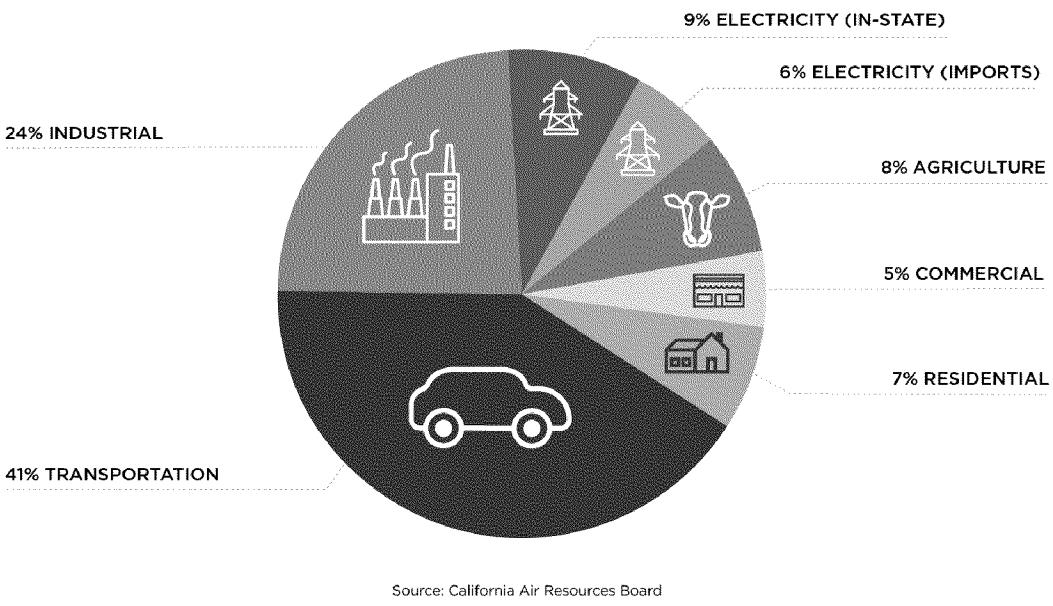
26 E2.org. Clean Jobs California 2020. June 25, 2020. https://e2.org/reports/clean-jobs-california-2020/.

27 The Clean Jobs California 2020 Report, sponsored by the CEC and CPUC, details employment demographic data from more than 4,500 energy employers in the last quarter of 2019.

28 According to E2, one in five construction workers are employed in clean energy, 43 percent of solar and wind energy jobs are in construction, and nearly 6 in 10 energy efficiency employees work in construction. Source: Clean Jobs America. April 2020. https://e2.org/wp-content/uploads/2020/04/E2-Clean-Jobs-America-2020.pdf.

29 BW Research Partnership. Clean Energy Employment Initial Impacts from the COVID-19 Economic Crisis, October 2020. November 12, 2020. https://e2.org/wp-content/uploads/2020/11/Clean-Energy-Jobs-October-COVID-19-Memo-Final.pdf.

Figure 13: California GHG Emissions by Sector



Source: CARB Emissions Inventory[30]

SB 100 sits within a portfolio of related key clean energy efforts to reduce climate and air pollution emissions while maintaining a reliable and affordable electric grid. These include:

Transportation Electrification

The transportation sector remains the largest source of GHG emissions in California, responsible for 50 percent of the state's climate-altering pollution.[31] Vehicle exhaust also accounts for 80 percent of smog-forming gases and other air pollutants linked to premature deaths from respiratory and heart disease.[32] Economywide, GHG emissions have been decreasing in recent years, but transportation emissions have largely increased since 2013 and remain the state's biggest decarbonization challenge.

In 2018, Governor Edmund G. Brown Jr. established by executive order[33] a target of 5 million zero-emission vehicles (ZEVs) on California roads by 2030. The order also called for the

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30 California Air Resources Board. GHG Emission Inventory Graphs https://ww2.arb.ca.gov/ghg-inventory-graphs.

31 When including emissions associated with production and refining of fossil fuels for transportation.

32 California Air Resources Board. 2016 Mobile Source Strategy Web page https://ww2.arb.ca.gov/resources/documents/2016-mobile-source-strategy.

33 Governor Edmund G. Brown, Jr. Executive Order B-48-18, January 26, 2018. https://www.ca.gov/archive/gov39/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/index.html.

installation of 250,000 publicly available electric vehicle charging ports and 200 hydrogen fueling stations by 2025. In September 2020, Governor Gavin Newsom expanded this goal when he issued an executive order[34] requiring that all new cars and passenger trucks be zero-emission by 2035 and all medium- and heavy-duty vehicles on the road be zero-emission by 2045.

These targets are ambitious, but California has already positioned itself as a leader in clean transportation. Many state programs are encouraging more motorists to shift to zero-emission vehicles, including:

- CPUC-approved investments in building more charging ports.
- CARB's Clean Vehicle Rebate Project, which has provided nearly $900 million in rebates to ZEV buyers.[35]
- A CARB program that gives vehicle fuel producers credits toward meeting the state's Low Carbon Fuel Standard by funding the installation of fast (direct current) electric vehicle chargers and hydrogen fuel stations.
- CEC's Clean Transportation Program, which invests up to $100 million annually to accelerate the development and deployment of ZEV chargers and advanced clean transportation technologies.

Today, California has more than 566,000 ZEVs on the road and more than 763,000 cumulative ZEV sales — nearly half of all ZEV sales in the nation. The state also home to 34 ZEV-related manufacturers.[36] In 2019, electric vehicles became the state's second-largest export, valued at more than $7 billion.[37]

Despite these major advancements, big challenges lie ahead on the road to 100 percent zero-emission transportation. Primarily, the charging infrastructure must be greatly expanded to support many electric vehicles.

Having so many more vehicles tapping the state's electricity system will require closely coordinated planning between the power and transportation sectors. It will also create new green jobs and opportunities for innovators. Through a process known as vehicle-grid integration, electric cars help manage loads on the grid. Standardized, smart charging

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34 Governor Gavin Newsom. Executive Order N-79-20. September 23, 2020. https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-text.pdf.

35 Center for Sustainable Energy (2020). California Air Resources Board Clean Vehicle Rebate Project, Rebate Statistics. https://cleanvehiclerebate.org/eng/rebate-statistics.

36 CEC Analysis, includes ZEV, ZEV component, and ZEV infrastructure manufacturers and employers.

37 United States Census Bureau. Foreign Trade: State Exports from California Web page https://www.census.gov/foreign-trade/statistics/state/data/ca.html.

technologies will make it easy for drivers to charge up with enough energy for their trips at the least possible cost.

Building Decarbonization

Another significant source of California's GHG emissions are those linked to everyday use of buildings, mainly natural gas heating and cooking. Decarbonizing energy use in new and existing buildings has recently emerged as a key climate-fighting strategy. In July 2019, Berkeley became the first U.S. city to ban natural gas in new buildings.[38] As of December 2020, 41 California cities have passed ordinances to either ban natural gas or favor electric heating.[39]

Assembly Bill 3232 (Friedman, Chapter 373, Statutes of 2018)[40] requires the CEC to identify and evaluate ways to reduce the GHG emissions of buildings by 40 percent below 1990 levels by 2030. The assessment will compare costs of different decarbonization pathways, estimate effects on the electricity grid, and recommend state actions.[41] Preliminary findings suggest switching from gas to highly efficient electric appliances such as heat pump water and space heaters is an effective strategy. A final report is planned for release in 2021.

The CPUC recently authorized $435 million through 2024 to spur the clean building technologies market.[42] Programs under development include:

- BUILD (Building Initiative for Low-Emissions Development): Provides incentives for installation of decarbonizing technologies such as heat pumps in all-electric, low-income new construction.
- TECH (Technology and Equipment for Clean Heating): Provides incentives to manufacturers and training for installers of low-emission space and water heaters in early stages of market development.

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38 City of Berkeley. Ordinance No. 7,672–N.S. Adding a New Chapter 12.80 to the Berkeley Municipal Code Prohibiting Natural Gas Infrastructure in New Buildings Effective January 1, 2020 https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/2019-07-23%20Item%20C%20Prohibiting%20Natural%20Gas%20Infrastructure.pdf.

39 Sierra Club. California's Cities Lead the Way to a Gas-Free Future https://www.sierraclub.org/articles/2020/12/californias-cities-lead-way-gas-free-future.

40 Assembly Bill 3232 https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB3232.

41 CEC. 2019. *2019 California Energy Efficiency Action Plan.* CEC-400-2019-010-CMF. Link to Final Commission Report: 2019 California Energy Efficiency Action Plan, https://efiling.energy.ca.gov/GetDocument.aspx?tn=231260&DocumentContentId=62914.

42 See "Fact Sheet – Heat Pump Water Heater Incentive Programs," available for download at the CPUC Building Decarbonization Web page https://www.cpuc.ca.gov/buildingdecarb/.

Energy Efficiency

California has been a global leader in energy efficiency for more than 40 years, beginning in the 1970s with the CEC's adoption of the nation's first energy conservation standards for buildings and appliances. Since 1990, these standards have saved Californians more than $100 billion in utility costs.[43]

Today's standards cover much of the home and work environments, from computers to lighting, toilets, faucets, water heaters, insulation, windows, and household appliances. New buildings are becoming increasingly energy-efficient as the CEC updates and improves standards, about every three years. A home built under 2019 standards, for instance, will use 53 percent less energy than one built under 2016 codes.

The CPUC oversees hundreds of utility ratepayer-funded programs across the state to improve compliance with building and appliance codes and encourage businesses, industries, and homeowners to use new technologies that exceed the standards. In 2019 alone, these programs saved more than 2,700 GWh of electricity and 84 million therms of natural gas — enough to power 328,000 homes for a year.

Load Flexibility on the Electricity Grid

Load flexibility — the ability to shift electricity use to other parts of the day — is critical to maintaining a reliable and affordable supply of electricity. Load flexibility can also reduce GHG emissions by maximizing electricity use when grid power is least polluting.

The CPUC and CEC are laying the groundwork for automating load flexibility by taking steps to implement time-dependent electricity rates and moving forward a range of additional actions including:

- Building Energy Efficiency Standards (Energy Code): The 2019 Energy Code provides compliance credit for battery storage systems and heat pump water heaters that meet specific load flexibility requirements.
- Load Management Standards: These are designed to increase flexibility of demand through rates, storage, and automation — minimizing costs and improving reliability.
- CalFlexHub: The California Flexible Load Research and Deployment Hub is a new CEC program to fund research, development, and deployment of flexible demand technologies.
- Flexible Demand Appliance Standards:[44] The CEC is developing standards that would require specified appliances sold in California to include flexible-demand technologies

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43 California Energy Commission. California Energy Commission Tracking Progress - Energy Efficiency. September 2018. https://www.energy.ca.gov/sites/default/files/2019-12/energy_efficiency_ada.pdf.

44 Under Senate Bill 49 (Skinner, Chapter 697, Statutes of 2019) https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB49.

that enable operations to be scheduled, shifted, or curtailed to help reduce GHG emissions and maintain system reliability at lowest cost.

- Vehicle-Grid Integration (VGI): The CPUC and CEC are working with other state agencies and stakeholders to assess opportunities and develop policies that support VGI, which will allow owners of battery-electric vehicles to program smart charging in a way that helps balance demand and supply on the grid.

Research and Innovation

Since 2012, California ratepayers have invested more than $1 billion in emerging technologies that help make energy more affordable, reliable, and environmentally sustainable. EPIC, California's flagship electricity R&D program administered by the CEC, invests more than $130 million annually to support the development of emerging clean energy technologies. Moving forward, EPIC will continue to catalyze advancements to support the cost-effective implementation of SB 100 in:

- Renewable and zero-carbon generation.
- Long-duration energy storage.
- Energy efficiency.
- Electric load flexibility.

State agencies are working to ensure the benefits of these investments benefit all Californians. As much as 65 percent of EPIC technology demonstration projects are in disadvantaged and low-income communities, surpassing the 35 percent target set by Assembly Bill 523 (Reyes, Chapter 551, Statutes of 2017).[45]

45 Assembly Bill 523 (Reyes, Chapter 551, Statutes of 2017) https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB523.

Removing Carbon From the Atmosphere

In the 2015 Paris Agreement, scientists agreed that carbon neutrality — the point at which the removal of carbon pollution from the atmosphere equals or exceeds emissions — must be achieved by midcentury to stabilize the climate.[46] Three years later, Governor Brown issued an executive order that California become carbon neutral by 2045. To reach that target, state leaders are going beyond GHG emissions reduction measures. They are taking steps to remove greenhouse gases from the atmosphere are store them underground — a strategy known as "carbon capture and sequestration," as shown in **Figure 14**. In October 2020, Governor Newsom directed CARB to set a science-based target for removal of carbon from "natural and working lands," primarily agricultural.[47]

While engineered carbon removal technologies may also be an important tool, sequestering carbon on land including farms and ranches costs less and improves soil health and crop production. Using cover crops, reducing tillage, and applying compost and other organic matter are among the methods that strengthen the ability of the soil to store carbon.[48] California's Healthy Soils Initiative, a collaboration of state agencies, funds demonstration projects and financially assists farmers and ranchers in putting soil-improving practices to work on their lands to sequester carbon and reduce GHG emissions. The program is funded by revenue from the state's cap-and-trade auctions.[49]

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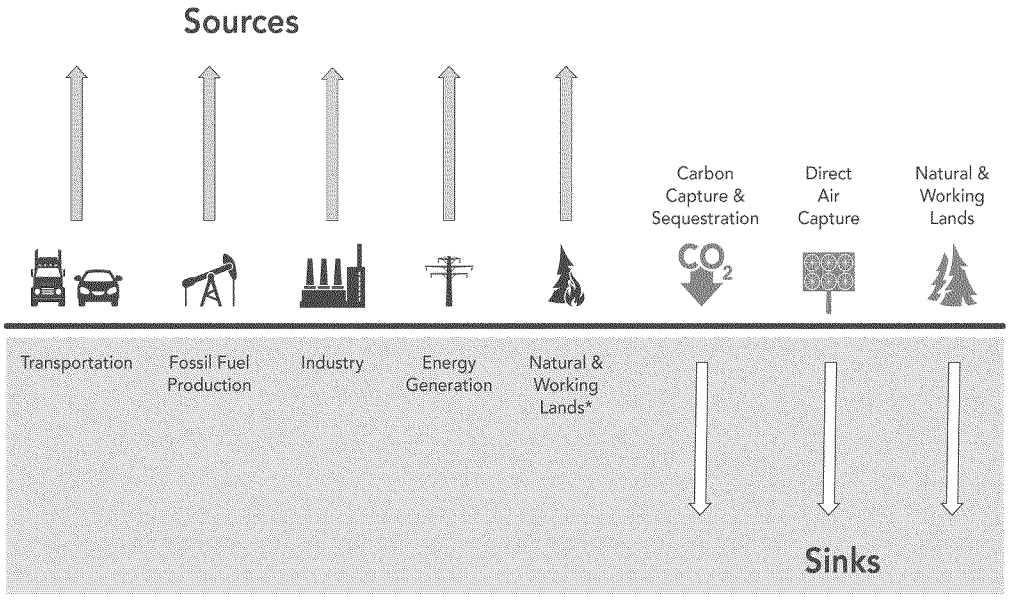
46 United Nations. Paris Agreement, Article 4.1. December 12, 2015. https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf

47 Governor Gavin Newsom. Executive Order N-82-20. October 7, 2020. https://www.gov.ca.gov/wp-content/uploads/2020/10/10.07.2020-EO-N-82-20-signed.pdf.

48 California Climate Investments. *2020 Annual Report to the Legislature on California Climate Investments Using Cap-and-Trade Auction Proceeds.* March 2020. https://ww2.arb.ca.gov/sites/default/files/classic/cc/capandtrade/auctionproceeds/2020_cci_annual_report.pdf; and Kat Kerlin, UC Davis, "A Climate Change Solution Beneath Our Feet." May 15, 2017. "Soil sequesters carbon through a complex process that starts with photosynthesis. A plant draws carbon out of the atmosphere and returns to the soil what isn't harvested in the form of residue and root secretions. This feeds microbes in the soil. The microbes transform the carbon into the building blocks of soil organic matter and help stabilize it, sequestering the carbon." https://climatechange.ucdavis.edu/news/climate-change-solution-beneath-feet/.

49 California Department of Food and Agriculture, Office of Environmental Farming & Innovation. Healthy Soils Program Web page. https://www.cdfa.ca.gov/oefi/healthysoils/.

Figure 14: Midcentury Carbon Neutrality



Natural and working land emissions include wildfire, disease, land and agricultural management practices, and other sources.

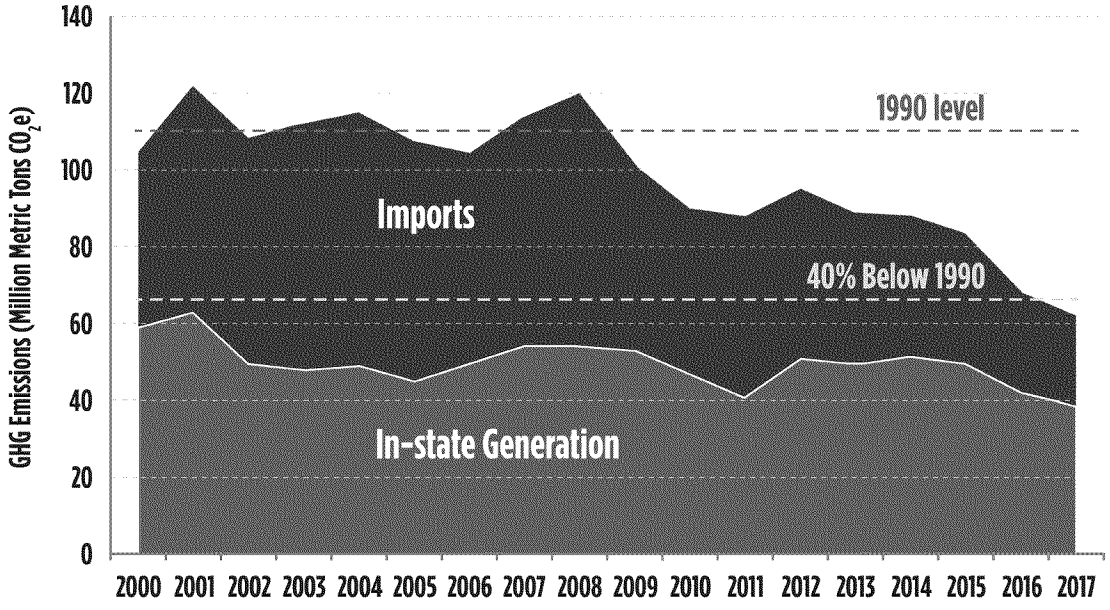
Source: CARB.

California's Electric Grid Today

Declining Emissions

GHG emissions from power generation have dropped by more than 40 percent since 2000, as shown in **Figure 15**. The declines are largely attributable to increased use and reduced cost of renewable energy, particularly solar, the state's energy efficiency standards, and greatly reduced use of coal-fired power plants. Although emissions are on an overall downward trend, the availability of hydroelectric power can significantly affect GHG emissions levels in wet versus dry years.

Figure 15: The Electricity Sector Has Significantly Reduced GHG Emissions Since the Turn of the Century



Sources: California Air Resources Board and CEC staff analysis, December 2019

Increasing Clean Generation

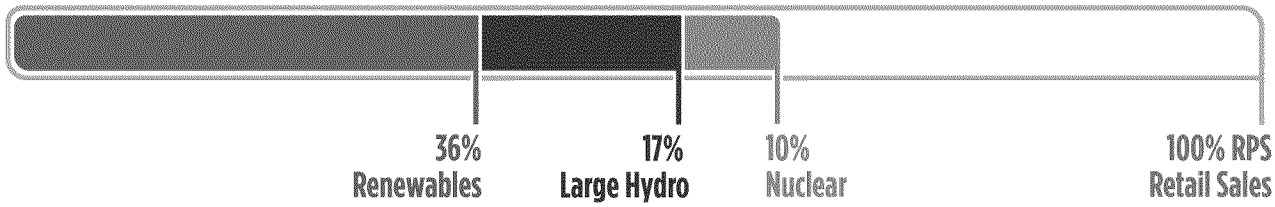
The proportion of California's electricity from renewable sources has increased dramatically since the establishment of the Renewables Portfolio Standard in 2002. Preliminary data show the state exceeded the 2020 target of 33 percent in 2019 with a total of 36 percent of retail sales supplied by eligible renewable energy resources.[50]

In 2019, nearly two-thirds of California's electricity came from carbon-free sources,[51] as shown in **Figure 16**. By 2025, out-of-state coal generation is projected to be eliminated from the state's resource mix altogether. The grid also is using less natural gas because of the increasing amount of renewable sources, In the near term to midterm, however, natural gas generation will continue to play a critical role in ensuring grid reliability.

50 California Energy Commission. California Energy Commission Tracking Progress – Renewable Energy. February 2020. https://www.energy.ca.gov/sites/default/files/2019-12/renewable_ada.pdf.

51 For purposes of the GHG inventory, these include solar, wind, large and small hydropower, and nuclear.

Figure 16: 63 Percent of 2019 Retail Sales From Nonfossil Resources



Source: CEC, Tracking Progress, 2020

The increasing integration of renewable resources into the grid is changing system planning and operations. With the growth in intermittent renewables, system operators need generators with flexible capabilities to balance supply and demand. The swift rise in solar and wind power coming onto the grid has resulted in more frequent instances of oversupply during the middle of the day, when the sun is brightest. In certain times of the year, the daily net load — the difference between forecasted load and expected electricity production from variable generation resources — is lower during the midday then quickly ramps up.[52]

Although several tools are available to rapidly adjust supply and demand, natural gas power plants provide about 75 percent of the flexible capacity of the grid (the ability to quickly ramp energy production up or down to match supply and demand). While some natural gas power plants are retiring, others are still needed to maintain grid reliability as more renewable power enters the system. In the long term, other resources such as demand-side management and storage are essential to maintaining reliability while integrating high penetrations of renewables. This need can also be supported through increased coordination and the evolution of markets in the western region, which are already helping better integrate renewables.

Overview of California's Electricity System

Agency Oversight

California has several energy organizations with different electricity related responsibilities:

- **The CEC** is the state's lead energy policy and planning agency. The CEC's primary functions include forecasting electricity and natural gas demand for state planning, siting and licensing thermal power plants 50 MW or greater, investing in energy technology, setting the state's appliance and building energy efficiency standards, and planning for and directing the state's response to energy emergencies. The CEC also publishes the *Integrated Energy Policy Report*, which assesses major energy trends and issues facing California's electricity, natural gas, and transportation fuel sectors.

52 California Independent System Operator. Fast Facts: What the Duck Curve Tells Us About Managing a Green Grid. 2016. https://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf.

- **The CPUC** regulates services and utilities, protects consumers, safeguards the environment, and assures Californians' access to safe and reliable utility infrastructure and services. The essential services regulated include electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies. The CPUC does resource planning for 80 percent of California's electric grid through the IRP proceeding and implements programs such as the RPS, efficiency incentives, transportation electrification investments, customer solar, and building decarbonization.
- **CARB's** mission is to promote and protect public health, welfare, and ecological resources through effective reduction of air pollutants while recognizing and considering effects on the economy. CARB is the lead agency for climate change programs and oversees all air pollution control efforts in California to attain and maintain health-based air quality standards.
- **City, county, and tribal governments** also influence statewide energy decisions and have permitting authority for transmission lines, thermal power generators under 50 MW and nonthermal power generators, including solar and wind operations on nonfederal lands.

Load-Serving Entities (LSEs)

California's electric load is met through a variety of LSEs, which serve retail customers.[53] The primary LSEs are the following:

- **Investor-owned utilities (IOUs)** provide transmission and distribution services to all electric customers in their service territory. The utilities also provide generation service for "bundled" customers, while "unbundled" customers receive electric generation service from an alternate provider, such as a community choice aggregator (CCA). California's electric IOUs are Pacific Gas and Electric, Southern California Edison, and San Diego Gas & Electric.
- **Publicly owned utilities (POUs),** or municipal utilities, are publicly financed and controlled by citizen-elected governing boards. The Los Angeles Department of Water and Power and Sacramento Municipal Utility District are among the largest POUs that together serve about 27 percent of the state's electricity demand.
- **Community choice aggregators (CCAs).** Growing numbers of California communities have formed these local agencies to buy electricity on behalf of their residents and businesses, often aiming to provide lower rates and greener electricity than offered by the default utility. CCAs are a relatively new type of load-serving entity

53 CPUC. California Customer Choice: An Evaluation of Regulatory Framework Options for an Evolving Electricity Market. August 2018. https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/Cal%20Customer%20Choice%20Report%208-7-18%20rm.pdf.

and have grown rapidly, projected to serve about 38 percent of the load within IOU service territories by 2022.[54]

- **Electric service providers (ESPs),** or direct access providers, are nonutility entities that market electric service directly to customers. However, the customer load service by ESPs is set at a limited amount. Like CCAs, ESPs must comply with resource adequacy, RPS, and IRP requirements overseen by the CPUC.

Grid Balancing

California's grid is divided into five balancing authority areas. The following balancing authorities balance supply and demand and maintain electric frequency on the grid. The authorities are:

- California ISO, which manages about 80 percent of the state's flow of electricity.
- Los Angeles Department of Water and Power.
- Balancing Authority of Northern California.
- Imperial Irrigation District.
- Turlock Irrigation District.

Western States Coordination

California is part of a larger integrated electricity system called the Western Interconnection, which includes all or parts of 14 western states as well as Alberta, British Columbia, and Baja California. Several of these jurisdictions have also adopted clean energy goals or standards,[55] expanding opportunities for market development and knowledge-sharing on integrating increasing amounts of renewable generation.[56]

In 2014, the California ISO initiated the Western Energy Imbalance Market (EIM), a real-time wholesale energy trading market with PacifiCorp as its first member.[57] The EIM manages

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54 CalCCA. 2010-2020: A Decade of CCA in California. May 1, 2020. https://cal-cca.org/celebrating-10-years-of-cca-in-california/.

55 For details on states with clean energy or renewable goals or standards, see the Link to State Policy Climate Maps at https://www.c2es.org/content/state-climate-policy/ or the CESA 100% Clean Energy Collaborative - Table of 100% Clean Energy States at https://www.cesa.org/projects/100-clean-energy-collaborative/table-of-100-clean-energy-states/.

56 These entities are described in the CEC's Western Energy Planning Fact Sheet at https://www.energy.ca.gov/sites/default/files/2019-06/Western_Energy_Planning.pdf.

57 The Western Energy Imbalance Market (EIM) is a real-time wholesale energy trading market that enables participants anywhere in the West to buy and sell energy when needed. The EIM platform balances fluctuations

congestion on high-voltage transmission lines to maintain grid reliability, supports integration of renewable resources, and makes excess renewable energy available to participating utilities at low cost rather than turning the generating units off.

The EIM has grown to 11 member entities, and another 11 plan to join by 2023, which will account for 82 percent of the load in the Western Interconnection.[58] This market is credited with achieving $1.18 billion in savings from increased operational efficiencies and a 1.3 million MWh reduction in curtailment of renewable energy.[59] There is interest in building off the EIM's success, including with the California ISO's Extended Day-Ahead Market (EDAM) Initiative.[60] The EDAM initiative, which is still in the early stages, aims to improve renewable integration and market efficiency through day-ahead scheduling and unit commitment across a larger area.

California is engaged with several other regional government and industry groups to ensure its energy interests are represented. They include:

- Western Electricity Coordinating Council: A nonprofit corporation that promotes bulk power system reliability and security in the Western Interconnection.
- Western Interstate Energy Board: An organization of 11 western states and three western Canadian provinces that promotes coordinated development of energy policies.
- Western Interconnection Regional Advisory Body: Created by western governors under the Federal Power Act to provide advice on grid reliability to the Federal Energy

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in supply and demand by automatically finding lower-cost resources to meet real-time power needs. The EIM manages congestion on high-voltage transmission lines to maintain grid reliability and supports integrating renewable resources. Further, it enhances reliability by increasing operational visibility across electricity grids. In addition, the market makes excess renewable energy available to participating utilities at low cost rather than turning the generating units off.

58 The entities and their dates of entry include the following: PacifiCorp (2014), NV Energy (2015), Arizona Public Service (2016), Puget Sound Energy (2016), Portland General Electric (2017), Idaho Power (2018), Powerex (2018), the Balancing Authority of Northern California/Sacramento Municipal Utility District (2019), Seattle City Light (2020), and Salt River Project (2020). Entities and their planned dates of entry include Los Angeles Department of Water and Power (2021), Northwestern Energy (2021), Turlock Irrigation District (2021), Public Service Company of New Mexico (2021), Balancing Authority of Northern California Phase 2 [Modesto Irrigation District, City of Redding, City of Roseville, and Western Area Power Administration–Sierra Nevada Region] (2021), Avista Utilities (2022), Tucson Electric Power (2022), Tacoma Power (2022), Bonneville Power Administration (2022), Xcel Energy – Colorado (2022), and El Paso Electric (2023).

59 California ISO, Western EIM Benefits Report, Fourth Quarter 2020, January 29, 2021, available at https://www.westerneim.com/Documents/ISO-EIM-Benefits-Report-Q4-2020.pdf.

60 Link to Extended Day-Ahead Market Initiative information on the California ISO's Web page http://www.California ISO.com/informed/Pages/StakeholderProcesses/ExtendedDay-AheadMarket.aspx.

Regulatory Commission, the North American Electric Reliability Corporation, and the Western Electricity Coordinating Council.

- Western Governors' Association: An instrument of the governors of 19 states and 3 U.S. territories for bipartisan policy development, information exchange, and collective action on issues of critical importance to the western United States.

Planning for a Midcentury Grid

Designing for a Changing Climate

California's electric grid must meet the state's clean energy goals while maintaining reliability and affordability, protecting public health and the environment, and distributing benefits of clean energy to all Californians — all in the face of fiercer and more frequent wildfires, droughts (reduced hydropower availability), and heat waves (higher loads from air conditioning). Meeting the state's goals also requires scientifically informed, flexible, and adaptive strategies to increase energy sector resilience to climate stressors, with particular attention to high fire threat areas and vulnerable populations. Future investments in electric generation, storage, distribution, and transmission must be designed and operated for a changing climate.

Changes in Supply and Demand

Planning a midcentury grid requires accommodating the variable nature of solar, wind and hydroelectric power; the increasing integration of renewable generation from utilities and customers; and increasing loads from building and transportation electrification. With the right policies, technologies, and price signals, a surge in all-electric vehicles and buildings can not only be accommodated, but could potentially support grid reliability.

August 2020 Rolling Blackouts Highlight Planning Needs

On August 14 and 15, 2020, the state experienced rotating outages during an extreme heat wave that spread across the West. An analysis[61] developed jointly by California ISO, CPUC, and CEC found a series of factors contributed to the emergency:

- The extreme, climate change-induced heat wave resulted in electricity demand exceeding supply; the existing resource planning processes are not designed to fully address an extreme heat wave like the one experienced in mid-August.
- Resource planners have not kept pace with the rapid rise of solar and wind power on the grid, resulting in insufficient supply to meet the high demand in the early evening in extreme conditions.

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61 California ISO, CPUC, and CEC. *Final Root Cause Analysis –: Mid-August 2020 Extreme Heat Wave*. January 13, 2021., January 13, 2021, http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.California ISO, CPUC, and CEC. *Preliminary Root Cause Analysis – Mid-August 2020 Heat Storm*. http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.

- Some practices in the day-ahead energy market exacerbate supply challenges when the grid is under high stress.

The heat wave that persisted from August 14 through 19 brought temperatures 10 to 20 degrees Fahrenheit above average. During this period, California experienced four out of the five hottest August days since 1985. Typically, California's hot daytimes in the summer are offset by cool evenings. During the extreme heat events, however, the high temperatures persisted into the evening and overnight, and air conditioners drove up electricity demand beyond normal.

The extreme heat also pinched electricity supply. Natural gas power plants ran less efficiently, and fewer imports of electricity were available as other western states also endured the extreme heat. At the same time, high clouds covered parts of California, reducing solar generation.

Heats waves of such severity and compounding factors are no longer outside the realm of planning contingencies. State agencies are busy recalibrating electricity supply and demand planning to more accurately reflect the increasing risk of extreme weather events.

SB 100: A Foundation for California's Clean Energy Future

SB 100 provides a tremendous opportunity for state agencies to collaboratively plan for a midcentury grid. As California moves toward a majority renewable grid in a changing climate, the state's planning processes likewise need to evolve to meet the needs of all Californians who depend on safe, affordable, and reliable electricity. Effectively integrating 100 percent renewable and zero-carbon electricity and achieving carbon neutrality by 2045 will require coordinated planning across state agencies, local governments, and electric utilities.

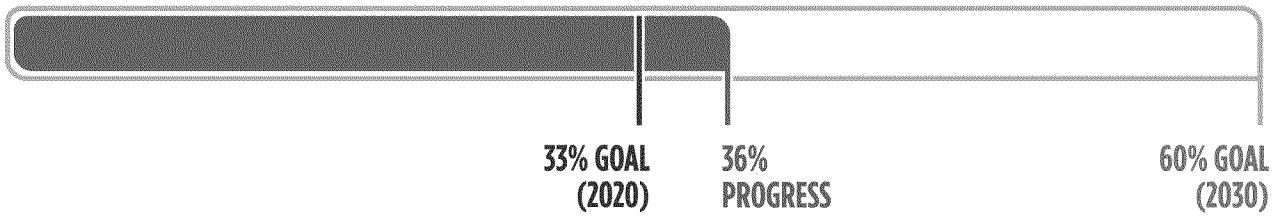
CHAPTER 2:
SB 100 Overview and Report Development Process

100 Percent Clean Electricity by 2045

The 100 Percent Clean Energy Act of 2018 (Senate Bill 100, De León) is California's keystone climate mitigation policy to drastically reduce greenhouse gas emissions in the power sector and help make California's economy carbon neutral by 2045.[62] SB 100:

- Sets a December 31, 2045 target for eligible renewable and zero-carbon energy resources to supply 100 percent of California's electricity to consumers and state agencies.[63]
- Increases the state's Renewables Portfolio Standard to 60 percent of electricity retail sales by December 31, 2030, and raises interim procurement requirements by amounts consistent with this increase.
- Requires that the joint agencies — CPUC, CEC, and CARB — use existing programs to achieve this policy and issue the Legislature a report on the implementation of the law by January 1, 2021, and every four years thereafter.

Figure 17: Progress Toward the 2030 60 Percent RPS Target



Source: CEC 2020, Tracking Progress – Renewable Energy, https://www.energy.ca.gov/sites/default/files/2019-12/renewable_ada.pdf

62 Governor Jerry Brown's September 10, 2018 Executive Order No. B-55-18, a complement to SB 100, states: "A new statewide goal is established to achieve carbon neutrality as soon as possible, and no later than 2045, and achieve and maintain net negative emissions thereafter. This goal is in addition to the existing statewide targets of reducing greenhouse gas emissions."

63 Public Utilities Code Section 454.53 https://codes.findlaw.com/ca/public-utilities-code/puc-sect-454-53.html.

State Agency Requirements

Under SB 100, the CPUC and CEC, in consultation with CARB, must ensure California's transition to a zero-carbon electric system is consistent with the Commerce Clause (which describes an enumerated power listed in the United States Constitution) and does not cause greenhouse gas (GHG) emissions to increase elsewhere in the western grid.

In addition, all state agencies must:

1. Maintain the safety and reliability of the electric system.
2. Prevent the implementation of the law from causing "unreasonable impacts" to customers' utility rates and bills, taking into "full consideration" the economic and environmental costs and benefits of clean electricity.
3. To the extent feasible and authorized under law, take actions to reduce greenhouse gas emissions in other economic sectors (industrial, commercial, agricultural, residential, transportation) to ensure equity between those sectors and the electricity sector.[64]

SB 100 Reports

SB 100 specifies that the joint agency reports be informed by public participation and consultation with California balancing authorities. The reports shall include:

1. A review of the 100 percent clean electricity policy focused on electricity technologies, forecasts, transmission, reliability, affordability, and environmental and public safety protection.
2. An evaluation of the potential effects of the law on electricity system reliability, statewide and local.
3. Anticipated costs and benefits to utilities and ratepayers (electric, gas, and water).
4. Identification of barriers to implementing the policy and benefits of achieving it.
5. Alternative scenarios to achieve the policy, with estimated costs and benefits.

SB 100 also emphasizes the need to benefit disadvantaged communities.[65] The joint agency reports consider how the implementation of the law affects disadvantaged communities, as well as tribal and rural communities.[66]

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64 Public Utilities Code Sections 399.11–399.33, 454.51, 454.52, 9621, and 9622.

65 This definition derives from CalEPA's CalEnviroScreen, a tool that identifies census tracts disproportionately burdened by and vulnerable to multiple sources of pollution. https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30. In April 2017, CalEPA released its list of disadvantaged communities for SB 535.

66 For more detail, see the Disadvantaged Communities Advisory Group Equity Framework, https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/DAC%20AG%20Equity%20Framework%20(Revised).pdf.

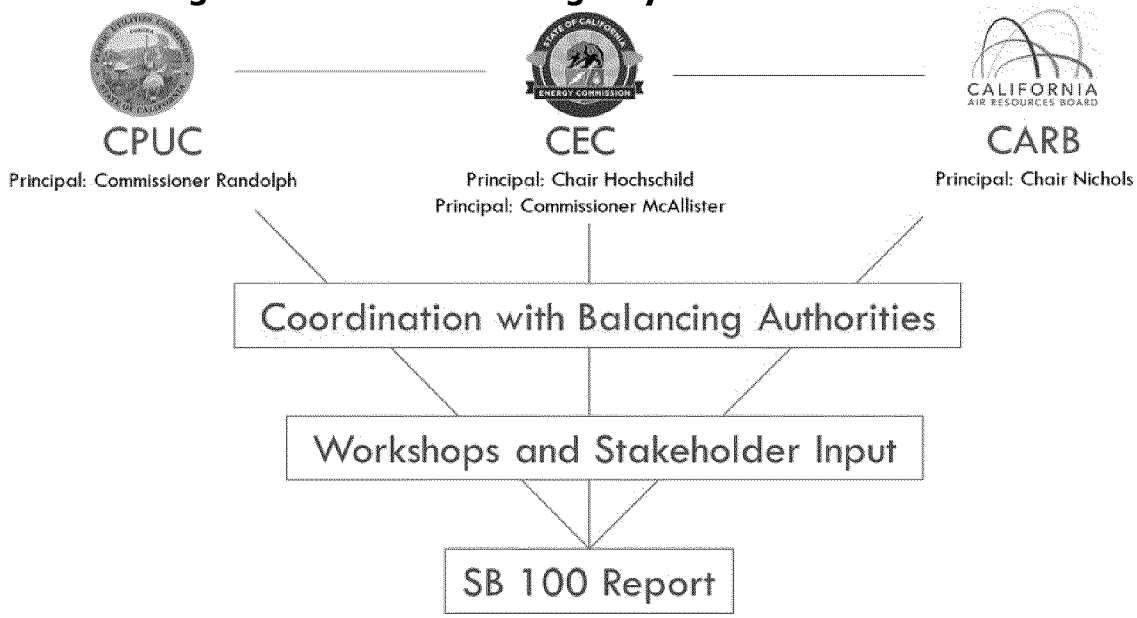
2021 Report Scope

This report examines implications of the 100 percent clean electricity policy under SB 100. Chapter 3 provides preliminary assessments of resource needs and projected costs of various implementation pathways.

The exploration builds on the modeling and assumptions used for CPUC's Integrated Resource Planning and considers California's overarching priorities on energy, climate, equity, and public health.

This report is neither a comprehensive nor prescriptive roadmap to 2045. As discussed in Chapter 4, future reports will delve deeper into critical topics such as system reliability and land use and further address energy equity and workforce needs.

Figure 18: SB 100 Joint Agency Coordination Process



Source: CEC, CPUC, and CARB. Developed by consensus

Public Engagement

The joint agencies held a year-long series of public workshops to solicit comments on the scope, analysis, and process of the report. A September 2019 kickoff workshop in Sacramento was followed by regional scoping workshops in Fresno, Redding, and Diamond Bar in Los

Angeles County and two technical workshops on the scenario modeling.[67] The agencies also held workshops on the draft modeling results and draft report.

The CEC conducted the outreach by email, phone, social media, and agency listservs. Most workshops had hundreds of attendees. The Draft Modeling Results Workshop drew nearly 400 participants via Zoom. The joint agencies received hundreds of comments at the workshops and online through the SB 100 docket.

Table 7: SB 100 Workshop Summary

Activity	Date
Kickoff Workshop (Sacramento)	September 5, 2019
Scoping Workshop 1: Central Valley (Fresno)	September 30, 2019
Scoping Workshop 2: Northern California (Redding)	October 25, 2019
Scoping Workshop 3: Southern California (Diamond Bar)	October 29, 2019
Technical Workshop (San Francisco)	November 18, 2019
Modeling Inputs & Assumptions Workshop (Sacramento)	February 24, 2020
Draft Modeling Results Workshop (Remote Only)	September 2, 2020
Draft Report Workshop (Remote Only)	December 4, 2020

Source: CEC, CPUC, and CARB

Consultation With Balancing Authorities

In September 2019, the joint agencies initiated consultation with the balancing authorities,[68] as required by SB 100.[69] The balancing authorities staff suggested inputs and assumptions for modeling the pathway scenarios and participated in the workshops as panelists. They were

67 For a complete record of the SB 100 report proceeding and public comments, see the SB 100 Joint Agency Report Webpage at https://www.energy.ca.gov/sb100 and the SB 100 docket at https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-SB-100.

68 "Balancing authorities" are responsible for balancing electricity supply with demand to ensure the generation, transmission and distribution of electricity all working reliably to meet California's energy needs. California's balancing authorities include the California Independent System Operator, Los Angeles Department of Water and Power, the Balancing Authority of Northern California, Imperial Irrigation District, and Turlock Irrigation District.

69 Public Utilities Code section 454.53 (d)(2) states: "In consultation with all California balancing authorities, as defined in subdivision (d) of Section 399.12, as part of a public process, issue a joint report to the Legislature by January 1, 2021, and at least every four years thereafter."

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particularly informative on wildfire threats and the future reliability of the state's electricity system in a changing climate.

Kickoff Workshop

September 5, 2019, Sacramento

State Resources Secretary Wade Crowfoot and Alice Reynolds, the Governor's Senior Energy Advisor, stressed the importance of SB 100 in helping the state meet its climate goals. The agency principals for the report[70] discussed the need to align the clean electricity goals of SB 100 with state efforts to decarbonize California's economy as a whole and ensure a safe, reliable, and equitable energy future for all Californians.

The workshop prompted a wide variety of oral and written comments (19 stakeholders made oral comments at the workshop, while 17 commenters submitted written comments following the workshop), including requests that the 2021 Report include the roles of energy conservation and storage, synergies between the electricity sector and other economic sectors, near-term system reliability needs, and a definition of "zero-carbon resource" that does not preclude nuclear power and large hydroelectric generation.[71]

Regional Scoping Workshops

- Central Valley, September 30, 2019, in Fresno
- Northern California, October 25, 2019, in Redding
- Southern California, October 29, 2019, in Diamond Bar

At each workshop, a diverse panel of local leaders and experts fielded questions on energy equity, grid reliability, and land use.[72] More than 150 attendees attended each workshop, either in person or online, and more than 100 sets of written comments were received.

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70 CEC Chair David Hochschild, CARB Chair Mary Nichols, CPUC Commissioner Liane Randolph, and CEC Commissioner Andrew McAllister.

71 Commenters also cited a letter submitted to the Senate Daily Journal stating the bill language was intended to include all existing carbon resources currently under contract, such as nuclear and large hydro resources.

72 The Central California Scoping Workshop occurred in Fresno on September 30, 2019. A stakeholder panel included representatives of Turlock Irrigation District, San Joaquin Valley Latino Environmental Advancement and Policy Project and Leadership Counsel for Justice and Accountability. The Northern California Scoping Workshop occurred in Redding on October 25, 2019. A stakeholder panel included representatives of Blue Lake Rancheria, Redding Electric Utility, the American Wind Energy Association California Caucus, the Balancing Area of Northern California, and the California Independent System Operator. The Southern California Scoping Workshop occurred in Diamond Bar on October 29, 2019. A stakeholder panel included representatives of California Environmental Justice Alliance, Port of Long Beach, the Los Angeles Department of Water and Power, and Imperial Irrigation District.

Commenters asked that the state's definition of "zero-carbon resource" include electricity from large hydroelectric dams, small modular nuclear power plants, hydrogen-based power, and bioenergy resources. They also stressed energy equity, workforce training, consumer protection, and greater system reliability as wildfires become fiercer and more frequent.

Technologies and Scenarios Workshop

November 18, 2019, San Francisco

Staff with the three agencies presented a framework for modeling SB 100 implementation scenarios and evaluating the associated costs, benefits, and impacts. They proposed to leverage existing modeling analyses, such as the 2018 Deep Decarbonization in a High Renewables Future: Updated Results from the California PATHWAYS Model[73] and the SB 100 2045 Framing Study for the CPUC IRP,[74] and include the publicly owned utility perspective.

Staff presented the "RPS+" interpretation of "zero-carbon resources" — technologies that are RPS-eligible or have zero onsite emissions — and a "zero-combustion" interpretation recommended by environmental justice advocates. Stakeholders overwhelmingly supported the former interpretation.

In addition to the 20 panelists and public commenters who spoke at the workshop, 26 stakeholders submitted written comments. Comments included requests for consideration of:

- All types and durations of energy storage.
- Natural gas-fired resources with carbon capture and sequestration.
- Hydrogen and fuel cell technologies.
- Implications of an energy storage accounting that excludes losses.
- Grid reliability risk analysis.

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73 Mahone, Amber, Zachary Subin, Jenya Kahn-Lang, Douglas Allen, Vivian Li, Gerrit De Moor, Nancy Ryan, Snuller Price. 2018. *Deep Decarbonization in a High Renewables Future: Updated Results from the California PATHWAYS Model*. CEC. Publication Number: CEC-500-2018-012. Link to Deep Decarbonization in a High Renewables Future: Updated Results from the California PATHWAYS Model https://www.ethree.com/wp-content/uploads/2018/06/Deep_Decarbonization_in_a_High_Renewables_Future_CEC-500-2018-012-1.pdf.

74 See the 2045 Framing Study results starting in Appendix A on slide 145 of the CPUC Energy Division's November 6, 2019 *2019-20 IRP: Proposed Reference System Plan.* https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/2018/2019%20IRP%20Proposed%20Reference%20System%20Plan_20191106.pdf.

Modeling Inputs and Assumptions Workshop

February 24, 2020, Sacramento

Three panels of experts discussed implementation of SB 100 and related implications for electricity rates, grid reliability, land use, workforce development, environmental justice, and energy equity. In addition to the panelists, 17 stakeholders provided public comments. More than 30 written comments were also received following the workshop.

Stakeholders reiterated requests for a more inclusive definition of "zero-carbon" energy resources that considers their land-use impacts. Others commented on the modeling — including assumptions, limitations, and scenarios — and the use of modeling results in developing policy recommendations.

Modeling Results and Implications Workshop

September 2, 2020, Online

CEC staff summarized the modeling study and detailed the results.[75] The modeling consultant, E3, joined staff in fielding audience questions. The workshop then broke out into panels on three topics: energy resource build requirements, grid planning implications, and energy equity and workforce considerations.

The agencies received more than 100 written comments after the workshop. Many favored accelerating the SB 100 target to 2030 and stressed the importance of maintaining grid reliability as the state transitions to 100 percent clean electricity. Other commenters stressed:

- Careful land-use planning to minimize environmental impacts.
- New transmission infrastructure.
- Energy production cost modeling to assess reliability.
- Modeling improvements to better refine technology costs, attributes, and performance.
- Energy equity, non-energy benefits, and affordability of electricity.

Draft 2021 Report Workshop

December 4, 2020, Online

CEC staff summarized the draft report, providing an overview of modeling results and updates made after the draft results workshop, areas for further analysis, additional considerations, and joint agency recommendations.

Stakeholder comments focused on the need to assess the reliability and operational feasibility of the scenarios, inclusion of non-energy benefits and social costs into the analytical

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75 As background, the joint agencies released two documents: the August 31, 2020 SB 100 Joint Agency Report Modeling Framework and Scenarios Overview and the Inputs & Assumptions: CEC SB100 Joint Agency Report.

framework, and requests to change technology assumptions and add technologies into future modeling.

Additional Outreach and Engagement

Clean Energy States Alliance (CESA)

The joint agencies exchange knowledge and ideas with their counterparts in 18 other states and entities in the United States (District of Columbia and Puerto Rico) that have 100 percent clean electricity and carbon neutrality goals. They engage through the 100% Clean Energy Collaborative, run by the Clean Energy States Alliance, a nonprofit coalition of public agencies and organizations working to advance clean energy.

In a May 2020 CESA webinar, CEC Chair David Hochschild discussed California's 100 percent clean energy policy and how other states could benefit by adopting a similar goal.

On July 21, 2020, staff with the CEC and an official with the New Jersey Board of Public Utilities presented on integrating energy equity considerations into 100 percent clean energy policy and implementation, generating interest in deeper discussion within the collaborative.

Disadvantaged Communities Advisory Group and Equity Stakeholders

In advance of the Modeling Inputs and Assumptions workshop, CEC staff presented an overview to the DACAG, the formal body that advises the CEC and CPUC on energy equity issues. Members moved to establish DACAG's SB 100 subcommittee to more closely track and assume responsibility for proceeding comments. In addition, the joint agencies included environmental justice and equity representatives on workshop panels to discuss implementation considerations.

The DACAG and a separate group of community and environmental justice organizations later submitted letters[76] urging the joint agencies to analyze at the local level how SB 100 implementation will affect communities' public health, land use, economic well-being, and air and water quality. The letters also urged consideration of communities' cumulative burdens resulting from the COVID-19 pandemic and the growing number and severity of heat waves and wildfires, particularly in under resourced communities that already bear the brunt of pollution.

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76 See RE: SB 100 Joint Agency Report: Charting a path to a 100% Clean Energy Future Docket #: 19-SB-100, June 12, 2020, https://efiling.energy.ca.gov/GetDocument.aspx?tn=233461&DocumentContentId=65990; and RE: SB 100 Joint Agency Report, Docket #: 19-SB-100, August 21, 2020, https://efiling.energy.ca.gov/GetDocument.aspx?tn=234415&DocumentContentId=67287.

Other Western States

On October 8, 2019, CEC staff gave a presentation titled "Senate Bill 100: Toward Zero-Carbon Electricity" at a meeting of the Joint Committee on Regional Electric Power Cooperation-Western Interconnection Regional Advisory Body.

Statutory Interpretation for Modeling

To model SB 100 implementation scenarios, the joint agencies needed to interpret the meaning of "zero-carbon resources"[77] in the law and determine the electric loads subject to the policy.

Zero-Carbon Resources Interpretation

SB 100 does not define "zero-carbon resources," and the state had no legal definition before the bill becoming law. The joint agencies interpreted "zero-carbon resources" to mean energy resources that either qualify as "renewable" in the most recent RPS (Renewables Portfolio Standard) Eligibility Guidebook[78] or generate zero greenhouse gas emissions on site.[79] SB 100 workshops and documents refer to these criteria as "RPS+".

Additional Criteria for Modeled Resources

Staff further limited the pool of modeled resources to those meeting the following criteria:

- Alignment with state policies and priorities
    - Staff excluded energy resources from some or all scenarios if the use of these resources in generating electricity would have significant negative effects on public health or the environment or were otherwise at odds with state policies and priorities.
- Technology readiness and resource availability
    - Only commercialized technologies with vetted and publicly available cost and performance data were included for core scenarios. Moreover, only technologies that have an anticipated pipeline of development were included. (For example,

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77 Senate Bill 100 (De León, Chapter 312, Statutes of 2018, 454.53 [a]), revises state policy in "that eligible renewable energy resources and zero-carbon resources supply 100 percent of all retail sales of electricity to California end-use customers and 100 percent of electricity procured to serve all state agencies by December 31, 2045. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100.

78 California Energy Commission. *Renewables Portfolio Standard Eligibility Guidebook, Ninth Edition (Revised)*. Publication Number: CEC-300-2016-006-ED9-CMF-REV. January 2017. https://efiling.energy.ca.gov/getdocument.aspx?tn=217317.

79 For modeling, this list does not acknowledge de minimis emissions associated with included technologies. SB 100 compliance programs would need to establish clear requirements for qualification as a zero-carbon generation resource.

although solar thermal is a well-proven renewable technology, little development is anticipated at this time, primarily because it cannot compete with solar photovoltaic on cost.)

- Generic firm zero-carbon resources were included in the exploratory study scenarios to illustrate the possible impact of emerging resources such as green hydrogen generation and natural gas generation with carbon capture if they are able to achieve specified costs.
- Excluded technologies may be included in future SB 100 analyses. Staff will update modeling as emerging technologies become commercialized.

Technologies Included in Modeling

Table 8 lists technologies that could meet the SB 100 criteria for renewable and zero-carbon resources, as interpreted by the joint agencies. The list is not prescriptive, but rather for evaluating potential SB 100 implementation strategies. This list may be updated for future SB 100-related modeling.

Table 8: Generation Technologies Included in Modeling

Technology	Eligibility Basis	Scenarios
Solar PV	RPS	Core and Study
Solar Thermal (existing only)	RPS	Core and Study
Onshore Wind	RPS	Core and Study
Offshore Wind	RPS	Core and Study
Geothermal	RPS	Core and Study
Bioenergy	RPS	Core and Study
Fuel Cells (green H_2)	RPS	Core and Study
Small Hydro (existing only)	RPS	Core and Study
Large Hydro (existing only)	Zero-Carbon	Core and Study
Nuclear (existing only)	Zero-Carbon	Core and Study
Generic Firm Dispatchable Resource[80]	Zero-Carbon	Study Only
Generic Firm Baseload Resource[81]	Zero-Carbon	Study Only

Source: CEC, CPUC, and CARB. Developed by consensus

80 For example, natural gas with 100 percent carbon capture and sequestration or 100 percent drop-in renewable fuels.

81 For example, low-cost geothermal or imports of emerging nuclear generation technologies.

Zero-Carbon Resources Not Modeled

Technologies that could meet the zero-emissions criteria but have other barriers to development were excluded from modeling for the reasons listed in **Table 9** and discussed in more detail below.

Table 9: Considered Technologies Excluded From 2020 Modeling

Technology	Reason for Exclusion
New in-state nuclear	State effectively has a moratorium on new in-state nuclear power plants under the Warren-Alquist Act.[82]
Drop-in renewable fuels[83] (green hydrogen and biomethane)	Technology for synthetic drop-in renewable fuels not yet commercially available in California or inadequate cost and supply data for modeling or both. Inadequate supply potential for biomethane in the power sector.
Natural gas generation with carbon capture and sequestration	Lack of cost and performance data for 100 percent carbon capture.
Coal-fired generation with carbon capture and sequestration	Incompatible with the state's public health priorities and lack of cost and performance data for 100 percent carbon capture.
New small hydroelectric generation	Inadequate data on new capacity cost and resource availability for modeling.
New concentrating solar power	Lack of proposed new development and high cost relative to other solar resources.
New large hydroelectric generation	Limited development feasibility at this time and environmental concerns.

Source: CEC, CPUC, and CARB joint agency consensus

82 California Energy Commission. January 2020. Warren-Alquist Act 2020 Edition, Sections 25524.1 and 25524.2. Publication Number: CEC-140-2020-001. https://ww2.energy.ca.gov/2020publications/CEC-140-2020-001/CEC-140-2020-001.pdf.

83 Green electrolytic hydrogen and synthetic methane are gaining breakthroughs and cost reductions as "drop-in" or replacement fuels in natural gas-fired power plants and potential zero-carbon dispatchable generation resources.

POVI 0003468

New In-State Nuclear

Since 1976, California law[84] has prevented the permitting of new nuclear fission power plants until adequately safe technologies exist for fuel rod reprocessing and disposal of high-level nuclear waste. Until these conditions can be satisfied, expansion of new in-state nuclear generating capacity is infeasible.

Imported nuclear power could be considered a zero-carbon resource, but uncertainty in cost projections for new nuclear projects excluded this resource from the core scenarios.

Drop-In Renewable Fuels

Green electrolytic hydrogen, synthetic methane, and biomethane are gaining breakthroughs and cost reductions as "drop-in" or replacement fuels in natural gas-fired power plants and potential zero-carbon dispatchable generation resources.

Hydrogen can be blended with natural gas to reduce emissions in the near term, and industry aims to eventually use 100 percent hydrogen fuel in retrofitted gas plants. Hydrogen can also be synthesized into renewable methane as a drop-in fuel. The Los Angeles Department of Water and Power is exploring the conversion of its Intermountain Power Plant in Utah to 30 percent hydrogen by 2025 and eventually 100 percent hydrogen fuel.

Fully converted plants could significantly affect the 2045 energy portfolio. However, staff excluded the drop-in fuels in this round of modeling because of inadequate publicly available cost and performance data, including costs to produce and transport the fuels. The generic zero-carbon resources modeled in the study scenarios could serve as proxies for these technologies if they are able to reach the specified price point.

Staff excluded biomethane because of the higher value in the other sectors.

Natural Gas Generation With Carbon Capture and Sequestration (CCS)

There are growing interest and investment in natural gas generation with CCS to provide more flexibility and reliability in the state's electricity grid. However, technological and economic barriers to full decarbonization of fossil fuels remain high. Partially decarbonized resources (that is, with less than 100 percent of onsite carbon emissions captured and stored) did not meet the joint agencies' criteria for zero-emission technologies.

The generic zero-carbon flexible resource modeled in the study can serve as a proxy for the effect natural gas with 100 percent CCS might have on the 2045 portfolio at the specified price point.

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84 California Energy Commission. January 2020. Warren-Alquist Act 2020 Edition, Sections 25524.1 and 25524.2. Publication Number: CEC-140-2020-001. https://ww2.energy.ca.gov/2020publications/CEC-140-2020-001/CEC-140-2020-001.pdf.

Coal-Fired Generation With CCS

Coal-fired generation with CCS also faces significant technical and economic barriers. Furthermore, the agencies have significant public health concerns regarding the use of coal-fired power plants, even with total carbon capture. Coal-fired plants emit 84 of the 187 hazardous air pollutants identified by the U.S. Environmental Protection Agency (EPA).[85] Of the suite of toxic metals present, the arsenic and mercury in solid coal combustion commonly pose the greatest public health risk because of the associated prevalence and high toxicity. The same is true of the prevalence of polycyclic aromatic hydrocarbons (PAHs) and related precursors in solid petroleum-based fuels (for example, coal). While gas-fueled combustion may also produce toxics, the amounts and toxicity are less impactful than coal combustion. Coal combustion also emits criteria pollutants and related precursors at higher levels than natural gas combustion.[86]

Coal extraction, transport, and storage, and waste storage are associated with additional health and environmental impacts.[87] Further, coal miners suffer from respiratory health issues, including black lung disease, and are at high risk for workplace fatalities.[88]

New Small Hydroelectric Generation

The modeling included current operations as zero-carbon resources, but there are inadequate resource potential and planned development for inclusion as a candidate resource in this round of modeling.

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85 U.S. EPA. Air Toxics Standards for Utilities: Utility MACT ICR Data. Part I & II: Final draft (version 2) of selected EU MACT ICR response data (excludes facility contact information), including; All Part I (General Facility Information); and All Part II (Fuel Analysis and Emission Data); including all Hg CEMs data. Available at https://www3.epa.gov/ttn/atw/utility/utilitypg.html.

86 SO_2 emission rates from coal plants far exceed those from natural gas plants, even with best available control technology. Sources: (a) U.S. EPA. RACT/BACT/LAER Clearinghouse (RBLC) Basic Information. Available at https://www.epa.gov/catc/ractbactlaer-clearinghouse-rblc-basic-information. (b) Emission levels from Intermountain Power Generating Station Unit 3. Air pollution controls include low NOx burners, over fire air, selective catalytic reduction, baghouse/fabric filter, wet flue gas desulphurization, and use of low sulfur coal. Accessed August 4, 2020, from U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC) at https://www.epa.gov/catc/ractbactlaer-clearinghouse-rblc-basic-information. (c) South Coast Air Quality Management District. Huntington Beach Energy Project Final Determination of Compliance. 2016. Numbers represent controlled, steady-state emission levels. Available at https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=12-AFC-02C.

87 EIA. *Coal Explained: Coal and the Environment*. Available at https://www.eia.gov/energyexplained/coal/coal-and-the-environment.php.

88 CDC. The National Institute for Occupational Safety and Health. *Mining Topic: Respiratory Diseases*. Available at https://www.cdc.gov/niosh/mining/topics/RespiratoryDiseases.html.

Concentrating Solar Power (CSP)

Solar thermal power plants with CSP technology, which use mirrors to collect the sun's energy, represent a small share of California's renewable generation. Because of the higher costs relative to solar photovoltaic and wind energy, there is limited development potential, and solar thermal plants were ruled out of the modeling study. Concerns regarding the environmental impacts of CSP projects — including avian mortality from power tower flux and evaporation ponds[89] — have also been a barrier to development, though recent technological and operation changes have reduced the mortality.

New Large Hydro Generation

While hydroelectric generation is considered a zero-carbon resource, the potential for developing costly new water diversions and dams with large environmental impacts is too small for this resource to be included in the modeling study.

Stakeholder Comments on Zero-Carbon Resource Definition

Many commenters supported the "RPS+" criteria for selecting energy resources in the study, and many urged the joint agencies to keep eligibility broadly defined to allow resource innovation and diversity.

The agencies carefully considered the high number of comments in favor of including or excluding specific technologies and made changes where appropriate. For a full list of technologies, inputs, and assumptions used for 2020 modeling, refer to the SB 100 Inputs & Assumptions document.[90]

Electricity Loads Subject to SB 100

SB 100 speaks only to retail sales and state agency procurement of electricity. The joint agencies interpret this to mean that other loads — wholesale or nonretail sales and losses from storage and transmission and distribution lines — are not subject to the law. The modeling reflects this interpretation.

The loads subject to SB 100 are therefore the total of the utility supplied retail sales and the state agency procurements — effectively the Department of Water Resources' (DWR) purchases of electricity to run the State Water Project pumping plants. The pump load is the largest consumer of electricity in California.

As shown in blue in **Figure 20,** these loads accounted for roughly 82 percent of total state consumption in 2018. The joint agencies considered the remaining loads to be outside the

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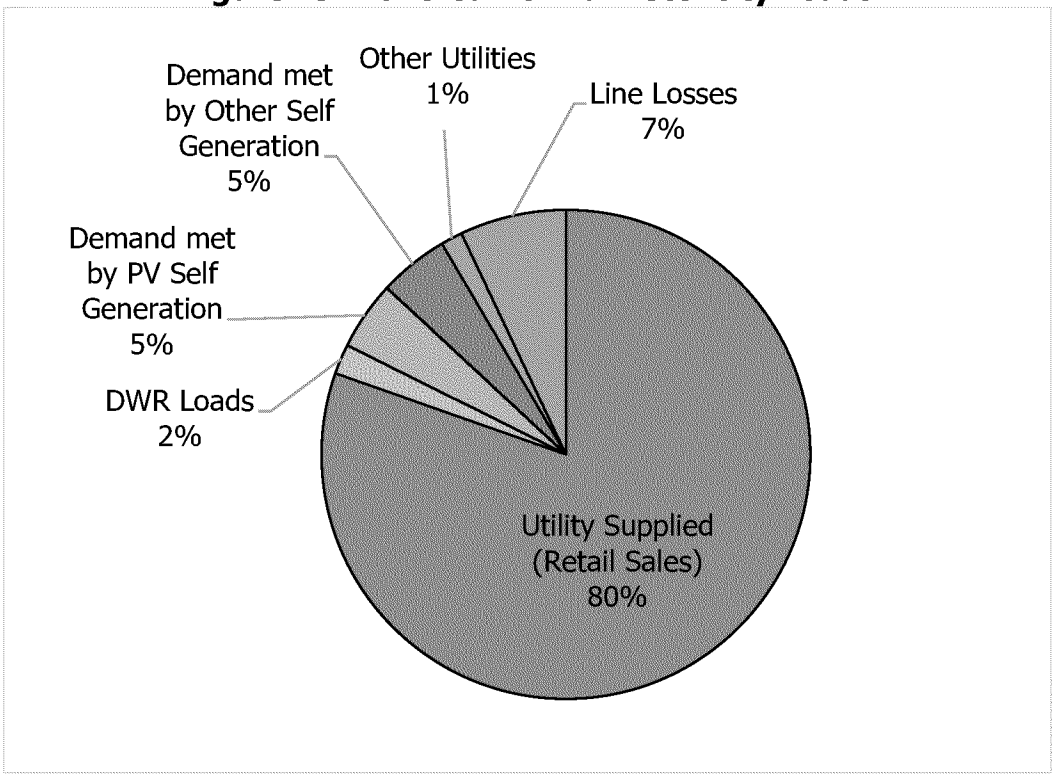
89 California Energy Commission staff. October 2016. *Final 2016 Environmental Performance Report of California's Electrical Generation System*. CEC. Publication Number: CEC-700-2016-005-SF. https://efiling.energy.ca.gov/getdocument.aspx?tn=214098.

90 E3. Inputs and Assumptions: CEC SB100 Interagency Report. June 2020. https://efiling.energy.ca.gov/getdocument.aspx?tn=234532.

scope of the 2045 goal of the law. Solar self-generation accounted for an additional 5 percent of total consumption in 2018.

Figure 19: 2018 California Electricity Loads



Source: 2019 California Energy Demand and the Quarterly Fuels and Energy Report Demand filings

The modeled scenarios also reflect assumptions made about electricity demand. The joint agencies analyzed a reference demand case using an extrapolation from the 2019 Integrated Energy Policy Report California Energy Demand Forecast,[91] as well as high electrification, high biofuels, and high hydrogen scenarios — building off the analysis in the 2018 Deep Decarbonization in a High Renewables Future report.[92]

Several stakeholders commented on the scope of loads covered SB 100. As noted above, the law states "that eligible renewable energy resources and zero-carbon resources supply 100%

91 California Energy Commission. February 2020. *2019 Integrated Energy Policy Report*. CEC. Publication Number: CEC-100-2019-001-CMF. https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report.

92 Energy and Environmental Economics, Inc. June 2018. *Deep Decarbonization in a High Renewables Future.* California Energy Commission, https://ww2.energy.ca.gov/2018publications/CEC-500-2018-012/CEC-500-2018-012.pdf.

of retail sales of electricity to California end-use customers and 100% of electricity procured to serve all state agencies by December 31, 2045."

Commenters favoring inclusion of system losses interpreted "supply" to include the upstream generation needed to deliver the retail sales of electricity.

After careful consideration, the joint agencies determined "supply" to mean only retail sales and state loads — an interpretation consistent with the state's Renewables Portfolio Standard.

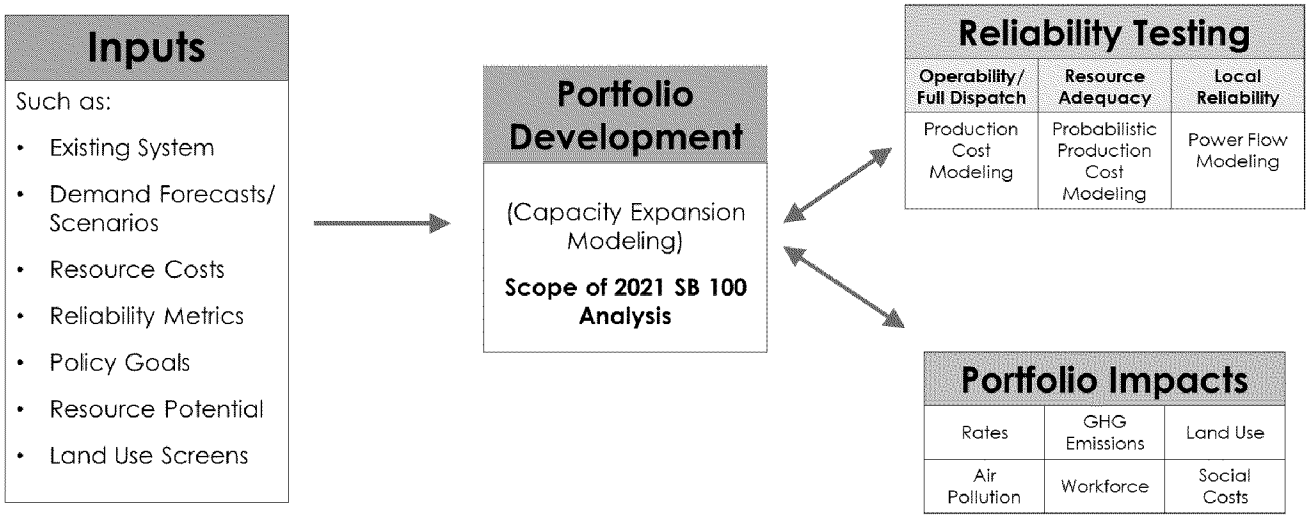
CHAPTER 3:
Capacity Expansion Modeling and Discussion

Modeling Scope

The 2021 Report uses capacity expansion modeling as a first step in evaluating the 2045 policy. Capacity expansion modeling optimizes new resource investments over the planning horizon, given the policy and reliability constraints. Typically, simplifications are necessary in capacity expansion modeling due to the computational complexity of optimizing resource selection over a long time horizon. Thus, resource planning typically includes multiple modeling steps to evaluate the reliability of the developed portfolios, as shown in **Figure 21**.

Ideally, in a statewide, long-term analysis such as SB 100, production cost modeling (to test operability and verify resource dispatch) and probabilistic production cost modeling (to determine resource adequacy) would also be completed. Comprehensive studies also evaluate the relevant environmental, economic, and societal impacts of the portfolio. If any assessments do not meet the reliability constraints or policy objectives, the portfolio or capacity expansion model would be adjusted and reassessed.

Figure 20: Resource Planning Modeling Steps



Source: CEC staff

All portfolios presented in this report are directional and intended to inform and complement ongoing analysis within the joint agencies. A comprehensive reliability assessment is not included in this first report; so the portfolio composition and associated costs may change after a more rigorous analysis is completed. Quantitative evaluation of environmental, health, and other societal impacts are also not included in the scope of the 2021 Report.

The modeled zero-carbon candidate resources represent a subset of possible resources that could qualify as "zero-carbon." Only commercialized resources with established and vetted

publicly available cost and performance data, as well as an anticipated development pipeline, were included in the core modeling scenarios, as described in Chapter 2: SB 100 Overview and Report Development Process. Drop-in renewable fuels that could partially decarbonize a generating unit were not included as these generating resources do not meet the "zero-carbon resource" criteria of emitting zero or negligible greenhouse gas (GHG) emissions. Generating resources operating on 100 percent renewable fuels were not included due to lack of established and vetted cost and performance data. Generic zero-carbon firm candidate resources[93] were included in a set of study scenarios and could indicate the potential impact of 100 percent renewable fuels at a specific cost point.

The study includes two types of scenarios, which are described in the Scenario Framework section of this chapter:

- Core scenarios, which reflect the joint agencies' interpretation of the 2045 target in SB 100
- Study scenarios, which are outside the joint agencies' interpretation of the 2045 target in SB 100 and provide information to further support California energy and climate planning and public health considerations

Modeling Framework

Modeling Tools

The 2021 Report modeling builds on existing studies, namely the CPUC Integrated Resource Planning (IRP) 2045 Framing Study, as presented in the 2019–21 IRP cycle.[94] The 2045 Framing Study provided guiding information about the state's long-term policy goals for the IRP's 2030 Reference System Plan. While the 2045 Framing Study is the basis for the SB 100 analysis, the version of the RESOLVE model used for the 2021 Report differs from the version used for the 2019–20 IRP cycle. The framework and modeling assumptions were updated to align with the goals of the 2021 Report. Some key changes are noted in the next section.

RESOLVE California Model

The RESOLVE California model is a capacity expansion model developed by Energy and Environmental Economics, Inc. (E3) The RESOLVE model produces a least-cost resource

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93 "Firm resources" are generating resources that can generate electricity at any given time. Examples of zero-carbon firm resources include geothermal, biomass, hydroelectric, and nuclear power.

94 CPUC Energy Division. 2019-20 IRP: Proposed Reference System Plan. November 6, 2019. https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/2018/2019%20IRP%20Proposed%20Reference%20System%20Plan_20191106.pdf. The modeling for this report has been prepared by E3 for the joint agencies. This report is separate from any work E3 is doing for the California Public Utilities Commission. However, the joint agencies will continue work together to implement SB 100, which will be informed by the findings and modeling in this report.

portfolio, or selection of new electricity generating resources, required to meet an assumed future electric demand by optimizing the net-present value of capital investments and operational costs under policy and reliability constraints.

RESOLVE contains two modules, investment and operational, that co-optimize for the least-cost resource portfolio. The RESOLVE optimization directly captures the linkages between investment decisions and system operations in a single stage. The operational module simulates hourly resource dispatch over a representative 37 independent days for each year modeled in the planning horizon. The investments and operations within the planning horizon are modeled under several potential constraints, including Renewables Portfolio Standard policy, GHG emissions, resource adequacy constraints to maintain reliability, and operational restrictions on generators and resources.

The resource adequacy constraint ensures there is sufficient capacity to meet the system resource adequacy requirement, or capacity requirement, in each modeled year using a net qualifying capacity approach for thermal generators, and an effective load carrying capacity (ELCC) approach for renewables and storage resources.[95] The system resource adequacy requirement is 115 percent of typical peak load.[96] Further reliability analysis for the selected portfolios is necessary and planned for future work, as described in Chapter 4 of this report.

Several changes were made from the CPUC 2019 IRP version of the RESOLVE model for the 2021 Report, including:

- Increasing the geographic footprint from the California ISO to include all balancing authority areas in California.
- Updating baseline resources to reflect the supply provided by additional balancing authority areas included in the geographic footprint.
- Updating the resource cost assumptions to the reflect the most current datasets available at the time of modeling. Details on cost assumptions are described in the Resource Assumptions section and in the Input and Assumptions documentation.

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95 "Effective load carrying capability" (ELCC) is the increment of load that could met by the resource while maintaining the same level of reliability. The ELCC of a variable renewable energy resource is based on the capacity coincident with peak load and the profile and quantity of existing variable renewable energy resources. For a detailed description of ELCC implementation in RESOLVE, see page 87 of the Inputs and Assumptions documentation.

96 As stated in the *Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave*, *Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave* , *Preliminary Root Cause Analysis: Mid-August 2020 Heat Storm,* the CEC and CPUC recognize that planning for a combination of a 1-in-2 peak with a 15 percent planning reserve margin may not be enough in a high renewables system, particularly when combined with the increasing impacts of extreme heat events, such as those experienced by California and the Western United States in 2020. Any changes to the current resource adequacy and reliability planning processes will be reflected in future assessments.

- Removing the GHG constraint to evaluate the impact of the 100 percent clean electricity policy without the impact of a potentially more stringent constraint.[97]
- Adding hydrogen fuel cells to the candidate resource options. Hydrogen was assumed to be produced off-grid by electrolyzers powered by renewables.
- Expanding the out-of-state (OOS) wind potential to 12 gigawatts (GW) and offshore wind potential to 10 GW.
- Changing how storage is constrained to a feasible dispatch pattern by placing a daily cycling limitation on battery energy storage and removing storage losses from the load portion of the compliance accounting method. For more details, please refer to the Inputs and Assumptions documentation.

Limitations of RESOLVE

Although capacity expansion modeling is an important tool, it is just the first step in a series of modeling phases to develop reliable portfolios that meet all applicable policy objectives. While RESOLVE does include a planning reserve margin constraint to represent system capacity needs, this constraint is not a substitute for probabilistic modeling to calculate a loss of load expectation or similar metrics.

There are specific limitations with RESOLVE that have implications for the modeling results:

- RESOLVE optimizes California as one zone. It does not reflect the impacts of separate balancing authority or load-serving entity requirements or policy objectives or evaluate local reliability needs. Furthermore, the model does not address land-use and spatial constraints that could limit the areas that are assumed by the model to be available for renewable or zero-carbon energy development.
- RESOLVE independently simulates dispatch for 37 representative days of any modeled year. These representative days, sampled from historical meteorological data from 2007 through 2009, are assigned weights to create a reasonable representation of the complete distribution of potential conditions in a full 8,760-hour (the number of hours in a year) simulation. While this representation is sufficient for the primary function of RESOLVE, capacity-expansion modeling, a model with more geographic and temporal granularity is necessary to simulate full dispatch operations and determine the reliability of the selected portfolio.
- RESOLVE includes minimal demand-side resource options for selection. This version of RESOLVE includes customer-side solar and shed demand response (DR). Resources such as energy efficiency, shift DR, and customer-side battery storage are not

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97 The CPUC IRP version of RESOLVE includes a 2030 GHG constraint to reflect the SB 350 requirement of planning to meet an electric sector GHG target. The 2045 Framing Study also includes a GHG constraint reflective the 80 percent economywide reduction in GHG emissions by 2050 scenarios. A GHG constraint may be more stringent than the statutory requirements in SB 100 and were removed to best evaluate the 2045 statutory goal. The 2030 GHG emissions for all scenarios are within the established 2030 GHG range.

candidate resources. As such, a sensitivity exploring the potential value of load flexibility was included in the analysis.

- As configured for this study, RESOLVE optimizes only storage resources within each modeled 24-hour day, so as long duration storage resources cannot be optimized across days and are thus not fully valued by the model. Tool development is underway to better evaluate the benefits of and compare types of long-duration storage in RESOLVE.[98] RESOLVE also does not represent hybrid resources, such as solar plus battery storage.

Finally, the analysis presented in this report does not include uncertainty or risk analysis. Given the limitations of the current modeling paradigm, all scenarios and results are intended to provide directional information and serve as a foundation for future analyses.

Inputs and Assumptions

Resource Assumptions

Supply-side candidate resources for selection in the optimization include renewable and zero-carbon resources (as described in Chapter 2), gas resources, storage resources, and transmission resources. Demand-side candidate resources for selection include customer-side solar, customer-side storage, and shed demand response.

RPS-eligible and zero-carbon resources that can be selected as candidate resources include utility-scale solar, wind resources — which are divided between in-state wind, out-of-state wind on new transmission (OOS wind), and offshore wind (OSW) — geothermal, biomass, and hydrogen fuel cells. Solar and wind resources are counted toward the system resource adequacy requirement based on an ELCC approach, as described on page 87 of the Input and Assumptions documentation. Gas resources include combustion turbine and combined-cycle gas turbine generators. Existing gas resources can also be economically retired by the model.

The costs for all generating resources are based on the National Renewable Energy Laboratory (NREL) 2019 Annual Technology Baseline (ATB), except hydrogen fuel cells, which are based on the Department of Energy's Hydrogen Analysis Project. Resource costs are shown in

Figure 22.[99] Hydrogen is assumed to be produced off grid by electrolyzers powered by renewables.

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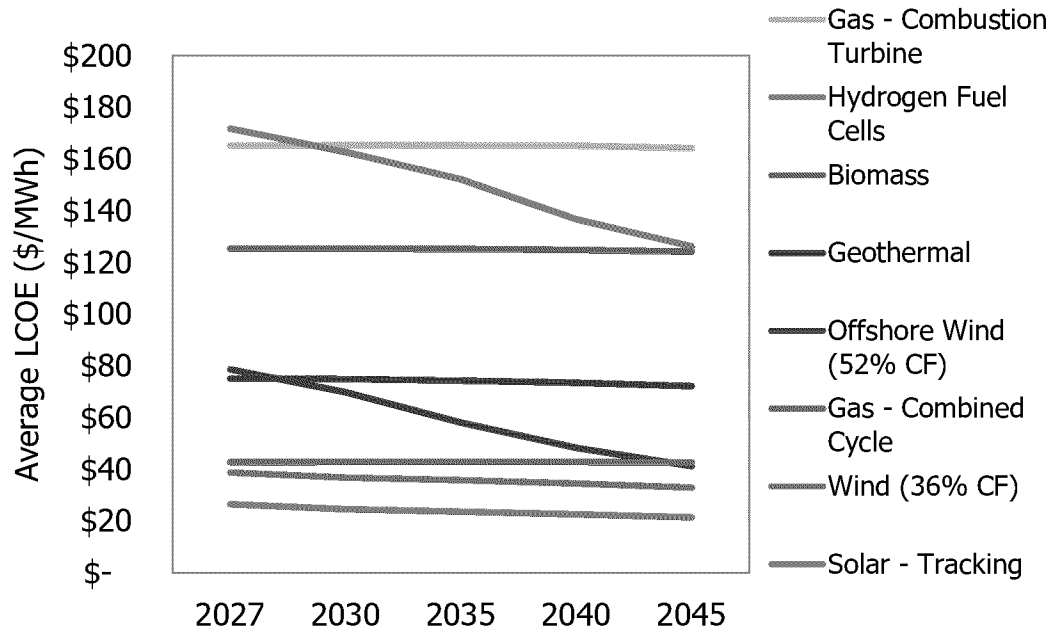
98 California Energy Commission. GFO-19-308- Assessing Long-duration Energy Storage Deployment Scenarios to Meet California's Energy Goals, https://www.energy.ca.gov/solicitations/2020-01/gfo-19-308-assessing-long-duration-energy-storage-deployment-scenarios-meet.

99 National Renewable Energy Laboratory. NREL 2019 Annual Technology Baseline Web page, https://atb.nrel.gov/electricity/2019/; and U.S. Department of Energy. DOE H2A Analysis Web page, https://www.hydrogen.energy.gov/h2a_analysis.html.

POVI 0003478

Figure 21: Implied Levelized Cost of Energy (LCOE) of Average Technologies (2016$/MWh)



Source: CEC staff and E3 analysis

Several storage resources are available for selection by the model, including lithium-ion battery storage and long-duration storage, which is modeled as pumped hydroelectric energy storage. The model can select the duration for each storage resource. Long-duration storage capacity is limited to 4,000 MW.[100] Storage resources are counted toward the resource adequacy requirement based on an ELCC approach, as described on page 89 of the Input and Assumptions documentation. Storage resource costs are based on Lazard's Levelized Cost of Storage Analysis 5.0 and supplemented by NREL's Solar and Storage Report.[101]

For more information on resource assumptions, see the Inputs and Assumptions documentation.

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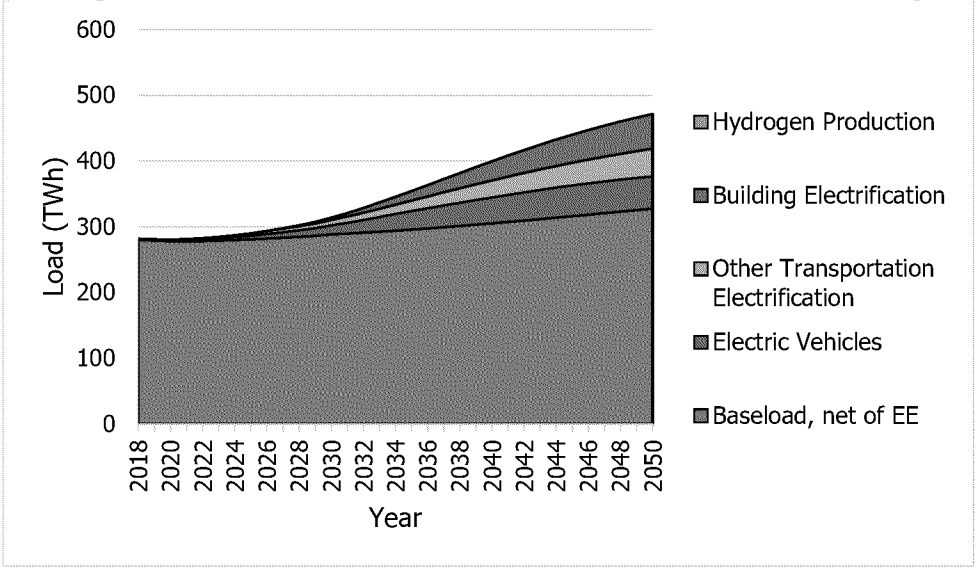
100 Long duration storage is generally considered storage resources that can sustain maximum output for 8 hours or longer.

101 Lazard. November 2019. Lazard's Levelized Cost of Storage Analysis- Version 5.0, https://www.lazard.com/media/451087/lazards-levelized-cost-of-storage-version-50-vf.pdf; and National Renewable Energy Laboratory. November 2018. 2018 U.S. Utility-Scale Photovoltaics Plus-Energy Storage System Costs Benchmark, https://www.nrel.gov/docs/fy19osti/71714.pdf.

Demand Scenarios

Demand scenarios are a key driver of resource portfolio development. This study used several demand scenarios, representing a range of future economywide scenarios, developed through the E3 PATHWAYS model. PATHWAYS is an economywide scenario tool used to evaluate potential pathways to meet economywide GHG reduction targets. Like the IRP 2045 Framing Study, this study uses three mitigation scenarios that meet the goal of 80 percent economywide reduction in GHG emissions by 2050[102]: high electrification (**Figure 23**), high biofuels (**Figure 24**), and high hydrogen[103] (**Figure 25**).[104]

Figure 22: High Electrification Demand Scenario Annual Loads by Category



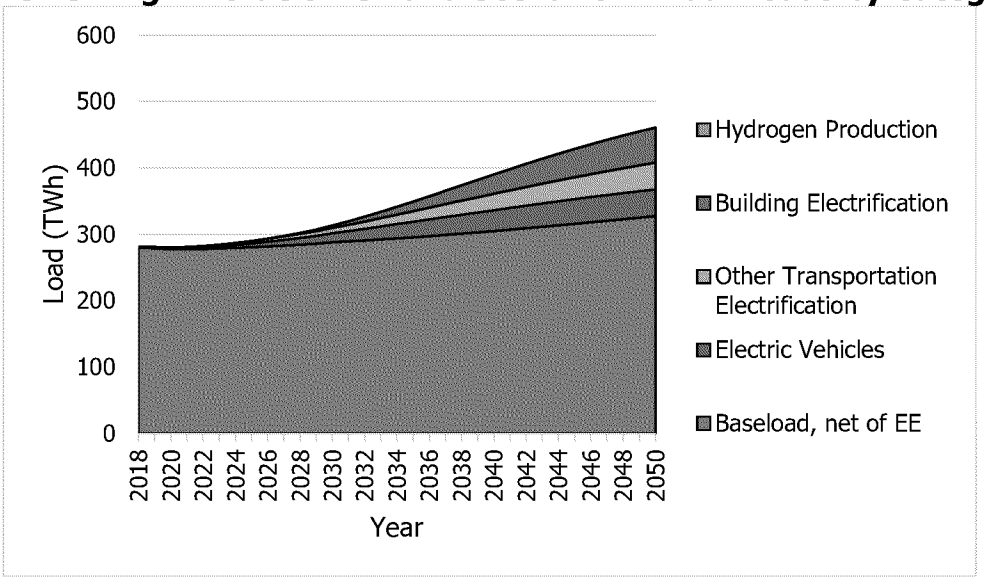
Source: E3 analysis

102 Governor Arnold Schwarzenegger, Executive Order S-3-05, June 1, 2005, https://www.library.ca.gov/Content/pdf/GovernmentPublications/executive-order-proclamation/5129-5130.pdf.

103 Hydrogen for demand-side end uses (such as vehicles) was assumed to be produced on-grid (in other words, have corresponding electric load), while hydrogen for the supply-side hydrogen fuel cell was assumed to be produced off-grid.

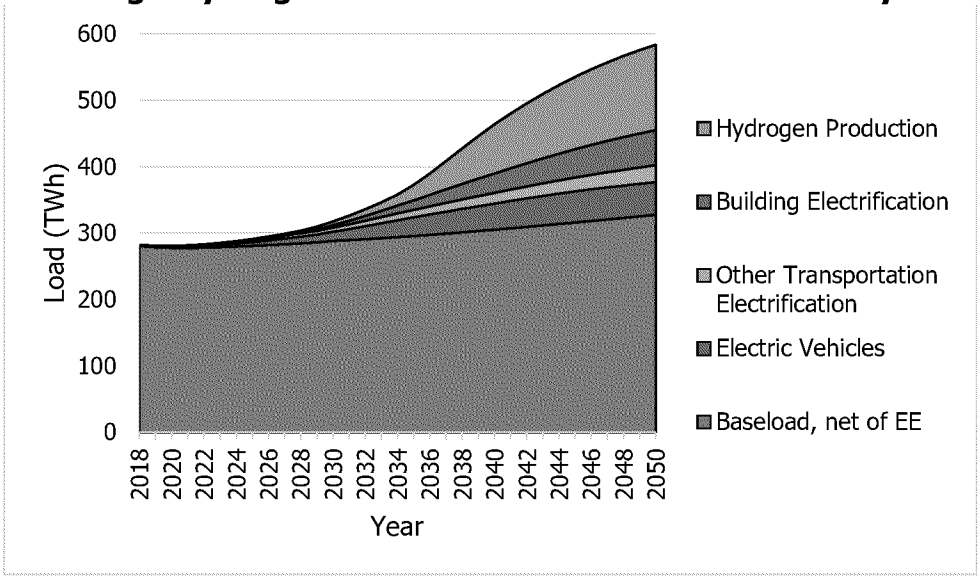
104 Mahone, Amber, Zachary Subin, Jenya Kahn-Lang, Douglas Allen, Vivian Li, Gerrit De Moor, Nancy Ryan, Snuller Price. 2018. *Deep Decarbonization in a High Renewables Future: Updated Results from the California PATHWAYS Model.* California Energy Commission. Publication Number: CEC-500-2018-012. https://ww2.energy.ca.gov/2018publications/CEC-500-2018-012/CEC-500-2018-012.pdf.

Figure 23: High Biofuels Demand Scenario Annual Loads by Category



Source: E3 analysis

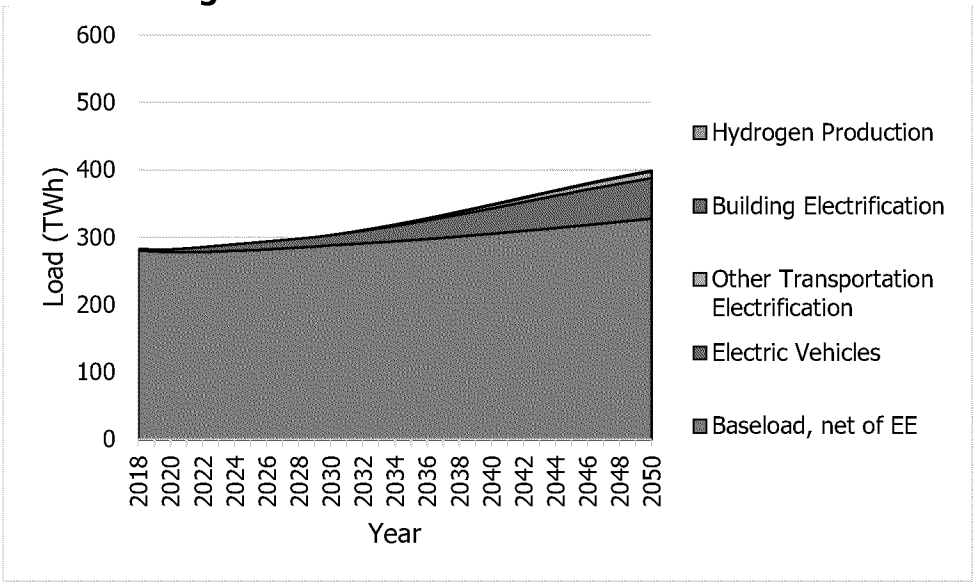
Figure 24: High Hydrogen Demand Scenario Annual Loads by Category



Source: E3 analysis

Moreover, the study used a reference scenario developed to align with the 2019 California Energy Demand Forecast through 2030 and an extrapolation of that forecast through 2045,[105] as shown in **Figure 26**.

Figure 25: Reference Demand Scenario



Source: E3 analysis

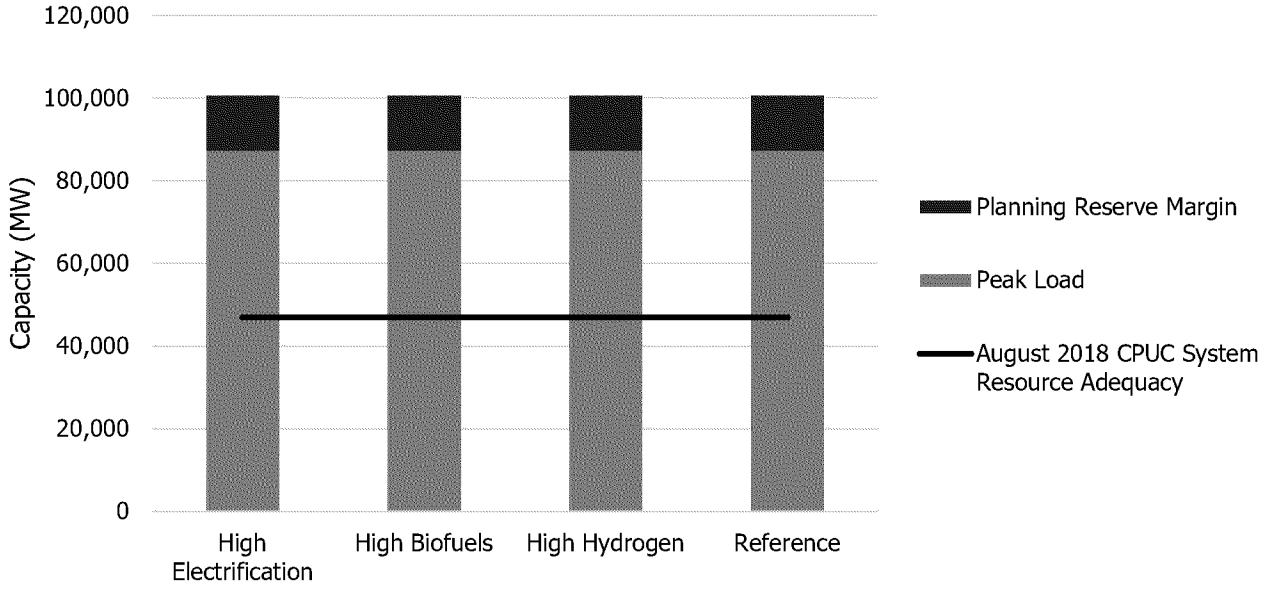
Each of the demand scenarios includes a significant increase in demand from 2020, ranging between a 22 percent increase by 2045 in the reference scenario and an 87 percent increase in the high hydrogen scenario.

With the substantial growth in annual loads by 2045, each scenario shows a near doubling of resource adequacy requirements compared to present day, as shown in **Figure 27**.[106]

105 California Energy Commission. February 2020. *2019 Integrated Energy Policy Report*. CEC. Publication Number: CEC-100-2019-001-CMF. https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report.

106 The RESOLVE reliability module resource adequacy requirement is peak load plus a 15 percent planning reserve margin; this reserve margin value is a user-configurable input variable. Figure 7 references the August 2018 CPUC System Resource Adequacy resource total. This number represents the capacity requirement for roughly 80 percent of state loads. Publicly owned utilities have separate resource adequacy processes.

Figure 26: 2045 Resource Adequacy Requirement for the High Electrification, High Biofuels, High Hydrogen, and Reference Demand Scenarios



Source: CEC staff and E3 analysis

Additional information about the demand scenarios and demand assumptions can be found in the Input and Assumptions documentation.

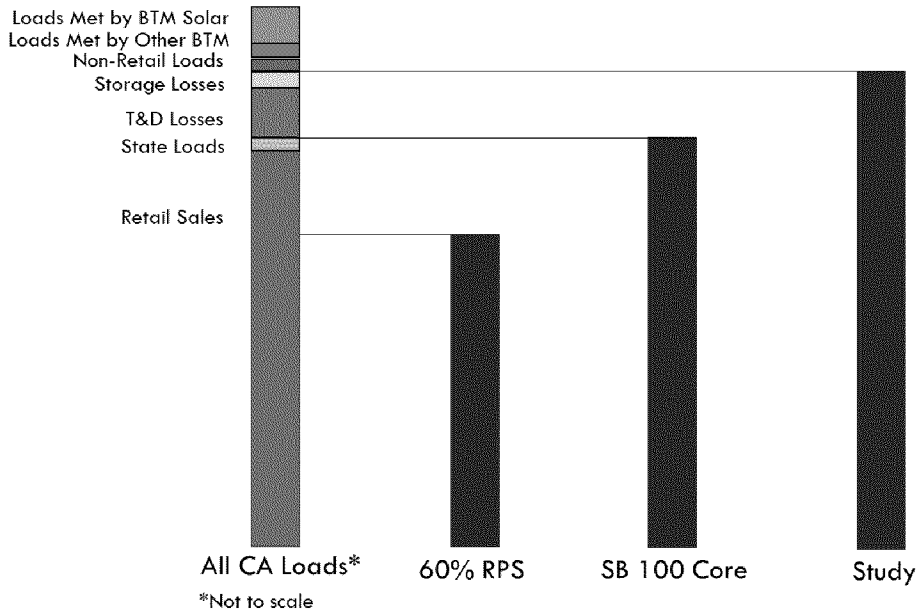
Zero-Carbon Load Coverage

Three zero-carbon load coverage targets, as illustrated in **Figure 28**, were considered in this study:

- A "60 percent RPS" load coverage target with a constant 60 percent of retail sales being met by RPS-eligible resources through 2045. This load coverage target acts as a counterfactual — or reference — to evaluate impacts of the 2045 100 percent clean electricity target.
- The "SB 100 core" load coverage target is consistent with the joint agencies' interpretation of SB 100, and 100 percent of retail sales plus state agency loads in 2045 are met by zero-carbon generation. Interim years include a linear zero-carbon target from 2030 to 2045.
- The "study" load coverage target goes beyond the joint agencies' interpretation of SB 100, and 100 percent of retail sales, state loads, transmission and distribution losses, and storage losses in 2045 are met by zero-carbon resources. Interim years include a linear zero-carbon target from 2030 to 2045.

All scenarios include a 60 percent RPS target in 2030 as required by SB 100.

Figure 27: 2045 Zero-Carbon Load Coverage Targets



Source: CEC, CPUC, CARB. Developed by consensus.

Scenario Framework

SB 100 states that the joint agency report shall include "alternative scenarios in which the policy … can be achieved and the estimated costs and benefits of each scenario." Furthermore, the statute requires the 2021 Report to include "a review of the policy … focused on technologies, forecasts, then-existing transmission, and maintaining safety, environmental and public safety protection, affordability, and system and local reliability."

The modeling included in this report evaluates the costs and benefits of various technological pathways to meet the 2045 target, while acknowledging that costs, performance, and availability of commercialized technologies will change over the next 25 years. Future modeling will be updated accordingly.

While the primary focus of this report is to analyze scenarios based on established cost and performance data and the joint agencies' interpretation of SB 100, the joint agencies recognize the importance of analyzing outcomes beyond these assumptions to support broader energy and climate planning and public health considerations. As such, scenarios are broken into two categories, "core scenarios" and "study scenarios."

Core Scenarios

The "Core Scenarios" modeled for the 2021 Report are consistent with the joint agencies' interpretation of the statute and, therefore, include the proposed loads subject to SB 100 (retail sales plus state agency loads) in the zero-carbon target. Generation applied toward

meeting the zero-carbon target includes generation from resources that meet the zero-carbon criteria as described in the Modeling Scope section of this chapter.

The scenarios reflect a central, "SB 100 Core Scenario," with the default assumptions of the SB 100 Core Load Coverage Target, High Electrification Demand Scenario, and all candidate resources available for selection by the model. Sensitivities then explore the effect of changing specific assumptions. Core scenarios are listed in **Table 10**.

Table 10: SB 100 Core Scenario Classification List

Scenario Classification	Scenario Description
60% RPS (Counterfactual)	60% RPS through 2045
SB 100 Core Scenario	Core Load Coverage; High Electrification Demand; All candidate resources available
SB 100 Core, Demand Sensitivities	Change: Demand Scenarios or Load Shape
SB 100 Core, Resource Sensitivities	Change: Candidate Resource Availability

Source: CEC, CPUC, and CARB. Developed by consensus.

Study Scenarios

The "study scenarios" are exploratory analyses that examine outcomes outside the scope of the joint agencies' working interpretation of the SB 100 policy. They are intended to provide additional information for consideration and support broader state energy, climate planning, and public health efforts. Study scenarios should not be interpreted as asserting the state's ability or intention to regulate beyond the interpreted scope of SB 100. Rather, they are intended to advance an understanding of long-term planning beyond the scope of SB 100. Study scenarios are listed in **Table 11**.

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Table 11: Study Scenario Classification List

Scenario Classification	Scenario Description
Expanded Load Coverage	Core Load Coverage plus storage and T&D losses; High Electrification Demand; All candidate resources available
Expanded Load Coverage, Demand Sensitivities	Change: Demand Scenarios
Expanded Load Coverage, Resource Sensitivities	Change: Candidate Resource Availability
Zero Carbon Firm Resources	Add generic zero carbon firm resources to candidate resources as a proxy for emerging zero-carbon technologies
Accelerated Timelines	Accelerate 100% target to 2030, 2035, and 2040
No Combustion	No conventional combustion resources included (fossil and biomass based); retire all in-state combustion resources by 2045

Source: CEC, CPUC, and CARB. Developed by consensus.

Preliminary Results

The initial SB 100 modeling resulted in the following key findings:

- SB 100 is achievable and will require significant resource capacity to meet the 2045 target and increasing electric demand.
- Gas capacity is maintained for resource adequacy, although gas generation decreases by half compared to a 60 percent RPS future.
- SB 100 reduces electric sector GHG emissions to around 24 MMT CO_2 in 2045 in a high-electrification future.
- Demand is a significant driver of new resource needs.
- Demand flexibility reduces total new resource needs and total supply cost.
- Cost-competitive zero-carbon firm resources would reduce total resource needs and total system costs.
- A no-combustion scenario appears technically achievable and results in significant new capacity and increased total resource cost compared to the SB 100 core scenario.

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Central Core and Study Scenario Results

All scenarios modeled result in significant capacity additions. **Figure 29** shows the cumulative capacity additions, plus the assumed new customer-side solar, for three scenarios with different zero-carbon load coverage targets, 60 percent RPS (60 percent of retail sales), SB 100 core (100 percent of retail sales and state loads), and study (core loads plus system losses) with high-electrification demand. Across all scenarios, the customer-side solar included is a modeling input, representative of projected customer-side solar adoption. No additional customer-scale solar was selected in the optimization.

In the 60 percent RPS scenario, 73 GW if utility-scale capacity is added by 2045, including:

- All 4.3 GW of assumed available in-state wind.
- 2.2 GW of out-of-state wind.
- 36 GW of utility-scale solar.
- 30 GW of battery storage.
- 1.7 GW of pumped storage.
- 440 MW of shed DR.
- 2.6 GW of new gas generation.

While the RPS target remains at 60 percent after 2030, increased electricity demand in the high-electrification demand scenario still drives the need for a significant amount of additional renewable energy resources, storage, and some gas resources.

In the SB 100 core scenario, 145 GW of utility-scale capacity additions are selected by 2045, including:

- All 4.3 GW of assumed available in-state wind.
- All 10 GW of assumed available offshore wind.
- All 4 GW of assumed available long-duration storage.
- 8.2 GW of out-of-state wind.
- 70 GW of utility-scale solar.
- 135 MW of geothermal.
- 49 GW of battery storage.

Moreover, the model economically retires 4.7 GW of gas capacity.

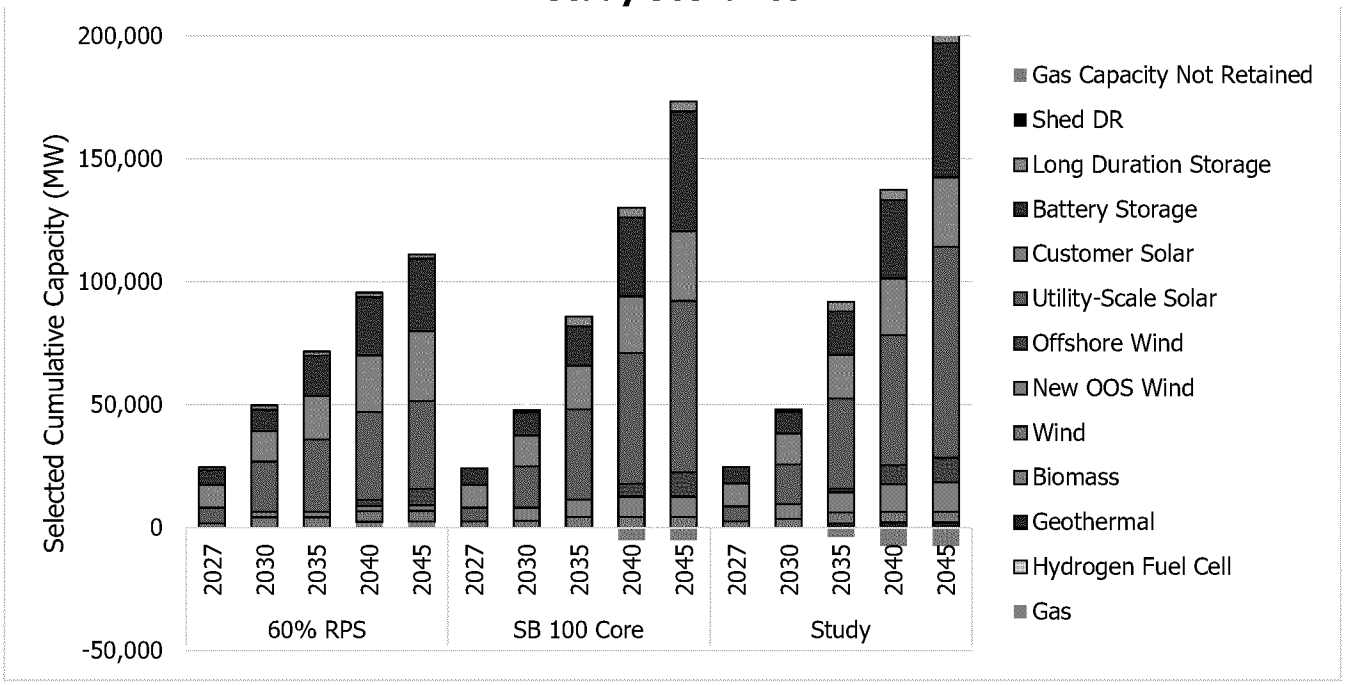
In the study scenario (expanded load coverage), 173 GW of utility-scale capacity additions are selected by 2045, including:

- All 4.3 GW of assumed available in-state wind.
- All 10 GW of assumed available offshore wind.
- All 4 GW of assumed available long-duration storage.
- 11.9 GW of out-of-state wind.

- 86 GW of utility-scale solar.
- 2.3 GW of geothermal.
- 55 GW of battery storage.

Furthermore, the model economically retires 7.2 GW of gas capacity.

Figure 28: Cumulative Capacity Additions for the 60 Percent RPS, SB 100 Core, and Study Scenarios

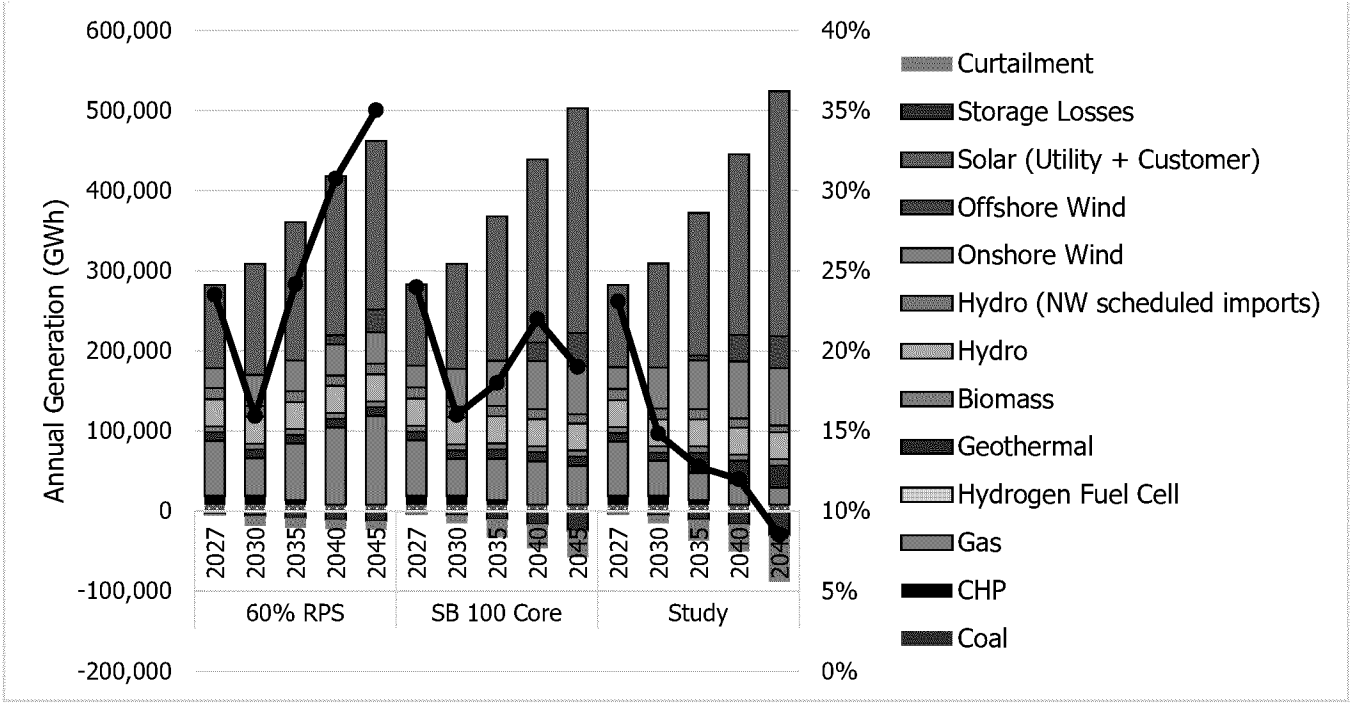


Source: CEC staff and E3 analysis

The annual generation in each of the scenarios increases significantly over the modeled years, as shown in **Figure 30**. In the 60 percent RPS scenario, gas generation and the gas fleet capacity factor increase between 2030 and 2045 (that is, gas generator are run more often). On the other hand, in both the SB 100 core and study (expanded load coverage) scenarios, gas generation and gas fleet capacity factors decrease between 2027 and 2045.

Renewable curtailment increases with the stringency of the zero-carbon target. In 2045, curtailment reached 2 percent in the 60 percent RPS scenario, 7 percent in the SB 100 core scenario, and 11 percent in the study (expanded load coverage) scenario.

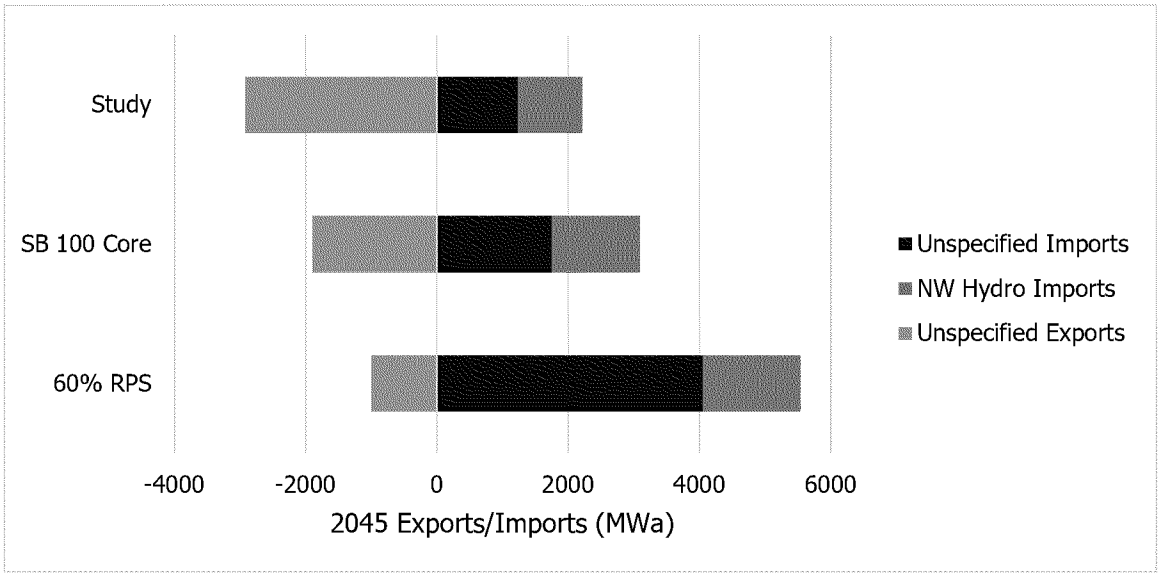
Figure 29: Annual Generation for the 60 Percent RPS, SB 100 Core, and Study Scenarios



Source: CEC staff and E3 analysis

As shown in **Figure 31**, as the stringency of the zero-carbon target increases, average imports decrease and average exports increase.

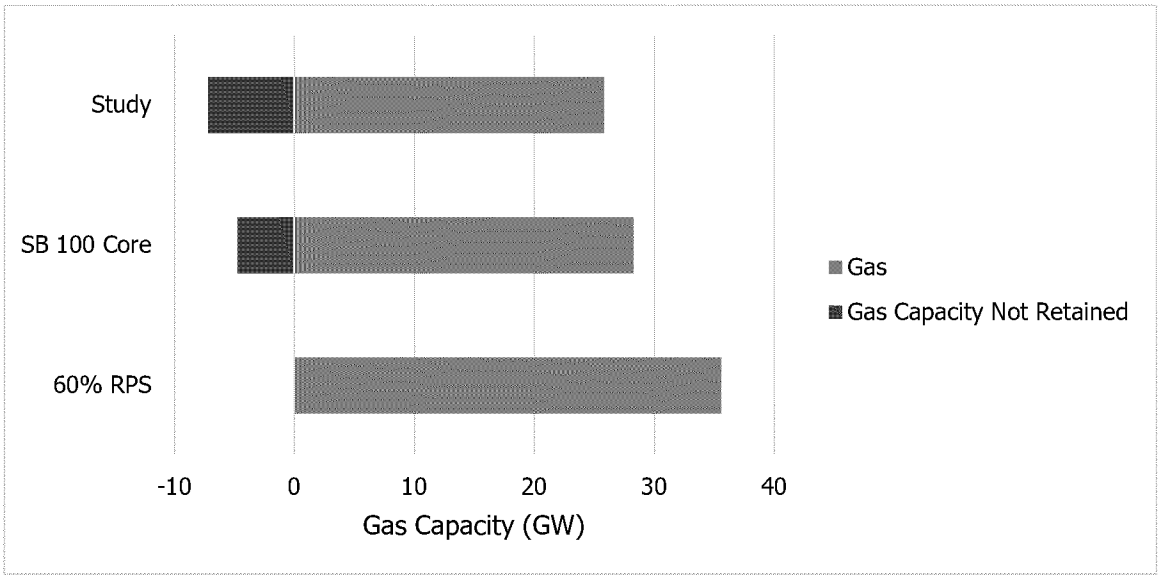
Figure 30: Average Imports and Exports in 2045 for the 60 Percent RPS, SB 100 Core and Study Scenarios



Source: CEC staff and E3 analysis

While both the SB 100 core and study (expanded load coverage) scenarios show decreases in gas generation, much of the gas fleet is retained, as shown in **Figure 32**.

Figure 31: Total Installed (Existing and New) and Retired Gas Capacity for the 60 Percent RPS, SB 100 Core and Study Scenarios



Source: CEC staff and E3 analysis

This analysis assumes no additional gas generators retirements beyond those planned at the time of modeling.[107] Additional retirements before the first modeled year would likely increase economic gas retention or storage additions or both. Gas maintenance costs are consistent with the NREL ATB's projected fixed operations and maintenance (O&M). Comparison to CPUC resource adequacy reported average contract prices suggest that costs included in NREL's ATB may be an underestimate of gas maintenance costs.[108] Higher than modeled gas fleet maintenance costs may decrease economic gas retention or increase total scenario cost or both.

Significant gas capacity is economically retained to contribute to meeting the system resource adequacy requirements, as shown in **Figure 33**.[109] Comparing across scenarios, despite the significant increase in variable renewable energy nameplate capacity, the ELCC contributions increase relatively little, with a marginal ELCC for solar at 2 percent and a marginal ELCC for wind at 19 percent. In scenarios where the optimization results in more battery storage, there are increases in economic gas retirements. While there is a resource adequacy constraint in the model (i.e., a 15 percent planning reserve margin), a full resource adequacy analysis is necessary to determine whether the portfolios produced are resource adequate.

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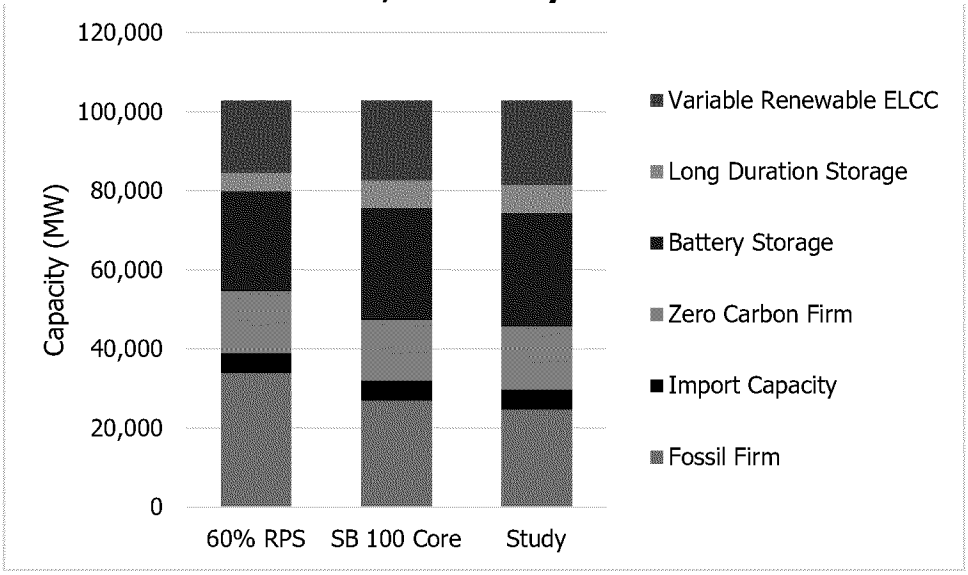
107 It is assumed the remaining once-through-cooling units retire on the planned retirement schedule. No other gas generators are assumed to retire.

108 California Public Utilities Commission. August 2019. *2018 CPUC Resource Adequacy Report*, https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Electric_Power_Procurement_and_Generation/Procurement_and_RA/RA/2018%20RA%20Report.pdf.

109 Economic retention does not mean gas resources are the only resource that can provide capacity but are the most economic resource to do so in these scenarios, given current inputs and assumptions.

Figure 32: System Resource Adequacy Contributions for the 60 Percent RPS, SB 100 Core, and Study Scenarios

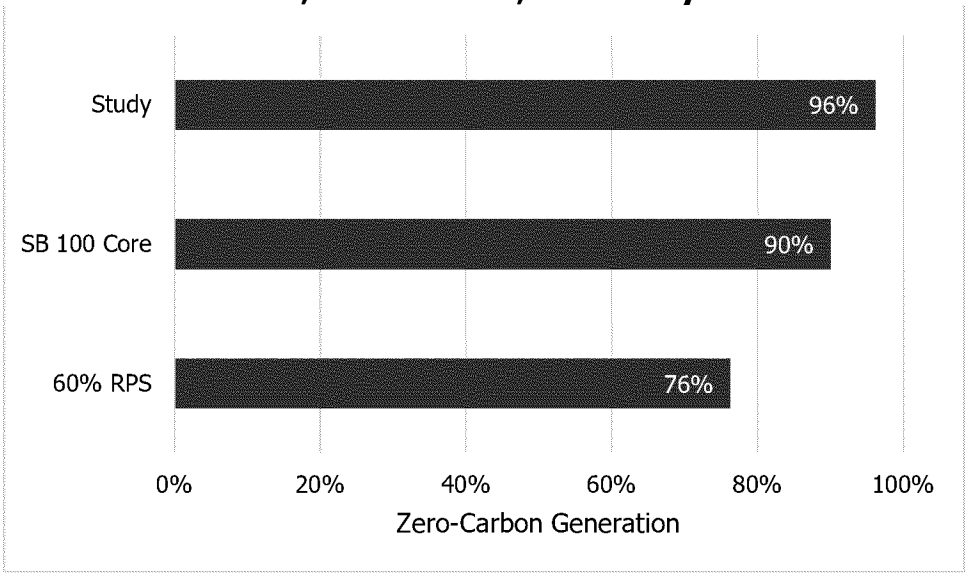


Source: CEC staff and E3 analysis

Figure 34 shows that total percentage of load served by renewable and zero-carbon generation increases with the stringency of the zero-carbon load coverage target. The SB 100 core target results in 90 percent of generation coming from renewable and zero-carbon resources.[110]

110 Zero-carbon generation, as reported here includes customer-side solar, which does not count toward the SB 100 target.

Figure 33: Load Served by Renewable and Zero-Carbon Generation for the 60 Percent RPS, SB 100 Core, and Study Scenarios



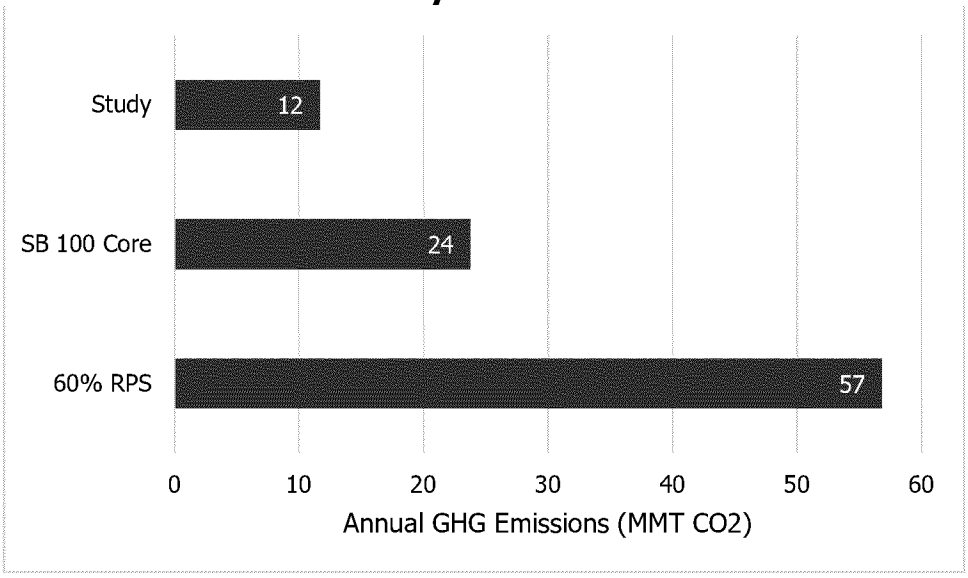
Source: CEC staff and E3 analysis

The total electric sector GHG emissions for each scenario trends inversely with the zero-carbon load coverage, as shown in **Figure 35**. None of the scenarios modeled include a GHG constraint. However, the scenarios provide an opportunity to understand GHG emission reductions that could occur under different resource futures. The GHG emissions for the 60 percent RPS scenario, at 57 million metric tons CO_2-equivalent (MMT) in 2045, are only 10 percent below present-day electric sector GHG emissions, at 63 MMT,[111] despite the increased RPS target due to increased loads driven by electrification.[112] The SB 100 core and study (expanded load coverage) scenarios result in emissions decreasing to 24 MMT and 12 MMT, respectively.

111 California Air Resources Board. California Greenhouse Gas Inventory for 2000-2018- by Category as Defined in the 2008 Scoping Plan, https://ww3.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_sum_2000-18.pdf.

112 This analysis does not assess economywide emission reductions that may be associated with electrification.

Figure 34: Greenhouse Gas Emissions for the 60 Percent RPS, SB 100 Core, and Study Scenarios



Source: CEC staff and E3 analysis

The annual total resource cost (TRC) for each scenario increases with the tightening of the zero-carbon load coverage level. (All costs presented are directional and require further analysis.) The TRC includes nonmodeled, existing costs that are the same across all scenarios, as well as scenario-specific nonmodeled costs that vary by demand sensitivities. It also includes scenario-specific fixed costs, which are levelized capital investments associated with generation, transmission, storage, and shed demand response resources selected in the model, as well as operating costs, as shown in **Table 12**. A full breakdown of costs associated with all scenarios can be found in the SB 100 Modeling Data Tables.

These do not include costs associated with new utility programs or distribution upgrades. "Average cost" as represented in **Table 12**, and all cost summary tables in this report do not represent projected retail rates and are intended to illustrate the average impact across customer classes of each scenario for each kWh of retail load. Investments in renewables, storage, and transmission constitute the primary differences in costs.

Table 12: 2045 Annual Cost Summary for the 60 Percent RPS, SB 100 Core, and Study Scenario

$ Billions (2016)	60% RPS	SB 100 Core	Study
Nonmodeled Costs	$38	$38	$38
Scenario Fixed Costs[113]	$9.8	$18.8	$25.0
Total Operating Costs	$7.0	$2.5	$0.5
Total Revenue Requirement	**$55**	**$60**	**$64**
Customer Costs	$6.7	$6.7	$6.7
Total Resource Costs	**$62**	**$66**	**$70**
Retail Sales (TWh)	372	372	372
Average Cost (¢/kWh)	**14.8**	**16.0**	**17.1**

Source: CEC staff and E3 analysis

Demand Sensitivities

Evaluating the impact of different demand scenarios provides insight into how various economywide approaches to decarbonization affect the pathway to achieving SB 100. As shown in **Figure 36**, different economywide scenarios do not change the composition of the portfolio but do significantly impact the total capacity added, particularly the quantity of solar and battery storage capacity added.

Across all scenarios, the maximum available long-duration storage, in-state wind, and offshore wind resources made available to the model are selected. The selection of new out-of-state wind ranges from 7 GW in the reference scenario to 11 GW in the high hydrogen scenario. The amount of solar selected by 2045 ranges from 44 to 70 GW. The amount of battery storage selected by 2045 ranges from 38 to 48 GW.

113 Scenario fixed costs include baseline thermal fixed costs, new thermal fixed costs, new renewables fixed costs, new storage fixed costs, new DR fixed costs, and new transmission fixed costs.

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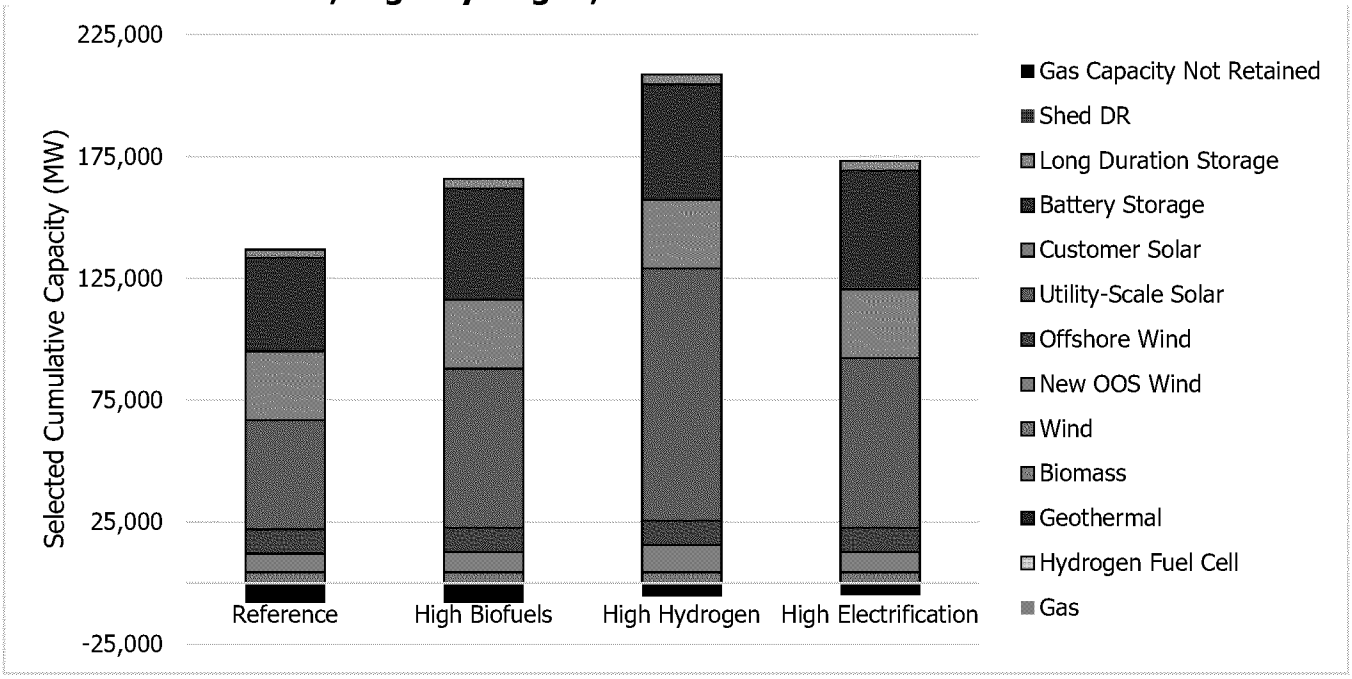
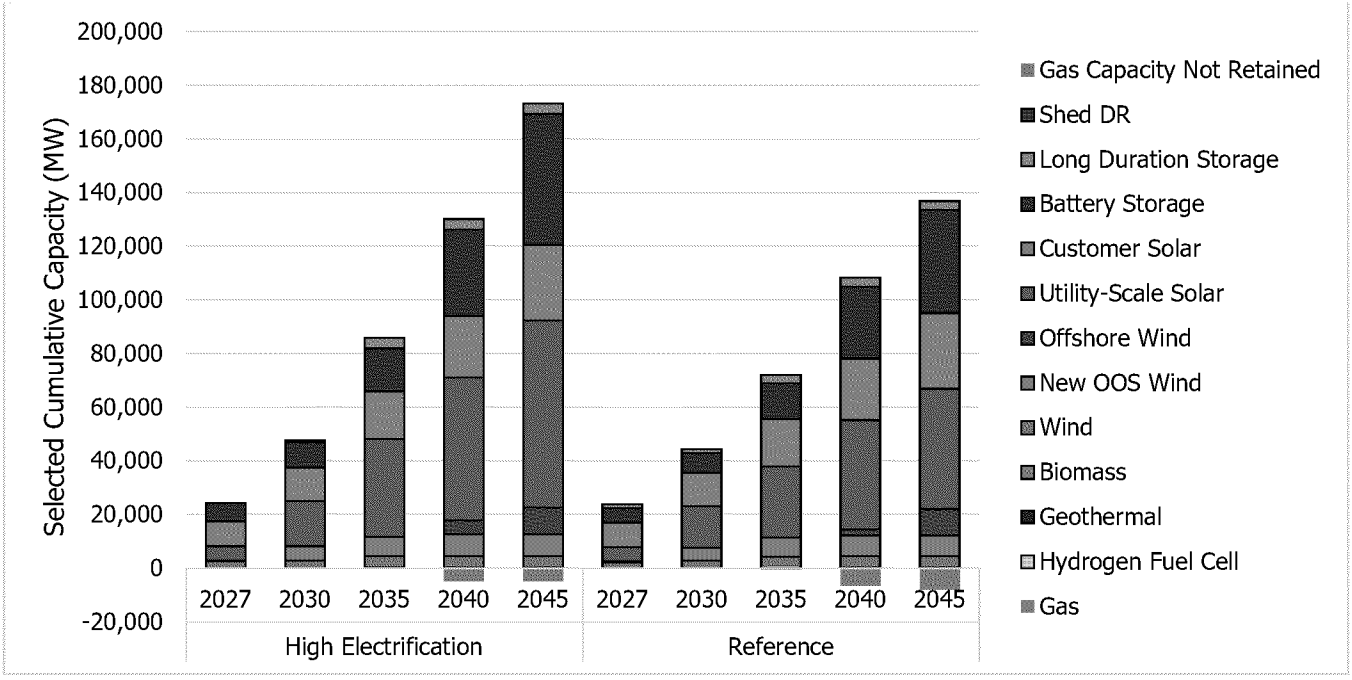
Figure 35: Cumulative Resource Build in 2045 for High Electrification, High Biofuels, High Hydrogen, and Reference Demand Scenarios



Source: CEC staff and E3 analysis

The timing of wind selection does not change between the reference and high electrification demand scenarios, as shown in **Figure 37**. After 2030, the high electrification scenario requires increasing solar and battery capacity each year compared to the reference scenario.

Figure 36: Cumulative Capacity Additions for the Reference and High Electrification Demand Scenarios



Source: CEC staff and E3 analysis

The TRC for the demand sensitivities increase with increased annual loads. However, the average cost per kWh decreases. While increased electricity demand can provide downward pressure on rates, infrastructure associated with hydrogen production or high levels of electrification are not included in this analysis, which could offset part of or all the rate decrease. The scenarios do not include costs associated with electrification, such as distribution upgrades or incentive programs, or other infrastructure required for biofuels and hydrogen, which may impact the relative cost to utility ratepayers. Average costs presented in **Table 13** are directional comparisons of demand scenarios and require additional analysis to include infrastructure costs associated with the demand scenarios.

Table 13: 2045 Annual Electricity Cost Summary for the High Electrification, High Biofuels, High Hydrogen, and Reference Demand Scenarios

$ Billions (2016)	High Elec.	High Biofuels	High Hydrogen[114]	Reference
Nonmodeled Costs	$38	$38	$38	$38
Scenario Fixed Costs	$19	$18	$24	$14
Total Operating Costs	$2.6	$2.4	$3.1	$1.8
Total Revenue Requirement	**$60**	**$58**	**$65**	**$53**
Customer Costs	$6.7	$6.7	$6.7	$6.7
Total Resource Costs	**$66**	**$65**	**$72**	**$60**

Source: CEC staff and E3 analysis

While the previous demand sensitivities focused on different economywide scenarios and varied by total annual electric energy demand, the shape and flexibility of electricity loads can significantly impact cost and resource build. While RESOLVE cannot at this time explicitly model load flexibility, the load shape and resource adequacy requirements can be modified to represent a future with greater load flexibility.

To achieve this, a high-flexibility scenario was created. Load modifiers in the high electrification demand scenario were adjusted to reflect managed charging profiles by electric vehicle drivers based on utility time-of-use rates and building flexibility based on the base case scenario in Lawrence Berkeley National Laboratory's (LBNL's) California Demand Response Study Phase 3.[115] It was also assumed that flexible load could contribute 6 GW to the annual system resource adequacy requirement.

Figure 38 shows the high-flexibility scenario results in 2.2 GW avoided battery storage build and a decrease in economic gas retention by 3.3 GW compared to the SB 100 core scenario, with the same annual electric energy demand.

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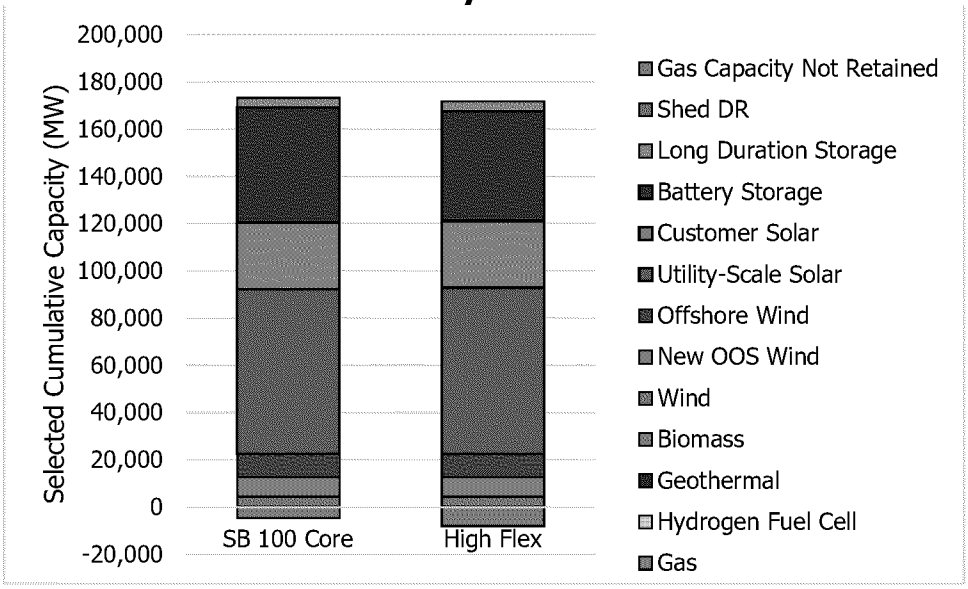
114 The High Hydrogen demand scenario includes all electrolysis loads for hydrogen production as retail sales.

115 Lawrence Berkeley National Laboratory. July 2020. The California Demand Response Potential Study, Phase 3: Final Report on the Shift Resource through 2030. https://eta-publications.lbl.gov/sites/default/files/ca_dr_potential_study_-_phase_3_-_shift_-_final_report.pdf. The Base Scenario assumed DR-enabling technology prices and performance are frozen at present-day values.

Figure 37: Cumulative Capacity Additions in 2045 for the SB 100 Core and High-Flexibility Scenarios



Source: CEC staff and E3 analysis

The high-flexibility scenario also results in nearly $1 billion of annual cost savings in 2045 compared to the SB 100 core scenario, primarily from avoided storage fixed costs, as shown in **Table 14**. The costs associated with programs to encourage flexible load are not included in this analysis.

Table 14: 2045 Annual Cost Summary for the SB 100 Core and High-Flexibility Scenarios

$ Billions (2016)	SB 100 Core	High Flex
Nonmodeled Costs	$38	$38
Scenario Fixed Costs	$19	$18
Total Operating Costs	$2.6	$2.5
Total Revenue Requirement	**$60**	**$59**
Customer Costs	$6.7	$6.7
Total Resource Costs	**$66**	**$65**
Retail Sales (TWh)	372	372
Average Cost (¢/kWh)	**16.0**	**15.8**

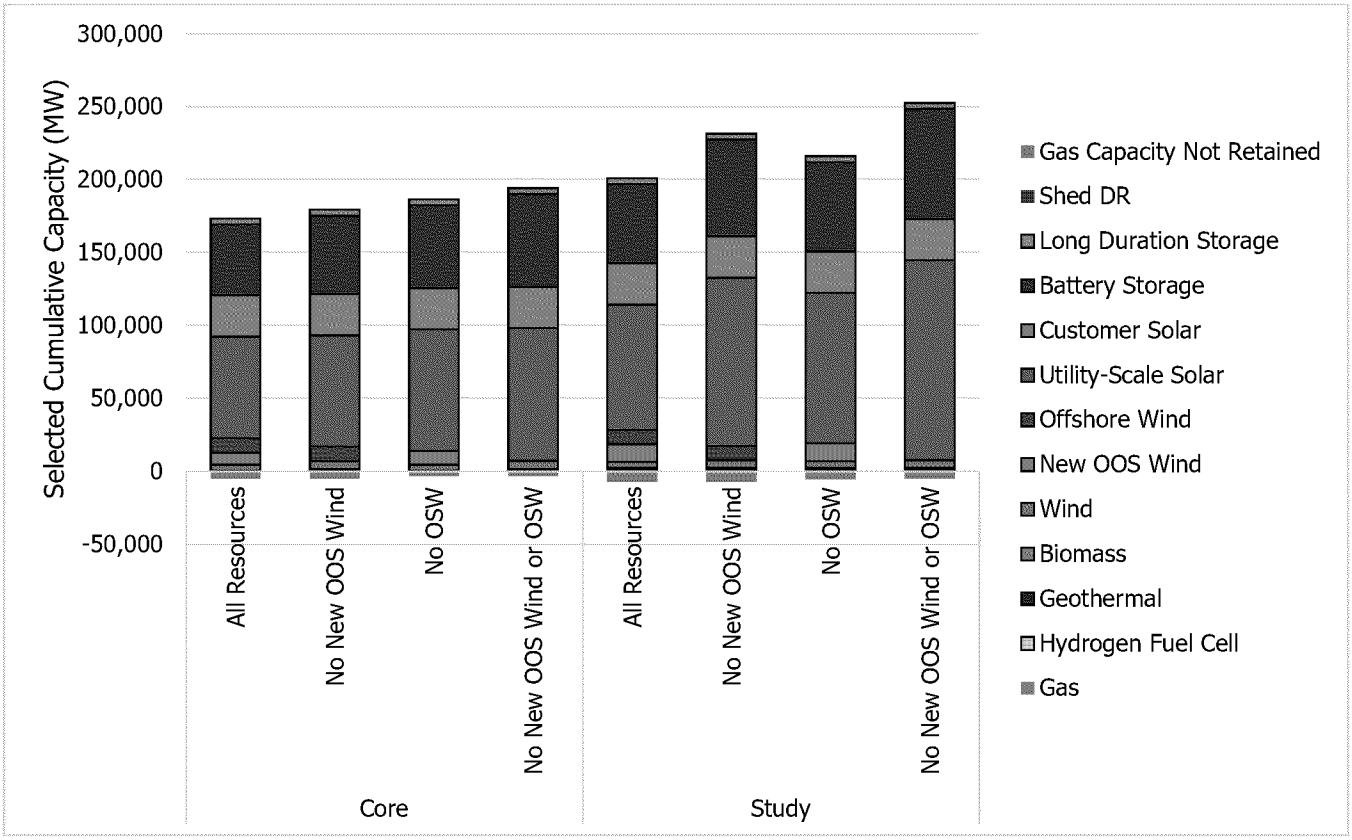
Source: CEC staff and E3 analysis

Resource Sensitivities

Evaluating futures where one or more resource types are not available or are not pursued can provide valuable planning information, especially for resources with long lead times for development. Resource sensitivities were included to evaluate the impact or benefit of pursuing new out-of-state wind resources and offshore wind resources.

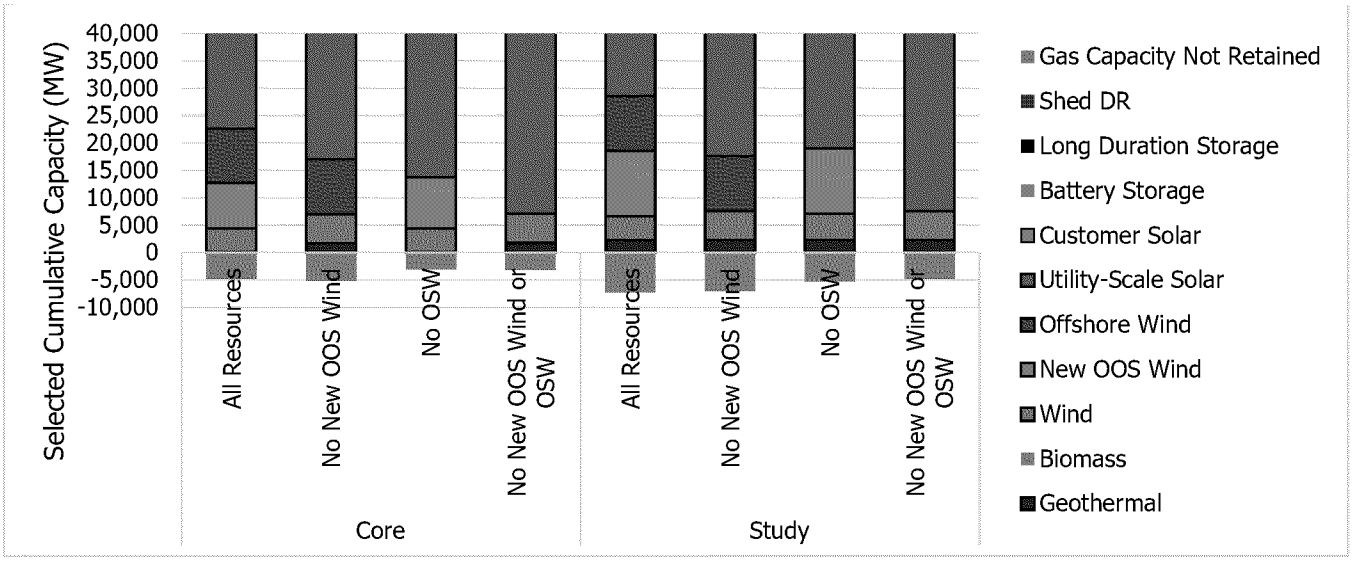
Figure 39 and Figure 40 show resource sensitivities that include "no new out-of-state (OOS) wind," "no offshore wind (OSW)," and "no new OOS wind or OSW" under the SB 100 core and study load coverages. In nearly all scenarios in which either or both the wind resources are not available or not pursued, the model selects increased geothermal capacity. Utility-scale solar and battery storage meet the remaining energy and capacity needs. The "SB 100 core no new OOS wind or OSW" requires 22 GW more solar capacity and 15 GW more storage capacity than the "SB 100 core all resources scenario."

Figure 38: Cumulative Resource Builds for the Core and Study Resource Sensitivities in 2045



Source: CEC staff and E3 analysis

Figure 39: Close up of Cumulative Resource Builds for the Core and Study Resource Sensitivities in 2045



Source: CEC staff and E3 analysis

The TRC increases in each of the scenarios where one or both the wind resources are not available or not pursued are not included, as shown in **Table 15**. The primary contributor to increased costs are increased renewable resource and storage costs.

Table 15: 2045 Annual Costs Summary for the SB 100 Core All Resources, No New OOS Wind, No OSW, and No New OOS Wind or OSW Scenarios

$ Billions (2016)	All Resources	No New OOS Wind	No OSW	No New OOS Wind or OSW
Non-modeled Costs	$38	$38	$38	$38
Scenario Fixed Costs	$19	$19	$20	$20
Total Operating Costs	$2.6	$2.7	$2.6	$2.8
Total Revenue Requirement	**$60**	**$60**	**$60**	**$61**
Customer Costs	$6.7	$6.7	$6.7	$6.7
Total Resource Costs	**$66**	**$67**	**$67**	**$68**
Retail Sales (TWh)	372	372	372	372
Average Cost (¢/kWh)	**16.0**	**16.1**	**16.2**	**16.4**

Source: CEC staff and E3 analysis

Study Scenario: Generic Zero-Carbon Firm Resources

Given the uncertainty of a 25-year planning horizon and the relatively conservative criteria for zero-carbon resource cost data used in the core scenarios, the joint agencies included study scenarios to evaluate the potential impact of commercialization of cost-competitive zero-carbon firm resources.

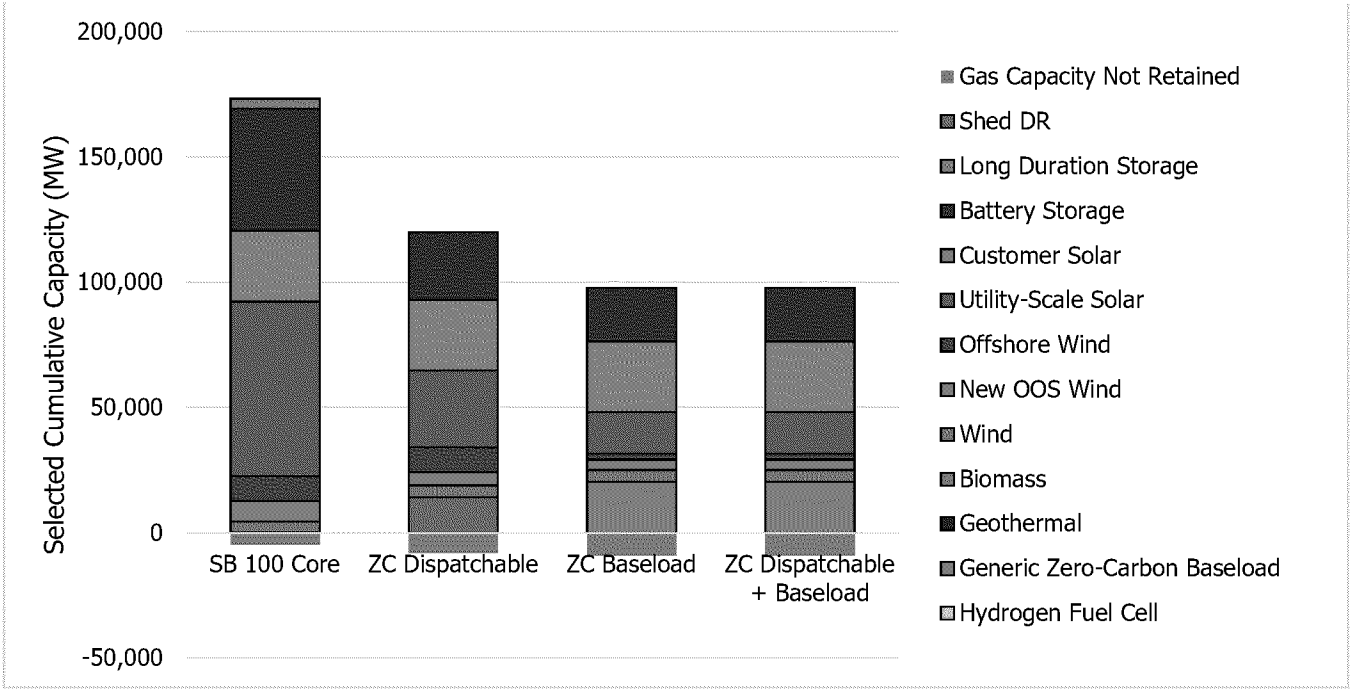
Several zero-carbon firm resources — geothermal, biomass, and hydrogen fuel cells — are already included in the core scenarios as candidate resources. Of these, 135 MW of geothermal is selected in the SB 100 core scenario, up to about 2 GW when new OOS wind or offshore wind are not available to the model. Neither biomass nor hydrogen fuel cells are selected in the core scenarios with the currently assumed cost projections.

The "generic dispatchable" resource and "generic baseload" resource included in these scenarios could represent already included technologies, should cost reductions be achieved, or a wide variety of emerging technologies, such as natural gas with 100 percent carbon capture, 100 percent green hydrogen combustion, or other renewable fuels, should the cost profiles be similar to one of the modeled generic resources.

The "generic dispatchable" resource includes a moderate capital cost and operating cost. The "generic baseload" resource includes a high capital cost and low operating cost. The LCOE of both resources are about $60/MWh when operating at a 90 percent capacity factor.

In scenarios where either the generic dispatchable resource, generic baseload resource, or both are included as a candidate resource, the model selects about 15-20 GW of either or both resources in total, as shown in **Figure 41**. The inclusion of the lower-cost zero-carbon firm resources also significantly lowers the utility-scale solar and battery storage selected in the model. Utility-scale solar selected by 2045 is reduced to 17-30 GW from 70 GW, while battery storage selection is reduced to 21-27 GW from 49 GW. Furthermore, long-duration storage selection is not selected and new OOS wind selected is reduced from 8.2 GW to 4.1-5.2 GW.

Figure 40: Cumulative Capacity Additions for the SB 100 Core and Generic Zero Carbon Firm Resource Scenarios in 2045



Source: CEC staff and E3 analysis

The Evolving Role of Geothermal

While the joint agencies attempt to use the most current publicly available and vetted cost data, there can be significant changes in available data after the modeling has been conducted. The NREL ATB is updated annually, usually with incremental adjustments to cost data. The 2020 ATB update, which was released after modeling for this report was underway, however, included a 30 percent reduction in geothermal cost projects, based on the Department of Energy Geovision Report.[116]

This cost-reduction projection places the geothermal LCOE below the LCOE of the generic zero-carbon firm resources modeled in these scenarios. As significant generic zero-carbon firm capacity was selected in the study scenario, it is likely that geothermal would be selected to a much greater extent should the updated cost data be used.

Geothermal costs are heterogeneous and can vary widely depending on project location. Coproduction of lithium from geothermal brine may also provide additional revenue streams, effectively lowering the cost of geothermal power, and will be evaluated by the Blue-Ribbon Commission on Lithium Extraction in California.[117]

Each of the generic zero-carbon firm resource scenarios resulted in significant decreases in TRC compared to the SB 100 core scenario, as shown in **Table 16**. Cost reductions are driven by new renewable and transmission fixed costs.

116 NREL ATB 2020 vs. 2019 Changes Reductions in geothermal costs are attributed to trends and predicted advancements in drilling efficiency and enhanced geothermal systems.

117 Ventura, Susanna, Srinivas Bhamidi, Marc Hornbostel, and Anoop Nagar. 2020. Selective Recovery of Lithium from Geothermal Brines. California Energy Commission. Publication Number: CEC500-2020-020. https://ww2.energy.ca.gov/2020publications/CEC-500-2020-020/CEC-500-2020-020.pdf. Assembly Bill 1657 (E. Garcia, Chapter 271, Statutes of 2020), Blue Ribbon Commission on Lithium Extraction in California.

Table 16: 2045 Annual Costs Summary for the SB 100 Core, Generic Dispatchable, Generic Baseload, and Generic Dispatchable + Baseload Scenarios

$ Billions (2016)	SB 100 Core	Generic Dispatchable	Generic Baseload	Gen. Dis. + Baseload
Non-modeled Costs	$38	$38	$38	$38
Scenario Fixed Costs	$19	$13	$14	$14
Total Operating Costs	$2.6	$6.0	$2.8	$2.8
Total Revenue Requirement	**$60**	**$58**	**$55**	**$55**
Customer Costs	$6.7	$6.7	$6.7	$6.7
Total Resource Costs	**$66**	**$64**	**$62**	**$62**
Retail Sales (TWh)	372	372	372	372
Average Cost (¢/kWh)	**16.0**	**15.5**	**15.0**	**15.0**

Source: CEC staff and E3 analysis

Study Scenario: No Combustion

While SB 100 does not preclude combustion resources from the resource portfolio, studying pathways in which combustion resources are expressly retired can provide insight into what it would take to significantly reduce the contribution to criteria pollutants and toxic air contaminants in California from supply-side electricity generation. To that end, a "no combustion" scenario in which all combustion resources are retired over the planning horizon and no combustion resources are available as candidate resources was included as a study scenario.

In this scenario, all units that use a combustion technology, combustion turbines, combined cycle, combined heat and power,[118] and biomass, retire over the planning horizon, as shown in **Figure 42**. The high-electrification demand scenario was used.

118 All combined heat and power facilities are assumed to retire after 2035 in all scenarios in this report.

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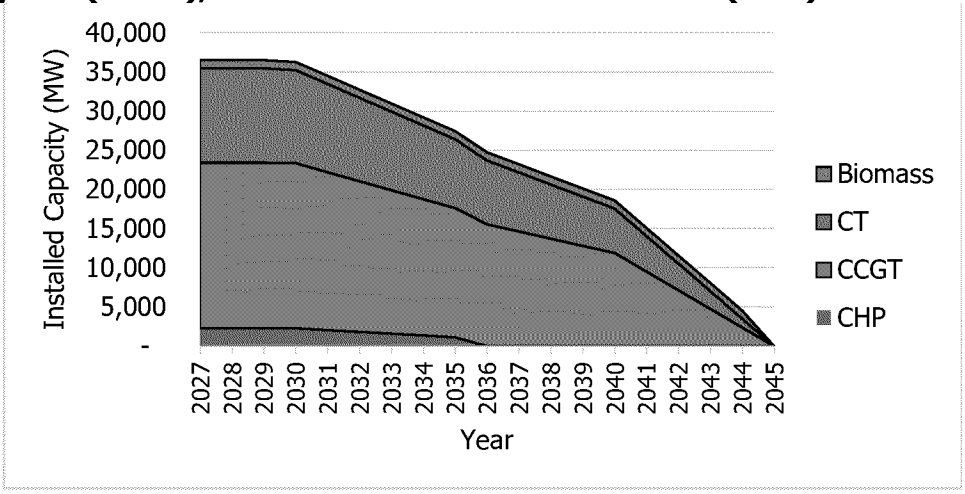
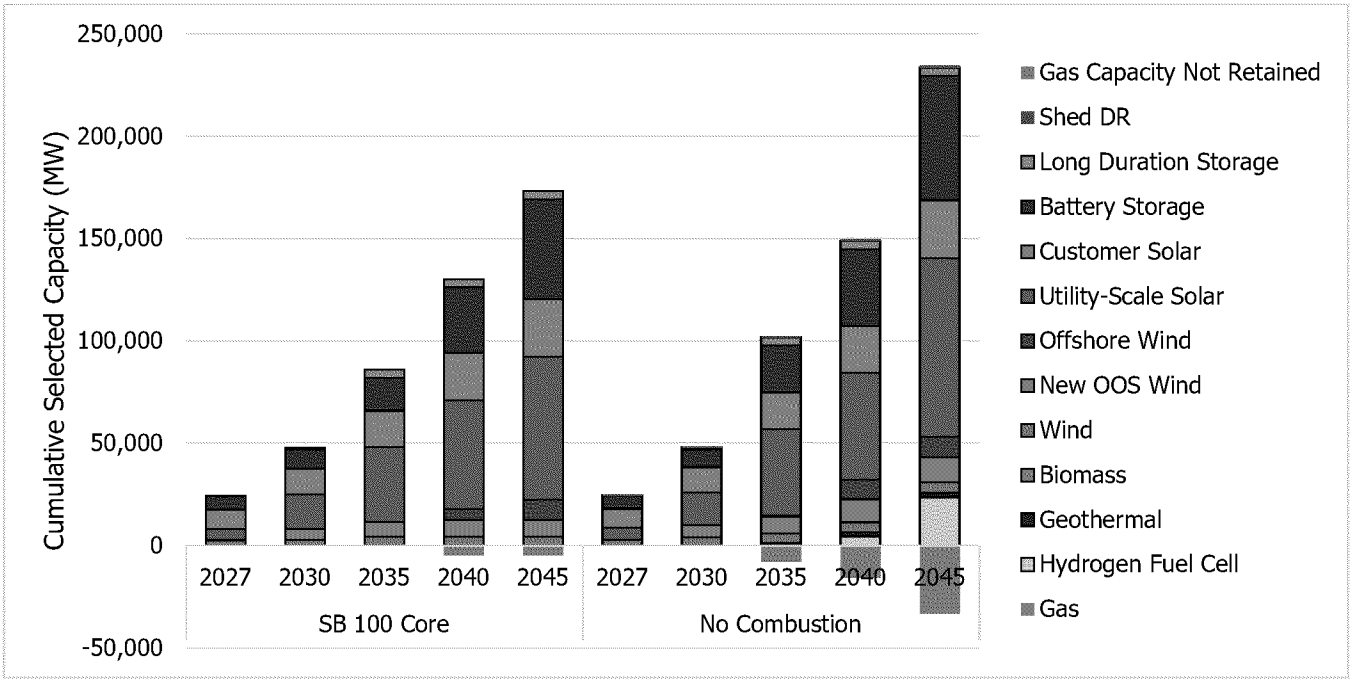
Figure 41: Retirement Schedule for Biomass, Combustion Turbines (CT), Combined Cycles (CCGT), and Combined Heat and Power (CHP) Resources



Source: CEC staff and E3 analysis

With the retirement of all combustion resources, 61 GW of additional capacity is selected compared to the SB 100 Core Scenario. In addition to the resources selected in the SB 100 core scenario, 24 GW of hydrogen fuel cells, the remaining 2.3 GW of geothermal, the remaining 3.8 GW new OOS wind, 18 GW of utility scale solar, 12 GW of battery storage and 1.1 GW of shed demand response were selected, as shown in **Figure 43**.

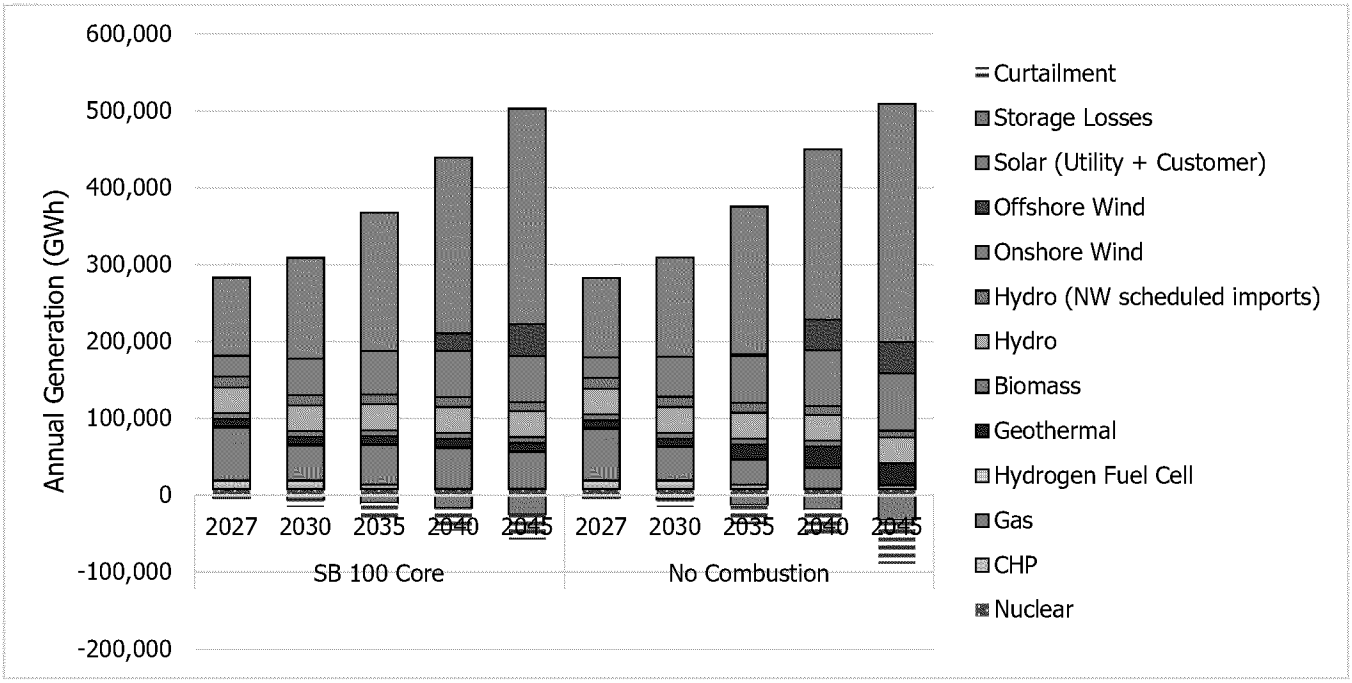
Figure 42: Cumulative Capacity Additions for the SB 100 Core and No Combustion Scenarios



Source: CEC staff and E3 analysis

While significant hydrogen fuel cell capacity was selected, it generates very little energy, as shown in **Figure 44**. The hydrogen fuel cells were selected for the capacity value and function as a peaking resource.

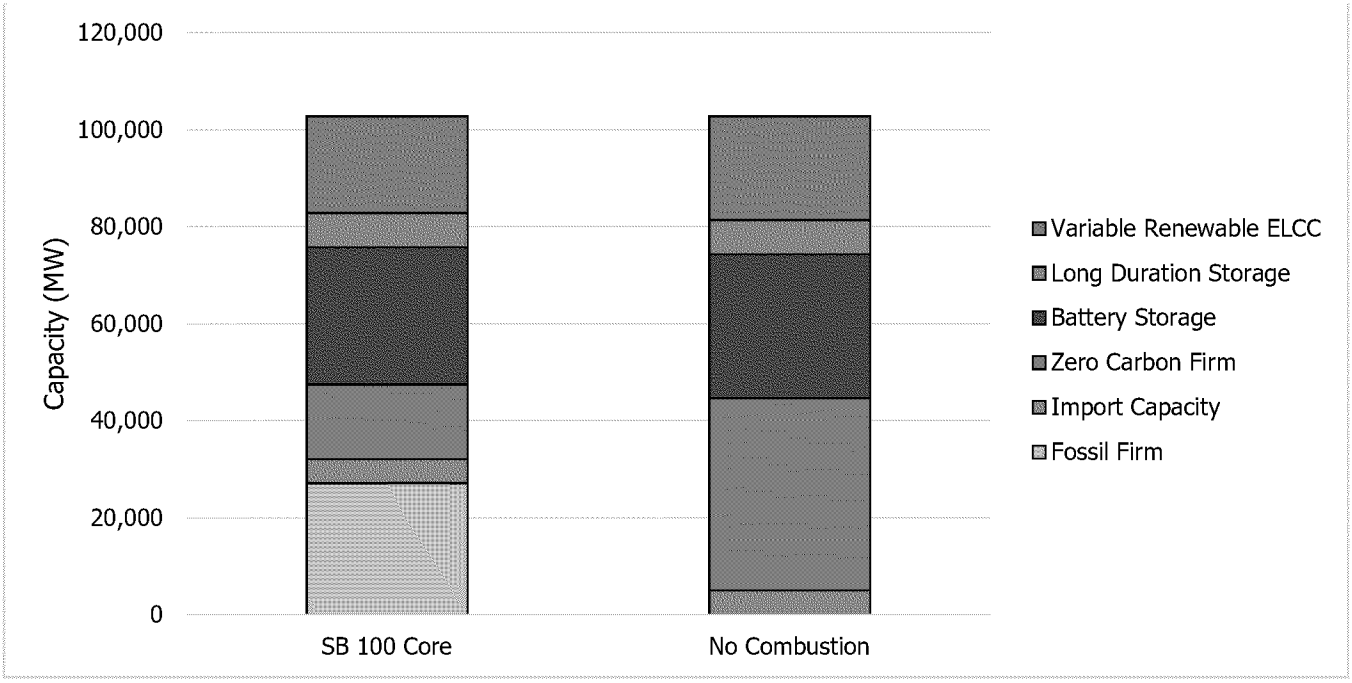
Figure 43: Annual Generation for the No Combustion Scenario



Source: CEC staff and E3 analysis

While fossil firm resources contribute a significant amount to the resource adequacy need in the SB 100 Core scenario, the retirement of these resources requires new resources to be selected to meet the capacity need in the No Combustion scenario. As shown in **Figure 45**, the fossil firm resource contributions are largely replaced by zero-carbon firm, which includes hydrogen fuel cells and new geothermal resources. While there is a resource adequacy constraint in the model (a 15 percent planning reserve margin), a full resource adequacy analysis is necessary to determine whether the portfolios produced meet other established reliability planning standards.

Figure 44: Resource Adequacy Contributions for the SB 100 Core and No Combustion Scenarios



Source: CEC staff and E3 analysis

Given the significant capacity additions in the no combustion scenario, there are increased annual TRC costs compared to the SB 100 core scenario, as shown in **Table 17**. The primary contributors to cost increases are new renewable resources, hydrogen fuel cells, storage, and transmission fixed costs.

Table 17: 2045 Annual Cost Summary of the SB 100 Core and No Combustion Scenarios

$ Billions (2016)	SB 100 Core	No Combustion
Non-modeled Costs	$38	$37
Scenario Fixed Costs	$19	$28
Total Operating Costs	$2.6	$1.8
Total Revenue Requirement	**$60**	**$67**
Customer Costs	$6.7	$6.7
Total Resource Costs	**$66**	**$74**
Retail Sales (TWh)	372	372
Average Cost (¢/kWh)	**16.0**	**18.1**

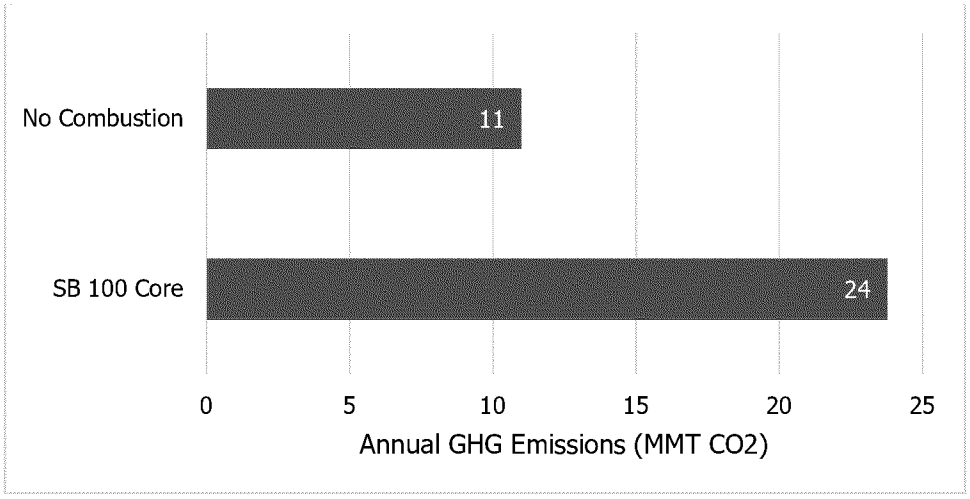
Source: CEC staff and E3 analysis

While all California combustion and virtually all GHG-emitting resources are retired[119] in the no combustion scenario, 11 MMT of GHG emissions attributed to the California electric grid remain, due to unspecified imports,[120] as shown in **Figure 46**.

119 Geothermal resources are not retired and do emit some GHG emissions.

120 As RESOLVE optimizes operations to best reflect energy market dynamics, in periods where the marginal price of energy in California is higher than the price of unspecified imports, unspecified imports are dispatched to California. Implementation of a GHG target in RESOLVE may limit the GHG emissions but may not necessarily reflect market dynamics.

Figure 45: GHG Emissions for the SB 100 Core and No Combustion Scenarios



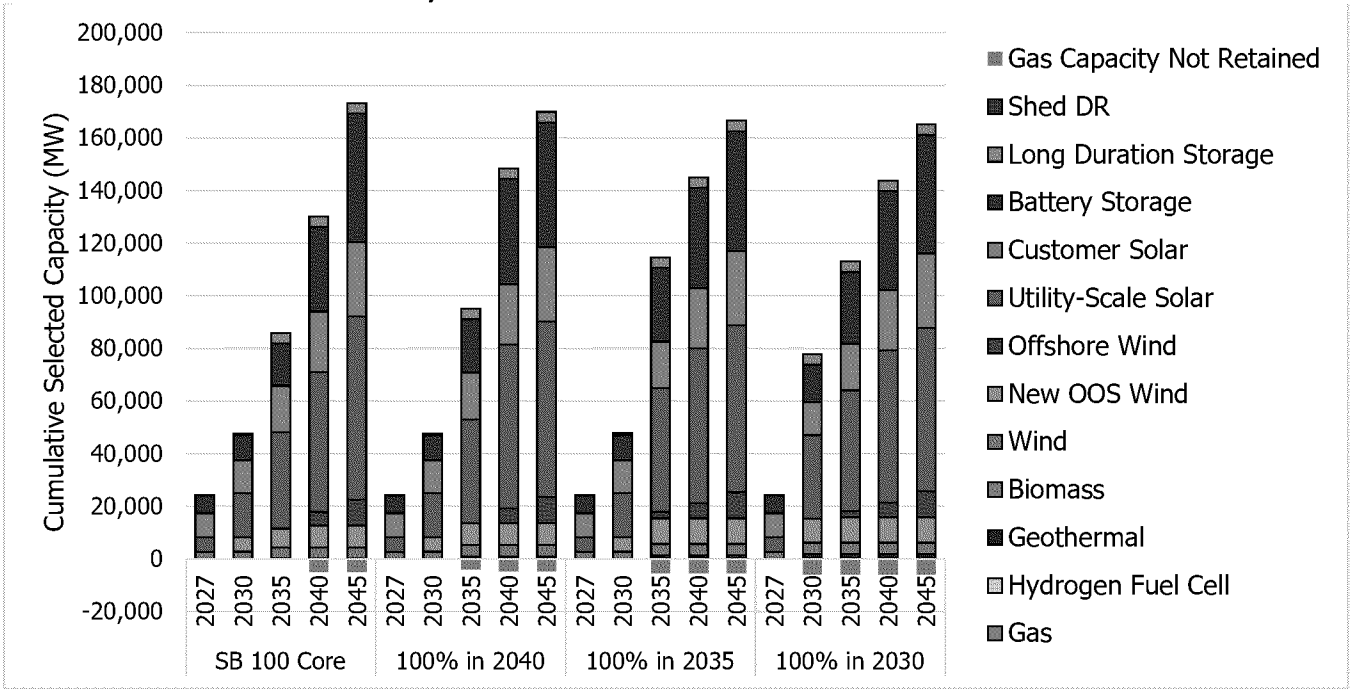
Source: CEC staff and E3 analysis

Study Scenarios: Accelerated Timelines

The final set of study scenarios examines the impacts of accelerating the 100 percent renewable and zero-carbon target to 2030, 2035, and 2040. For each of these scenarios, the SB 100 Core target was accelerated with a linear interim zero-carbon target between 2030 and the target year. After the target year, the 100 percent target is held constant through 2045. The high electrification demand scenario was used for all accelerated timeline scenarios.

In **Figure 47**, each accelerated timeline scenario shows a significant jump in resource build in the 100 percent target year, while the 2045 portfolio remains similar across scenarios. All the accelerated timeline scenarios result in an increase of geothermal resource selection by at least 1 GW. Accelerating the 100 percent target to 2030 or 2035 results in increased new OOS wind selection by 1.3–1.4 GW and decreases in utility-scale solar selection by 6-7 GW and battery storage by 3 GW. Accelerating the target to 2030 or 2035 also results in a 0.5-1 GW of decreased economic gas retention.

Figure 46: Cumulative Capacity Additions for the SB 100 Core (2045 SB 100), 100% in 2040, 100% in 2035 and 100% in 2030 Scenarios



Source: CEC staff and E3 analysis

Each accelerated timeline scenario results in increased annual TRC compared to the SB 100 Core scenario for every modeled year except 2027, as shown in **Table 18**. In general, the TRC shows a significant jump in the year the 100 percent target is set to. By 2045, the TRC for the accelerated scenarios result in less than a 1 percent increase over the SB 100 Core scenario.

Table 18: Annual Total Resource Cost for the SB 100 Core, 100 Percent in 2040, 100 Percent in 2035, and 100 Percent in 2030 Scenarios

TRC ($B)	2027	2030	2035	2040	2045
SB 100 Core	$44.8	$47.0	$50.6	$59.5	$66.3
100% in 2040	$44.8	$47.0	$53.6	$61.5	$66.5
100% in 2035	$44.8	$47.0	$55.8	$61.7	$66.7
100% in 2030	$44.8	$50.1	$55.8	$61.8	$66.8

Source: CEC staff and E3 analysis

Resource Build Rates

Given the magnitude of the capacity additions, the average build rates provide important implications for implementation and achievement of the SB 100 2045 policy goal. Build rates

can indicate whether there could be bottlenecks in supply-chain or regulatory and permitting processes, resulting in barriers to procurement.

Over the last decade, California has built on average 1 GW of utility solar and 300 MW of wind per year, with a maximum annual build of 2.7 GW of utility scale solar and 1 GW of wind capacity. **Table 19** shows near-term build rates to 2030 are similar regardless of the electricity demand scenarios and are above the historical 10-year average build rate for utility scale solar and wind capacity.

The long-term build rates to 2045, shown in Table 20, differ significantly for utility-scale solar depending on the demand scenario, ranging from 1.8 GW per year in the reference scenario to 4.1 GW per year in the high hydrogen scenario.

Table 19 Average Build Rates for the High Electrification, High Biofuels, High Hydrogen and Reference Demand Scenarios

Year To	Demand Scenario	Solar (GW/year)	Wind (GW/year)	Storage[121] (GW/year)
2030	High Electrification (SB 100 Core)	1.5	0.8	1.1
2030	High Biofuels	1.7	0.8	0.9
2030	High Hydrogen	1.7	0.8	0.9
2030	Reference	1.5	0.8	0.8
2045	High Electrification (SB 100 Core)	2.8	0.9	2.0
2045	High Biofuels	2.6	0.9	1.8
2045	High Hydrogen	4.1	1.0	1.9
2045	Reference	1.8	0.9	1.5

Source: CEC staff and E3 analysis

Inclusion of diverse wind resources in the portfolio also impacts the average solar and storage build rate, disproportionately from the reduction in wind build rate, with an increase of up to 0.8 GW per year for utility scale solar and 0.6 GW per year for battery storage, as shown in Table 20.

121 Storage in this table is inclusive of new battery storage selected by the model.

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Table 20: Average Build Rates for the SB 100 Core, No New OOS Wind, No OSW, and No New OOS Wind or OSW Scenarios

Year To	Resource Sensitivity	Solar (GW/year)	Wind (GW/year)	Storage (GW/year)
2045	SB 100 Core	2.8	0.9	2.0
2045	No New OOS Wind	3.0	0.6	2.2
2045	No OSW	3.3	0.5	2.3
2045	No New OOS Wind or OSW	3.6	0.2	2.6

Source: CEC staff and E3 analysis

Commercialization of cost-competitive zero-carbon firm resources has the potential to significantly reduce average build rates for utility-scale solar and battery storage resources. **Table 21** show that the utility-scale solar build rate reduces to 0.6-1.2 GW per year — on par with historic build rates — and battery storage build rate reduces to 0.9-1.1 GW per year.

Table 21: Average Build Rates for the SB 100 Core, Generic Dispatchable, Generic Baseload, and Generic Dispatchable + Baseload Scenarios

Year To	Resource Sensitivity	Solar (GW/year)	Wind (GW/year)	Storage (GW/year)
2045	SB 100 Core	2.8	0.9	2.0
2045	Generic Dispatchable	1.2	0.8	1.1
2045	Generic Baseload	0.6	0.5	0.9
2045	Generic Dispatchable + Baseload	0.6	0.5	0.9

Source: CEC staff and E3 analysis

Key Takeaways From Preliminary Modeling

SB 100 Is Achievable

This initial analysis demonstrates that supplying 100 percent of retail sales and state loads with renewable and zero-carbon technologies is technically achievable. The modeling suggests the total resource cost of achieving the target is about 6 percent higher than a 60 percent RPS future in 2045, though additional analysis is needed to validate these findings. These costs

may be lower if the cost trends for renewables continue to fall faster than projections. Cost reductions and innovation in zero-carbon technologies, as well as load flexibility and energy storage development, can further reduce implementation costs. Moreover, variations on the scenarios studied will develop over time as reliability is examined, technologies develop, and procurement decisions are made.

Increased Resource Diversity Lowers Overall Costs

Portfolio diversity, both technological and geographical, is generally valued by the model. In scenarios where out-of-state or offshore wind are available, the model always selects a significant quantity, if not all, of the resource potential. Furthermore, even a modest amount of load flexibility can reduce battery storage requirements, decrease economic gas retention, and decrease the total resource cost of achieving SB 100. Commercialization of cost-competitive zero-carbon firm technologies could reduce overall system costs and decrease gas capacity retention. If these technologies reach a cost of roughly $60/MWh, they could reduce system costs by an estimated $2 billion annually in 2045.

Gas Capacity Is Retained for Reliability Needs, but Cost Reductions and Innovation in Zero-Carbon Firm Resources and Storage May Reduce Gas Capacity Needs

Natural gas capacity is largely economically retained in the SB 100 core scenario, but fleetwide utilization decreases by half compared to a 60 percent RPS future. The gas fleet is primarily retained because natural gas capacity is the most economic option to provide capacity for reliability needs with the current resource assumptions. Cost reductions and innovation in zero-carbon firm resources and storage resources may reduce economic gas fleet retention.

Further analysis is needed to evaluate costs associated with maintaining an aging gas fleet operating in a high renewables system, including an evaluation of existing gas capacity maintenance costs and the impact of additional gas retirements.

Sustained Record Setting Build Rates Will Be Required to Meet SB 100 in a High Electrification Future

Growing electricity demand is a significant driver of resource build rates in the SB 100 scenarios. The added demand from the various pathways to achieve economywide decarbonization creates a significant resource need, regardless of the SB 100 policy. This added demand has implications for workforce needs, land-use planning, resource supply chains, and regulatory and permitting processes that must be considered for successful implementation of SB 100. Innovation and cost reductions, leading to greater portfolio diversity, may reduce utility-scale solar and storage build rates necessary to meet the SB 100 policy goals.

Goals Beyond SB 100 May Be Achievable but Require Additional Analysis

The study scenarios are beyond the scope of SB 100. However, they provide directional insight to inform the state's energy and climate planning efforts and contribution toward other environmental and public health goals.

Eliminating all in-state combustion resources results in a significant increase in storage and zero-carbon firm resource selection to replace natural gas capacity. This scenario adds an estimated $8 billion to annual system costs in 2045 compared to the SB 100 core scenario. Further analysis could identify public health benefits, particularly in disadvantaged communities where a disproportionate number of combustion resources are. This analysis may help determine whether the public health benefits outweigh the additional costs.

Accelerating the SB 100 timeline to achieve the 2045 target by 2030, 2035, or 2040 results in increased total resource costs and required additional capacity in the target year. All scenarios resulted in similar annual resource costs and resource portfolios by 2045.

Current SB 100 Analysis Is Directional, and Further Analysis Is Necessary

This analysis is the first step in an ongoing effort to evaluate and plan for the SB 100 policy. As described in the Limitations of RESOLVE section of this chapter, capacity expansion is a powerful and informative tool but is limited by necessary simplifying of assumptions. Further analysis is necessary to determine reliability of the portfolios.

Future work should better capture the effect and value of resources that are either not represented or not well valued in the current modeling framework. Long-duration storage is not fully valued in RESOLVE due to limitations on dispatch. Hybrid resources are not represented in RESOLVE and should be represented in future analysis, as they are increasingly a part of utility plans. Emerging technologies, such as green hydrogen and natural gas with 100 percent carbon capture and sequestration, should be incorporated in future analysis.

The role of demand-side resources load flexibility should also be further evaluated. Significant customer-side solar was assumed in the model, at 39 GW. No additional customer solar was selected by the model in the optimization. Factors outside system costs, such as customer preference and resilience benefits, may affect customer-side resource adoption. Customer storage was also not selected but may provide local capacity and resilience value not captured by the model.

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CHAPTER 4:
Next Steps and Considerations for Implementation

SB 100 Is an Ongoing Effort

The analysis in the 2021 Report is intended to be a first step in an iterative and ongoing effort to assess barriers and opportunities to implementing the 100 percent clean energy policy established by SB 100. As discussed in Chapter 3, this report includes capacity expansion modeling to provide directional insights into what a 2045 portfolio of renewable and zero-carbon resources may look like, as well as the associated costs and resource build requirements to achieve such a portfolio. These results, however, have not undergone a comprehensive assessment for reliability, which is the suggested next step in the process. From there, the projected portfolio may be adjusted in an iterative manner to ensure reliability for all hours of the year in line with state planning requirements, while meeting clean energy and climate goals.

Additional analytical work is needed to better capture emerging zero-carbon resources and nongeneration technologies; provide higher-resolution insights to address equity concerns, including local public health and economic impacts; and address land use and other environmental implications. Topics for consideration in future SB 100 work are discussed below.

Next Steps for Analysis

System Reliability

In August 2020, California experienced rolling blackouts over two consecutive days. While a sustained west-wide heat wave resulted in the tightness in the electricity supply conditions and contributed to the load shed events, the final root cause analysis[122] that was subsequently released jointly by CPUC, California ISO, and CEC identified the need to comprehensively examine reliability in the near term (by summer 2021) and long term (2022 and beyond) as the state rapidly transitions to the stated goals of SB 100. The final root cause analysis identified the need to reflect the uncertainty of weather, operational characteristics of clean energy resources, and market dynamics into the state's reliability planning processes and studies. While the August events emphasized the need for near-term reliability, the state agencies and balancing authorities recognize the need to incorporate these reliability principles into the 2045 time horizon.

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122 California ISO, CPUC, and CEC. *Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave*, January 13, 2021, http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.

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The joint agencies plan to evaluate resource portfolios developed in this report for reliability in a multistep process using a production cost model, which will simulate the performance of the portfolio over a year. The first step will evaluate the resource portfolios in all 8,760 hours of the year and highlight potential supply shortfalls in meeting the projected demand. This step will also better capture value provided by some resources, such as long-duration storage, that are not fully captured in a capacity expansion model. After this analysis, the resource portfolio may be adjusted manually, or through revised capacity expansion modeling, to adjust for any operability shortcomings.

The second step will evaluate the revised resource portfolio with a set of probabilistic production cost model runs, which analyzes reliability over a wide range of conditions. This set of runs will explore probabilistic variables, such as loads, renewable energy and hydro availability, and power plant outages to determine the loss of load probability (likelihood of power outages due to insufficient capacity or energy) of the resource mix. A loss of load probability that exceeds, or is significantly under, an acceptable limit will result in additional resource portfolio adjustments and restarting this process at the first step.

Completion of the reliability assessment will provide the joint agencies a more substantiated assessment of pathways to achieve SB 100 while maintaining reliability. This step could be completed as part of the 2025 SB 100 Report or possibly through existing state efforts. The CEC and CPUC are assessing resource availability to complete this modeling ahead of the next report.

Emerging Technologies and Innovation

Additional strategies and technologies have the potential to further enable a high-renewables and decarbonized grid — either by delivering or complementing zero-carbon electricity. State agencies are working together to spur innovation in areas that will be critical to cost-effectively meeting the goals of SB 100.

This collaboration leverages the state's key role in assessing technology gaps and supporting new and innovative technologies through funding of research, development, and deployment programs, including the Electric Program Investment Charge (EPIC) and the Natural Gas Research and Development Program. The state's long-term electricity planning processes inform its approach to innovation for a cost-effective clean energy transition, helping identify technology characteristics that can deliver a decarbonized grid, reduce costs, increase resilience and reliability, and contribute to improved air quality.

Listed below are example technology categories that could significantly impact SB 100 planning if development and adoption barriers are overcome and they can be deployed at scale. Future analyses will be updated to incorporate changes in market conditions, costs, and resource availability of new and existing technologies. Other technologies that could affect a 2045 portfolio, such as natural gas generation with carbon capture and sequestration and emerging nuclear technologies, are not discussed here because of cost uncertainty and limited development potential seen at this time.

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Offshore Wind

State agencies are exploring opportunities for the development of offshore wind off the California coast. Offshore wind is an attractive technology from a system planning perspective due to the associated generation potential profile that complements solar, with higher output in the evenings, when electricity demand is high and solar production is low. Offshore wind also complements solar seasonally and can provide more consistent output during winter months when solar production is lower.[123]

While there is a significant resource potential off the California coast — an estimated 112 GW of accessible offshore wind resource — there are also considerable barriers. Among the foremost challenges are significant anticipated transmission requirements and competing coastal uses, including shipping, fishing, recreation, marine conservation, and Department of Defense activities. Together, these factors severely limit the feasible resource potential.

In 2016, the BOEM California Intergovernmental Renewable Energy Task Force, a partnership of state, local, and tribal governments and federal agencies, was created to identify potential sites for offshore wind development off the coast. The task force is conducting a public process evaluating possible sites off the Northern and Central Coasts.

Moreover, because California's offshore resource is in water depths greater than 60 meters, floating turbines are needed.[124] While fixed-bottom offshore wind turbines are a proven technology, floating technologies are relatively nascent, with a total of about 66 MW installed worldwide at the end of 2019. However, the global industry for floating turbines is growing rapidly with almost 6.2 GW of global projects in the pipeline, including 64 MW to be installed in the next year, 1,100 MW under construction and planned to be built by 2025, and 7 GW in development.[125]

The National Renewable Energy Laboratory (NREL) recently published a California-focused study on offshore wind. The study estimated LCOE ranges from $57 per megawatt-hour (MWh) to $68 per MWh for offshore wind coming online in 2030.[126] The first commercial scale floating offshore wind projects are projected to have a higher

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123 National Renewable Energy Laboratory. December 2016. *Potential Offshore Wind Energy Areas in California: An Assessment of Locations, Technology, and Costs*. https://www.nrel.gov/docs/fy17osti/67414.pdf.

124 National Renewable Energy Laboratory. December 2016. *Potential Offshore Wind Energy Areas in California: An Assessment of Locations, Technology, and Costs*. https://www.nrel.gov/docs/fy17osti/67414.pdf.

125 Lee, Joyce and Feng Zhao. August 2020. Global Offshore Wind Report 2020. Global Wind Energy Council. https://gwec.net/wp-content/uploads/2020/12/GWEC-Global-Offshore-Wind-Report-2020.pdf

126 Beiter, Philipp, Walter Musial, Patrick Duffy, Aubryn Cooperman, Matt Shields, Donna Heimiller, and Mike Optis. 2020. *The Cost of Floating Offshore Wind Energy in California Between 2019 and 2032*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-77384. https://www.nrel.gov/docs/fy21osti/77384.pdf.

LCOE than fixed-bottom offshore wind turbines due to a higher degree of financial uncertainty, technical challenges, and a less established supply chain and manufacturing process. Floating offshore wind projects in the next 7-10 years are projected to bid at levels competitive with the first fixed-bottom offshore wind projects.

In 2019, the CPUC included offshore wind as a candidate resource in Integrated Resource Planning sensitivity modeling for the first time. Since then, the CPUC collaborated with BOEM and NREL on their report described above. The CPUC will propose that the transmission needs of offshore wind be studied in the next California ISO Transmission Planning Process, kicking off in February 2021. This study will provide improved understanding of the cost of transmission to deliver offshore wind power to load centers in California and, along with the improved assumptions from NREL, will enhance the state's understanding of the possible contribution of offshore wind in meeting the goals of SB 100.

In 2019, the CEC released a funding opportunity that, for the first time, called for research projects focused on offshore wind energy in California. The solicitation sought two types of projects: (1) projects that develop real-time monitoring systems for offshore wind technologies to help increase productivity, reduce O&M costs, support detection and identification of affected species and habitats, and (2) projects that increase understanding of how offshore energy deployments may affect sensitive species and habitats.

Energy Storage

Energy storage technologies — including batteries, pumped hydro, hydrogen, and other emerging technologies — are expected to play a significant role in helping balance the grid as the state implements SB 100. Storage can help bridge the gap between variable renewable generation and grid energy demands (a role played in large part by natural gas plants today) and provide ancillary services and capacity rapidly to support system stability and reliability.

Nearly all newly procured storage by the California utilities, as required by AB 2514, has been four-hour lithium-ion batteries, driven by rapid declines in battery costs.[127] Since 2010, lithium-ion battery costs have dropped by 90 percent and are expected to decline by another 40 percent by 2024.[128] Though lithium ion dominates the global storage market today, increasing demand is allowing competing technologies to enter the market — including advanced battery chemistries, flow batteries, flywheels, thermal energy storage, and other emerging technologies. This trend will be amplified as other states and nations pursue increasingly clean electric grids and electrify transportation.

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127 CPUC Energy Storage Web page, https://www.cpuc.ca.gov/General.aspx?id=3462.

128 BloombergNEF, Electric Vehicle Outlook presentation to CEC for the 2020 IEPR Update, June 11, 2020, slides 17 and 20. https://efiling.energy.ca.gov/GetDocument.aspx?tn=233410&DocumentContentId=65926.

One key area of innovation is in long-duration storage technologies. While there are 4.5 GW of pumped hydro energy storage in California, new longer-duration energy storage systems (for example, 100 or more hours of energy storage) are in the development phase and may be deployed within the next decade with the right market signals. Longer-duration storage technologies, such as advanced batteries, thermal energy storage, liquid air energy storage, and compressed air energy storage, can support reliability and further promote achievement of SB 100 goals.

Additional research and innovation will be important to address a range of outstanding issues, including increasing the cycling rate (number of cycles per day) of battery systems; ensuring reliability of systems over the lifetime of these systems; environmental issues associated with the manufacturing supply chain, including reliance on rare earth minerals; management of thermal runaway and fire potential at storage facilities; and end-of-life disposal and recycling of the battery (for example, some technologies rely upon toxic and extreme pH electrolyte materials). Through EPIC, the state is conducting research to advance storage technologies and better understand the storage needs for meeting SB 100.

Hydrogen

Hydrogen technologies — including as a storage resource, use in fuel cells, and direct combustion — can support the cost-effective implementation of SB 100 by integrating more intermittent renewables and providing flexible supply to balance the grid. Hydrogen may improve the economic efficiency of renewable investments and serve as carbon-free seasonal storage, supplying energy when renewable energy production is low and energy demand is high. A recent study by E3 by Mitsubishi Hitachi Power Systems estimates that the hydrogen market in California could be up to 10 GW by 2045, driven primarily by long-duration energy storage.[129]

Some challenges remain for wider adoption of hydrogen production, storage, and use as a direct source of electricity. Production costs are not cost-competitive with other sources of storage and generation, and additional infrastructure is needed to support the transportation and storage of hydrogen. Moreover, gas pipeline systems have been optimized to transport methane; therefore, introducing hydrogen at a large scale requires addressing regulatory and technical barriers that may persist in distributing hydrogen in the existing natural gas pipelines or developing a new hydrogen-specific distribution system. Continued market, policy, and research advances will be needed to propel technologies and strategies needed to overcome these challenges.

The Natural Gas Research and Development Program and the CEC's Clean Transportation Program are investing in hydrogen fueling infrastructure deployment and vehicle demonstration projects to accelerate market growth of fuel cell-electric vehicles.

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129 E3. Hydrogen Opportunities in a Low Carbon Future. June 2020. https://www.ethree.com/wp-content/uploads/2020/07/E3_MHPS_Hydrogen-in-the-West-Report_Final_June2020.pdf.

Growth in hydrogen demand from the transportation sector, particularly the heavy-duty sector, will assist in achieving scale in the electricity sector, which is necessary to reduce the costs in production and distribution. Furthermore, EPIC is researching the expanded use of hydrogen in the industrial processing and long-term energy storage markets.

Load Flexibility

Flexible load and other demand-side management technologies and strategies — across transportation, buildings, and industry — will be critical for cost-effective implementation of SB 100 and state electrification goals. Load flexibility enables grid balancing by temporarily aligning demand with the availability of preferred supply resources, including intermittent renewable generation and other zero-carbon resources. Load flexibility supports variable renewable electricity supply by providing fast-response flexible load substitutes for ancillary services. These functions will be increasingly important with greater deployment of variable renewables.

Several barriers constrain the growth of load flexibility. First, there are limited mechanisms to compensate for load flexibility in current utility programs and rate designs. Continued work is needed to create incentives commensurate with the value of load flexibility for the grid. The CEC has undertaken several initiatives to help accelerate load flexibility for reliability and meeting the state's environmental goals. The *2019 Building Energy Efficiency Standards*[130] require load-flexibility capability for battery storage and heat pump water heaters to obtain compliance credit. The 2020 Load Management Standards proceeding[131] will create a platform to enable greater automation of load flexibility. The AB 3232 *Building Decarbonization Assessment*[132] assesses the potential and value of load flexibility as a key strategy.

On October 14, 2020, the CEC approved an order instituting rulemaking for the flexible demand appliance standards and labeling requirements included in Senate Bill 49 (Skinner, Chapter 697, Statutes of 2019). Staff will be working throughout 2021 to develop a set of initial proposed flexible demand appliance standards based on a range of considerations relating to technology readiness, load-shifting potential, and estimated GHG emissions savings.

For many applications, the enabling technologies for load flexibility are still in the early development stages. For example, in the transportation space, smart charging and

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130 CEC 2019 Building Energy Efficiency Standards Web page, https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2019-building-energy-efficiency.

131 CEC 2020 Load Management Rulemaking Web page, https://www.energy.ca.gov/proceedings/energy-commission-proceedings/2020-load-management-rulemaking.

132 CEC Building Decarbonization Assessment Web page, https://www.energy.ca.gov/data-reports/reports/building-decarbonization-assessment.

bidirectional power flow technologies are largely precommercial, and continued development will improve the associated value proposition. Demand flexibility costs vary significantly by end use. Costs for a range of demand response applications and scenarios are discussed in Lawrence Berkeley National Laboratory's 2025 California Demand Response Potential Study.[133]

Through EPIC, the state is pursuing a wide array of load-flexibility research to further develop the needed technology, lower costs, and foundation for market growth. The CEC released a solicitation (GFO-19-309) in September 2020 to fund a California Flexible Load Research and Deployment hub to conduct R&D and deployment projects that increase the use and market adoption of advanced, interoperable, and flexible demand technologies.

Overall, state agencies can leverage research and development investments in technology innovation to help achieve SB 100 goals. This leveraging will require strategic and coordinated investment over the long term, with a focus on technologies, state incentives, and targeted regulations and strategies that augment or complement existing commercially available solutions.

Land-Use and Environmental Impacts

Natural and working lands are important to the state's climate change strategy because they sequester carbon and support clean air, wildlife and pollinator habitat, and rural economies. They are also critical components of the state's water infrastructure and can be a source and sink for GHG emissions. Keeping these lands and waters intact and functioning ecologically in the future is necessary to supporting the well-being and security of Californians and reducing conversion to intensified uses.

Because renewable and zero-carbon energy technologies often have large footprints and may require new supporting infrastructure to deliver power (for example, transmission), incorporating land use into planning is necessary to minimize adverse societal and environmental impacts and maximize potential environmental, health, and economic co-benefits.

It will be important to incorporate land-use planning into electric system planning to consider trade-offs between energy development and conservation of land for agricultural, natural lands, or housing. Several geospatial studies, such as NREL's GIS mapping of renewable energy resources,[134] have already screened for locations with high renewable energy resource potential in California. However, energy-planning processes have not yet been fully integrated

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133 Lawrence Berkeley National Laboratory. March 2017. *2025 California Demand Response Potential Study – Charting California's Demand Response Future: Final Report on Phase 2 Results*. https://eta-publications.lbl.gov/sites/default/files/lbnl-2001113.pdf.

134 National Renewable Energy Laboratory Geospatial Data Science Web page, https://www.nrel.gov/gis/.

with land conservation values to evaluate the environmental and system cost and benefit implications of clean energy policies and siting decisions.

As California considers the more ambitious renewable energy goals of SB 100, proactive landscape-scale planning can help identify opportunities for renewable energy facility and transmission development while reducing adverse effects. Landscape-scale planning considers a wide range of potential constraints and conflicts, including environmental sensitivity, conservation and other land uses, tribal cultural resources, and more when considering future renewable energy development. The benefits of using landscape-level approaches for renewable energy and transmission planning include early identification and resolution of large issues or barriers to development, coordinated agency permitting processes, increased transparency in decision making, increased collaboration, avoidance of impacts, and more rapid development of environmentally responsible renewable energy projects.

Planning should also reflect the Garamendi Principles,[135] encouraging strategies to maximize the use of the existing transmission system and existing rights-of-way before considering the expansion or creation of new rights-of-way. Such strategies include using advanced transmission technologies as well as siting supply resources in strategic locations.

California has already worked extensively with stakeholders and other agencies through science-based collaborative landscape planning processes in multiple geographic areas of the state with renewable energy potential. Previous planning efforts include the first and second Renewable Energy Transmission Initiatives[136] (RETI) processes, the joint agency work on the

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135 California Senate Bill 2431, Chapter 1457, declared that it is in the best interest of the state to conduct transmission siting according to the following principles ("Garamendi Principles"):

1. Encourage the use of existing right-of-way (ROW) by upgrading existing transmission facilities where technically and economically justifiable.
2. When construction of new transmission line is required, encourage expansion of existing ROW, when technically and economically feasible.
3. Provide for the creation of new ROW when justified by environmental, technical, or economic reasons as determined by the appropriate licensing agency.
4. Where there is a need to construct additional transmission capacity, seek agreement among all interested utilities on the efficient use of that capacity.

136 *Renewable Energy Transmission Initiative Phase 2A Final Report*, September 2019, available at: https://web.archive.org/web/20100330223729/http://www.energy.ca.gov/2009publications/RETI-1000-2009-001/RETI-1000-2009-001-F-REV2.PDF. *Renewable Energy Transmission Initiative 2.0 Final Plenary Report*, February 23, 2017, available at https://efiling.energy.ca.gov/getdocument.aspx?tn=216198.

Desert Renewable Energy Conservation Plan (DRECP),[137] and the stakeholder-led San Joaquin Valley Identification of Least-Conflict Lands study.[138]

Through these, federal and state agencies, local governments, tribes, and stakeholders have gained experience with planning approaches to identify the most appropriate areas for renewable energy development and long-term conservation. These planning efforts have also enabled the collection of environmental data and information into a single, publicly accessible portal, the California Statewide Energy Gateway.[139] This information supports science-based conservation planning, decision-making for renewable energy expansion, and future landscape-scale planning.

The CPUC's IRP process includes environment and land-use screens as part of capacity expansion modeling. The CEC then uses the land use and environmental information assembled from these landscape planning efforts to map selected resources to substation busbars for input to the California ISO's transmission modeling for the TPP. The CPUC's inclusion of land-use screens in the upcoming IRP cycle will also inform statewide land-use planning.

California's lands are naturally capable of sequestering huge amounts of carbon to limit climate change and are, therefore, a key component of meeting the state's carbon neutrality goals. Ongoing disturbances to natural and working lands such as severe wildfire, land degradation, and land conversion cause these landscapes to emit more carbon dioxide than they store. Policy in the electricity sector must be made with a clear understanding of the need to balance increased renewable energy demand with loss of ecosystem carbon storage and loss of future sequestration associated with large footprint energy resources such as utility-scale solar. California's climate objectives for natural and working lands are to maintain them as a resilient carbon sink (that is, net-zero or negative GHG emissions) and minimize the net GHG emissions associated with management, biomass disposal, and wildfires.

Moreover, Governor Newsom's Executive Order (N-82-20) requires the state to have a target for the natural and working lands sector in achieving California's carbon neutrality goal. The order directs state agencies to use strategies to maximize the full climate benefits of natural and working lands and sets a first-in-the-nation goal to conserve 30 percent of the state's land and coastal water by 2030 to fight species loss and ecosystem destruction.

In future assessments of land-use impacts, the joint agencies can draw from these efforts and experiences. As next steps, the joint agencies plan to review methods to include land-use

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137 CEC Desert Renewable Energy Conservation Plan Web page, https://www.energy.ca.gov/programs-and-topics/programs/desert-renewable-energy-conservation-plan.

138 See *A Path Forward: Identifying Least-Conflict Solar PV Development in California's San Joaquin Valley*. Available at : https://sjvp.databasin.org/pages/least-conflict.

139 Access the California Statewide Energy Gateway at: https://caenergy.databasin.org.

impacts in system modeling and assess needs to update previous land-use studies to reflect the increased resource requirements of SB 100. Future system modeling and land-use impacts must be coordinated with any recommendations from the Climate Smart Strategy called for in Executive Order N-82-20 and the AB 32 Scoping Plan.

Social Costs and Non-Energy Benefits

Another key area for further analysis is the inclusion of social costs and non-energy benefits (NEBs). For this report, community leaders and advocacy organizations[140] recommended the joint agencies consider an equity scenario that excludes combustion resources and includes social costs and NEBs.

The comment letter states that "social costs" are the negative externalities or impacts on society associated with the construction and operation of energy infrastructure and any associated activity, with a specific focus on localized public health impacts. Non-energy benefits (NEBs) represent the benefits or positive impacts on society associated with the construction and operation of energy infrastructure and any associated activity.

Stakeholders recommended the joint agencies integrate at least the following NEBs and social costs into SB 100 planning:

- Land-use impacts
- Public health and air quality
- Water supply and quality
- Economic impacts
- Resilience

As discussed in Chapter 3, the joint agencies included a study scenario that excludes all new and existing combustion resources in the modeling scope. Further refinement to localized air pollution impacts and the other NEBs listed above was not feasible in this round of modeling, partly because of the modeling tools used, unknowns about where generation resources will be located, and lack of higher resolution data on when and how specific resources will be used.

The joint agencies plan to continue engaging with the DACAG and other stakeholders to explore opportunities to better integrate these topics into future analyses. Land use is addressed in the preceding section, and further discussion on the other recommended NEBs is included below.

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140 Including the UC Berkeley Environmental Law Clinic, Central California Asthma Collaborative (CCAC), the Center on Race, Poverty & the Environment (CRPE), the Greenlining Institute, GRID Alternatives, Leadership Counsel for Justice and Accountability, Sierra Club California and the California Environmental Justice Alliance.

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State Efforts to Evaluate Social Costs

The joint agencies will explore the use of emerging cost analysis tools and methods that integrate social costs. Some of these new methods are being tested in active proceedings such as the CPUC's San Joaquin Valley Affordable Energy proceeding (R.15-03-010) to begin evaluating energy solutions with consideration of NEBs and social costs.

The CPUC is also performing Societal Cost Test modeling, as ordered by IDER D.19-05-019. This work includes changing RESOLVE assumptions to reflect a social discount rate, a social cost of carbon, and an air quality adder. A report that contains this analysis and select sensitivities will be released through the IRP in early 2021. The Public Health and Air Quality section below includes a preliminary social cost assessment for a subset of portfolios.

The joint agencies are monitoring the application of available tools and stakeholder input to determine if they are appropriate for SB 100-related analysis.

Preliminary Analysis on Avoided Social Costs of SB 100

For this report, CARB performed an initial assessment of the avoided social costs of carbon of the SB 100 Core Scenario relative to the 60 percent RPS Scenario (reference). Future assessments will build off this initial analysis and more thoroughly reflect state efforts to quantify social costs.

The social cost[141] of carbon (SC-CO_2) estimates the value of damages avoided by reducing GHGs. It is intended to provide a comprehensive measure of net damages — the monetized value of the net impacts — from global climate change that result from an additional ton of carbon dioxide (CO_2). These include changes in net agricultural productivity, energy use, human health, property damage from increased flood risk, as well as nonmarket damages, such as services that natural ecosystems provide to society. Many of these damages from CO_2 emissions today will affect economic outcomes throughout the next several centuries.[142]

Table 22 presents the range of SC-CO_2 values developed by the Council of Economic Advisors and the Office of Management and Budget-convened Interagency Working Group on the Social

141 "Social costs" are generally defined as the cost of an action on people, the environment, or society and are widely used to evaluate the impact of regulatory actions.

142 From The National Academies, Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide, 2017, available at https://www.nap.edu/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of.

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Cost of Greenhouse Gases (IWG)[143] and used in the *2017 California Climate Change Scoping Plan.*[144]

The SC-CO_2 increases over time as systems become stressed from the cumulative impacts of climate change, and future emissions cause incrementally larger damages. The SC-CO_2 is highly sensitive to the discount rate. Higher discount rates decrease the value today of future environmental damages, reflecting the trade-off of consumption today and future damages.

Table 22: Social Cost of CO2, 2015–2050 (in 2007 Dollars per Metric Ton CO2)

Year	5% Discount Rate	3% Discount Rate	2.5% Discount Rate
2015	$11	$36	$56
2020	$12	$42	$62
2025	$14	$46	$68
2030	$16	$50	$73
2035	$18	$55	$78
2040	$21	$60	$84
2045	$23	$64	$89
2050	$26	$69	$95

Source: CARB staff analysis

Table 23 shows the estimated avoided social costs of the SB 100 core scenario (high electrification demand) relative to the 60 percent RPS scenario. (See calculation details in Appendix C.)[145]

143 Originally titled the Interagency Working Group on the Social Cost of Carbon, the IWG was renamed in 2016.

144 U.S. EPA. The Social Cost of Carbon: Estimating the Benefits of Reducing Greenhouse Gas Emissions. Retrieved on November 19, 2020, from: https://19january2017snapshot.epa.gov/climatechange/social-cost-carbon_.html.

145 The 2045 values shown in **Table 23** were translated into 2016 dollars and multiplied by the differential between the GHG emissions associated with the two scenarios, as detailed in Chapter 3.

Table 23: Estimated Avoided Social Cost (Avoided Economic Damages) of SB 100 in 2045

Scenario	Social Cost of Carbon, $ million USD (2016 dollars) 5% Discount Rate	Social Cost of Carbon, $ million USD (2016 dollars) 3% Discount Rate	Social Cost of Carbon, $ million USD (2016 dollars) 2.5% Discount Rate
SB 100 Core Scenario relative to 60% RPS Scenario	$887	$2,470	$3,430

Source: CARB staff analysis

The SC-CO_2, while intended to be a comprehensive estimate of the damages caused by carbon globally, does not represent the cumulative cost of climate change and air pollution to society due to modeling and data limitations.[146] The joint agencies will continue engaging with experts to evaluate the comprehensive California-specific impacts of climate change and air pollution.

Public Health and Air Quality

The state's air quality and climate policies, strategies, and regulations strive to maximize public health protection through reducing respiratory, cardiovascular, and other chronic illnesses; reducing early deaths; and promoting healthier and more sustainable lifestyles in all communities. Despite decades of progress in improving air quality, California still suffers some of the worst air quality in the nation, resulting in more than 7,000 premature deaths and thousands of illnesses and emergency room visits each year.

The effects of climate change are already felt today in California. Climate change can impact human health through extreme weather events including drought, precipitation, floods, heat waves, and wildfires.[147] These climate impacts contribute to heat-related illnesses, increases in cardiovascular and respiratory illnesses, increased prevalence of asthma and allergies, increased water-borne and vector-borne diseases, adverse child and reproductive health

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146 Including costs associated with changes in copollutants and the social cost of other GHGs including methane and nitrous oxide.

147 (a) U.S. Global Change Research Program. 2018. *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* (Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart [eds.]). U.S. Global Change Research Program, Washington, D.C., United States of America. https://nca2018.globalchange.gov/. (b) World Health Organization. 2003. *Climate Change and Human Health, Risks and Responses*. Geneva, Switzerland. https://www.who.int/globalchange/publications/climchange.pdf. (c) NRDC. 2019. Climate Change and Health in California. https://www.nrdc.org/sites/default/files/climate-change-health-impacts-california-ib.pdf.

outcomes, and other effects. Climate change is already taking a toll on human health, and taking action to reduce greenhouse gas emissions is a necessity.

Power generated from fossil fuel combustion[148] also emits criteria air pollutants and related precursors, including oxides of nitrogen (NOx) and oxides of sulfur (SOx). While NOx and SOx are directly harmful, they are more impactful on health when they are converted to fine particles by chemical processes in the atmosphere. Fine particle pollution (that is, pollution from particulate matter with a diameter ≤2.5 μm, also known as $PM_{2.5}$) contributes to more fatalities than other air pollutants. Health effects from long-term exposure to fine particle pollution includes increased risk of heart attacks and heart disease, impaired lung development in children, the development and exacerbation of asthma, and premature death. U.S. EPA has determined that fine particles play a causal role in premature death from heart- and lung-related illnesses.[149]

Millions of California residents live in disadvantaged communities that experience a combination of increased vulnerability to adverse health effects from pollution and high levels of exposure to pollution sources. Research has demonstrated higher rates of illness and early death in disadvantaged communities.[150] For these residents, actions to transition from fossil fuel combustion are even more urgent.

Those individuals and communities that are at a social and financial disadvantage are also less able to deal with stresses caused by climate change such as high temperatures and wildfire damages, and they are more likely to suffer physical and psychological harm. Replacing fossil fuel-powered generation plants with clean electricity resources will reduce the burden on public health from air pollution and climate change and help address environmental justice disparities.

Quantifying Health Benefits of SB 100

To illustrate the potential quantified health benefits in 2045 from decreased $PM_{2.5}$ pollution linked to power plant emissions, CARB used a simplified version of its Incidence-Per-Ton (IPT)

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148 Power generation that uses conventional combustion technologies are typical sources of criteria air pollutant emissions; however, noncombustion thermal technologies can also emit criteria air pollutants.

149 U.S. EPA. September 2019. *Policy Assessment for the Review of the National Ambient Air Quality Standards for Particulate Matter, External Review Draft*. https://www.epa.gov/sites/production/files/2019-09/documents/draft_policy_assessment_for_pm_naaqs_09-05-2019.pdf.

150 (a) American Lung Association. 2020. *State of the Air*. https://www.stateoftheair.org/assets/SOTA-2020.pdf. (b) Union of Concerned Scientists, USA. January 28, 2019. *Inequitable Exposure to Air Pollution From Vehicles in California (2019)*. https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles-california-2019#ucs-report-downloads. (c) Cushing L., Faust J., August L. M., Cendak, R., Wieland, W., and Alexeeff, G. 2015. "Racial/Ethnic Disparities in Cumulative Environmental Health Impacts in California: Evidence From a Statewide Environmental Justice Screening Tool (CalEnviroScreen 1.1)." Am J Public Health 105(11): 2341–2348. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4605180/.

method, which evaluates the health endpoints of premature mortality, cardiopulmonary hospitalizations, and asthma emergency room (ER) visits.

Health impacts were estimated using California-specific relationships between emissions and air quality. This method is assumed to have an approximately linear relationship between changes in $PM_{2.5}$ emissions and health outcomes. CARB estimated the numbers of health outcomes by multiplying emissions by an incidents-per-ton scaling factor.[151] **Table** 24 summarizes these estimated health impacts for SB 100 at the statewide level for 2045. These are rough estimates using limited emission information and should not be taken as absolute values of the health outcomes of the 100 percent clean electricity policy. Further, this analysis does not attempt to quantify the improved health outcomes from reduction in greenhouse gases nor global climate change, as climate change mitigation requires global actions.

Table 24: Summary of Ranges of Estimated Health Impacts for the SB 100 Scenario in 2045

	Fewer Premature Deaths	Fewer Cardiopulmonary Hospitalizations	Fewer Asthma ER Visits
Primary $PM_{2.5}$	174 (136-213)	61 (8-114)	80 (50-109)

Source: CARB staff analysis. Numbers in parentheses represent the 95% confidence interval.

A more comprehensive analysis can use well-established methods that translate regional emissions reductions in criteria air pollutants into health outcomes.[152] Steps to further analyze the health impacts from criteria air pollution, specifically $PM_{2.5}$, include the following:

1. Estimate $PM_{2.5}$ emissions from power plants for at least two points in time, such as the current year and at full implementation of the SB 100 target in 2045. Key milestone years (for example, achievement of 60 percent renewables by 2030) may also be evaluated, as well as impacts in disadvantaged communities.
2. Use estimates of $PM_{2.5}$ emissions and exposures, together with an effect estimate, to quantify health impacts at the statewide or air basin level. The quantitative analysis should include updated ranges of estimated premature deaths, hospitalizations, and emergency room visits on a statewide basis, as well as cancer risk estimates if sufficient data are available.

151 These factors are derived from research studies showing the associations between the number of incidents (premature deaths, hospitalizations, emergency room visits) and exposure to PM2.5.

152 CARB 2019a, Fann et al. 2009, 2012. Fann, N., C. M. Fulcher and B. J. Hubbell (2009). "The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution." Air Qual Atmos Health 2(3): 169-176.

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Climate change impacts, such as extreme weather events, can also affect air quality and health. A more comprehensive analysis of health impacts and benefits may include factors related to climate impacts to yield a fuller picture of economic benefits.

Analysis of health impacts is closely connected to economic analysis: the monetized value of avoided illness and premature death provides a helpful measure of the health value of air pollution controls. According to U.S. EPA methodology, the current value of a statistical life (VSL) is nearly $10 million, so the cumulative health impacts of a regulation over decades can be substantial.[153]

As the energy sector continues to evolve and decarbonize, the behavior of facilities and the design of the grid will change, with important distributional effects. Some power plants may operate more flexibly to balance renewables, emerging technologies may become more prevalent, and aging facilities may be replaced. These trends will likely shift patterns of criteria pollutant emissions with local benefits and impacts. Because many existing power plants are in or near disadvantaged communities, it is important that this transition benefits those most burdened by pollution.[154]

Water Supply and Quality

The energy-water nexus is a critical juncture between energy production, environmental impacts, and dependence on water resources. The joint agencies' analysis of NEBs and social costs should therefore encompass energy resource impacts on water quality or quantity and impacts of water supply on the energy system.

Conserving fresh water and avoiding its wasteful use have long been state priorities, as reflected in the State Constitution[155] and state policies. A State Water Resources Control Board (Water Boards) resolution[156] protects beneficial uses of the state's water resources and keep the consumptive use of fresh water for power plant cooling to only essential levels. The policy reflects the state's concerns over discharges from power plant cooling, as well as the conservation of fresh water.

In response to concerns about power plants significantly impacting local water supplies, the CEC adopted a water policy in 2003 that calls for the use of alternative technologies and water sources. Since then, there has been a trend away from the use of fresh water for power plant

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153 National Center for Environmental Economics et al., *Appendix B: Mortality Risk Valuation Estimates, Guidelines for Preparing Economic Analyses* (EPA 240-R-10-001, Dec. 2010) available at https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-22.pdf.

154 California Health and Safety Code Section 38562(b)(2).

155 Article X, Section 2.

156 Resolution No. 75-58, Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling, June 19, 1975, https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/1975/rs75_058.pdf.

cooling compared to previous years, as well as increased use of recycled water, more efficient cooling technologies, dry cooling, and recycling of process wastewater through zero-liquid-discharge systems.[157]

Both solar PV and wind technologies can operate with essentially no water requirements, though PV facilities typically use some water for panel washing. However, because of size, all utility-scale renewable energy facilities can require large amounts of water during construction for dust control and soil grading. With sandy, dry, and windy conditions typical of the desert, where many projects are located (and where significant buildouts may be in the future), the amount of water used for construction can be considerable, especially considering limited water supplies available in many parts of the desert.

Water efficiency in California's electric generation sector will continue to improve as the fleet modernizes and natural gas-fired plants are run less often, recycled water sources are used preferentially, and renewables are deployed. However, given that a reliable supply of water will continue to be a key contributor to a reliable generation sector, it will be imperative for water quality and quantity impacts to be considered in planning and permitting processes.[158]

Economic Development and Impacts

SB 100 presents a significant opportunity for job creation and sustainable careers because of the expected record-setting resource build. While this report does not contain an analysis of local economic impacts or benefits, nor job creation associated with SB 100 implementation, these topics will be explored quantitatively and qualitatively in future SB 100 work.

The joint agencies will continue coordinating with the California Workforce Development Board (CWDB) to maximize alignment between SB 100 implementation and the state's efforts to ensure a just transition into the clean energy future and promote equity in the clean energy workforce. The CPUC has recently entered into an agreement with CWDB to draw upon CWDB's expertise to ensure the state has the workforce and industry-based training partnerships necessary to meet its clean energy goals.

The CWDB's new report titled *Putting California on the High Road: A Jobs and Climate Action Plan for 2030*[159] provides a vision to integrate economic and workforce development into climate policies and programs to help achieve California's major climate goals. The CWDB's report, developed following Assembly Bill 398 (E. Garcia, Chapter 135, Statutes of 2017),

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157 Even before adoption of the 2003 water policy, a good portion of California's steam-cycle facilities (combined-cycle, steam boiler, and geothermal) used recycled water for cooling.

158 For more detailed information on the energy-water nexus for California's electric generation system, see the CEC staff report *Final 2016 Environmental Performance Report of California's Electrical Generation System*.

159 UC Berkeley Labor Center. *Putting California on the High Road: A Jobs and Climate Action Plan for 2030*. June 2020. https://laborcenter.berkeley.edu/wp-content/uploads/2020/09/Putting-California-on-the-High-Road.pdf.

creates a framework for maximizing the positive labor market outcomes of California's climate investments by simultaneously advancing equity and economic mobility for Californians and delivering skills and competitiveness for California employers. Key takeaways from the report include the following:

- Labor should be considered an investment rather than a cost — and investments in growing, diversifying, and upskilling California's workforce can positively affect returns on climate mitigation. In other words, well-trained workers are key to delivering emissions reductions and moving California closer to its climate targets.
- California can achieve greater social equity in labor market outcomes for disadvantaged workers and communities when policy makers pay attention to job quality. Identifying high-quality careers (in other words, ones that offer family-supporting wages, employer-provided benefits, worker voice, and opportunities for advancement) first, and then building pathways up and into such careers, are critical to ensuring that investments in workforce education and training meaningfully improve workers' economic mobility.
- Deliberate policy interventions are necessary to advance job quality and social equity as California transitions to a carbon-neutral economy, just as such efforts are required to reduce pollution, protect human and environmental health, and safeguard communities from an already-changing climate.

DACAG's Equity Framework[160] serves as another guide in assessing local economic and workforce opportunities. The framework states, "Climate policies and programs should invest in a clean energy workforce by ensuring California has a trained and ready workforce prepared to improve our infrastructure and built environment as well as bring green technologies to market by:

- Promoting and funding workforce development pathways to high-quality careers in the construction and clean energy industries, including pre-apprenticeship and other training programs,
- Setting and tracking hiring targets for low-income, disadvantaged, and underrepresented populations (including women, re-entry, etc.) to enter these industries,
- Ensuring that these careers are high-road, with a career-ladder, family-sustaining wages and with benefits,
- Training the next generation of climate leaders and workers for the clean energy economy, and
- Supporting small and diverse business development and contracting."

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160 CPUC. Disadvantaged Communities Advisory Group Equity Framework, available at https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/DAC%20AG%20Equity%20Framework%20(Revised).pdf.

The road to economic recovery is even more critical now that the COVID-19 pandemic has hit the entire country. People of color are disproportionately impacted by the economic downturn resulting from the pandemic and are overrepresented in nonessential, low-wage jobs.[161] The clean energy economy represents a unique opportunity to focus workforce development efforts in disadvantaged communities. Creating clean jobs and careers with growth potential can help accelerate the economic rebuilding for workers, families, and the greater economy.

Community Resilience

The Governor's Office of Planning and Research defines resilience as "...the capacity of any entity — an individual, a community, an organization, or a natural system — to prepare for disruptions, to recover from shocks and stresses, and adapt and grow from a disruptive experience."[162] Future investments in electric generation, storage, distribution, and transmission facilities must be designed and operated with reliability and resilience in mind to account for a changing climate. In particular, planning for and developing these facilities require an understanding of the challenges posed by increasing wildfire risk, extreme heat, and other effects of climate change. This planning is especially important as the electric grid expands to serve additional end uses, such as transportation.

Resilience to climate impacts is a priority in state policy and program design and implementation. Several state agencies, including the CEC and Strategic Growth Council, administer grant programs focused on improving local resilience to climate impacts. These grants have enabled cities to develop local adaptation plans that consider regional climate threats and identify regionally relevant adaptation strategies. Local adaptation planning may benefit from more refined results from the SB 100 and related proceedings on the resource mix and likely location and operation of resources. A more detailed discussion of electricity system resilience and planning for climate impacts is included later in this chapter.

Accelerating SB 100 Implementation

This report includes study scenarios in which the 100 percent renewable and zero-carbon target is accelerated to 2030, 2035, and 2040. While preliminary modeling results suggest accelerating the implementation timeline of the SB 100 target is technically achievable, these scenarios are exploratory and require more rigorous analysis.

Notably, the accelerated timelines resulted in additional economic gas retirements, increased selection of geothermal resources, and decreased selection of solar and battery storage. These results suggest accelerated implementation could affect the overall 2045 resource portfolio.

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161 PolicyLink. "Race, Risk, and Workforce Equity in the Coronavirus Economy." June 2020. https://www.policylink.org/our-work/economy/national-equity-atlas/COVID-workforce.

162 Governor's Office of Planning and Research. 2018. *Planning and Investing for a Resilient California: A Guidebook for State Agencies*. https://opr.ca.gov/docs/20180313-Building_a_Resilient_CA.pdf.

Each accelerated timeline scenario results in increased annual costs compared to the SB 100 Core scenario. In general, the TRC increases in the year in which the 100 percent target is accelerated but largely levels off by 2045. For example, in the 2030 accelerated scenario, the 2045 TRC is less than a 1 percent increase over the SB 100 core scenario. Total cumulative cost differences between these scenarios have not been evaluated.

The joint agencies plan to continue analysis of the 2030, 2035, and 2040 scenarios in the 2025 SB 100 report analyses. In the meantime, the CPUC, in the IRP process, will continue to evaluate requiring load-serving entities to meet reduced GHG emission targets within the range set by CARB. These processes will be done in collaboration with CEC and may support opportunities to accelerate progress toward the SB 100 goal.

Additional Considerations for Implementation

As the joint agencies produce more refined analysis of the SB 100 scenarios, additional factors must be considered in planning for SB 100 implementation and coordination with complementary proceedings and programs.

Equity

As stated by the DACAG, "The impact of climate change on low-income and disadvantaged communities can exacerbate existing inequities but can also be an opportunity to level the playing field through intentional interventions that address climate impacts on these communities directly." In 2018, the DACAG developed an Equity Framework to guide the CEC and CPUC along with other state agencies to help ensure equity is kept "front and center" during all phases of policy design and implementation of clean energy such as SB 100.[163] The Equity Framework includes the following components:

- Health and safety
- Access and education
- Financial benefits
- Economic development
- Consumer protection

Future SB 100 work will consider this framework and other recommendations made by equity experts and community leaders throughout the process, including the AB 32 Environmental Justice Advisory Committee, to benefit communities in a meaningful and measurable way. The Equity Framework priorities will be considered as part of the continued efforts of SB 100, including program design, modeling, analysis, implementation, and evaluation. In addition, AB

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163 CPUC, Disadvantaged Communities Advisory Group Equity Framework, available at https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/Infrastructure/DC/DAC%20AG%20Equity%20Framework%20(Revised).pdf.

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617 Community Emissions Reduction Plans provide a resource for actions that will achieve air pollution emission and exposure reductions within disproportionately impacted communities and are tailored to address the communities' air quality priorities.

The joint agencies conducted ongoing engagement with equity stakeholders throughout the development of the 2021 Report, and plan to have continued engagement with the DACAG's SB 100 subcommittee and other stakeholders to further refine the agencies' approach to equity in SB 100 implementation.

Affordability

Meeting the SB 100 2045 target will likely require substantial new investments in the electric system, which may have impacts on electricity rates for consumers. Under some emissions reduction scenarios, modeling conducted for this report indicates that the state's installed electric generation capacity may grow from about 85,000 MW today to between 227,000 MW and 301,000 MW in 2045 — roughly a threefold increase in capacity. As the transportation, buildings, and industrial sectors deploy low-carbon technologies to meet the state's long-term climate goals, they will likely rely more on the electricity sector, which will increase load and customer sensitivity to rates. Maintaining affordable electricity rates is critical to successful achievement of the state's GHG targets across sectors.

As mentioned in Chapter 3, the 2021 Report analysis results provide rough estimates of system costs associated with the various scenarios. However, further analysis is required to better understand how these costs will be factored into rates that directly affect consumers. The modeling does not take into account important factors including costs associated with build-out to maintain local reliability and system hardening efforts for improved system resilience to wildfires and other climate threats.

Through proceeding (R.18-07-006), the CPUC aims to better understand and define affordability for residential utility customers within California. This proceeding has primarily analyzed metrics that may be used to compare affordability as rates change. However, a baseline threshold to determine when something is or is not affordable has not yet been established, and the CPUC continues to assess appropriate methods to do so.

The decision adopted in the first phase of the proceeding defines affordability as "the degree to which a representative household is able to pay for an essential utility service charge, given its socioeconomic status."[164] The decision also adopted three metrics to compare and assess affordability:

> **Household affordability ratio**: a ratio that sums the expected cost for three utility services (energy, telecommunication, and water services — together, these are deemed "essential utility services") and divides them by a household's income less total housing

164 California Public Utilities Commission. *Decision Adopting Metrics and Methodologies for Assessing the Relative Affordability of Utility Service*. July 16, 2020. https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M344/K049/344049206.PDF.

costs. This ratio provides a percentage for how much a household spends of its nonhousing budget on utilities.

Socioeconomic vulnerability index: a 100-point scale that can be used to compare one census tract area to another. The metric is a composite of five socioeconomic indicators that are components of California Office of Environmental Health Hazard Assessment's CalEnviroScreen: educational attainment, housing burden, linguistic isolation, poverty, and unemployment.[165] This metric provides an index that is independent of essential service charges. It answers the question: "What is the underlying socioeconomic vulnerability of a given geography?"

Hours at minimum wage: a statistic based on the estimated total cost for the essential utility services of energy, telecommunication, and water. This total is then compared to the minimum wage for a given locality. The number of hours of minimum wage needed to afford essential utility service is then calculated by dividing the total utility cost by the minimum wage value.

Taken together, these various metrics allow the utility to understand how rate changes may affect affordability for different regions and communities.

Implementing SB 100 with a focus on equity will require statewide focus on energy affordability with an emphasis on vulnerable populations and households in areas of the state that spend a disproportionately high share of their household income on energy. This focus underscores the importance of managing overall energy costs and engaging in thoughtful ratemaking to avoid large price spikes for vulnerable households, and integrated program implementation whereby grants and other targeted programming can be directed toward households that face affordability challenges.

Safety

In the last decade, California has experienced the challenges of safely operating the electric infrastructure that is built to serve high fire-threat areas of the state, and the consequences of underinvestment in the safety of gas storage, transmission, and distribution. California is grappling with how to prioritize the mitigation of numerous new risks associated with electric and gas infrastructure and how to pay for the mitigation. All these present-day safety challenges must be considered in long-term planning to meet the goals of SB 100.

To support the goals of SB 100, some existing energy infrastructure will need maintenance, hardening, repurposing, upgrades, or retirement. Similarly, newly constructed infrastructure under the given scenarios and patterns of the buildout must be capable of safe operation.

The areas of safety that will need to be considered in such analyses include:

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165 California Office of Environmental Health Hazard Assessment. CalEnviroScreen 3.0 (Updated June 2018) Web page. https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30.

- Safety in the planning, engineering, construction, operation, and maintenance of the electric, natural gas, biofuel, and hydrogen infrastructure and resources depending on the scenario and pattern of the buildout,
- Safety of workers, customers, and the public.

The CPUC and IOUs must engage in an ongoing assessment of risks and a prioritization of how to address those risks, including how to pay for the costs of mitigation. The risk mitigation strategies related to electric infrastructure being implemented and considered today include:

- System hardening.
- Undergrounding or covered conductors.
- Vegetation management and right-of-way (ROW) management to effectively protect the environment.
- Weather forecasting to develop situational awareness.
- Appropriate retirement schedules given changing climate conditions to ease safe transition.
- New and adaptive infrastructure proposals using California's climate change forecasts in the Fourth Climate Assessment and the forthcoming Fifth Climate Assessment.
- Upgrade transmission and distribution switching protocols to safely and reliably operate the transmission and distribution systems in an islanding mode and/or develop microgrids to minimize the impact of power shut-offs or to avoid the power shut-offs to end users at all.
- Public safety power shutoffs (PSPS) as the last resort.

The CPUC and gas utilities must similarly engage in an ongoing assessment of risks and prioritization of how to address those risks. California's natural gas infrastructure faces an additional layer of complexity under the goals of SB 100: fossil-based gas could be phased out over the long term, but the infrastructure used by the fossil-based gas energy may still be needed if the state embarks on a pathway that includes biofuels energy or hydrogen energy.

These challenges highlight the importance of assessing public safety within the context of 2045 scenario planning. While each scenario with different buildout patterns will present its own unique challenges, the state has a responsibility to ensure this transition and the services provided by new resources and infrastructure occur in a safe, reliable manner — minimizing risk as much as possible and maintaining public safety. State planners should seek to better understand the current state of energy sector public safety in California, identify approaches to decarbonization that enhance public safety, and recommend how to formally incorporate public safety into long-term planning and the road map to the goal of 100 percent clean electricity.

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Electric System Resilience

Assessing Climate Impacts

The electric grid must now be designed and operated to be resilient, especially as changing climate causes more unpredictable and extreme weather events. Already, climate change-induced extreme weather events, such as wildfires and heat waves, are affecting the ability of the grid to provide continuous power to customers.

In the last few years, California's grid experienced considerable challenges from wildfires, which resulted in a greater application of public safety power shutoffs (PSPS) — in which California investor-owned utilities (IOUs) turn off power off in areas high winds and dry conditions to reduce the risk of the electric utility infrastructure starting wildfires. While PSPS events are an important tool to reduce the risk of catastrophic wildfires, the duration and frequency of the PSPS events posed challenges to communities and customers who rely on essential services. Moreover, the extreme heat events that occurred in 2020 resulted in rolling blackouts over two days in August and the threat of additional rolling blackouts later in August and again in September, which the state has not experienced since the California Electricity Crisis of 2000–2001.

Cost-effective achievement of SB 100 goals requires that investments in electricity generation and integration technologies and infrastructure consider how climate change may alter the geographic and temporal distribution of renewable energy resources and other impacts to electric infrastructure. Examples of such changes include:

- **Hydropower availability** — Summertime hydroelectric generation, which has historically provided an important renewable resource for meeting peak demand, depends upon spring and summer snowmelt, which is projected to decline substantially within this century.[166] Without additional innovation or cost reductions in zero-carbon dispatchable resources, increased variability in hydropower supplies could induce greater reliance on dispatchable fossil resources.
- **Wind and solar resources** — Climate impacts such as warmer temperatures and changes in wind patterns may alter the output of solar and wind resources.[167] The CEC is supporting research to better understand possible impacts, including one such

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166 Pierce, D. W., J. F. Kalansky, and D. R. Cayan, (Scripps Institution of Oceanography). 2018. *Climate, Drought, and Sea Level Rise Scenarios for the Fourth California Climate Assessment*. California Energy Commission. Publication Number: CNRA-CEC-2018-006. https://www.energy.ca.gov/sites/default/files/2019-11/Projections_CCCA4-CEC-2018-006_ADA.pdf.

167 U.S. Department of Energy. *Climate Change and the Electricity Sector: Guide for Climate Change Resilience Planning*. September 2016. https://www.energy.gov/sites/prod/files/2016/10/f33/Climate%20Change%20and%20the%20Electricity%20Sector%20Guide%20for%20Climate%20Change%20Resilience%20Planning%20September%202016_0.pdf.

project[168] that aims to develop methods to improve projections of climate-related parameters that govern availability and distribution of solar and wind resources, with a focus on surface-level solar radiation and hub-height wind fields.

- **Water-energy nexus** — The intensity of drought conditions could impact the availability of water needed for cooling associated with certain renewable energy technologies, such as solar thermal and geothermal power plants.[169] Further, drought exacerbated by higher temperatures increases demand on groundwater supplies, which in turn requires substantial energy for pumping. For example, during California's 2011–2015 drought, farmers' increased reliance on groundwater supplies roughly doubled their energy consumption compared to predrought conditions.[170]
- **Extreme Heat** — Heat waves increase cooling loads, which in extreme cases can lead to supply shortages, such as those experienced in August 2020. Extreme heat can also compromise the performance and accelerate the degradation of generation, transmission, and distribution infrastructure. This strain can also precipitate local power outages, such as occurred in July 2018 when a Southern California heat wave led to more than 700 power outages that affected more than 80,000 customers.[171]
- **Wildfire Risk** — Wildfires can directly damage transmission and distribution systems, and associated ash can also impact performance of nearby solar generation. Further, windy and dry weather conditions raise the risk of fire ignitions from utility infrastructure and indirectly result in planned power shutoffs to protect public safety, such as the series of shutoffs in fall of 2019 and 2020 that have affected millions of Californians.

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168 EPIC-funded grant EPC-16-063 titled "Advanced Statistical-Dynamical Downscaling Methods and Products for California Electricity System Climate Planning." For more information, see the February 2018 *Electric Program Investment Charge 2017 Annual Report* (California Energy Commission Publication Number CEC-500-2018-005, available at http://web.archive.org/web/20181202000310/https://www.energy.ca.gov/2018publications/CEC-500-2018-005/CEC-500-2018-005-CMF.pdf.)

169 Tarroja, Brian (et al.), University of California, Irvine. 2019. *Building a Climate Change Resilient Electricity System for Meeting California's Energy and Environmental Goals*. California Energy Commission. Publication Number: CEC-500-2019-015. https://ww2.energy.ca.gov/2019publications/CEC-500-2019-015/CEC-500-2019-015.pdf.

170 Public Policy Institute of California (PPIC). October 2016. "Energy and water use in California are interconnected." https://www.ppic.org/content/pubs/report/R_1016AER.pdf.

171 Los Angeles Department of Water and Power. July 9, 2018. Weekend of July 6, 2018 Heat Storm Related Power Outages and Response. https://s3-us-west-2.amazonaws.com/ladwp-jtti/wp-content/uploads/sites/3/2018/07/11114410/July-2018-Heat-Storm-Outage-Event-Summary-071118.pdf.

- **Sea-Level Rise** — Climate change-driven tidal inundation, flooding, and erosion increase the risk of physical damage and disruption to coastal substations, transformers, power lines, and other equipment.[172]
- **Out-of-state resources** — Furthermore, the state needs to consider the impacts of climate change on the availability of real-time imports to balance the grid. For example, westwide heat waves, such as the one experienced in August 2020, can result in short-term impacts to the availability of imports as cooling loads can drive sustained energy demand over a large geographic region.

State agencies are working to better understand these impacts and incorporate the latest research into energy planning efforts. Through EPIC, the CEC is advancing the next generation of climate projections and analytics to develop decision-relevant parameters for state agencies and energy sector stakeholders. State-funded climate research has also informed the state's Climate Change Assessments, which provide a scientific foundation for understanding climate-related vulnerabilities. California's Fifth Climate Change Assessment is anticipated for release before the 2025 SB 100 update.

Through its ongoing climate adaptation rulemaking (R.18.04-019), the CPUC has directed the IOUs to develop vulnerability assessments every four years, including anticipated climate change impacts to utility operations, services, and assets, over a 20–30-year horizon. The IOUs will also provide options to address identified vulnerabilities. A key part of the IOUs' development of the vulnerability assessment is deep engagement with disadvantaged vulnerable communities.

Microgrids to Support Resilience

In addition to taking steps to better understand worsening climate impacts to the electric system, state agencies are exploring options for backup power when there are disruptions to the grid. Clean energy microgrids have emerged an important alternative to fossil fuel backup generators, which degrade air quality and emit greenhouse gases. However, like all backup power solutions, clean energy microgrids have limitations, particularly in how long they can keep the power on and the associated relatively high cost. State efforts[173] are underway to

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172 Bruzgul, Judsen, Robert Kay, Andy Petrow, Tommy Hendrickson, Beth Rodehorst, David Revell, Maya Bruguera, Dan Moreno, Ken Collison. (ICF and Revell Coastal). 2018. *Rising Seas and Electricity Infrastructure: Potential Impacts and Adaptation Actions for San Diego Gas & Electric*. California's Fourth Climate Change Assessment, California Energy Commission. Publication Number: CCCA4-CEC- 2018-004. https://www.energy.ca.gov/sites/default/files/2019-11/Energy_CCCA4-CEC-2018-004_ADA.pdf.

173 Through EPIC, the CEC has awarded more than $90 million grants to fund nearly 45 microgrid projects across a diverse range of applications. The CEC's *2020 IEPR Update* (planned for release in early 2021) will outline key findings from the state's microgrid research efforts. Through Rulemaking 19-09-009, the CPUC is

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explore technological and economic improvements to microgrids and assess the strategic deployment of microgrids as a resilience asset.

Addressing Barriers to Project Development

The initial SB 100 analysis indicates that several resources that have lengthy permitting requirements or development times will be necessary to meet the SB 100 2045 target of 100 percent clean electricity. Offshore wind, long-duration storage, and resources dependent on new transmission, such as out-of-state wind, require significant time between the initial identification of need and interconnection. All these resources may require up to 10 years from permitting to completion. Furthermore, large, long lead-time projects may require multiple off-takers because of the necessary size of the project.

New transmission will also be necessary to achieve the large resource builds needed to meet the SB 100 goals. While California has historically taken a proactive approach to transmission planning for renewable energy goals, it will be necessary to continue to identify appropriate development sites years in advance of when resources will be needed. One key challenge with transmission development is aligning planning between relevant entities. SB 100 is a state energy policy, but project implementation is a local process and must address local resource values. Today, most of California's local jurisdictions are not equipped with plans achieve the state's energy goals. To reach 100 percent clean electricity by 2045, a unified planning process for developing utility-scale energy projects and the respective transmission lines must be considered.

Collaboration Across Western States

As described in Chapter 1, California is part of a larger integrated electricity system in the western United States called the Western Interconnection, which includes all or parts of 14 western states as well as Alberta, British Columbia, and Baja California. Regional coordination is a key component of California's strategy to realize its renewable energy and GHG emission reduction goals. With other states in the West also adopting higher clean energy goals or standards,[174] opportunities exist for increased coordination and market development that can take advantage of the geographic diversity of loads and resources

Coordination offers significant potential to ease importation and integration of additional renewable energy facilities in regions where resource attributes match or complement California's seasonal and daily operational needs. Much of this coordination follows naturally

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assessing microgrid-related actions to reduce the impact of outages associated with public safety power shutoffs or unplanned grid failures. In the longer term, the rulemaking will consider a wider range of microgrid and resilience issues.

174 For details on states with clean energy or renewable goals or standards, see the Link to the Center for Climate and Energy Solutions State Climate Policy Maps Web page (https://www.c2es.org/content/state-climate-policy/) or the Clean Energy States Alliance (CESA) 100% Clean Energy Collaborative Web page (https://www.cesa.org/projects/100-clean-energy-collaborative/table-of-100-clean-energy-states/).

from peak load diversification; the Northwest peaks in winter, and the rest of the West in summer, allowing each region to rely on the other for a share of its seasonal peak capacity needs. Regional coordination also provides for geographic diversification in renewable energy, allowing for more consistent supply.

The Western Energy Imbalance Market (EIM) serves as the primary platform for interstate coordination across the west. The EIM (described in more detail in Chapter 1) is a real-time wholesale energy trading market that enables participants anywhere in the West to buy and sell energy when needed. This market has proven successful in producing cost savings and reducing renewables curtailment for all Western participants. For instance, when one utility area has excess hydroelectric, solar or wind power, the market optimizes delivery to market participants within the EIM footprint to help meet demands that would otherwise be met by more expensive — and less clean — energy resources.

There are opportunities to build on the success of the EIM and unlock additional benefits associated with increased regional coordination. As successful and valuable as the real-time EIM has been, it is only the tip of the iceberg to unlocking the potential benefits associated with increased regional coordination. There is growing interest in extending the California ISO's day-ahead market to include Western EIM entities on a voluntary basis. To that end, the California ISO launched its Extended Day-Ahead Market (EDAM) Initiative to develop an approach to extend participation in the day-ahead market to EIM entities. The EDAM initiative, which is still in its early stages, would aim to improve renewable integration and market efficiency through day-ahead scheduling and unit commitment across a larger area.

California's continued engagement with regional entities — including the Western Electricity Coordinating Council, Western Interstate Energy Board, Western Interconnection Regional Advisory Board, and Western Governors' Association — is critical to ensuring that California's energy policies and interests are represented in efforts related to reliability, transmission planning, market development, and other issues of interest to states and provinces in the West.

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CHAPTER 5: Recommendations

Following the results of the 2021 Report analysis and comments from stakeholders and the public, the joint agencies propose key recommendations for near- and medium-term actions to support the implementation of SB 100 and inform long-term planning. The recommendations highlight areas for further analysis and additional actions to support the successful implementation of the 100 percent policy. For further discussion on these topics, please refer to Chapter 4.

This report does not contain specific recommendations for guidelines and compliance related to a 100 percent clean electricity program. Instead, the joint agencies pose the following for consideration as part of the ongoing efforts that agencies undertake, both in the context of future SB 100 reports and in other existing planning processes, to plan for a 100 percent renewable and zero-carbon electricity grid. Separately and in parallel, the CPUC will also continue to analyze the 2045 goal in its ongoing IRP modeling so that decisions about near-to-medium term portfolio selection and GHG target setting can be informed by the long-term needs of SB 100.

Areas for Further Study in the 2025 SB 100 Report

1. **Perform a comprehensive reliability assessment as the next step in the modeling process.**

   The analytical portion of this report includes capacity expansion modeling, which provides possible resource portfolios that meet the requirements of SB 100. The next step in this process is to perform additional modeling to ensure the projected portfolios meet system reliability requirements. This modeling may be an iterative process to arrive at resource portfolios that meet all requirements. The CEC and CPUC recommend using deterministic production cost modeling to assess operability across all hours of a selected modeled year or years, as well as probabilistic production cost modeling to assess system reliability through metrics such as loss of load probability.

   This step could be completed as part of the 2025 SB 100 Report, or possibly through existing state efforts. The CEC and CPUC are assessing resource availability to complete this modeling ahead of the next report. The joint agencies will continue to consult with the California balancing authorities when developing the tools and metrics for this analysis to best represent their respective areas.

2. **Continue to assess the role and impacts of emerging technologies and nongeneration resources.**

   Modeling inputs and assumptions should be updated in future analyses to reflect market changes in existing and emerging technologies, including changes in price, the

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commercialization of new technologies, and updates to total resource potential. Furthermore, the joint agencies should continue to evaluate and consider ways to better assess the impacts of less-proven technologies that could have a significant impact to a 2045 resource mix and total cost. This work will build off the "generic" zero-carbon firm resources included in the study scenarios to explore the projected impact of technologies that can achieve specific price milestones. These technologies could include green hydrogen combustion, lower-cost geothermal resources, and gas with carbon capture and sequestration (CCS), among other emerging technologies.

Similarly, future modeling should aim to capture the value of hybrid resources and key nongeneration resources, such as long-duration energy storage, behind-the-meter energy storage, and demand flexibility, which can significantly alter the generation capacity needs in 2045.

3. **Analyze projected land-use impacts of scenarios and opportunities to address environmental impacts.**

   Work to better quantify the carbon stored in natural and working lands is continuing across state agencies, but given the long timelines to change landscapes, actions to manage, restore, and conserve these lands must be incorporated into electricity land-use planning to complement climate measures. Closer collaboration with other state agencies, tribal governments, local and regional jurisdictions, and stakeholders to plan for development will be important to balance the clean electric grid infrastructure needs of the built environment while supporting and investing in efforts to restore, conserve, and strengthen natural and working lands.

   The CEC is developing tools to assess the total land area required to implement SB 100 and the potential areas across the state where new resources could be located. This work can expand to understand how land use impacts vary across scenarios, assess the relative environmental impacts in different areas, and identify strategies to avoid or mitigate environmental impacts and maximize environmental cobenefits. The CPUC's inclusion of land-use screens in the upcoming IRP cycle will also inform state-wide land-use planning.

4. **Define and include social costs and non-energy benefits (NEBs) in future analyses.**

   The joint agencies will continue evaluating available modeling tools and metrics to capture non-energy benefits and social costs in future SB 100 analyses. Stakeholders including the DACAG and environmental justice, equity, and health organizations representing communities throughout the state recommended the inclusion of at least the following NEBs and social costs, which will be included as appropriate:

   - Land-use impacts
   - Public health and air quality

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- Water supply and quality
- Economic impacts
- Resilience

The modeling tools used for the analysis in this report do not provide information regarding where generation resources will be located nor data on when and how specific resources will be used. This higher-resolution information needed to meaningfully address the topics above, requires using additional tools and metrics to better understand localized impacts of the 100 percent policy. To this end, the joint agencies plan to continue engaging with the DACAG SB 100 subcommittee and other stakeholders to explore opportunities to better integrate these topics into future analyses. CARB has also already begun work to assess local air pollution impacts associated with climate action. The 2022 Scoping Plan Update will include quantified benefits associated with climate action, specifically less combustion of fossil fuels.

5. **Continue to study opportunities and impacts related to achieving the 100 percent clean electricity target prior to 2045.**

   The joint agencies plan to continue analysis of the 2030, 2035, and 2040 scenarios in future SB 100 report analyses.

Process and Engagement for SB 100 Reports

6. **Convene an annual joint-agency SB 100 workshop in years between reports.**

   Hosting an annual workshop will support alignment between agencies on relevant topics and proceedings and enhance continuity between SB 100 reports. These workshops will also provide an opportunity for joint agency leadership and staff to hear from stakeholders and the public on topics related to SB 100 progress.

7. **Align future SB 100 planning with findings and outcomes from relevant state efforts.**

   The joint agencies aim to incorporate findings and outcomes from other relevant efforts in future SB 100 reports. Relevant efforts include:

   - The CEC's energy demand forecasts, including electrification trends and updates for extreme climate event planning.
   - Transmission planning and development.
   - Reliability planning, including possible updates to resource adequacy requirements.
   - Electric system resilience planning.
   - Assessments from CPUC's Integrated Resource Planning, CEC's Integrated Energy Policy Report, and CARB's Scoping Plan.

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8. **Consult with advisory groups to guide equitable planning and implementation.**

   For the 2021 Report, the joint agencies engaged with the DACAG, the advisory body to the CEC and CPUC on clean energy matters, through its SB 100 subcommittee, and other environmental justice, health and equity stakeholders. These groups provided valuable input on the scope of the report, key findings, and considerations for ongoing analyses.

   For the 2025 SB 100 Report, the joint agencies plan to continue collaborating with the DACAG and other equity stakeholders, as well as the Environmental Justice Advisory Committee (EJAC), CARB's advisory body on climate change efforts. DACAG and EJAC are essential liaisons that should convene and coordinate to help ensure SB 100-related efforts benefit all Californians, particularly those in disadvantaged and low-income communities.

9. **Retain and expand upon best practices for community outreach and accessibility.**

   The joint agencies worked to ensure broad access to the 2021 Report process by holding workshops across the state; conducting significant outreach by phone, email listservs, and social media; and offering remote attendance options for all workshops. For future SB 100 reports (every four years), the agencies will retain these best practices while exploring additional methods to maximize participation and access to meeting information and materials for California residents. Specific best practices and recommendations for development of future SB 100 reports include the following:

   - Continue to host workshops in different sites throughout the state to engage with more geographically diverse communities.
   - Continue to promote outreach to state legislators and their constituents, particularly around meetings held in their districts.
   - Build closer partnerships with local governments on workshop outreach and continue to find meeting sites that are trusted and accessible to communities, such as spaces frequently used by community-based organizations and residents.
   - Broaden engagement with tribal governments, particularly on efforts related to land-use planning.
   - Continue to use accessible virtual platforms for all meetings, including those with an in-person attendance option and tailor workshops to accommodate community logistical needs.

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Supporting Achievement of the 100 Percent Target

10. **Continue state support for research and innovation in clean energy technologies.**

    While the SB 100 target is achievable with existing technologies, continued investments in research and innovation can accelerate technology performance and cost improvements that can make progress easier and faster and reduce costs to electricity ratepayers. The Electric Program Investment Charge (EPIC) — California's flagship electricity R&D program — invests $130 million annually to support the development of emerging clean energy technologies. In August 2020, the CPUC reauthorized EPIC for another $1.5 billion over the next decade.

    Moving forward, EPIC will continue to catalyze advancements to support the cost-effective implementation of SB 100 in areas including renewable and zero-carbon generation, long-duration energy storage, energy efficiency, and load flexibility. Further, the EPIC-funded California Energy Innovation Ecosystem connects clean energy entrepreneurs with the funding, training, resources, and expertise needed to help turn concepts into products that benefit consumers, companies, and utilities. This ongoing collaboration with cleantech incubators, research labs, and private investment firms will be critical to best leverage state funding in innovation.

11. **Continue to prioritize energy efficiency and load flexibility to minimize total implementation costs.**

    In 2003, the state established a loading order policy that directs that California's energy demands be met first by efficiency and demand response before new generation is considered. Prioritizing cost-effective energy efficiency and load flexibility measures remains critical as the state moves toward a 100 percent clean electricity future. Taking steps to reduce energy demand can offset the need for additional generation capacity, saving Californians money, while reducing land use and other environmental impacts associated with the construction of new facilities.

12. **Identify and address bottlenecks in project permitting and development.**

    Numerous stakeholders highlighted barriers that can slow planning and construction of projects, such as permitting delays and long lead times for transmission projects. Because SB 100 implementation will require sustained record-setting construction rates, these barriers need to be addressed early and comprehensively. The CEC and CPUC should engage with stakeholders — including developers, utilities, balancing authorities, local governments, and community organizations — to better understand the specific barriers to project development and advance strategies to address them.

13. **Promote workforce development programs that focus on high-quality job creation.**

    Implementation of SB 100 creates a significant opportunity to support California companies, benefit local economies, and create family-sustaining jobs while optimizing

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climate outcomes. The joint agencies should continue collaborating with the California Workforce Development Board (CWDB) and other stakeholders to identify strategies and best practices to support an equitable clean energy workforce and high-quality job creation. The agencies can also seek the expertise of the DACAG's workforce subcommittee. As a starting point, the joint agencies shall consider the takeaways from the CWDB's 2020 report, *Putting California on the High Road*,[175] including the following:

- Labor should be considered an investment rather than a cost, as well-trained workers are key to delivering emissions reductions and moving California closer to its climate targets.
- Identifying high-quality careers that offer family-supporting wages, employer-provided benefits, worker voice, and opportunities for advancement, along with building pathways into such careers, is critical to ensuring investments in workforce education and training meaningfully improve workers' economic mobility.
- Deliberate policy interventions are necessary to advance job quality and social equity as California transitions to a carbon-neutral economy.

175 UC Berkeley Labor Center. *Putting California on the High Road: A Jobs and Climate Action Plan for 2030*. June 2020. https://laborcenter.berkeley.edu/wp-content/uploads/2020/09/Putting-California-on-the-High-Road.pdf.

APPENDIX A:
Acronyms and Abbreviations

AB – Assembly Bill

ATB – Annual Technology Baseline

BA – balancing authority

BANC – Balancing Authority of Northern California

BOEM – Bureau of Ocean Energy Management

BTM – behind-the-meter

BUILD – Building Initiative for Low-Emissions Development

CalFlexHub – California Flexible Load Research and Deployment Hub

California ISO – California Independent System Operator

CARB – California Air Resources Board

CCA – Community choice aggregation

CCGT – combined cycle gas turbine

CCS – carbon capture and sequestration

CEC – California Energy Commission

CESA – Clean Energy States Alliance

CHP – combined heat and power

CNG – compressed natural gas

CNRA – California Natural Resources Agency

CO_2 – carbon dioxide

COVID-19 – Coronavirus Disease 2019

CPUC – California Public Utilities Commission

CREPC – Committee on Regional Electric Power Cooperation

CSP – concentrating solar power

CT – combustion turbine

CWDB – California Workforce Development Board

DACAG – Disadvantaged Communities Advisory Group

DR – demand response

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DRECP – Desert Renewable Energy Conservation Plan

DWR – California Department of Water Resources

E3 – Energy and Environmental Economics, Inc.

EDAM – extended day-ahead market

EE – energy efficiency

EIM – Western Energy Imbalance Market

EJAC – Environmental Justice Advisory Committee

ELCC – effective load-carrying capacity

EO – executive order

EPIC – Electric Program Investment Charge

ESP – electric service provider

EV – electric vehicle

FERC – Federal Energy Regulatory Commission

GDP – gross domestic product

GHG – greenhouse gas

GW – gigawatt

GWh – gigawatt-hours

HVAC – heating, ventilation, and air conditioning

IEPR – Integrated Energy Policy Report

IID – Imperial Irrigation District

IOU – investor-owned utility

IRP – integrated resource plan

IWG – Interagency Working Group on the Social Cost of Greenhouse Gases

kW – kilowatt

kWh – kilowatt-hour

LADWP – Los Angeles Department of Water and Power

LBNL – Lawrence Berkeley National Laboratory

LCOE – levelized cost of energy

LOLE – loss of load expectation

LOLP – loss of load probability

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LSE – load-serving entity

MMT – million metric tons

MMT CO_2e – million metric tons of carbon dioxide equivalent

MW – megawatt

MWh - megawatt-hour

NEB – non-energy benefit

NERC - North American Electric Reliability Corporation

NO_X – oxides of nitrogen

NRDC – Natural Resources Defense Council

NREL - National Renewable Energy Laboratory

O&M – operations and maintenance

OOS – out-of-state

OSW – offshore wind

PAH – polycyclic aromatic hydrocarbon

PG&E – Pacific Gas and Electric

PM – particulate matter

PM2.5 – fine inhalable particles with diameters that are generally 2.5 micrometers and smaller

POU – publicly owned utility

PSPS – public safety power shutoff

PV – photovoltaic

R&D – research and development

RA – resource adequacy

RC – reliability coordinator

RETI – Renewable Energy Transmission Initiative

ROW – right-of-way

RPS – Renewables Portfolio Standard

SB – Senate bill

SC-CO_2 – social cost of carbon

SCE – Southern California Edison

SDG&E – San Diego Gas & Electric

SGIP – Self-Generation Incentive Program

SMUD – Sacramento Municipal Utility District

SoCalGas – Southern California Gas Company

SOx – oxides of sulfur

SWRCB – State Water Resources Control Board

TECH – Technology and Equipment for Clean Heating

TID – Turlock Irrigation District

TPP – Transmission Planning Process

TRC – total resource cost

UCLA – University of California, Los Angeles

USEPA – United States Environmental Protection Agency

USGCRP – United States Global Change Research Program

VGI – vehicle-grid integration

WECC – Western Electricity Coordinating Council

WGA – Western Governors Association

WHO – World Health Organization

WIEB – Western Interstate Energy Board

WIRAB – Western Interconnection Regional Advisory Board

ZEV – zero emission vehicle

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APPENDIX B:
Glossary

For additional information on commonly used energy terminology, see the following industry glossary links:

- California Air Resources Board Glossary, available at https://ww2.arb.ca.gov/about/glossary
- California Energy Commission Energy Glossary, available at https://www.energy.ca.gov/resources/energy-glossary
- California Energy Commission Renewables Portfolio Standard Eligibility Guidebook, Ninth Edition Revised, available at: https://efiling.energy.ca.gov/getdocument.aspx?tn=217317
- California Independent System Operator Glossary of Terms and Acronyms, available at: http://www.caiso.com/Pages/glossary.aspx
- California Public Utilities Commission Glossary of Acronyms and Other Frequently Used Terms, available at https://www.cpuc.ca.gov/glossary/
- Federal Energy Regulatory Commission Glossary, available at https://www.ferc.gov/about/what-ferc/about/glossary
- North American Electric Reliability Corporation Glossary of Terms Used in NERC Reliability Standards, available at: https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf
- US Energy Information Administration Glossary, available at: https://www.eia.gov/tools/glossary/

Adaptation

In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.

Ancillary services

Ancillary services include regulation, spinning reserve, non-spinning reserve, voltage support and black start, together with such other interconnected operation services as the California ISO may develop in cooperation with market participants to support the transmission of energy from generation resources to loads while maintaining reliable operation of the CAISO controlled grid in accordance with Western Electricity Coordinating Council standards and good utility practice.

Balancing authority

A balancing authority is the responsible entity that integrates resource plans ahead of time, maintains load-interchange-generation balance within a balancing authority area, and supports interconnection frequency in real time. Balancing authorities in California include the Balancing Authority of Northern California (BANC), California ISO, Imperial Irrigation District (IID), Turlock Irrigation District (TID) and Los Angeles Department of Water and Power (LADWP). The California ISO is the largest of about 38 balancing authorities in the Western Interconnection, handling an estimated 35 percent of the electric load in the West. For more information, see the WECC Overview of System Operations: Balancing Authority and Regulation Overview Web page.

Biodiversity

Biological diversity means the variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Bioenergy

Energy derived from any form of biomass or its metabolic by-products.

Biogas

Biogas is a type of biofuel that is naturally produced from the decomposition of organic waste (such as food scraps) and includes methane, carbon dioxide, and other gases. Biofuels differ from fossil fuels because a biofuel is fuel from recently living biological matter, where fossil fuels come from long dead biological matter.

Biomass

Biomass energy resources are derived from organic matter. These include wood, agricultural waste and other living-cell material that can be burned to produce heat energy. They also include algae, sewage and other organic substances that may be used to make energy through chemical processes.

Capacity expansion modeling

Capacity expansion modeling analyzes different resource investment options over a planning horizon. The model identifies the least cost resource investments, given the policy and reliability constraints. Due to the large number of resources that can be selected by the model, simplifications are necessary. These simplifications can include, only modeling characteristic days for each year, simplified power plant operating characteristics, and simplified transmission networks. For more information, see the US Department of Energy Overview of Power Sector Modeling.

Cap-and-Trade Program

The Cap-and-Trade Program is a key element of California's strategy to reduce greenhouse gas (GHG) emissions. It complements other measures to ensure that California cost-effectively meets its goals for GHG emissions reductions. The Cap-and-Trade Regulation

establishes a declining limit on major sources of GHG emissions throughout California, and it creates a powerful economic incentive for significant investment in cleaner, more efficient technologies. The Program applies to emissions that cover approximately 80 percent of the State's GHG emissions. CARB creates allowances equal to the total amount of permissible emissions (i.e., the "cap"). One allowance equals one metric ton of carbon dioxide equivalent emissions (using the 100-year global warming potential). Each year, fewer allowances are created and the annual cap declines. An increasing annual auction reserve (or floor) price for allowances and the reduction in annual allowances creates a steady and sustained carbon price signal to prompt action to reduce GHG emissions. All covered entities in the Cap-and-Trade Program are still subject to existing air quality permit limits for criteria and toxic air pollutants. For more information, see the CARB Cap-and-Trade Program Web page.

Carbon capture and sequestration (CCS)

A process in which a relatively pure stream of carbon dioxide (CO_2) from industrial and energy-related sources is separated (captured), conditioned, compressed and transported to a storage location for long-term isolation from the atmosphere. For more information, see the CARB Carbon Capture & Sequestration Web page.

Carbon dioxide (CO_2)

A naturally occurring gas, CO_2 is also a by-product of burning fossil fuels (such as oil, gas and coal), of burning biomass, of land-use changes, and of industrial processes (for example, cement production). It is the principal anthropogenic greenhouse gas (GHG) that affects the Earth's radiative balance. It is the reference gas against which other GHGs are measured and therefore has a global warming potential (GWP) of 1.

Carbon neutrality

Carbon dioxide and other greenhouse gas (GHG) emissions generated by sources such as transportation, power plants, and industrial processes must be less than or equal to the amount of carbon dioxide that is stored, both in natural sinks such as forests and mechanical sequestration such as carbon capture and sequestration. Executive order B-55-18 established a target for California to achieve carbon neutrality by 2045 and maintain net negative emissions thereafter. For more information, see the CARB Carbon Neutrality Web Page.

Carbon price

The price for avoided or released carbon dioxide (CO_2) or CO_2-equivalent emissions. This may refer to the rate of a carbon tax or the price of emission permits. In many models that are used to assess the economic costs of mitigation, carbon prices are used as a proxy to represent the level of effort in mitigation policies.

Carbon sink

A reservoir (natural or human, in soil, ocean, and plants) where a greenhouse gas, an aerosol or a precursor of a greenhouse gas is stored.

Climate

Climate in a narrow sense is usually defined as the average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate adaptation

A growing body of new policies — referred to as "climate adaptation" — is intended to grapple with what is known from climate science and incorporate planning for climate change into the routine business of governance, infrastructure management, and administration.

Climate change

Climate change refers to a change in the state of the climate that can be identified (for example, by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use. **Anthropogenic** climate change is defined by the human impact on Earth's climate while **natural** climate change are the natural climate cycles that have been and continue to occur throughout Earth's history. Anthropogenic (human-induced) climate change is directly linked to the amount of fossil fuels burned, aerosol releases, and land alteration from agriculture and deforestation. For more information, see the Energy Education Natural vs Anthropogenic Climate Change Web page.

Climate Change Scoping Plan

CARB's 2022 Scoping plan Update will provide an actionable, cost-effective, and technologically feasible path to achieve economy-wide carbon neutrality by 2045. For more information, see the CARB AB 32 Climate Change Scoping Plan Web page.

CO_2 equivalent (CO_2-e) emissions

The amount of carbon dioxide (CO_2) emissions that would cause the same integrated radiative forcing or temperature change, over a given time horizon, as an emitted amount of a greenhouse gas (GHG) or a mixture of GHGs. There are a number of ways to compute such equivalent emissions and choose appropriate time horizons. Most typically, the CO_2-equivalent emission is obtained by multiplying the emission of a GHG by its global warming potential (GWP) for a 100-year time horizon. For a mix of GHGs it is obtained by summing the CO_2-equivalent emissions of each gas. CO_2-equivalent emission is a common scale for comparing

emissions of different GHGs but does not imply equivalence of the corresponding climate change responses. There is generally no connection between CO_2-equivalent emissions and resulting CO_2-equivalent concentrations.

Community choice aggregation (CCA)

Community choice aggregation (or CCA) lets local jurisdictions aggregate, or combine, their electricity load to purchase power on behalf of their residents. In California, community choice aggregators are legally defined by state law as electric service providers and work together with the region's existing utility, which continues to provide customer services (for example, grid maintenance and power delivery). For more information see What Is CCA? or Community Choice Is Transforming the California Energy Industry.

Decarbonization

The process by which countries, individuals or other entities aim to reduce or achieve zero fossil carbon emissions. Typically refers to a reduction of the carbon emissions associated with electricity, industry and transport.

Demand response (DR)

Demand response refers to providing wholesale and retail electricity customers with the ability to choose to respond to time-based prices and other incentives by reducing or shifting electricity use ("shift DR"), particularly during peak demand periods, so that changes in customer demand become a viable option for addressing pricing, system operations and reliability, infrastructure planning, operation and deferral, and other issues. It has been used traditionally to shed load in emergencies ("shed DR"). It also has the potential to be used as a low-greenhouse gas, low-cost, price-responsive option to help integrate renewable energy and provide grid-stabilizing services, especially when multiple distributed energy resources are used in combination and opportunities to earn income make the investment worthwhile.

For more information, see the CPUC Demand Response Web page.

Disadvantaged community

Disadvantaged communities refer to the areas throughout California which most suffer from a combination of economic, health, and environmental burdens. These burdens include poverty, high unemployment, air and water pollution, presence of hazardous wastes, as well as high incidence of asthma and heart disease. One way that the state identifies these areas is by collecting and analyzing information from communities all over the state. CalEnviroScreen, an analytical tool created by the California Environmental Protection Agency, combines different types of census tract-specific information into a score to determine which communities are the most burdened or "disadvantaged." For more information, see the California Office of Environmental Health Hazard Assessment's CalEnviroScreen Web page.

Disadvantaged Communities Advisory Group (DACAG)

The Clean Energy and Pollution Reduction Act of 2015 (also known as Senate Bill 350) called upon the CPUC to help improve air quality and economic conditions in disadvantaged communities by, for example, changing the way the state plans the development and future

operations of power plants, or rethinking the location of clean energy technologies to benefit burdened communities. Additionally, Senate Bill 350 required the CPUC and the CEC to create a group representing disadvantaged communities to advise the agencies about in understanding how energy programs impact these communities and could be improved to benefit these communities.

For more information, see the CPUC Disadvantaged Communities Advisory Group Web page.

Distributed energy resources (DER)

Distributed energy resources are any resource with a first point of interconnection of a utility distribution company or metered subsystem. Distributed energy resources include:

- Demand response, which has the potential to be used as a low-greenhouse gas, low-cost, price-responsive option to help integrate renewable energy and provide grid-stabilizing services, especially when multiple distributed energy resources are used in combination and opportunities to earn income make the investment worthwhile.
- Distributed renewable energy generation, primarily rooftop photovoltaic energy systems.
- Vehicle-Grid Integration, or all the ways plug-in electric vehicles can provide services to the grid, including coordinating the timing of vehicle charging with grid conditions.
- Energy storage in the electric power sector to capture electricity or heat for use later to help manage fluctuations in supply and demand.

Effective load carrying capability (ELCC)

Effective load carrying capability" (ELCC) is the increment of load that could met by the resource while maintaining the same level of reliability. The ELCC of a variable renewable energy resource is based on both the capacity coincident with peak load and the profile and quantity of existing variable renewable energy resources. For a detailed description of ELCC implementation in RESOLVE, see page 87 of the Inputs & Assumptions: CEC SB100 Joint Agency Report.

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Electric Program Investment Charge Program (EPIC)

The California Energy Commission's Electric Program Investment Charge (EPIC) program invests in scientific and technological research to accelerate the transformation of the electricity sector to meet the state's energy and climate goals. The EPIC program invests more than $130 million annually in areas including renewable energy, energy storage, electric system resilience, and electric technologies for buildings, businesses, and transportation. For more information, see the CEC Electric Program Investment Charge Program Web page and the CPUC Energy Research, Development & Deployment Web page.

Electric service provider (ESP)

An electric service provider is a company that purchases wholesale electricity from electricity generators and sells it at a retail level to the general public.

Electrolyzer

A device that breaks a chemical compound down into its elements by passing a direct current through it. Electrolysis of water, for example, produces hydrogen and oxygen.

Energy efficiency

Energy efficiency means adapting technology to meet consumer needs while using less energy. The CEC adopts energy efficiency standards for appliances and buildings, which reduces air pollution and saves consumers money. The CPUC regulates ratepayer-funded energy efficiency programs and works with the investor-owned utilities, other program administrators, and vendors to develop programs and measures to transform technology markets within California using ratepayer funds. For more information, see the CEC Energy Efficiency Web page and the CPUC Energy Efficiency Web page.

Environmental justice

Environmental justice is the fair treatment of people of all races and incomes with respect to development, implementation and enforcement of environmental laws, regulations and policies.

Equity (Energy equity)

Energy equity is the principle of fairness in burden sharing and is a basis for understanding how the impacts and responses to climate change, including costs and benefits, are distributed in and by society in more or less equal ways. It is often aligned with ideas of equality, fairness and justice and applied with respect to equity in the responsibility for, and distribution of, climate impacts and policies across society, generations, and gender, and in the sense of who participates and controls the processes of decision-making.

Extreme weather event

An extreme weather event is an event that is rare at a particular place and time of year. Definitions of rare vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By definition, the characteristics of what is called extreme weather may vary from place to

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place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g., drought or heavy rainfall over a season).

Federal Energy Regulatory Commission (FERC)

The *Federal Energy Regulatory Commission*, also known as *FERC*, is an independent agency that regulates interstate transmission of electricity, oil, and natural gas. It also regulates natural gas and hydropower projects in the United States. For more information, see the Federal Energy Regulatory Commission Web page.

Fossil fuels

Carbon-based fuels from fossil hydrocarbon deposits, including coal, oil, and natural gas.

Fuel cell

An energy conversion device that combines hydrogen with oxygen in an electrochemical reaction to produce electricity. A fuel cell powered by **green hydrogen** is an RPS-eligible resource.

Generic firm baseload resource

For modeling purposes, a generic firm baseload resource is a zero-carbon generating technology that is intended to run continuously. Examples include low-cost geothermal or imports of emerging nuclear generation technologies.

Generic firm dispatchable resource

For modeling purposes, a generic firm dispatchable resource is a zero-carbon generating technology that can be dispatched as needed. Examples include natural gas with 100 percent carbon capture and sequestration or 100 percent drop-in renewable fuels.

Geothermal

Natural heat from within the earth, captured for production of electric power.

Green hydrogen

Green hydrogen means hydrogen gas that is not produced from fossil fuel feedstock sources and does not produce incremental carbon emissions during its primary production process.

Greenhouse gas (GHG)

Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself and by clouds. This property causes the greenhouse effect. Water vapor (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary GHGs in the Earth's atmosphere. Moreover, there are a number of entirely human-made GHGs in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, dealt with under the Montreal Protocol. Beside CO_2, N_2O and CH_4, the Kyoto Protocol deals with the GHGs sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). In response to

Assembly Bill 32 (California Global Warming Solutions Act of 2006), the definition of greenhouse gases defined in Health and Safety Code section 38505 includes nitrogen trifluoride (NF3) in addition to those defined under the Montreal and Kyoto Protocols.

Hydroelectric (Large, Small)

A technology that produces electricity by using the kinetic energy of flowing or falling nonmarine water to turn a turbine generator.

A **large hydro facility** is an electrical generation facility employing one or more hydroelectric turbine generators, the sum capacity of which exceeds 30 megawatts. A large hydro facility is not RPS-eligible, but is a zero-carbon resource.

A **small hydro facility** is an electrical generation facility employing one or more hydroelectric turbine generators, the sum capacity of which does not exceed 30 megawatts except in the case of qualifying efficiency improvements under Public Utilities Code Section 399.12.5. A small hydro facility is an RPS-eligible resource.

Integrated Energy Policy Report (IEPR)

Senate Bill 1389 (Bowen, Chapter 568, Statutes of 2002) requires the California Energy Commission to prepare a biennial integrated energy report. The report, which is crafted in collaboration with a range of stakeholders, contains an integrated assessment of major energy trends and issues facing California's electricity, natural gas, and transportation fuel sectors. The report provides policy recommendations to conserve resources, protect the environment, ensure reliable, secure, and diverse energy supplies, enhance the state's economy, and protect public health and safety. For more information, see the CEC Integrated Energy Policy Report Web page.

Integrated Resource Planning (IRP)

The CPUC's Integrated Resource Planning (IRP) process is an "umbrella" planning proceeding to consider all of its electric procurement policies and programs and ensure California has a safe, reliable, and cost-effective electricity supply. The proceeding is also the Commission's primary venue for implementation of the Senate Bill 350 requirements related to IRP (Public Utilities Code Sections 454.51 and 454.52). The process ensures that load serving entities meet targets that allow the electricity sector to contribute to California's economy-wide greenhouse gas emissions reductions goals. For more information see the CPUC Integrated Resource Plan and Long-Term Procurement Plan (IRP-LTPP) Web page.

Investor-owned utility (IOU)

Investor-owned utilities (IOUs) provide transmission and distribution services to all electric customers in their service territory. The utilities also provide generation service for "bundled" customers, while "unbundled" customers receive electric generation service from an alternate provider, such as a Community Choice Aggregator (CCA). California has three large IOUs offering electricity service: Pacific Gas and Electric, Southern California Edison, and San Diego Gas & Electric.

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Landscape-scale planning

Landscape-level approaches, also known as landscape-scale planning, take into consideration a wide range of potential constraints and conflicts, including environmental sensitivity, conservation and other land uses, tribal cultural resources, and more when considering future renewable energy development. The benefits of using landscape-level approaches for renewable energy and transmission planning include early identification and resolution of large issues or barriers to development, coordinated agency permitting processes, increased transparency in decision making, increased collaboration, avoidance of impacts, and more rapid deployment of environmentally responsible renewable energy projects.

Levelized cost of energy (LCOE)

The levelized cost of energy (LCOE) is a measure of the average net present cost of electricity generation for a generating plant over its lifetime. The LCOE is calculated as the ratio between all the discounted costs over the lifetime of an electricity generating plant divided by a discounted sum of the actual energy amounts delivered. The LCOE is used to compare different methods of electricity generation on a consistent basis. Inputs to LCOE typically include cost of capital, fuel costs, fixed and variable operations and maintenance costs, financing costs, and an assumed utilization rate.

Load serving entity (LSE)

A load serving entity is defined by the California Independent System Operator as an entity that has been "granted authority by state or local law, regulation or franchise to serve [their] own load directly through wholesale energy purchases." For more information see the California Independent System Operator's Web page.

Loss of load expectation (LOLE)

The expected number of days per year for which available generating capacity is expected to be insufficient to serve the daily peak demand (load). When given in hours/year, it represents a comparison of hourly load to available generation.

Loss of load probability (LOLP)

The proportion (probability) of days per year, hours per year or events per season that available generating capacity/energy is expected to be insufficient to serve the daily peak or hourly demand.

Methane (CH_4)

One of the six greenhouse gases (GHGs) to be mitigated under the Kyoto Protocol and is the major component of natural gas and associated with all hydrocarbon fuels. Emissions also occur as a result of dairy and livestock operations and disposal of organics in landfills, and their management represents a major mitigation option. Methane is a short-lived climate pollutant. Unlike CO_2, which lasts for about 100 years in the atmosphere, reductions of methane can create a relatively quick reduction in global warming.

Metric ton

A metric ton is a unit of weight equal to 1,000 kilograms (or 2,205 pounds).

Microgrid

A microgrid is an interconnected system of loads and energy resources, including, but not limited to, distributed energy resources, energy storage, demand response tools, or other management, forecasting, and analytical tools, appropriately sized to meet customer needs, within a clearly defined electrical boundary that can act as a single, controllable entity, and can connect to, disconnect from, or run in parallel with, larger portions of the electrical grid, or can be managed and isolated to withstand larger disturbances and maintain electrical supply to connected critical infrastructure. (Source: Senate Bill 1339)

Mitigation (of climate change)

A human intervention to reduce greenhouse gas emissions and/or enhance carbon sinks.

Mitigation measures

In climate policy, mitigation measures are technologies, processes or practices that contribute to mitigation, for example, renewable energy technologies, waste minimization processes and public transport commuting practices.

Negative GHG emissions

Removal of greenhouse gases (GHGs) from the atmosphere by deliberate human activities, i.e., in addition to the removal that would occur via natural carbon cycle processes.

Net load

Net load is electricity load minus solar and wind generation.

Net negative emissions

A situation of net negative emissions is achieved when, as result of human activities, more greenhouse gases are removed from the atmosphere than are emitted into it. Where multiple greenhouse gases are involved, the quantification of negative emissions depends on the climate metric chosen to compare emissions of different gases (such as global warming potential, global temperature change potential, and others, as well as the chosen time horizon).

Non-energy benefits (NEBs)

Non-energy benefits (NEBs) represent the benefits or positive impacts on society associated with the construction and operation of energy infrastructure and any associated activity. For more information, see Chapter 4.

Non-spinning reserves

The portion of resource capacity that is capable of being synchronized and ramping to a specified load in ten minutes (or that is capable of being interrupted in ten (10) minutes) and

that is capable of running (or being interrupted) for at least thirty (30) minutes from the time it reaches its award capacity.

North American Electric Reliability Corporation (NERC)

The *North American Electric Reliability Corporation*, also known as *NERC*, is an international regulatory authority whose mission is to reduce risks to the reliability and security of the grid. Its area of responsibility spans the continental United States, Canada, and the northern part of Baja California, Mexico. For more information see the NERC Web page.

Nuclear (existing)

Electricity generated by the use of the thermal energy released from the fission of nuclear fuel in a reactor. Because the State effectively has a moratorium on new in-state nuclear power plants under the Warren-Alquist Act, only existing nuclear generating facilities are modeled. A nuclear facility is not RPS-eligible, but is a zero-carbon resource.

Offshore wind

Refers to an ocean-based (or other body of water) technology that converts energy from the environmental movement of air into mechanical energy and then electricity. Offshore wind turbine technologies include both fixed foundation and floating types.

Once-through cooling (OTC)

Once-through cooling technologies intake ocean water to cool the steam that is used to spin turbines for electricity generation. The technologies allow the steam to be reused, and the ocean water that was used for cooling becomes warmer and is then discharged back into the ocean. The intake and discharge have negative impacts on marine and estuarine environments. For more information on the phase-out of power plants in California using once-through cooling, see the Statewide Advisory Committee on Cooling Water Intake Structures Web page and the CEC Once-Through Cooling Phaseout Tracking Progress Report.

Onshore wind

Refers to a land-based technology that converts energy from the environmental movement of air into mechanical energy and then electricity.

Particulate matter

Any material, except pure water, that exists in the solid or liquid state in the atmosphere. The size of particulate matter can vary from coarse, wind-blown dust particles to fine particle combustion products.

PATHWAYS Model

The PATHWAYS model, developed by Energy and Environmental Economics, Inc (E3), is an economy-wide scenario tool used to identify pathways to achieve economy-wide decarbonization. For more information, see PATHWAYS Model.

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Planning reserve margin (PRM)

Planning reserve margin (PRM) is used in resource planning to estimate the generation capacity needed to maintain reliability given uncertainty in demand and unexpected capacity outages. A typical PRM is 15% above the forecasted 1-in-2 weather year peak load, although it can vary by planning area.

Power flow modeling

Power flow modeling evaluates the flow of power on the electric grid. Power flow models provide a snapshot of transmission, generation and load and used to determine if the grid is stable and within operating limits for the case study. For more information see North American Transmission Forum's Power Flow Modeling Reference Document.

Precursors

Atmospheric compounds that are not greenhouse gases (GHGs) or aerosols, but that have an effect on GHG or aerosol concentrations by taking part in physical or chemical processes regulating their production or destruction rates.

Production cost modeling

Production cost modeling simulates least-cost dispatch given a set of generating resources, load, fuel prices and transmission and dispatch constraints. Production cost models can be run deterministically or probabilistically. Typically, a deterministic production cost model models all 8,760 hours of each year modeled with specified load and weather conditions. Typically, a probabilistic production cost model simulates the same system with changing inputs, such as load, weather, and generator outages to study how these changes impact the dispatch of the system. This approach can be used to determine the loss-of-load probability of the system.

Public safety power shutoff (PSPS)

A *public safety power shutoff*, also known as *PSPS*, is a system used by utilities to prevent wildfires by proactively turning off electricity when gusty winds and dry conditions present a heightened fire risk. More information can be found at the Prepare for Power Down Web page.

Publicly owned utility (POU)

Publicly owned utilities (POUs), or Municipal Utilities, are controlled by a citizen-elected governing board and utilizes public financing. These municipal utilities own generation, transmission and distribution assets. In contrast to CCAs, all utility functions are handled by these utilities. Examples include the Los Angeles Department of Water and Power and the Sacramento Municipal Utility District. Municipal utilities serve about 27 percent of California's total electricity demand.

Pumped Hydro

An energy storage technology consisting of two water reservoirs separated vertically; during off-peak hours, water is pumped from the lower reservoir to the upper reservoir, allowing the off-peak electrical energy to be stored indefinitely as gravitational energy in the upper

reservoir. During peak hours, water from the upper reservoir may be released and passed through hydraulic turbines to generate electricity as needed.

Reliability coordinator

The entity designated by the Western Electricity Coordinating Council (WECC) as responsible for reliability coordination in real time for the area defined by WECC.

Renewables Portfolio Standard (RPS)

The *Renewables Portfolio Standard*, also referred to as *RPS*, is a program that sets continuously escalating renewable energy procurement requirements for California's load-serving entities. The generation must be procured from RPS-certified facilities (which include solar, wind, geothermal, biomass, biomethane derived from landfill and/or digester, small hydroelectric, and fuel cells using renewable fuel and/or qualifying hydrogen gas). More information can be found at the CEC Renewables Portfolio Standard web page and the CPUC RPS Web page.

Resilience

The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation.

RESOLVE Model

The RESOLVE mode is a capacity expansion model developed by Energy and Environmental Economics, Inc. (E3). The tool identifies least-cost resource investments given a set of reliability and policy constraints. For more information, see the Inputs & Assumptions: CEC SB100 Joint Agency Report.

Resource adequacy (RA)

The program that ensures that adequate physical generating capacity dedicated to serving all load requirements is available to meet peak demand and planning and operating reserves, at or deliverable to locations and at times as may be necessary to ensure local area reliability and system reliability. For more information, see the CPUC Resource Adequacy Web page.

Resource build

Resource build is a set of generating, transmission and integration resources identified to meet future policy and reliability goals.

Scenario

A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (for example, rate of technological change, prices) and relationships. Note that scenarios are neither predictions nor forecasts, but are used to provide a view of the implications of developments and actions.

This report includes three types of scenarios with different zero-carbon load coverage targets:

- The **60% RPS scenario** is based on 60 percent of retail sales
- The **SB 100 Core scenario** is based on 100 percent of retail sales and state loads.
- The **Study scenario** includes the Core loads plus system losses with High Electrification demand.

For more information, see Chapter 3.

Short-lived climate pollutant (SLCP)

A short-lived climate pollutant is an agent that has a relatively short lifetime in the atmosphere, from a few days to a few decades, and a warming influence on the climate that is more potent than that of carbon dioxide. (Source: Senate Bill 605)

Solar PV

A technology that uses a semiconductor to convert sunlight directly into electricity via the photoelectric effect.

Solar Thermal

The conversion of sunlight to heat and the related concentration and use to power a generator to produce electricity.

Solar-plus-storage

A *solar-plus-storage* project is a battery system that is charged by a connected solar system.

Spinning reserves

The portion of unloaded synchronized resource capacity that is immediately responsive to system frequency and that is capable of being loaded in ten (10) minutes, and that is capable of running for at least thirty (30) minutes from the time it reaches its award capacity.

Supply-side measures

Policies and programs for influencing how a certain demand for goods and/or services is met. In the energy sector, for example, supply-side mitigation measures aim at reducing the amount of greenhouse gas emissions emitted per unit of energy produced.

Sustainability

A dynamic process that guarantees the persistence of natural and human systems in an equitable manner.

Sustainable development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs and balances social, economic and environmental concerns.

Time-dependent electricity rates

Also known as time-of-use rates, time-dependent electricity rates vary depending on the time periods in which the energy is consumed. In a time-of-use rate structure, higher prices are charged during utility peak-load times. Such rates can provide an incentive for consumers to curb power use during peak times.

Total resource cost

Total resource cost (TRC) is the total cost of the system to meet the future policy and reliability goals. The TRC in the SB 100 scenarios includes non-modeled, existing costs which are the same across all scenarios, as well as scenario-specific non-modeled costs that vary by demand sensitivities. It also includes scenario-specific fixed costs, which are levelized capital investments associated with generation, transmission, storage and shed demand response resources selected in the model, as well as operating costs.

Transmission Planning Process (TPP)

The California Independent System Operator's annual transmission plan, which serves as the formal roadmap for infrastructure requirements. This process includes stakeholder and public input and uses the best analysis possible (including the Energy Commission's annual demand forecast) to assess short- and long-term transmission infrastructure needs. For more information, see the California ISO Transmission Planning Web page.

Utility-scale solar

A utility-scale solar power plant, using either photovoltaic [PV] or concentrating solar thermal technology, that sells its electricity to wholesale utility buyers. Often, utility-scale solar projects are described as being "in front of the meter" as opposed to small distributed generation systems, which tend to be "behind the meter."

Vehicle-grid integration

The term vehicle-grid integration or VGI, encompasses the ways EVs can provide grid services, including coordinating the timing of vehicle charging with grid conditions. To that end, EVs must have capabilities to manage charging or support two-way interaction between vehicles and the grid.

Western Electricity Coordinating Council (WECC)

The *Western Electricity Coordinating Council*, also known as *WECC*, is a nonprofit organization that works to address risks to the reliability and security of the Western Interconnection's power system. For more information, see the WECC Web page.

Western Energy Imbalance Market (EIM)

The *Western Energy Imbalance Market*, or Western EIM, is a real-time bulk power trading market. The Western EIM's systems automatically find the lowest-cost energy to serve customer demand across a wide geographic area in the western United States. For more information, see the Western Energy Imbalance Market Web page.

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Western Governors Association (WGA)

The Western Governors' Association (WGA) is a non-partisan organization of all 22 United States Governors (representing 19 U.S. States and 3 U.S. territories) that are considered to be part of the Western region of the nation. The WGA addresses important policy and governance issues in the West, advances the role of the Western states in the federal system, and strengthens the social and economic fabric of the region. WGA develops policy and carries out programs in the areas of natural resources, the environment, human services, economic development, international relations and state governance. For more information, see the Western Governors Association Web page.

Western Interconnection (WI)

The *Western Interconnection* is a wide area synchronous grid. It is one of the two major alternating current power grids in the continental United States (the other is the Eastern Interconnection). For more information, see the WECC's Western Interconnection Web page.

Western Interconnection Regional Advisory Body (WIRAB)

The Western Interconnection Regional Advisory Body (WIRAB) was created by Western Governors under the Federal Power Act and focuses on electric grid reliability in the Western Interconnection. WIRAB advises the Electric Reliability Organization (North American Electric Reliability Corporation ["NERC"]), the regional entity (Western Electricity Coordinating Council ["WECC"]), and the Federal Energy Regulatory Commission ("FERC") on whether proposed reliability standards within the region, as well as the governance and budgets of NERC and WECC, are just, reasonable, not unduly discriminatory or preferential and in the public interest. WIRAB's membership is composed of member representatives from all states and International provinces that have load within the Western Interconnection. For more information, see the Western Interstate Energy Board's WIRAB Web page.

Western Interstate Energy Board (WIEB)

The *Western Interstate Energy Board* is an organization of 11 western states and three Canadian provinces. The Board promotes energy policy that is developed cooperatively among member states and provinces and with the federal government. For more information, see the Western Interstate Energy Board Web page.

Zero-carbon resource (for modeling purposes)

The joint agencies' interpretation of "zero-carbon resources," as stated in the SB 100 statute, includes generation resources that meet one or both of the following criteria. (This set of criteria is referred to as "RPS+" in SB 100 workshops and documents.)

- Meets the requirements for RPS-eligibility set forth in the most recent RPS Eligibility Guidebook.[176]
- Has zero onsite greenhouse gas emissions.[177]

For more information, see the 2021 Senate Bill 100 (SB 100) Joint-Agency Report Modeling Framework and Scenarios Overview.

Zero-emission vehicles (ZEVs)

There are three types of zero-emission vehicles:

- Battery-electric vehicles (BEVs) that refuel exclusively with electricity.
- Plug-in hybrid electric vehicles (PHEVs) that can refuel with either electricity or another fuel, typically gasoline. BEVs and PHEVs are collectively known as "plug-in electric vehicles," or PEVs.
- Fuel cell electric vehicles (FCEVs) that refuel with hydrogen.

176 California Energy Commission. *Renewables Portfolio Standard Eligibility Guidebook, Ninth Edition (Revised)*. Publication Number: CEC-300-2016-006-ED9-CMF-REV. January 2017. https://efiling.energy.ca.gov/getdocument.aspx?tn=217317.

177 For modeling purposes, this list does not acknowledge *de minimis* emissions associated with included technologies. SB 100 compliance programs would need to establish clear requirements for qualification as a zero-carbon generation resource.

APPENDIX C:
Assumptions and Calculations to Estimate the Social Cost of Carbon in SB 100 Core Scenario

This appendix describes the assumptions and calculations employed to estimate the social cost of carbon associated with the SB 100 core scenario under high electrification demand.

Greenhouse Gas Reductions

The greenhouse gas (GHG) emissions reductions associated with implementation of SB 100 were estimated by taking the emissions difference between the 60 percent RPS and SB 100 core scenarios modeled under high electrification demand. The GHG emissions associated with in-state generation and unspecified imports are summarized in Table C-1 for year 2045.

Table C-1: Avoided GHG Emissions in 2045 from Core Scenario High Electrification Demand

Scenario	In-State, MT CO_2	Unspecified Imports*, MT CO_2	Total, MT CO_2
60% RPS	42,639,193	15,207,098	57,846,291
SB 100 core	18,423,033	6,574,439	24,997,472

*Unspecified imports use the emissions intensity of 0.428 MT CO_2 per MWh.

The total GHG emissions difference between the 60% RPS and SB 100 Core scenario is 32,848,819 MT CO_2.

Social Cost of Carbon Values

As described in Chapter 4, the social cost of carbon (SC-CO_2) estimates the value of damages avoided by reducing an additional ton of carbon dioxide (CO_2). These damages include, but are not limited to, changes in net agricultural productivity, energy use, human health, property damage from increased flood risk, as well as nonmarket damages, such as the services that natural ecosystems provide to society.

In 2009, the Council of Economic Advisors and the Office of Management and Budget convened the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG) to develop a methodology for estimating the SC-CO_2. This methodology relied on a standardized range of assumptions and could be used consistently when estimating the benefits of regulations across agencies and around the world. The IWG, comprised of scientific and economic experts, recommended the use of SC-CO_2 values based on three integrated

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assessment models developed over decades of global peer-reviewed research, which are summarized in Table C-2.[178]

Table C-2: Social Cost of CO2, 2015-2050 (in 2007 dollars per metric ton CO2)

Year	5% Discount Rate	3% Discount Rate	2.5% Discount Rate
2015	$11	$36	$56
2020	$12	$42	$62
2025	$14	$46	$68
2030	$16	$50	$73
2035	$18	$55	$78
2040	$21	$60	$84
2045	$23	$64	$89
2050	$26	$69	$95

The IWG SC-CO_2 values are in 2007 dollars. These were translated into 2016 dollars using California Department of Finance consumer price index values for California and are shown in Table C-3.[179]

178 Additional documents relating to the IWG process, including iterations of the Technical Support Document for the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866 are available at the President Barack Obama White House Office of Management and Budget Social Cost of Greenhouse Gases Web page. https://obamawhitehouse.archives.gov/omb/oira/social-cost-of-carbon.

179 State of California, Department of Finance. Inflation: Consumer Price Index Web page. See Calendar Year averages: from 1950 available at: http://www.dof.ca.gov/Forecasting/Economics/Indicators/Inflation/ (version last updated January 2021).

Table C-3: Social Cost of CO2, 2015-2050 (in 2016 dollars per metric ton CO2)

Year	5% Discount Rate	3% Discount Rate	2.5% Discount Rate
2015	$12.92	$42.28	$65.76
2020	$14.09	$49.32	$72.81
2025	$16.44	$54.02	$79.85
2030	$18.79	$58.72	$85.73
2035	$21.14	$64.59	$91.60
2040	$24.66	$70.46	$98.64
2045	$27.01	$75.16	$104.52
2050	$30.53	$81.03	$111.56

Avoided Social Costs

The estimated avoided social cost of the SB 100 Core scenario compared to the 60% RPS scenario is calculated by multiplying the IWG SC-CO_2 values in Table C-3 for year 2045 at the 2.5, 3, and 5 percent discount rates by the GHG emissions difference in Table C-1. The social costs using these assumptions are shown in Table C-4 at the various discount rates.

For example, 32,848,819 MT CO_2 x $27.01/MT CO_2 = $887,236,053

Table C-4: Estimated Social Cost (Avoided Economic Damages)

Scenario	Social Cost of Carbon (2016 dollars) 5% Discount Rate	Social Cost of Carbon (2016 dollars) 3% Discount Rate	Social Cost of Carbon (2016 dollars) 2.5% Discount Rate
SB 100 core, high electrification demand	$887,236,053	$2,468,830,755	$3,433,217,769

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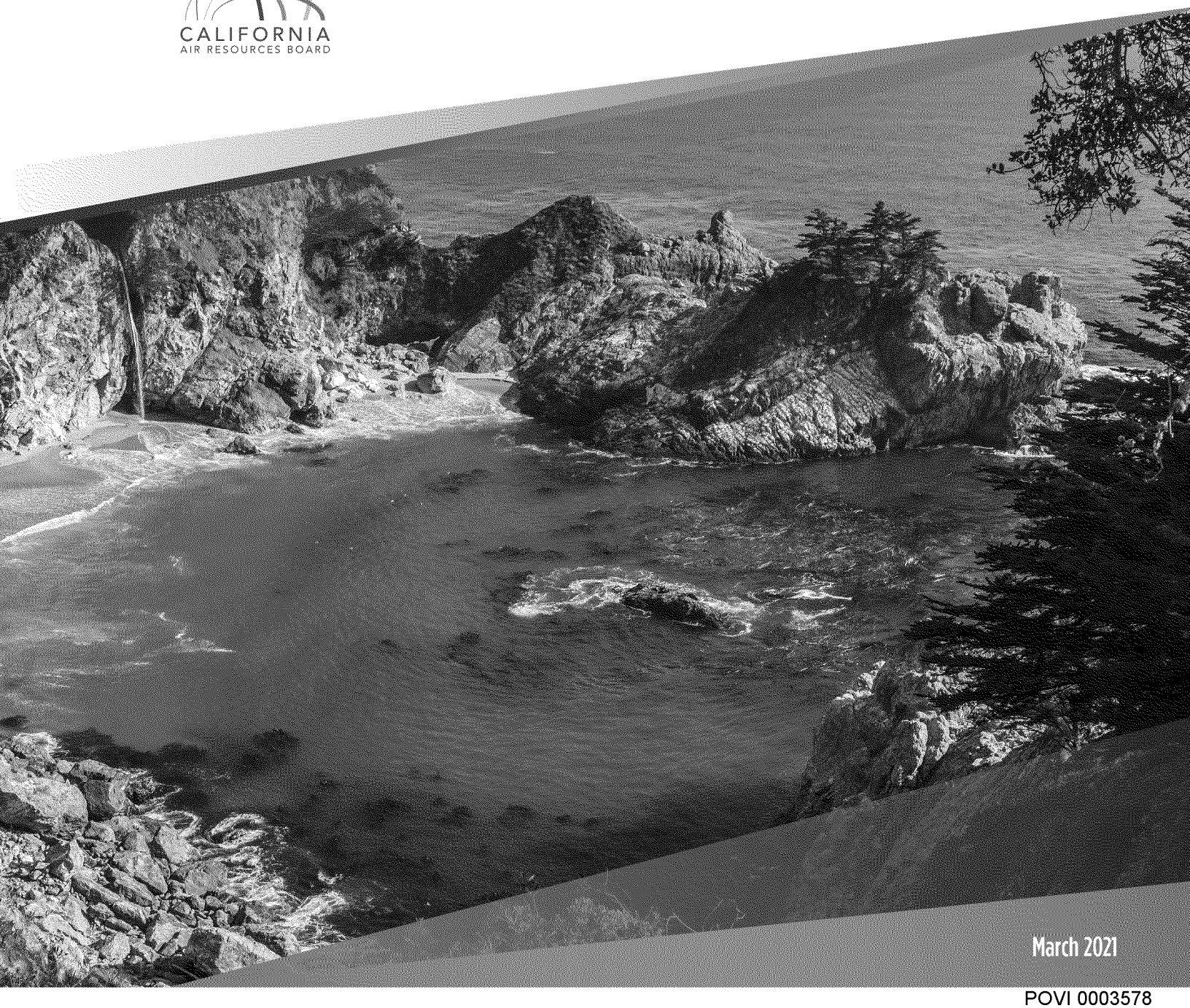
DOCKETED	
Docket Number:	19-SB-100
Project Title:	SB 100 Joint Agency Report: Charting a path to a 100% Clean Energy Future
TN #:	239588
Document Title:	2021 SB 100 Joint Agency Report Summary Achieving 100% Clean Electricity in California
Description:	***This Document Supersedes TN#237168***
Filer:	Harinder Kaur
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	9/3/2021 9:05:12 AM
Docketed Date:	9/3/2021

2021 SB 100 Joint Agency Report Summary

Achieving 100% Clean Electricity in California

An Initial Assessment



March 2021

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Senate Bill 100

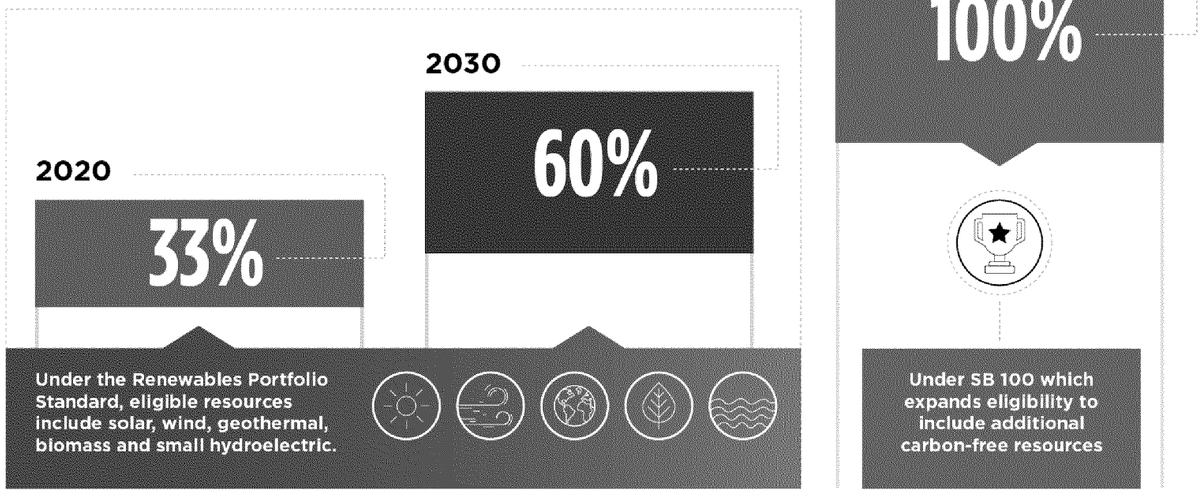
Officially titled "The 100 Percent Clean Energy Act of 2018," Senate Bill 100 (SB 100, De León):

1. Sets a 2045 goal of powering all retail electricity sold in California and state agency electricity needs with renewable and zero-carbon resources — those such as solar and wind energy that do not emit climate-altering greenhouse gases.
2. Updates the state's Renewables Portfolio Standard to ensure that by 2030 at least 60 percent of California's electricity is renewable.
3. Requires the Energy Commission, Public Utilities Commission and Air Resources Board to use programs under existing laws to achieve 100 percent clean electricity and issue a joint policy report on SB 100 by 2021 and every four years thereafter.

SB 100 Builds on Existing Efforts

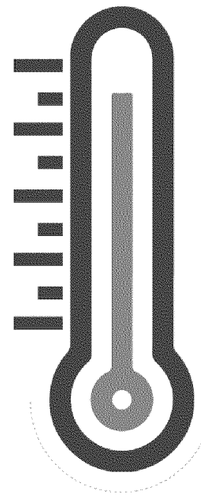
California has already made significant progress toward a clean energy future through many programs that promote renewable energy, energy efficiency and the storage technologies needed to retire fossil fuel resources. SB 100 builds on this progress by escalating the state's renewables procurement requirement and makes the advancement to 100 percent clean electricity official state policy — not just an aspiration.

California's
Clean Electricity Goals



The Climate Imperative

In the summer of 2020, Californians experienced the damaging effects of climate change as never before: a historic siege of wildfires and smoke, and a record-breaking heat wave. Scientists worldwide agree that without bolder mitigation measures, climate-related disasters will recur with increasing frequency and greater devastation.



BY 2100

AVERAGE ANNUAL MAXIMUM DAILY TEMPERATURE

IS PROJECTED TO INCREASE BY

5.6–8.8°F

Depending on greenhouse gas emissions reductions. The greatest increase is seen with business-as-usual emissions levels.

Source: California's Fourth Climate Change Assessment

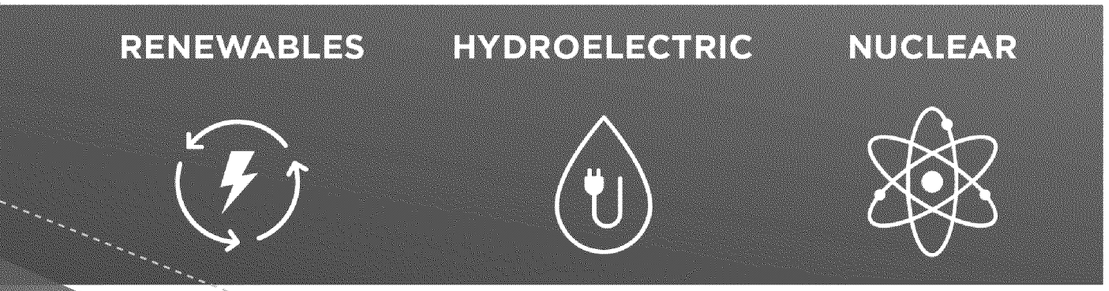
More Acres Burned
From Wildfires in 2020 Than the Last Four Years Combined

Continuing a Legacy of Bold Leadership

California has long led the world in combating climate change. The state's policies to vastly increase renewable energy and drastically reduce carbon emissions will not only help temper the effects of climate change globally but also improve the health of Californians and their economy. The state has now committed to becoming "carbon neutral" by 2045 — eliminating as much climate-warming pollution as it emits by that year.

In 2019,

63% of California's electricity retail sales came from non-fossil fuel sources:

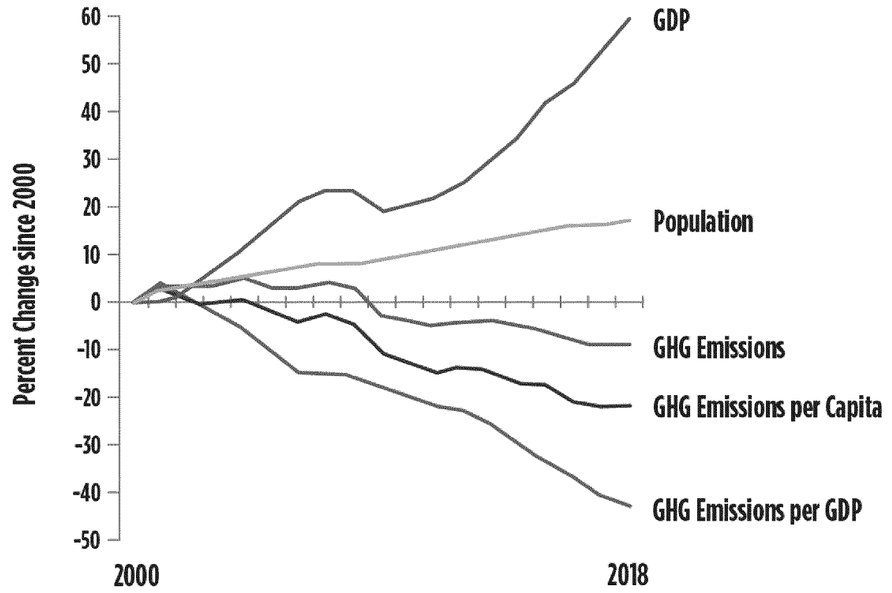


California has already made significant progress toward clean electricity. Carbon emissions from generating electricity have dropped 43 percent since 1990, and in 2017, for the first time ever, the state drew most of its power from carbon-free sources — primarily solar. These gains are largely attributable to:

- California's energy efficiency standards for buildings and appliances
- The state's Renewables Portfolio Standard
- Greatly reduced use of coal-fired power plants

Statewide Trends

of Emissions and Indicators (2000–2018)



Source: California Air Resources Board

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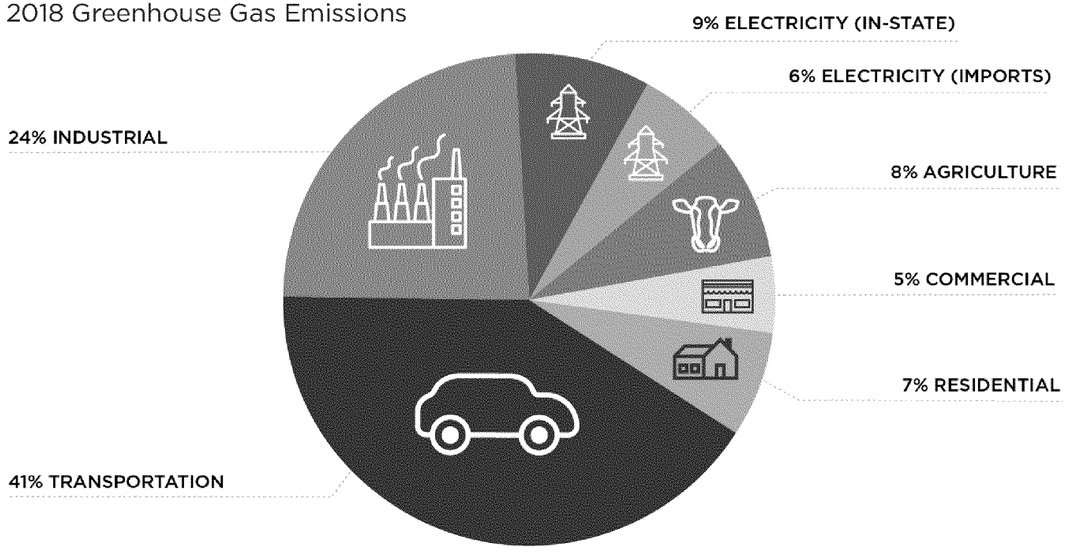
Decarbonizing the Power Grid

California's
2018 Greenhouse Gas Emissions



Source: California Air Resources Board

A clean electricity grid is necessary to achieve economy wide carbon neutrality. Using clean electricity to power transportation, buildings and industrial operations helps decarbonize these sectors of the economy, which, along with electricity generation, account for 92 percent of the state's carbon emissions.

SB 100 is central to improving California's energy system. Clean electricity works in synergy with other state efforts to reduce emissions and make the state's electricity system more resilient, affordable and environmentally sustainable.

Related Clean Energy Efforts

Transportation electrification – California is moving toward having 100 percent of new cars and passenger trucks sold in the state be zero-emission by 2035, but the environmental impacts of transportation are about more than tailpipe pollution. The electricity powering zero-emission vehicles must also be carbon-free.

Building decarbonization – State agencies are assessing ways to decarbonize energy use in buildings, mainly natural gas used for space and water heating. Electrifying more building energy uses is environmentally more effective if the power comes from zero-carbon sources.

Energy efficiency – The Energy Commission is continuously improving the state's energy efficiency standards for buildings and appliances to reduce customer bills and offset the need for additional generation capacity. Improved energy efficiency will reduce the economic and environmental costs of expanding California's clean electricity generating capacity.

Load flexibility – The state is working to increase the ability of the grid to shift the timing of electricity use to sunny and windy parts of the day when most renewable energy is produced. This load flexibility is critical to maintaining a reliable power supply at a low cost.

Benefits
of 100% Clean Energy

Moving toward 100 percent clean electricity will bring social benefits, such as less air pollution and improved public health. It will also create more jobs, including those in manufacturing and installing wind turbines and solar panels, and developing new clean energy technologies.

More than 23 million Californians live in areas where smog-forming pollutants routinely exceed federal health-based standards. The phaseout of fossil fuel-generated electricity is expected to reduce smog-related deaths and illnesses.

Disadvantaged communities — low-income neighborhoods that have historically suffered poor health, dirty air and other burdens — will reap the highest health benefits from clean electricity. Half of the state's natural gas power plants are in communities that rank among the 25 percent most disadvantaged.

SB 100-driven growth in the capacity to generate and store clean electricity can create thousands of new high-quality clean energy jobs, especially in the installation and maintenance of solar and wind systems.

The 2021 SB 100 Joint Agency Report

The 2021 report is a first step to evaluate the challenges and opportunities in implementing SB 100. It includes an initial assessment of the additional energy resources and the resource building rates needed to achieve 100 percent clean electricity, along with the associated costs. It uses a computer model to analyze these factors under various conditions and technologies.

The estimates in this report will change over time as additional factors are examined. The next study will focus mainly on grid reliability. The joint agencies will evaluate the measures needed to ensure California's power needs are met under a wide range of conditions as the state transitions to 100 percent clean electricity. Future modeling will also:

Further assess the potential of emerging technologies, such as long-duration energy storage and green hydrogen generation.

Examine the economic and land-use effects.

Evaluate consistency with the state's goals for clean energy equity.[2]

Public Outreach

A diverse array of interests informed this report through a year-long series of public workshops and comment opportunities. Participants included:

Community leaders

Energy experts with utilities, technology companies and trade groups

University researchers

Environmental groups

Environmental justice organizations

The joint agencies also consulted with the California balancing authorities and the Disadvantaged Communities Advisory Group, which advises the Energy Commission and Public Utilities Commission on energy equity issues.

Modeled Scenarios and Results

The energy consulting firm E3 developed the model and performed the scenario analyses. The modeling inputs and assumptions are consistent with the joint agencies' interpretation of SB 100. The analysis builds on the modeling and assumptions used for the Public Utilities Commission's Integrated Resource Planning and considers California's overarching priorities on energy, climate, equity and public health.

The joint agencies interpreted "zero-carbon resources" to mean energy resources that qualify as "renewable" in the Renewables Portfolio Standard program or generate zero greenhouse gas emissions on site. The modeled zero-carbon technologies are limited to those that are consistent with state policies and priorities and are commercialized, with publicly available cost and performance data. Excluded technologies may be considered in future SB 100 analyses. Staff will update modeling as new technologies enter the market.

Renewable/Zero-Carbon Technologies Modeled:

- Solar, photovoltaic and thermal (existing only)
- Wind, onshore and offshore
- Geothermal
- Bioenergy
- Fuels cells
- Hydroelectric, existing large and small operations only
- Nuclear, existing power plants only

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Modeling Results

Clean Electricity Resources

To reach the 2045 target, California will need to roughly triple its current electricity power capacity. The projected increase is driven by the conversion to clean energy resources and growing electricity demand.

California
Clean Electricity Resources

	Existing Resources	Projected New Resources	
	2019*	2030**	2045**
Solar (Utility-Scale)	12.5 GW	16.9 GW	69.4 GW
Solar (Customer)	8.0 GW	12.5 GW	28.2 GW
Storage (Battery)	0.2 GW	9.5 GW	48.8 GW
Storage (Long Duration)	3.7 GW	0.9 GW	4.0 GW
Wind (Onshore)	6.0 GW	8.2 GW	12.6 GW
Wind (Offshore)	0 GW	0 GW	10.0 GW
Geothermal	2.7 GW	0 GW	0.1 GW
Biomass	1.3 GW	0 GW	0 GW
Hydrogen Fuel Cells	0 GW	0 GW	0 GW
Hydro (Large)	12.3 GW	N/A†	N/A†
Hydro (Small)	1.8 GW	N/A†	N/A†
Nuclear	2.4 GW	N/A†	N/A†

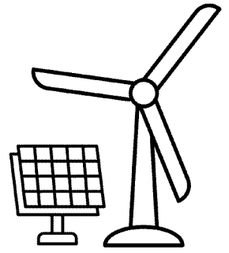
**Includes in-state | **Includes in-state and out of state capacity | †New hydro and nuclear resources were not candidate technologies for this round of modeling and could not be selected*

While no new natural gas generation is selected in the SB 100 Core scenario, much of the existing natural gas capacity is retained through 2045. Generation of renewable and zero-carbon resources must be at least equal to retail sales by 2045, however natural gas generation can serve non-retail load or system losses. Cost reductions and innovation in zero-carbon firm resources and storage resources may reduce the amount of gas generation needed.

Build Rates

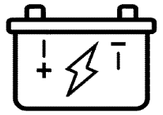
California will need to sustain its expansion of clean electricity generation capacity at a record-breaking rate for the next 25 years. On average, the state will need to build 6 GW of new solar, wind and battery storage resources annually.

To Achieve Clean Energy
Development Needs To Rapidly Accelerate



Solar & Wind

3X Solar and wind build rates need to nearly triple*



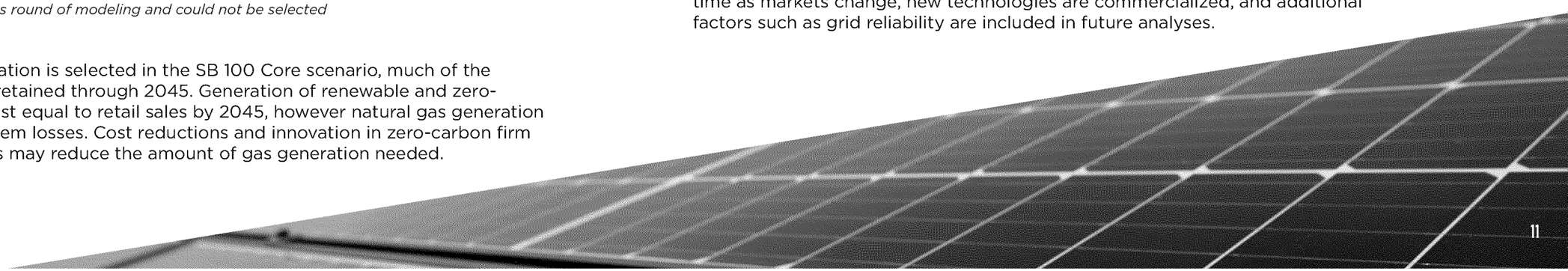
Battery

8X Battery storage build rates need to increase by nearly eightfold**

**Based on 10-year average | **Based on 2020*

Costs

Modeling results indicate that achieving 100 percent clean electricity will increase the total annual electricity system costs by nearly $4.6 billion by 2045. This is 6 percent more than the cost under the state's Renewables Portfolio Standard requirement of having at least 60 percent clean electricity by the end of 2030. These estimates will change over time as markets change, new technologies are commercialized, and additional factors such as grid reliability are included in future analyses.



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Additional Scenarios

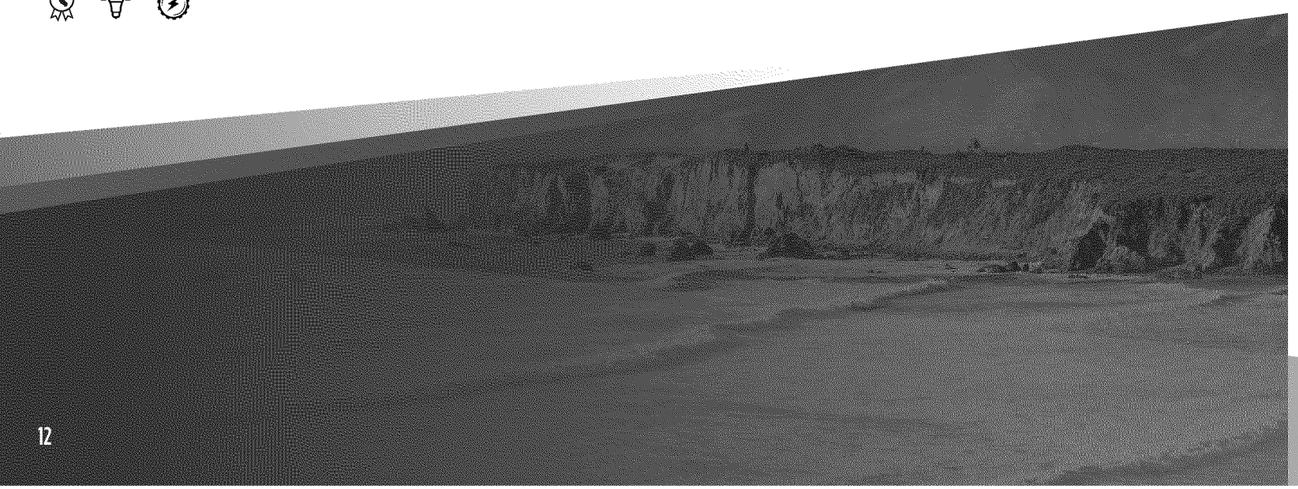
The joint agencies modeled SB 100 implementation in a "high-flexibility" scenario in which the grid's ability to shift high demand to times of surplus supply is improved. This scenario results in nearly $1 billion in annual cost savings by 2045 and a reduction in the amount of energy storage (batteries) and natural gas needed to support the grid. These results suggest greater load flexibility could significantly lower implementation costs.

The agencies also explored scenarios outside their interpretation of SB 100. These "study scenarios" are intended to inform broader state planning efforts on energy, climate, and public health:

No-Combustion:
Excludes electricity generated from combustion of biomass and fossil fuels, including natural gas. Modeling indicates this scenario may result in a 12 percent increase to annual costs by 2045.

Zero-Carbon Firm Resources:
Adds generic carbon-free energy resources that are "firm" — always available. These represent emerging technologies that may become cost-competitive and commercialized over the next 25 years. Examples include 100 percent green hydrogen-fueled turbines and natural gas with systems that can capture and store 100 percent of carbon emissions. Results indicate that the inclusion of these resources could reduce annual electricity system costs in 2045 by $2 billion, roughly 3 percent.

Accelerated Timeline:
Accelerates 100 percent target to 2030, 2035, and 2040. Preliminary results indicate these targets may be achievable but may increase overall costs.



Key Takeaways from Modeling

This initial analysis suggests SB 100 is technically achievable through multiple pathways.

Construction of clean electricity generation and storage facilities must be sustained at record-setting rates.

Diversity in energy resources and technologies lowers overall costs.

Retaining some natural gas power capacity may minimize costs while ensuring uninterrupted power supply during the transition to 100 percent clean energy.

Increased energy storage and advancements in zero-carbon technologies can reduce natural gas capacity needs.

Further analysis is needed.

Recommendations for Further Analysis

Verify that scenario results satisfy the state's grid reliability requirements.

Continue to evaluate the potential effects of cost-saving emerging resources, such as offshore wind, long-duration energy storage, green hydrogen technologies, and demand flexibility.

Assess environmental, social, and economic costs and benefits of the additional clean electricity generation capacity and storage needed to implement SB 100.

Hold annual workshops to support alignment among the joint agencies and continuity between SB 100 reports.

POVI 0003584

SB 100 Joint Agencies

California Energy Commission (CEC): leads the state to a 100 percent clean energy future by investing in clean energy and transportation innovation, forecasting energy demand, setting the state's appliance and building energy efficiency standards, and directing the state's response to energy emergencies.

California Public Utilities Commission (CPUC): regulates services and utilities, protects consumers, safeguards the environment, and assures Californians' access to safe and reliable utility infrastructure and services.

California Air Resources Board (CARB): leads the state's climate change programs and oversees all air pollution control efforts in the state.

POVI 0003585

Williamson Act Statistics

2022-2023

Our Mission

The Department of Conservation balances today's needs with tomorrow's challenges and fosters intelligent, sustainable, and efficient use of California's energy, land, and mineral resources. The Department administers multiple programs to promote the conservation of working lands and orderly growth and development.

The Williamson Act

The Williamson Act, also known as the California Land Conservation Act of 1965, has helped preserve agricultural and open space lands since 1965. Local governments and landowners enter into voluntary contracts to restrict enrolled lands to agricultural and open space uses, typically for 10-year rolling terms, in exchange for property tax reductions. The Act supports California's conservation, food security, and orderly growth goals while helping farmers and ranchers stay in production.

For further information, please contact:

California Department of Conservation
Division of Land Resource Protection
Williamson Act Program
715 P Street, MS 1904
Sacramento, CA 95814-3528
(916) 324-0850
TDD (916) 324-2555
Email: lca@conservation.ca.gov
https://www.conservation.ca.gov/dlrp

Williamson Act Program Staff

Monique Wilber, Senior Environmental Planner, Program Manager
Davina Smith, Senior Staff Attorney
Farl Grundy, Associate Environmental Planner
Annie Giovacchini, Associate Environmental Planner

Division of Land Resource Protection

Shanna Atherton, Division Director

Biennial Statistics

Government Code Section 51207 directs the Department of Conservation (DOC) to post on its website biennial statistics on Williamson Act implementation, including enrolled acreage and removals due to cancellation, public acquisition/eminent domain, and annexation. Senate Bill 574 adopted in 2022 by the state legislature streamlined Williamson Act enrollment reporting by requiring cities and counties to submit enrollment data as Geographic Information System (GIS) files. These data are accessible on DOC's website in the "Doc Maps" agriculture section or https://maps.conservation.ca.gov.

While GIS-based enrollment data is available on DOC's website, the detailed information required by Government Code Section 51207 will continue to be published separately in the "Reports" section of the DOC Williamson Act website as a PDF document. The following table summarizes enrollment totals and contract terminations based on self-reported data from cities and counties for the 2022–23 reporting period (January 1, 2022 – December 31, 2023).

Biennial Statistics Table:

Year	WA Acres Reported[1]	Final Cancellations Approved[2]	Acres Cancelled[3]	Pending Tentative Cancellation[4]	Outstanding Cancellation Fees ($)[5]	Acres Removed (Public Acquisition)[6]	Acres Removed (Annexation)[7]
2022	15.1M	8	1,284	9	$1,604,875	1,675	None Reported
2023	15.3M	8	361	11	$1,604,875	37	None Reported
Totals	N/A	16	1,645	57	$1,604,875	1,712	0

[1] **WA Acres Reported:** WA Acres are derived from county and city self-reported data.

[2] **Final Cancellations Approved**: A **Final Certificate of Cancellation** was recorded within the reporting year, and the county notified the DOC.

[3] **Acres Cancelled**: Includes only the acres where a **Final Certificate of Cancellation** was recorded by the county and reported to DOC during the reporting year.

[4] **Pending Tentative Cancellations**: A **Tentative Certificate of Cancellation** was recorded within the reporting year and is still awaiting a **Final Certificate of Cancellation** to be recorded. Tentative cancellations can remain on record for up to **10 years**, and the total reflects all tentative cancellations remaining on record at end of the reporting year by DOC.

[5] **Outstanding Cancellation Fees**: A **Final Certificate of Cancellation** was issued by the county within the reporting year, but the cancellation fees were **not forwarded** to the State Controller's Office.

[6] **Acres Removed through Public Acquisition**: Public agencies that acquire Williamson Act land through eminent domain/in lieu of eminent domain or some other means are required to notify DOC within 10 days of acquiring the land. The table reflects the acres notified to DOC.

[7] **Acres Removed by Annexation**: Derived from **Board of Equalization tax data** compared to **Williamson Act contract data** reported to the Department.
https://services6.arcgis.com/snwvZ3EmaoXJiugR/ArcGIS/rest/services/City_and_County_Boundary_Line_Changes/FeatureServer/0

POVI 0003587

Message

From: David, Travis@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=08B483B8D5464B41B536DAF809EB1A0D-DAVID, TRAV]
Sent: 1/13/2026 7:47:12 PM
To: Koch, Andrea@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8024cfdec6344412812ea6c8320f29b2-Koch, Andre]; Energy - GIS [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e6f8ddb65f0f4a3190ad863248c91580-Energy - GI]; Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]
CC: Giorgi, Erika@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d171e5d706e34c26ad9d13c230f2349f-1324b266-6e]
Subject: RE: Alameda County- Acres in Williamson Act Contracts

According to the Department of Conservation's latest Williamson Act dataset. There are **143,934.6 Acres** of Williamson Act Land in Alameda County. This total includes Nonprime (140,158.5 Acres), Prime (3,466.2 Acres), and Nonrenewal (309.8 Acres) Williamson Act parcels.

Let me know if you have any questions.

Travis David
Electric Generation System Specialist
Siting, Transmission and Environmental Protection Division

From: David, Travis@Energy
Sent: Tuesday, January 13, 2026 11:31 AM
To: Koch, Andrea@Energy <Andrea.Koch@energy.ca.gov>; Energy - GIS <GIS@energy.ca.gov>; Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Cc: Giorgi, Erika@Energy <Erika.Giorgi@energy.ca.gov>
Subject: RE: Alameda County- Acres in Williamson Act Contracts

I'm working on this now.

Travis David
Electric Generation System Specialist
Siting, Transmission and Environmental Protection Division

From: Koch, Andrea@Energy <Andrea.Koch@energy.ca.gov>
Sent: Tuesday, January 13, 2026 10:48 AM
To: Energy - GIS <GIS@energy.ca.gov>; David, Travis@Energy <travis.david@energy.ca.gov>
Cc: Giorgi, Erika@Energy <Erika.Giorgi@Energy.ca.gov>
Subject: Alameda County- Acres in Williamson Act Contracts

Hi Travis.

Could you figure out, given the most recent statistics, approximately how many acres in Alameda County are currently under Williamson Act contracts?

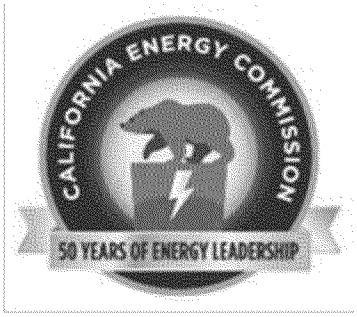
https://www.arcgis.com/home/item.html?id=29dd1328c36a467991a1a1ad8b1caefa#visualize

Thank you so much!

Andrea

Andrea Koch
Environmental Planning Specialist
Land Use & Public Services Unit
Siting and Environmental Branch
Siting, Transmission and Environmental Protection Division
Phone: 1-279-226-1028

California Energy Commission
Website: www.energy.ca.gov



Appointment

From: Veerkamp, Eric@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=A16598E8714E422FB3216B7B05602C48-VEERKAMP, E]
Sent: 1/6/2026 11:57:14 PM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Alvert V. Lopez [albert.lopez@acgov.org]; damien.curry@acgov.org; rodrigo.orduna@acgov.org; samuel.tan@acpwa.org; dilan.roe@acgov.org; josh.barbosa@acgov.org; Natali.Colom@acgov.org [natali.colom@acgov.org]; Nicola Park [nicola.park@clearwayenergy.com]; Aarty Joshi [aarty.joshi@clearwayenergy.com]; Ackerman, James@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cc35de240cf4253af9cc7d3d2cbb643-Ackerman, J]; Abulaban, Abdel-Karim@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c1ff1d38281a4068b2708271d22c0d94-Abulaban, A]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]; Giorgi, Erika@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d171e5d706e34c26ad9d13c230f2349f-1324b266-6e]; Borkowski, Barbara@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ab8f496b4b784ff199bebeb01ec055e2-51690376-8e]; Paul Miller [pmiller@therchgroup.com]; Daniel Jones [djones@therchgroup.com]; Jenna Yang [Jenna.Yang@Waterboards.ca.gov]; Tadlock, Stephanie@Waterboards [Stephanie.Tadlock@waterboards.ca.gov]; linda.lai@acgov.org; muhammed.khan@acgov.org; caroline.hoskins@acgov.org; Shahi, Hurshbir@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b9e9678d3d4746b19d23b00bf9066eca-c691b5be-4a]; Heiser, John@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ec7b7da387974d03a2e76a6f5365753e-Heiser, Joh]
CC: Knight, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=be42548337f44852a291a9845f226f62-Knight, Eri]; Fooks, Brett@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=870df74143964b71ada0039bf13c5a9a-Fooks, Bret]; Parent, Michelle [mparent@zone7water.com]; Neptune, Chad K.@Waterboards [Chad.Neptune@Waterboards.ca.gov]; Keenan, Grace@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=900e20ed5c9f4d578ef515167dea57fb-f37bb591-f6]

Subject: Potentia-Viridi battery project (Opt-In), wastewater permits; AGENDA
Attachments: Potentia Meeting County septic permitting Agenda20260122.docx
Location: Microsoft Teams Meeting

Start: 1/22/2026 10:45:00 PM
End: 1/22/2026 11:45:00 PM
Show Time As: Tentative

Required Attendees: Veerkamp, Eric@Energy; Alvert V. Lopez; damien.curry@acgov.org; rodrigo.orduna@acgov.org; samuel.tan@acpwa.org; dilan.roe@acgov.org; josh.barbosa@acgov.org; Natali.Colom@acgov.org; Nicola Park; Aarty Joshi; Ackerman, James@Energy; Abulaban, Abdel-Karim@Energy; Chang, Kaycee@Energy; Giorgi, Erika@Energy; Borkowski, Barbara@Energy; Paul Miller; Daniel Jones; Jenna Yang; Tadlock, Stephanie@Waterboards; linda.lai@acgov.org; muhammed.khan@acgov.org; caroline.hoskins@acgov.org; Shahi, Hurshbir@Energy; Heiser, John@Energy
Optional Attendees: Knight, Eric@Energy; Fooks, Brett@Energy; Parent, Michelle; Neptune, Chad K.@Waterboards; Keenan, Grace@Energy

Hello and Happy New Year.

Some in this invite may remember when we last convened a meeting on May 22, 2025 to discuss the proposed Potentia-Viridi battery project in the east county. CEC staff presented a general overview of the state of California Opt-In program, but there was little focused topical discussion. Since that time, as you may be aware, new ownership has taken over the project; Clearway Energy Group, LLC/Renew Development HoldCo, LLC completed the purchase of the project from Eurowind Energy in Q4 2025.

CEC staff is initiating a meeting to discuss issues related to permitting for the proposed above-ground septic tanks that will contain sanitary wastewater. Our understanding is that permits for the tanks fall under the County Onsite Wastewater Containment Unit (OWCU) requirements, which are flow through permits originating with the California Water Boards. We are working with the applicant to facilitate approval of necessary permits within the 90-day window, post certification.

Thank you. Please let me know if you have any questions.

Eric Veerkamp
Project Manager
916-661-8458

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For organizers: Meeting options | Reset dial-in PIN

Potentia-Viridi Battery Energy Storage System (California Energy Commission (CEC) Opt-In project) CEC/Applicant/Agencies

January 22, 2026 – 2:45 pm to 3:45 pm

Invitees: <albert.lopez@acgov.org>; damien.curry@acgov.org; rodrigo.orduna@acgov.org; samuel.tan@acpwa.org; dilan.roe@acgov.org; josh.barbosa@acgov.org; <natali.colom@acgov.org>; <nicola.park@clearwayenergy.com>; <aarty.joshi@clearwayenergy.com>; <james.ackerman@energy.ca.gov>; <Abdel-Karim.Abulaban@energy.ca.gov>; <kaycee.chang@energy.ca.gov>; <Erika.Giorgi@energy.ca.gov>; <Barbara.Borkowski@energy.ca.gov>; Paul Miller <pmiller@therchgroup.com>; Daniel Jones <djones@therchgroup.com>; <Jenna.Yang@Waterboards.ca.gov>; <Stephanie.Tadlock@waterboards.ca.gov>; linda.lai@acgov.org; muhammed.khan@acgov.org; caroline.hoskins@acgov.org; <Eric.Knight@energy.ca.gov>; <Brett.Fooks@energy.ca.gov>; Parent, Michelle <mparent@zone7water.com>; <Chad.Neptune@Waterboards.ca.gov>

Meeting Purpose: The purpose of this meeting is to discuss issues related to permitting for proposed above-ground septic tanks containing sanitary wastewater. Our understanding is that permits for the tanks fall under the County Onsite Wastewater Containment Unit (OWCU) requirements, which are flow through permits originating with the California Water Boards. The CEC is working with the applicant to facilitate approval of necessary permits within the 90-day post certification window.

1. Intro to Project, CEC and Clearway
2. Intro to CEC's Opt-in process (as it relates to timing)
3. Summary of Potentia-Viridi project proposed by Clearway, focusing on septic system
4. List of questions for discussion
    a. What are the Alameda County application requirements/process for septic given the scope proposed?
    b. How might the application requirements vary if the scope was different (leach field)?
    c. Alameda County and Zone 7 coordination on permitting, expectations.
    d. What is the timeline otherwise for finalizing the required permits?

e. Can the County and Zone 7 process fall within the 90 days of CEC approval window since Water board delegated their decision-making on septic to the County?

5. Next steps/other questions

Appointment

From: Veerkamp, Eric@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=A16598E8714E422FB3216B7B05602C48-VEERKAMP, E]
Sent: 1/12/2026 11:57:49 PM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Crisp, Ann@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b89c4de7ece742679d19e1e3ee713dc2-Crisp, Ann@]; Julie Myrah [field@energyveterans.org]; Mudge, Annie E. [amudge@coxcastle.com]; Giorgi, Erika@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d171e5d706e34c26ad9d13c230f2349f-1324b266-6e]; Borkowski, Barbara@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ab8f496b4b784ff199bebeb01ec055e2-51690376-8e]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]; raisa.lee@clearwayenergy.com; Single, Alex@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=67f4b571beab4b189c77463bdbcdc018-cfdcc901-02]
CC: Knight, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=be42548337f44852a291a9845f226f62-Knight, Eri]; Koch, Andrea@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8024cfdec6344412812ea6c8320f29b2-Koch, Andre]; Hull, Robbie C. [RHull@coxcastle.com]; Nicola Park [Nicola.Park@clearwayenergy.com]; Aarty Joshi [Aarty.Joshi@clearwayenergy.com]; Sinclair, Crystal@Wildlife [Crystal.Sinclair@wildlife.ca.gov]; Quillman, Gabriele@Wildlife [Gabriele.Quillman@wildlife.ca.gov]

Subject: Potentia-Viridi; BIO mitigation approach
Location: Microsoft Teams Meeting

Start: 1/13/2026 9:00:00 PM
End: 1/13/2026 10:00:00 PM
Show Time As: Tentative

Required Attendees: Crisp, Ann@Energy; Julie Myrah; Mudge, Annie E.; Giorgi, Erika@Energy; Borkowski, Barbara@Energy; Chang, Kaycee@Energy; raisa.lee@clearwayenergy.com; Single, Alex@Energy
Optional Attendees: Knight, Eric@Energy; Koch, Andrea@Energy; Hull, Robbie C.; Nicola Park; Aarty Joshi; Sinclair, Crystal@Wildlife; Quillman, Gabriele@Wildlife

Hello all,
Please hold this time for a team to team discussion of BIO mitigation/methodology.

Initial questions provided by the applicant are below, along with CEC staff's initial general responses. TY.

Bio Mitigation Methodology
a. Project's intent is to comply with Eastern Alameda Conservation Strategy (EACCS) and mitigation requirements within it, which USFWS has accepted. Has CEC received any feedback from CDFW on this? How is CEC viewing the Project in light of the EACCS? Are other requirements expected to be imposed?
b. Project's intent is to incorporate grazing into the long-term management plan for the mitigation lands as the chief means of vegetation management as well as to create habitat for threatened species. Project also intends for landowner to continue grazing the area around the BESS. Are there any other agricultural requirements that are anticipated or that were previously proposed/discussed related to Williamson Act or otherwise?
CEC initial Responses:
1. CEC staff are coordinating with CDFW to determine the appropriateness of using EACCS as a mitigation framework, provided that project-specific impacts are adequately addressed and mitigation ratios are appropriately applied. Where appropriate, the mitigation ratios would be included in staff's proposed Conditions of

Certification and could also support in-lieu take authorization under the CEC's permitting authority.
2. Grazing is beneficial for some of the covered species and is included in most of the long-term management plans under ITPs. Williamson Act contracts often have allowed uses such as ranch infrastructure development, vineyard development, etc. that conflict with land management for CESA covered species so the management plan requirements included in staff's conditions of certification may define allowed uses and prohibited uses on mitigation lands.

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9 July 2025

Patrick Leitch
Levy Alameda, LLC
155 Wellington Street, Suite 2930
Toronto, Ontario, M5V 3H1, Canada
PLeitch@capstoneinfra.com

NOTIFICATION OF A COMPLETE SECTION 401 WATER QUALITY CERTIFICATION APPLICATION; LEVY ALAMEDA, LLC, POTENTIA-VIRIDI BATTERY ENERGY STORAGE SYSTEM PROJECT (PV-BESS) (WDID#5B01CR00050), ALAMEDA COUNTY

Thank you for submitting an application for Section 401 Water Quality Certification (Certification) for the Potentia-Viridi Battery Energy Storage System Project (PV-BESS) (Project) dated 17 June 2025. Based on review of the above materials submitted, the application appears to be complete. Central Valley Regional Water Quality Control Board staff will be preparing a Certification for the Project.

Pursuant to title 23, section 3856, subdivision (b) of the California Code of Regulations, "[a] full, technically accurate description, including the purpose and final goal, of the entire activity" must be provided before an application will be considered "complete." If there are any changes to the Project, your application may be deemed incomplete, and we may contact you for other information to assist us in preparing the Certification.

Pursuant to California Code of Regulations, Title 23, section 3856, subdivision f, a copy of any draft CEQA document(s) prepared for the activity shall be submitted to the certifying agency. A valid CEQA document, which includes the final CEQA document and a Notice of Determination filed with the State Clearinghouse, while not required for a complete application, must be provided and the certifying agency shall have ample time to properly review a final copy of valid CEQA documentation before taking a certification action.

Failure to submit valid CEQA documentation may result in a denial without prejudice. The denial without prejudice is issued for procedural rather than substantive reasons, and carries with it no judgement on the technical merits of the activity.

When submitting materials related to this application, please reference the Project name and WDID number as shown in the subject line. The materials must be converted to a searchable portable document in PDF format. Please submit the required materials

electronically to CentralValleySacramento@waterboards.ca.gov. Documents that are 50 MB or larger should be transferred to a disk and mailed to the address listed below.

Attention: Jenna Yang
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670-6114

Please contact Jenna Yang immediately at (916) 464-4764 or at Jenna.Yang@waterboards.ca.gov if you have any questions or if there are changes to the project description.

Stephanie Tadlock
Senior Environmental Scientist
401 Water Quality Certification Unit

cc: [Via email only]

Matthew Di Loreto (SPK-2024-00486)
United States Army Corps of Engineers
Sacramento District Office
Regulatory Division
Matthew.J.DiLoreto@usace.army.mil
SPKRegulatoryMailbox@usace.army.mil

United States Environmental Protection Agency
R9CWA401@epa.gov

CWA Section 401 WQC Program
State Water Resources Control Board
StateBoard401@waterboards.ca.gov

Ann Crisp
California Energy Commission
Ann.Crisp@energy.ca.gov

Naomi Schowalter
Integral Consulting Inc.
NSchowalter@integral-corp.com

PUBLIC UTILITIES COMMISSION
STATE OF CALIFORNIA
505 VAN NESS AVENUE | SAN FRANCISCO, CALIFORNIA 94102
300 CAPITOL MALL | SACRAMENTO, CALIFORNIA 95814

ALICE BUSCHING REYNOLDS
PRESIDENT

TEL: (415) 703-3700
FAX: (415) 703-3352
ALICE.REYNOLDS@CPUC.CA.GOV

November 21, 2025

Patricia K. Poppe
Chief Executive Officer
Pacific Gas and Electric Company
300 Lakeside Dr
Oakland, CA 94612

Subject: Support for Realization of Generation and Storage Projects via Expediting Required PG&E Interconnection and Transmission Activities

Dear Ms. Poppe,

In August 2025, Governor Newsom issued Executive Order (EO) N-33-25[1] in response to recently passed federal legislation that removes Inflation Reduction Act (IRA) investment and production tax credits for solar and wind power plants placed in service after December 31, 2027, with limited exemptions for power plants that are, or will soon be, under construction. The EO directs the CPUC to:

- Identify critical generation and storage projects expected to come online in the next three years and request that utilities under its jurisdiction prioritize actions to enable them to interconnect.

- Coordinate with utilities under its jurisdiction and the CAISO to identify priority actions to expedite transmission development that can support the connection of new resources in the next three years.

The actions identified in the EO build on the work I requested PG&E to prioritize in a March 2022 letter. In that letter, I requested PG&E to prioritize actions that continue

[1] See Executive Order N-33-25, available for reference: https://www.gov.ca.gov/wp-content/uploads/2025/08/Clean-Energy-EO_8.29.25_FINAL.SIGNED.pdf.

bringing online new wholesale generation and storage resources in light of the reliability events in 2020 and 2021.[2]

I recognize the important actions that PG&E has already undertaken to address interconnection and transmission challenges in response to my March 2022 letter. For example, PG&E has expanded new equipment vendor relationships to decrease the impact to interconnection projects caused by long lead-time materials and supply chain bottlenecks. But more work is urgently needed to speed up the development and interconnection of key renewable resources and transmission projects at the lowest possible cost for ratepayers.

Thus, I request that PG&E submit a report to the Commission by January 15, 2026, describing its efforts to expedite interconnection of new resources in 2025 and 2026, and identify process improvements for the transmission and interconnection build out in 2026 and the coming years. PG&E's response should describe whether any actions would interfere with its efforts to reduce costs for ratepayers.

Attached is a list of in-development wholesale generator interconnection projects in your utility service territory that may be impacted by recent federal action phasing out IRA tax credits. It also includes wholesale storage projects. In your forthcoming report, please describe actions that PG&E is taking to ensure that these projects meet their planned in-service dates, and what actions PG&E is taking to accelerate these in-service dates when appropriate.

This attachment also includes CPUC requested actions for PG&E to take to support wholesale generator and storage development. Your report should describe how PG&E is addressing these requested actions, and describe other actions already taken or underway that will allow PG&E to fulfill its responsibilities related to interconnection, especially as agreed to in existing signed interconnection agreements with developers.

Currently there are over 20,000 MW of additional, new clean energy resources under contract to CPUC-jurisdictional load serving entities – including for PG&E's bundled customers – and these resources are seeking interconnection to the CAISO grid as soon as possible. These new resource additions are essential to meet California's growing electricity demand, maintain grid reliability, and achieve the state's greenhouse gas reduction goals.

These expected new resources are under contract to serve load, but each project needs to also achieve the requisite interconnection, permitting, financing, and

[2] See Prior Letter dated March 2022, available at https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/summer-2021-reliability/tracking-energy-development/2022-03-11-cpuc-interconnection-letter-to-pge.pdf

construction to successfully come online. If unexpected challenges arise during the interconnection process, there can be significant impacts to the State's energy affordability and clean energy goals. Federal policy changes present an immediate risk to developers seeking to bring projects online and can raise their business costs, which likely will be passed on to California ratepayers.

My ask today is for PG&E to continue work that it has undertaken since I sent the March 2022 letters and to identify how you will continue to bring new wholesale resources online in a timely manner, especially in light of expiring tax credits. This work will build on the collective efforts across the state that allowed California to develop an unprecedented and record-breaking quantity of new clean energy, including over 4,100 new MW interconnecting to PG&E's system[3] since 2020. The successful interconnection of these resources has been essential to enhancing the reliability of California's grid.

Building upon our collective success with interconnecting a record-setting number of clean resources since 2020, I am calling on PG&E to continue prioritizing efforts to support grid reliability in 2026 and 2027, and to accelerate the interconnection of the resources listed in the attachment, especially those that may be able to take advantage of expiring IRA tax credits.

I look forward to the January 15, 2026 report on your continued efforts.

Sincerely,

Alice Busching Reynolds
President
California Public Utilities Commission

CC:
Matthew Baker, CPUC Commissioner, matthew.baker@cpuc.ca.gov
Karen Douglas, CPUC Commissioner, karen.douglas@cpuc.ca.gov
Darcie L. Houck, CPUC Commissioner, darcie.houck@cpuc.ca.gov
John Reynolds, CPUC Commissioner, john.reynolds@cpuc.ca.gov
David Hochschild, California Energy Commission, Chair, Chair.Hochschild@energy.ca.gov
Siva Gunda, California Energy Commissioner, Siva.Gunda@energy.ca.gov
Elliot Mainzer, California Independent System Operator, CEO, eemainzer@caiso.com

[3] See slide 8: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/summer-2021-reliability/tracking-energy-development/resource-tracking-data-september-2025-releasev2.pdf

Leuwam Tesfai, CPUC, Deputy Executive Director for Energy and Climate Policy, leuwam.tesfai@cpuc.ca.gov
Rohimah Moly, Governor's Office of Business Development (GO-Biz), Deputy Director Rohimah.Moly@gobiz.ca.gov
Dee Dee Myers, Governor's Office of Business Development (GO-Biz) Director, Deedee.myers@gobiz.ca.gov

Attachment: CPUC requested actions for PG&E to take in order to support wholesale generator and storage development via activities related to interconnection and transmission.

In your response to each of these, identify where addressing would increase cost to ratepayers. Responses should also report on measures PG&E has taken to reduce ratepayer costs in interconnecting new wholesale generation and storage projects.

- **Interconnection Agreements – Report on Process and Timelines**

  Review all signed PG&E interconnection agreements and transmission projects that pose dependencies to interconnection agreements. PG&E should identify what actions it can undertake to facilitate execution of all interconnection projects, especially those with signed interconnection agreements that may be impacted by the phase-out of IRA tax credits. Many of these include solar and wind projects that can start construction by July 4, 2026, or that have the potential to be put in-service by December 31, 2027.

  a. Report to the Commission about actions taken and underway to ensure that these interconnection agreements can be fulfilled and the projects can achieve commercial operation.

  b. Report on the interconnection, and any related transmission timelines, for the current portfolio of projects in PG&E's service territory, including descriptions of key timeline milestones and metrics for success.

  c. Provide information, to the extent available, about process improvements that have been reached for supporting the interconnection of wholesale projects, and their transmission dependencies, seeking to connect to the PG&E system.

- **Staffing and Financial Resources**

  Review PG&E's staffing and financial resources required to support realization of interconnection requests.

  a. Confirm whether staffing resources are sufficient on PG&E's Transmission and Interconnection teams to support the interconnection of new wholesale generation and storage resources.

  b. Identify if there are financial constraints that are limiting the ability of the PG&E to invest in the requisite substation, transmission, or interconnection equipment.

- **Efficient Procurement of Requisite Equipment**

  Review PG&E's ability to procure requisite equipment for interconnection facilities and transmission lines needed for the successful interconnection of new generation and storage assets. Report on whether PG&E experiences delays procuring circuit breakers, transformers, specialized steel structures, and other equipment necessary to support interconnection and transmission upgrades.

  a. Review and report on any proactive efforts PG&E has taken to procure long lead-time equipment necessary for interconnection upgrades and transmission lines to avoid generator and storage project delays.

  b. Review and report on whether PG&E can (and does) work with developers to share project development building activities, including self-build options or self-provision of long lead-time equipment in accordance with utility specifications and utility procurement agreements, to facilitate on-time delivery of interconnection projects and dependent transmission.

- **Timely Construction of Critical Transmission Network Upgrades and Facilitate Interconnection**

  Report on the status of critical transmission upgrades already identified as necessary to support future interconnections, as well as policies PG&E can implement to remove barriers to timely interconnections. It is critical that PG&E identify, track, and deliver delayed transmission projects and network upgrades that will have the highest impact on reliability, and that may prevent large amounts of generation and storage from coming online on time.

  a. Identify and focus on critical transmission upgrades: CPUC staff's 2025 Senate Bill 1174 transmission system assessment is in progress[4] and has found that nearly 8.5 GW of PG&E's expected new generation and storage resources are dependent on PG&E transmission projects and network upgrades that have been delayed. For example, delays to Vaca Dixon Substation 230 kV circuit breaker upgrades are expected to prevent two resources (450 MW) from meeting their in-service dates, and are putting another two resources (900 MW) at risk of delay. It is critical that PG&E identify and focus on the transmission projects and network upgrades that will have the highest impact on reliability and that are preventing large amounts of generation and storage from coming online on time.

  b. Identify whether there are policies that can facilitate generation through sharing utility owned easements in order to help prevent unnecessary project delays due to extended negotiations for greenfield easements from local

[4] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/summer-2021-reliability/tracking-energy-development

cities, counties and landowners for the interconnection tie lines between the new generation and substation

- **Ongoing Processes to Provide Transparency, Cost Savings, and Efficiency for New Transmission and Interconnection**

  Continue to participate in information and process reform efforts and report to the CPUC whether there are any steps that can be taken to improve these forums to support transparency, cost savings, and efficiency of the interconnection process.

- **List of Projects in PG&E's Interconnection Queue**

  The data listed below reflect a snapshot of LSE-submitted data on projects and developments for current procurement efforts, with a focus on projects expected to reach commercial operation in the near-term. Project ordering does not connote priority in development. Because this list is based on data provided by LSEs, some project information and other projects currently in development may be missing. CPUC and the Tracking Energy Development (TED) Task Force request that PG&E increase their focus on these projects, as well as others PG&E knows to be in-development in its service territory, and look for opportunities to accelerate the in-service dates of projects when appropriate:

Project Name	Queue Position	Resource Type	Nameplate MWs
North Fork Community Power	2007-RD	Biomass/Biogas	2
Sandrini BESS	Q1397	Storage	92
Ranch Sereno	2597-WD	Solar	3
Hummingbird	Q1454	Storage	75
Redemeyer Solar	3086-WD	Solar	4
Redemeyer Storage	3086-WD	Storage	4
Angela	Q1443	Solar and Storage	60
Godinho Dairy Digester	3281-RD	Biomass/Biogas	2
American Canyon RV Boat Storage	3547-RD	Solar	2
Tesoro Commons LLC	3098-WD	Solar	3
Noosa Energy Storage	Q1557	Storage	99
Gateway Solar RV and Boat Storage	3238-RD	Solar	3
Stellar Wright BESS LLC	Q779	Storage	80
Conflitti Solar	2226-WD	Solar	4
Gonzaga Wind Farm	Q1378	Wind	76
Alpaugh	Q1143	Storage	10

Chalan Solar	Q1495	Solar and Storage	90
Althea Avenue Solar Phase I	3170-WD	Solar	5
Althea Avenue Solar Phase II	3179-WD	Solar	4
4Gibson Solar	2595-WD	Solar and Storage	26
Flying Goose Deuce	3497-WD	Solar	3
Redux Solar (San Luis West)	Q1389	Solar and Storage	156
Blue Mountain Electric Company	2008-RD	Biomass/Biogas	3
Engeman SVRC Green Energy	3507-RD	Biomass/Biogas	3
Key Storage	Q1479	Storage	300
Gonzaga Hybrid	Q1718	Wind and Storage	115
Aramis	Q1349	Solar and Storage	200
Scarlet III BESS	Q1135	Storage	160
Jasmine Solar	Q1499	Solar and Storage	134
Janus	Q1455	Solar and Storage	160
Zeta	Q1728	Solar and Storage	150
Tracy Modification Request	Q268 Q606	Storage	80
Saloon Energy Storage	Q1444	Storage	150
Cormorant	Q1552	Storage	250
Kyan	Q1260	Solar	100
Midway BESS	Q54	Storage	120
Corby	Q1270	Storage	300
Twin Pines Solar	3086-WD	Solar	5
5Las Camas 1	Q1382	Solar and Storage	200
Las Camas 3	Q1456	Solar and Storage	200
Sonrisa	Q1391	Solar and Storage	384
Pelicans Jaw	Q1593	Solar and Storage	1000
Fountain Wind	Q1106	Wind	205
Rosemary	Q1709	Solar and Storage	140
Potentia-Viridi	Q1702	Storage	400
Denali Energy Storage	Q1690	Storage	93
Lock Storage	Q1962	Solar and Storage	1000
Buttonbush 1	Q1596	Solar and Storage	1600
GARDEN GREEN, VCI ENERGY INC	Q2358	Solar and Storage	100
Spikes Peak Solar	Q1958	Solar and Storage	316
Baylands (Mission Blue)	Q1900	Storage	250
Cornucopia	Q1959	Solar and Storage	600
Allium Hybrid	Q1921	Solar and Storage	224

Message

From: Yang, Jenna@Waterboards [Jenna.Yang@Waterboards.ca.gov]
Sent: 1/6/2026 7:58:06 PM
To: Nicola Park [Nicola.Park@clearwayenergy.com]; Aarty Joshi [Aarty.Joshi@clearwayenergy.com]
CC: Tadlock, Stephanie@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8c816f7cdb324c09b5cbd2d6ecf38a6a-Waterboards]; Ackerman, James@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cc35de240cf4253af9cc7d3d2cbb643-Ackerman, J]; Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]
Subject: Re: Meeting - Potential Viridi BESS Project (PoVi) and Clearway/ CEC

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Water Resource Control Engineer

R5 CENTRAL VALLEY - SACRAMENTO
R5 Point Source Permitting

Email: Jenna.Yang@Waterboards.ca.gov
Phone: +1 (916) 464-4764

Regional Water Quality Control Boards
11020 Sun Center Drive, Suite 200, Rancho Cordova CA 95760
Website: www.waterboards.ca.gov

Follow: X | YouTube | Facebook | LinkedIn

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Subject: Meeting - Potential Viridi BESS Project (PoVi) and Clearway/ CEC

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Do you perhaps have time on Jan 22nd to meet with Clearway, CEC staff, Alameda County Environmental Health and Zone 7 Water Agency to briefly discuss the project and its septic permitting requirements/timeline?

Best,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Nicola Park
Sent: Wednesday, November 12, 2025 10:54 AM
To: Kelly Strain <KStrain@capstoneinfra.com>; Yang, Jenna@Waterboards <jenna.yang@waterboards.ca.gov>; Cameron Johnson <cjohnson@integral-corp.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Lauren McLeod <LMcLeod@capstoneinfra.com>
Subject: RE: Sale of Potential Viridi BESS Project (PoVi) and Clearway Introductions

Thanks for the intro and handoff, Kelene.

Hi Jenna,

Great to meet you by email and look forward to working with you. The Clearway team is excited to take ownership of the project.

Looping in Aarty Joshi, Senior Director Permitting for Clearway. We will be in touch as the project progresses through the CEC process. Please feel free to reach out to myself and Aarty as key POC in the meantime.

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Director, Hawaii

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To: Yang, Jenna@Waterboards <jenna.yang@waterboards.ca.gov>; Cameron Johnson <cjohnson@integral-corp.com>; Nicola Park <Nicola.Park@clearwayenergy.com>
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Kind regards,

Kelene Strain
Environmental & Permitting Manager
CAPSTONE INFRASTRUCTURE CORPORATION
Direct +1 (310) 899-5340
Facsimile +1 (416) 649-1335
Email KStrain@capstoneinfra.com
Web www.capstoneinfrastructure.com

Los Angeles, California

Message

From: Ackerman, James@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=3CC35DE240CF4253AF9CC7D3D2CBB643-ACKERMAN, J]
Sent: 1/6/2026 8:30:09 PM
To: Yang, Jenna@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e41e549c7a4a4634bdb4de7fcb65914d-Waterboards]
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Subject: RE: Meeting - Potential Viridi BESS Project (PoVi) and Clearway/ CEC

Jenna: I don't have any other information than what I sent in the original email.

As I mentioned in my original email, the sanitary wastewater system would not be a septic system, but would consist of two above ground holding tanks, which would be pumped out and transported off-site by a third-party vendor.

Alameda County includes this type of system as an Onsite Wastewater Containment Unit (OWCU) under their OWTS program as delegated by the SWRCB.

It would be interesting to know if SWCRB delegation still applies if proposed system is not a typical OWTS.

James Ackerman, PG #6493
Engineering Geologist
California Energy Commission
Siting, Transmission and Environmental Protection Division
Direct: (530) 878-4966
Email: james.ackerman@energy.ca.gov

From: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Sent: Tuesday, January 6, 2026 11:58 AM
To: Nicola Park <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Tadlock, Stephanie@Waterboards <Stephanie.Tadlock@waterboards.ca.gov>; Ackerman, James@Energy <james.ackerman@energy.ca.gov>; Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
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Direct +1 (310) 899-5340
Facsimile +1 (416) 649-1335

Email KStrain@capstoneinfra.com
Web www.capstoneinfrastructure.com

Los Angeles, California

Message

From: Nicola Park [Nicola.Park@clearwayenergy.com]
Sent: 1/7/2026 2:53:23 AM
To: Yang, Jenna@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e41e549c7a4a4634bdb4de7fcb65914d-Waterboards]; Aarty Joshi [Aarty.Joshi@clearwayenergy.com]
CC: Tadlock, Stephanie@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8c816f7cdb324c09b5cbd2d6ecf38a6a-Waterboards]; Ackerman, James@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cc35de240cf4253af9cc7d3d2cbb643-Ackerman, J]; Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]
Subject: RE: Meeting - Potential Viridi BESS Project (PoVi) and Clearway/ CEC
Attachments: Attachment 16, Updated Civil Plans.pdf

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Hi Jenna,

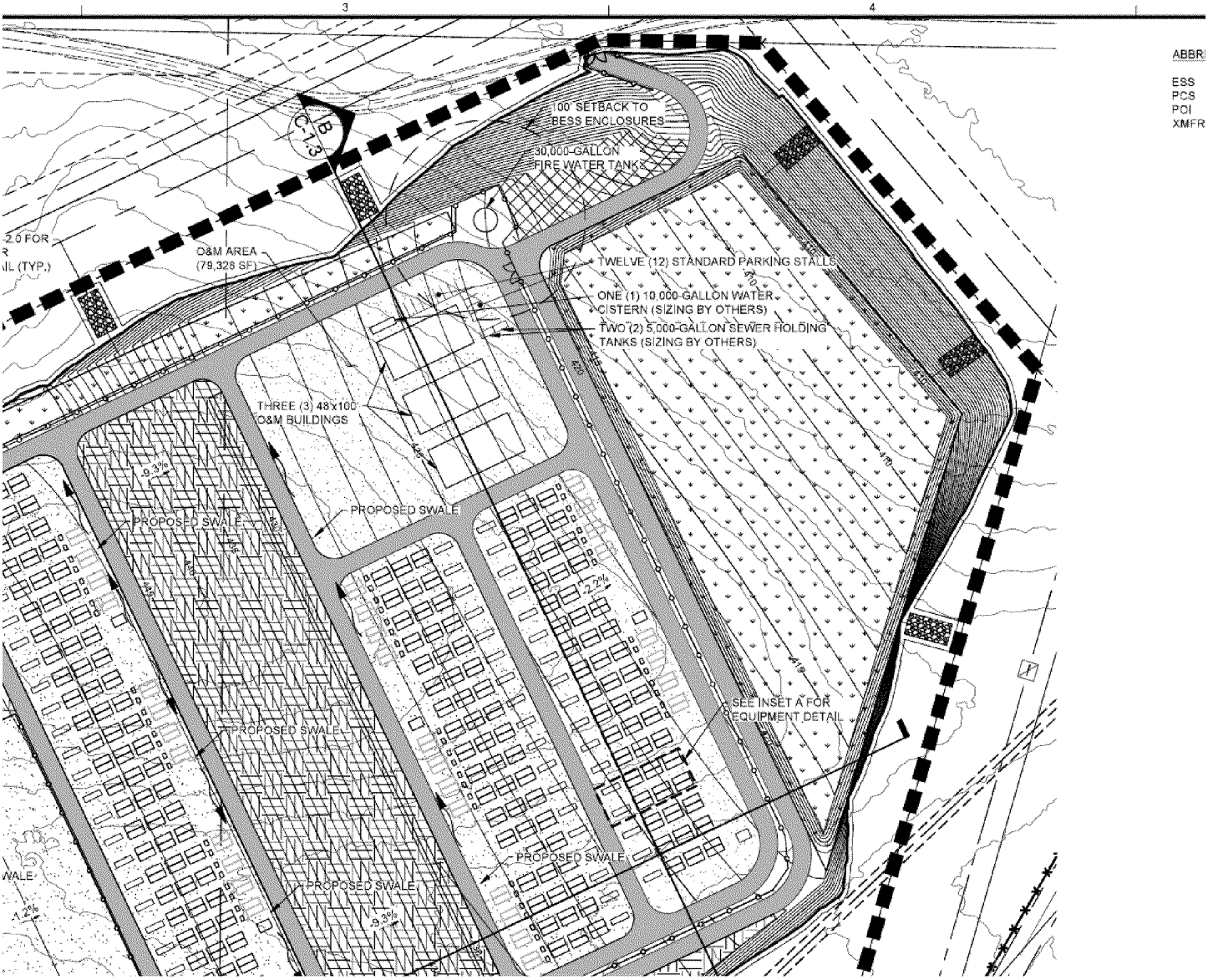
Thanks for getting back to us and appreciate you putting us in touch with the right folks at the Water Board.

The project civil plans are attached along with screenshots below of the sewage holding tank area (2 X 5,000 gallon sewage holding tanks).

Following construction of the BESS facility, three O&M buildings would be constructed a minimum of 20' apart within the primary laydown yard for the Project's anticipated three 18 full-time operations staff. The main O&M building would include parking, outside equipment and laydown areas, basic offices, meeting rooms, and washroom facilities and climate-controlled storage for certain equipment and materials. A 10,000 gallon above ground potable water storage tank would provide water for washroom and sanitary facilities, and sewage/wastewater would be collected in a 2 separate 5,000 gallon below ground sewer holding tanks. Potable water would be trucked to the water storage tank periodically during O&M, and sewage/wastewater would be pumped from the storage tank, transported offsite via truck, and disposed of at a sanitary dump station, as needed, during operations.

The remaining two O&M buildings would be used primarily for storage, maintenance and repair activities associated with the Project . Neither of these buildings would have washroom facilities.

Pump septic waste anticipated to be 10,000 gallons every 11 days (2-5k gallon loads). Tanks must have a 3" cam lock fitting with valve.



Please let me know if there are other questions you have in order to direct us to the right folks/ determine correct permitting pathway.

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Cc: Lauren McLeod <LMcLeod@capstoneinfra.com>
Subject: Sale of Potential Viridi BESS Project (PoVi) and Clearway Introductions

CAUTION: This message originated from an external sender.

Jenna,

We would like to inform you that the sale of the PoVi Project has officially closed, and ownership has now transferred to Clearway. It has been a pleasure working with you on this project.

Please don't hesitate to contact Nicola or me if you have any questions. That said, Clearway will be following up with you shortly.

Kind regards,

Kelene Strain
Environmental & Permitting Manager
CAPSTONE INFRASTRUCTURE CORPORATION
Direct +1 (310) 899-5340
Facsimile +1 (416) 649-1335
Email KStrain@capstoneinfra.com
Web www.capstoneinfrastructure.com

Los Angeles, California

Message

From: Yang, Jenna@Waterboards [Jenna.Yang@Waterboards.ca.gov]
Sent: 1/7/2026 10:01:52 PM
To: Nicola Park [Nicola.Park@clearwayenergy.com]; Aarty Joshi [Aarty.Joshi@clearwayenergy.com]
CC: Tadlock, Stephanie@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8c816f7cdb324c09b5cbd2d6ecf38a6a-Waterboards]; Ackerman, James@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cc35de240cf4253af9cc7d3d2cbb643-Ackerman, J]; Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]
Subject: Re: Meeting - Potential Viridi BESS Project (PoVi) and Clearway/ CEC

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Thank you for this information. I checked with the folks in our tanks unit and the Central Valley Water Board does not have any permitting requirements for these sewage holding tanks. We are fine with Alameda County providing the permitting pathway for these tanks. That said, they do recommend that you consider installing a septic system instead of a tank and haul system if it's possible.

CALIFORNIA Water Boards

Jenna Yang
Water Resource Control Engineer

R5 CENTRAL VALLEY - SACRAMENTO
R5 Point Source Permitting

Email: Jenna.Yang@Waterboards.ca.gov
Phone: +1 (916) 464-4764

Regional Water Quality Control Boards
11020 Sun Center Drive, Suite 200, Rancho Cordova CA 95760
Website: www.waterboards.ca.gov

Follow: X | YouTube | Facebook | LinkedIn

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Tuesday, January 6, 2026 6:53 PM
To: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Tadlock, Stephanie@Waterboards <Stephanie.Tadlock@waterboards.ca.gov>; Ackerman, James@Energy <james.ackerman@energy.ca.gov>; Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Subject: RE: Meeting - Potential Viridi BESS Project (PoVi) and Clearway/ CEC

Hi Jenna,

Thanks for getting back to us and appreciate you putting us in touch with the right folks at the Water Board.

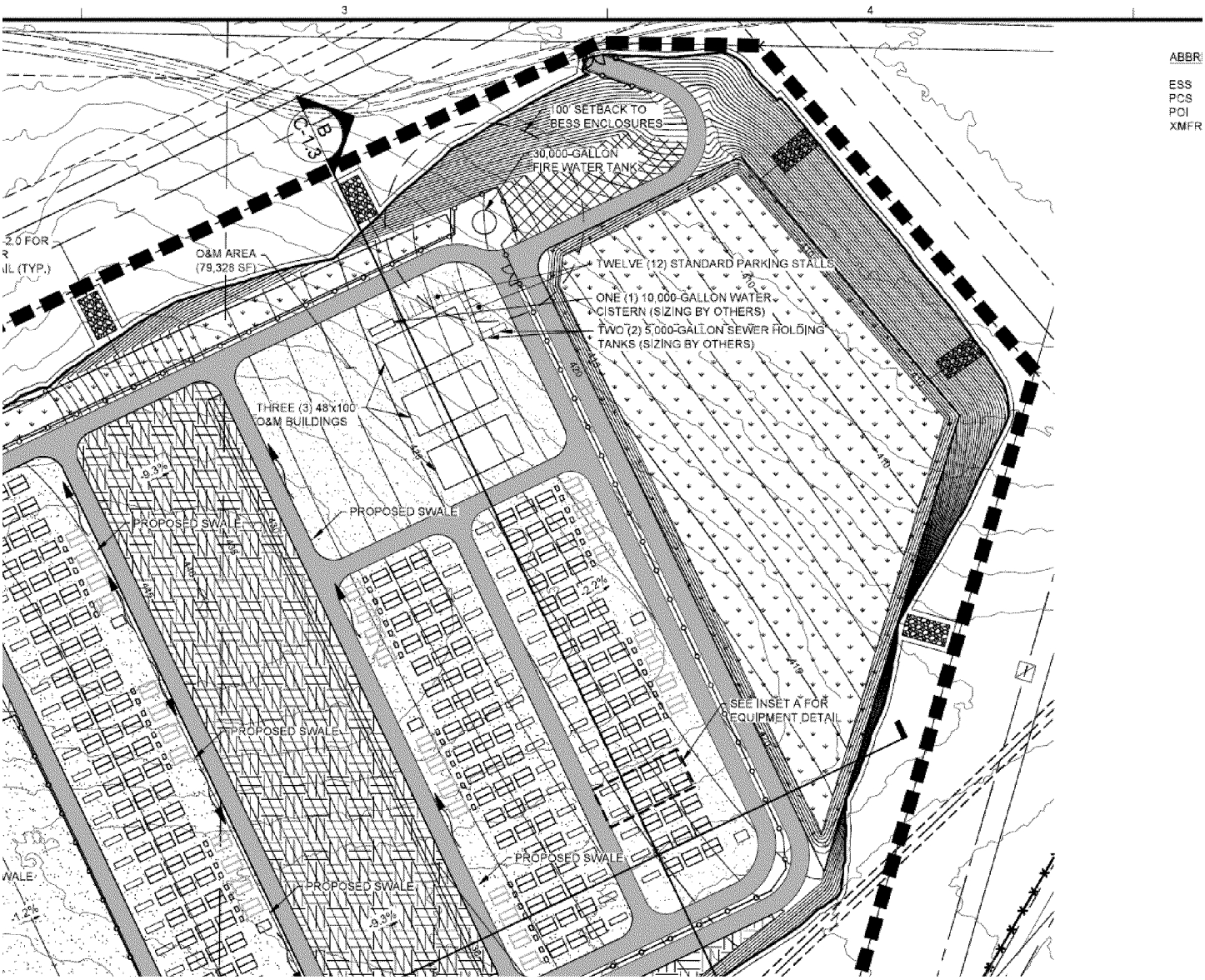
The project civil plans are attached along with screenshots below of the sewage holding tank area (2 X 5,000 gallon sewage holding tanks).

Following construction of the BESS facility, three O&M buildings would be constructed a minimum of 20' apart within the primary laydown yard for the Project's anticipated three 18 full-time operations staff. The main O&M building would include parking, outside equipment and laydown areas, basic offices, meeting rooms, and washroom facilities and climate-controlled storage for certain equipment and materials. A 10,000 gallon above ground potable water storage tank would

provide water for washroom and sanitary facilities, and sewage/wastewater would be collected in a 2 separate 5,000 gallon below ground sewer holding tanks. Potable water would be trucked to the water storage tank periodically during O&M, and sewage/wastewater would be pumped from the storage tank, transported offsite via truck, and disposed of at a sanitary dump station, as needed, during operations.

The remaining two O&M buildings would be used primarily for storage, maintenance and repair activities associated with the Project . Neither of these buildings would have washroom facilities.

Pump septic waste anticipated to be 10,000 gallons every 11 days (2-5k gallon loads). Tanks must have a 3" cam lock fitting with valve.



Please let me know if there are other questions you have in order to direct us to the right folks/ determine correct permitting pathway.

Thanks,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Sent: Tuesday, January 6, 2026 9:58 AM
To: Nicola Park <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Tadlock, Stephanie@Waterboards <Stephanie.Tadlock@waterboards.ca.gov>; Ackerman, James@Energy <james.ackerman@energy.ca.gov>; Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Subject: Re: Meeting - Potential Viridi BESS Project (PoVi) and Clearway/ CEC

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Good morning,

A different unit at the Water Board would handle permitting requirements for septic systems. If possible, can you please send me any general design plans/specs/drawings along with information on capacity, expected daily flow, etc.?

It would help me get the right people involved so that we can find the correct permitting pathway.

Thank you,

Jenna Yang
Water Resource Control Engineer

R5 CENTRAL VALLEY - SACRAMENTO
R5 Point Source Permitting

Email:
Jenna.Yang@Waterboards.ca.gov
Phone: +1 (916) 464-4764

Regional Water Quality Control Boards
11020 Sun Center Drive, Suite 200, Rancho Cordova CA 95760
Website:
www.waterboards.ca.gov

Follow: X | YouTube | Facebook | LinkedIn

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Monday, January 5, 2026 4:31 PM
To: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Subject: Meeting - Potential Viridi BESS Project (PoVi) and Clearway/ CEC

Caution: External Email. Use caution when clicking links or opening attachments. When in doubt, contact DIT or use the Phish Alert Button.

Hi Jenna, and Happy New Year,

We are reaching out to request a meeting regarding the Potentia Viridi BESS project to discuss septic permitting and how it fits into the CA Energy Commission accelerated permitting timelines under AB 205.

Do you perhaps have time on Jan 22nd to meet with Clearway, CEC staff, Alameda County Environmental Health and Zone 7 Water Agency to briefly discuss the project and its septic permitting requirements/timeline?

Best,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Nicola Park
Sent: Wednesday, November 12, 2025 10:54 AM
To: Kelly Strain <KStrain@capstoneinfra.com>; Yang, Jenna@Waterboards <jenna.yang@waterboards.ca.gov>; Cameron Johnson <cjohnson@integral-corp.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Lauren McLeod <LMcLeod@capstoneinfra.com>
Subject: RE: Sale of Potential Viridi BESS Project (PoVi) and Clearway Introductions

Thanks for the intro and handoff, Kelene.

Hi Jenna,

Great to meet you by email and look forward to working with you. The Clearway team is excited to take ownership of the project.

Looping in Aarty Joshi, Senior Director Permitting for Clearway. We will be in touch as the project progresses through the CEC process. Please feel free to reach out to myself and Aarty as key POC in the meantime.

Best,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Hawaii

+1 (949) 439-3349 cell

From: Kelly Strain <KStrain@capstoneinfra.com>
Sent: Wednesday, November 12, 2025 10:32 AM
To: Yang, Jenna@Waterboards <jenna.yang@waterboards.ca.gov>; Cameron Johnson <cjohnson@integral-corp.com>; Nicola Park <Nicola.Park@clearwayenergy.com>
Cc: Lauren McLeod <LMcLeod@capstoneinfra.com>
Subject: Sale of Potential Viridi BESS Project (PoVi) and Clearway Introductions

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Jenna,

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Please don't hesitate to contact Nicola or me if you have any questions. That said, Clearway will be following up with you shortly.

Kind regards,

Kelene Strain
Environmental & Permitting Manager
CAPSTONE INFRASTRUCTURE CORPORATION
Direct +1 (310) 899-5340
Facsimile +1 (416) 649-1335
Email KStrain@capstoneinfra.com
Web www.capstoneinfrastructure.com

Los Angeles, California

Message

From: Nicola Park [Nicola.Park@clearwayenergy.com]
Sent: 1/27/2026 5:36:52 PM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Aarty Joshi [Aarty.Joshi@clearwayenergy.com]
Subject: RE: Potentia-Viridi, Staff Assessment publication
Attachments: 401_Application_2025.06.13 (002).pdf; PV 401 Application Fee Payment.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good Morning Eric,

Yes, and thanks for sharing! We have been pouring over the Staff Assessment and digesting key pieces as a team. May have some questions for you soon.

In the meantime, we were hoping to kickoff the 401 application with Waterboard as submitted with our application. Is that something we should pursue directly with Waterboard or will CEC be engaged in that process? (TN264361 and revised figures on TN264903). It is my understanding that the Water Board is a MOU agency so they would be working the CEC to process the 401 application as it was submitted to the CEC. Would a second submittal be required? The only detail I believe we need to change is the contact information.

Thanks,

Nicola

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Tuesday, January 27, 2026 6:33 AM
To: Nicola Park <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Subject: Potentia-Viridi, Staff Assessment publication

CAUTION: This message originated from an external sender.

Good Morning Nicola,
Just a quick note. You have probably already seen the posting, but if not, the Potentia-Viridi BESS staff assessment along with the notice of availability were filed to the project docket late yesterday, https://efiling.energy.ca.gov/GetDocument.aspx?tn=268314&DocumentContentId=105489.

Have a good week.

Eric W. Veerkamp
Project Manager
California Energy Commission
916-661-8458
STEPSiting@energy.ca.gov
www.energy.ca.gov

CALIFORNIA ENERGY COMMISSION
50 YEARS OF ENERGY LEADERSHIP

Docusign Envelope ID: 32EF3236-2C00-496D-9AA0-BD9F98B0DE35

Application: Discharges of Dredged or Fill Material to Waters of the State

The State Water Resource Control Board (State Board) or Regional Water Quality Control Boards (collectively, Water Boards) have the authority to regulate the discharge of dredged or fill material under section 401 of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act (Porter-Cologne). Dischargers that obtain a federal permit or license that authorizes impacts to waters of the U.S. (i.e., waters that are within federal jurisdiction), such as section 404 of the CWA and section 10 of the Safe Rivers and Harbors Act, must obtain certification from the Water Boards to ensure that the discharge does not violate state water quality standards or any other appropriate requirement of State law. When a discharge is proposed to waters outside of federal jurisdiction, the Water Boards regulate the discharge under Porter-Cologne through the issuance of Waste Discharge Requirements (WDRs). CWA section 401 Water Quality Certifications, WDRs, and waivers of WDRs are referred to as orders or permits.

The State Wetland Definition and Procedures for the Regulation of Discharges of Dredged or Fill Material to Waters of the State (Procedures) and the California Code of Regulations, title 23, section 3856 identify items that are required for a complete application in all cases. Additionally, the Procedures identify items that may be required for a complete application on a case-by-case or conditional basis. The State Water Board webpage links to the Procedures (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/procedures_conformed.pdf).

Water Board staff will review an application within 30 days of receipt and provide a completeness determination to the applicant. A completeness determination may include a request for additional information for a complete application. Application fees must be paid before an application is determined complete. See Application Section Thirteen for options on how to make a payment.

For more information on how applications will be processed, refer to the Implementation Guidance for the Procedures (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/dredge_fill/revised_guidance.pdf).

This application form outlines a broad range of items that may be required; however, as noted above, not all items are required in all cases. Use of this form is not required. Applicants may submit information that was submitted for a different federal or state permit to reduce duplicative submittals. In such cases, applicants should use the text boxes in this form to indicate the name, relevant section, and page number where relevant information is located. Finally, the level of detail submitted with this application should be commensurate with the size and the scope of the proposed discharge.

Applicants are encouraged to contact the appropriate Water Board to discuss the applicability of this application form, items required for a complete application, and/or the appropriate level of detail needed to obtain authorizations.

Applications for projects that cross regional board boundaries should be submitted to the State Board. All other applications should be submitted to the appropriate regional water quality control board.

A staff directory for the Water Board's Water Quality Certification Program is located on the program webpage (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/wqc_staffdir.pdf).

STOP: If you answer 'yes' to any of the following questions, do not complete this application. Instead, please contact the State Water Board's Division of Water Rights to obtain a copy of their water quality certification application:

- Does the project require a Federal Energy Regulatory Commission (FERC) license or amendment to a FERC license?
- Does this project involve an appropriation of water?
- Does this project involve a diversion of water for domestic, irrigation, power, municipal, industrial, or other beneficial use?

Section One: Contact Information

Review **Section Twelve** Legally Responsible Person (LRP) eligibility and signature requirements before completing this application.

Applicant (Organization and Legally Responsible Person) Information	
Organization Name:	Levy Alameda, LLC
LRP Name:	Patrick Leitch
Title:	Chief Operating Officer
Street Address:	155 Wellington Street West, Suite 2930
City:	Toronto
State:	Ontario
County:	N/A, Canada
Zip Code:	M5V 3H1
Telephone:	310-899-5340
Email:	PLeitch@Capstoneinfra.com

The LRP may assign a Duly Authorized Representative (DAR) to make decisions on their behalf and provide application information. If a DAR is assigned to this project, provide the assigned person's contact information below and assign the DAR in Section Twelve.

Duly Authorized Representative Information (Optional)	
Organization Name:	Integral Consulting Inc.
DAR Name:	Naomi Schowalter
Title:	Consultant
Street Address:	433 Visitacion Ave
City:	Brisbane
State:	California
County:	San Mateo
Zip Code:	94005
Telephone:	619-647-7344
Email:	nschowalter@integral-corp.com

Section Two: Project Information

Project Name or Title: Project Name should match all other agency permits and correspondence Potentia-Viridi Battery Energy Storage System Project (PV-BESS)	
Project Street Address: Provide the project's physical location, not the mailing address 17257 Patterson Pass Road	
City:	Tracy
State:	California
County:	Alameda
Zip Code:	95377
Latitude:	37.712130
Longitude:	-121.573369
Assessor's Parcel Number(s):	99B-7890-2-4, 99B-7890-2-6, and 99B-7885-12
Section, Township, Range:	Section 31, T2S, R4E

Directions to the Project Site:

From Sacramento, California: Drive south on Interstate 5 to Lathrop, then westward on Highway 205 to Highway 580 (south). Take the Patterson Pass exit westward approximately 2.5 miles to the project site.

Project Purpose and Overall Goal of Entire Activity:

The purpose of the project is to construct, operate, and eventually repower or decommission a 400-megawatt battery energy storage system. The project would draw electricity from the power grid to charge and store electrical energy and discharge back to the power grid when the stored energy is needed. The project would provide several benefits to the power grid, including reducing the need to operate natural gas power plants to balance intermittent renewable generation and serving as an additional capacity resource that would enhance grid reliability.

Project Description: Provide a full, technically accurate description of the entire project.

See Attachment A (Supplemental Information).

Project Size: Total size of the entire project area for all work/activities/construction that will be performed to meet the final goal: 70 acres

Is this a linear project (for example a powerline, pipeline, highway, etc.)? Yes ☐ No ☒

If yes, indicate length of project from end-to-end in feet: feet

Anticipated Project Start and End Dates:

Construction Start Date: Q1 2026

Construction End Date: Q2 2028

Estimated Construction Duration: 18 months

Will any ground disturbance take place during the wet season months?

Yes ☒ No ☐

Additional Information: Additional information may include documentation relevant to pre-application consultations which may help inform application processing.

In addition to responding to the questions above, provide a project map with a scale of at least 1:24000 (1" = 2000') and of sufficient detail to show:

- The boundaries of the lands owned or to be utilized by the applicant in carrying out the proposed activity, including grading limits, proposed land uses, and the location, dimensions and type of any structures erected (if known) or to be erected.
- All aquatic resources that may qualify as waters of the state, within the boundaries of a project, and all aquatic resources that may qualify as waters of the state outside of the boundary of the project that could be impacted by the project.

A map verified by the Corps may satisfy this requirement if it includes all potential waters of the state.

Note that a map in electronic format (e.g., GIS shapefiles) may be required.

Section Three: Agency Contact Information

Attach copies of any final and signed federal, state, and local licenses, permits, and agreements (or copies of the draft documents or submitted application, if not finalized) associated with construction, operation, maintenance, or other actions relevant to the project. If a draft or final document is not available, a list of all remaining agency regulatory approvals being sought should be included. (CCR § 3856 (e).)

Federal Permit(s) or Completed Federal Applications

U.S. Army Corps of Engineers

☐ Not Applicable

District: ☐ ☒Sacramento ☐

☐ Individual Permit

☐ Letter of Permission

☒ Which Nationwide Permit Number has been applied for, if any? 7 and 14

For Nationwide Permits, select one of the following: ☐ Non-Reporting, or ☒ Reporting

☒ Corps File No. SPK-2024-00486

☐ Regional General Permit / Number

☐ Other Permit Name:

Corps Contact Information	
Name:	Matthew Di Loreto
Telephone:	916-557-7882
Email:	matthew.j.diloreto@usace.army.mil

U.S. Fish and Wildlife Service

☐ Not Applicable

☒ Biological Assessment

☐ Biological Opinion

☐ Incidental Take Permit

U.S. Fish and Wildlife Contact Information	
Name:	Sacramento Fish and Wildlife Office
Telephone:	916-414-6600
Email:	

National Marine Fisheries Service

☒ Not Applicable

☐ Biological Assessment

☐ Biological Opinion

National Marine Fisheries Service Contact Information
Name:
Telephone:
Email:

State Permit(s) or Completed State Application(s)

List permits for activities related to waters whether applied for or approved, e.g., California Department of Fish and Wildlife (CDFW) Lake or Streambed Alteration Agreement (Fish and Game Code sections 1600-1608), CESA section 2081 Incidental Take Permit, Construction Stormwater Enrollment, Coastal Development Permit, etc.

State or Local Permit Number	File Date	Tracking Number
☒ CDFW Lake and Streambed Alteration Agreement (Fish and Game Code section 1600)	Click or tap to enter a date.	
☒ CDFW Incidental Take Permit (Fish and Game Code section 2081)	Click or tap to enter a date.	
☐ CDFW Consistency Determination (Fish and Game Code section 2080)	Click or tap to enter a date.	
☒ State Water Board Construction Stormwater General Permit Enrollment	Click or tap to enter a date.	Order WQ 2022-0057-DWQ
☐ California Coastal Commission (Development Permit)	Click or tap to enter a date.	
☐ California Coastal Commission (Consistency Determination)	Click or tap to enter a date.	
☐ Bay Conservation and Development Commission (Development Permit)	Click or tap to enter a date.	
☐ Bay Conservation and Development Commission (Consistency Determination)	Click or tap to enter a date.	
☐ Central Valley Flood Protection Board	Click or tap to enter a date.	
☒ Other: California Energy Commission (CEC) Opt-In Certification Program	Click or tap to enter a date.	24-OPT-04

State or Local Agency Contact Information: Provide additional contacts, as needed	
Agency Name:	CEC
Contact Name:	Ann Crisp
Telephone:	916-352-0543
Email:	STEPsiting@energy.ca.gov

Agency Name:	
Contact Name:	
Telephone:	
Email:	

Section Four: Special Status Species

If known, provide information about the presence of species identified as rare, threatened, or endangered under state or federal law. Attach all biological assessments, surveys, formal consultation determination letters, and mitigation proposals, as applicable.

Are you aware of any rare, threatened, or endangered species at this site? Yes ☐ No ☐

Species Habitat and/or Name	Biological Assessment Prepared?	Survey Conducted? (Yes/No)	Dates Survey Conducted
California red-legged frog	**Yes** ☒ ☐	☒ **No** ☐	8/2/2023
California tiger salamander	**Yes** ☒ ☐	☐ **No** ☒	Click or tap to enter survey date.
San Joaquin kit fox	**Yes** ☒ ☐	☒ **No** ☐	5/16/2023, 8/2/2023, 1/18/2024

Was the project planned in accordance with an approved Habitat Conservation Plan (HCP) or Natural Community Conservation Plan (NCCP)? Yes ☐ No ☒

If yes, list the HCP or NCCP name:

Section Five: California Environmental Quality Act and/or National Environmental Policy Act Compliance

Unless an exemption applies, the Water Boards must comply with the California Environmental Quality Act (CEQA). Although not required for a complete application, final CEQA documentation must be provided to the Water Board with ample time to properly review before an Order may be issued. (CCR § 3856 (f).)

The Water Boards will determine whether a project qualifies for a CEQA exemption during review of the project information. Identify below if applicable the relevant categorical or statutory exemption number you believe applies.

If you do not know whether a CEQA exemption applies to the proposed project, submit the application with as much information as possible.

Document Type	Status (In Preparation, Complete, or Under Revision)	Date Completed or Expected Completion Date
Scoping Document		Click or tap to enter a date.
Initial Study		Click or tap to enter a date.
Negative Declaration		Click or tap to enter a date.
Notice of Preparation		Click or tap to enter a date.

Mitigated Negative Declaration		Click or tap to enter a date.
Environmental Document	In Preparation	Click or tap to enter a date.

Does the project meet a statutory or categorical CEQA exemption?
No ☒ **Yes, proposed statutory exemption number:** **Yes, proposed categorical exemption number:**

Section Six: Aquatic Resource Information

Attach any aquatic resource delineation reports and maps for all aquatic resources that may qualify as waters of the state, including those outside of federal jurisdiction. Water Board staff will verify the presence or absence of waters of the state outside of federal jurisdiction during the application review process. (CCR § 3856 (h)(7).) The Water Boards may require supplemental field data from the wet season to substantiate dry season delineations (Procedures section IV.A.2.a).

Aquatic Resource Delineation Report Information	
Was an aquatic resource delineation report prepared? Yes ☐ **No** ☒	
Report Title:	N/A, a standalone delineation report was not prepared. Dudek biologists Mikaela Bissell and Erin Colton Fisher delineated Patterson Run.
Delineation Date(s):	1/18/2024
Name of Person who Prepared the Report:	
Title of Person who Prepared the Report:	
Organization/Company who Prepared the Report:	
Was the report verified by the U.S. Army Corps of Engineers? Yes ☐ **No** ☒ **If yes, enter verification date and submit a copy of the verification with this application:** Click or tap to enter a verification date.	
Are there waters outside of federal jurisdiction? **Yes** ☐ **No** ☒	

Receiving waters and groundwater potentially impacted by any project are protected in accordance with the applicable water quality control plans (https://www.waterboards.ca.gov/plans_policies/#plans) (Basin Plans) for the regions and other plans and policies (http://www.waterboards.ca.gov/plans_policies). If known, list impacted hydrologic unit(s) in the impacted Regional Water Quality Control Board's Basin Plan. The Basin Plans include water quality standards, which consist of existing and potential beneficial uses of waters of the state, water quality objectives to protect those uses, and the state and federal antidegradation policies.

The Lahontan Regional Water Quality Control Board prohibits discharge to lands within the Walker, Carson, Lake Tahoe, Little Truckee, and Truckee River Hydrologic Basins unless specific prohibition exemption criteria are met. For projects in this region, in addition to this application, complete the applicable prohibition criteria form for projects discharging to the Lake Tahoe Hydrologic Basin (https://www.waterboards.ca.gov/lahontan/water_issues/programs/clean_water_act_401/docs/att3.doc) or the Little Truckee or Truckee River (https://www.waterboards.ca.gov/lahontan/water_issues/programs/clean_water_act_401/docs/att4.doc) Hydrologic Basins.

Hydrologic Information
Was the project developed in accordance with a watershed plan? Yes ☐ No ☒ **If yes, what is the name of the watershed plan name? Attach the plan, or a link to the plan, if feasible:**
How many waterbodies would be impacted by the project activity? One (1) If the project impacts more than one waterbody, attach the information below for each impacted waterbody; an excel spreadsheet or table may be used for projects with multiple impact sites.
Does the impacted waterbody have a name? Yes ☒ No ☐ **Name of the impacted waterbody; if unnamed, name of the nearest downstream named waterbody:** Patterson Run
Basin plan hydrologic unit(s), and if included in a basin plan, the hydrologic area and hydrologic subarea, if known: North Diablo Range Hydrologic Unit (Hydrologic Unit Number 543.00)

Does the proposed project do any of the following?	
Discharge to an Area of Special Biological Significance (ASBS), Marine Protected Area (MPA), or Outstanding National Resource Water (ONRW)?	**Yes** ☐ **No** ☒
Discharge to a waterbody listed as impaired on the Clean Water Act 303(d) list?	**Yes** ☐ **No** ☒
Discharge to a waterbody with a total maximum daily load (TMDL)?	**Yes** ☐ **No** ☒

Section Seven: Impact Quantities and Classification

List temporary and permanent **fill/excavation** impacts to waters of the state according the aquatic resource type in the tables below. Round acres to at least the hundredth place (0.01); round cubic yards and linear feet to the nearest whole number.

Fill/Excavation Temporary Impacts

Lake/Reservoir

Acres	
Cubic Yards	
Linear Feet	

Stream Channel

Acres	0
Cubic Yards	0
Linear Feet	0

Ocean/Bay/Estuary

Acres	
Cubic Yards	
Linear Feet	

Vernal Pool

Acres	
Cubic Yards	
Linear Feet	

Riparian Zone

Acres	
Cubic Yards	
Linear Feet	

Wetland

Acres	
Cubic Yards	
Linear Feet	

Classification System Name (if known):
Classification(s):

Fill/Excavation Permanent Impacts

Lake/Reservoir

Acres	
Cubic Yards	
Linear Feet	

Stream Channel

Acres	~0.04
Cubic Yards	~34 cy excavation and 55 cy fill
Linear Feet	~38

Ocean/Bay/Estuary

Acres	
Cubic Yards	
Linear Feet	

Vernal Pool

Acres	
Cubic Yards	
Linear Feet	

Riparian Zone

Acres	
Cubic Yards	
Linear Feet	

Wetland

Acres	
Cubic Yards	
Linear Feet	

Classification System Name (if known):
Classification(s):

List temporary and permanent **dredge/extraction** impacts to waters of the state according the aquatic resource type in the tables below. Round acres to at least the hundredth place (0.01); round cubic yards and linear feet to the nearest whole number.

Dredge/Extraction Temporary Impacts

Lake/Reservoir

Acres	
Cubic Yards	
Linear Feet	

Stream Channel

Acres	0
Cubic Yards	0
Linear Feet	0

Ocean/Bay/Estuary

Acres	
Cubic Yards	
Linear Feet	

Vernal Pool

Acres	
Cubic Yards	
Linear Feet	

Riparian Zone

Acres	
Cubic Yards	
Linear Feet	

Wetland

Acres	
Cubic Yards	
Linear Feet	

Classification System Name (if known):
Classification(s):

Dredge/Extraction Permanent Impacts

Lake/Reservoir

Acres	
Cubic Yards	
Linear Feet	

Stream Channel

Acres	0
Cubic Yards	0
Linear Feet	0

Ocean/Bay/Estuary

Acres	
Cubic Yards	
Linear Feet	

Vernal Pool

Acres	
Cubic Yards	
Linear Feet	

Riparian Zone

Acres	
Cubic Yards	
Linear Feet	

Wetland

Acres	
Cubic Yards	
Linear Feet	

Classification System Name (if known):
Classification(s):

Additional Direct and Indirect Impact Information

Direct Impact Description: Describe the nature and extent of temporary and permanent impacts to waters of the state. Attach map(s) that clearly depict the anticipated area of direct impact.

Permanent impacts to Patterson Run will result from improvements to an existing stormwater outfall and the installation of a ford (i.e., low-water crossing). The stormwater outfall improvements will impact approximately 80 square feet and 8 linear feet of Patterson Run for the excavation of approximately 16 cubic yards of material and placement of approximately 3 cubic yards of native fill and 5 cubic yards of riprap below top of bank. The ford will impact approximately 1,600 square feet and 30 linear feet of Patterson Run for the excavation of approximately 18 cubic yards of material and placement of approximately 17 cubic yards of imported fill and 30 cubic yards of riprap below top of bank.

Indirect Impact Description: Indirect impacts could be those that are reasonably foreseeable outside of the direct impact area, or that occur later in time, that may have an adverse effect on water quality. Examples of indirect impacts could include fluctuating or disturbed water levels, climate change adaptation, and disturbed habitat connectivity corridors.

Describe potential impacts to water quality from the project discharge. For example, describe increased turbidity, settleable matter, or other pollutants that may affect beneficial uses associated with the proposed project area. Attach map(s) that clearly depict the anticipated area of indirect impact, as feasible.

Indirect impacts to waters of the State may include changes to erosion and sedimentation patterns around the outfall and ford locations due to increased surface roughness and altered channel dimensions; increased turbidity due to ground disturbance associated with the overall project; and increased risk of pollutants reaching Patterson Run due to the ford installation and vehicle/equipment use for project construction and operation. Indirect impacts associated with erosion and pollutants would be minimized with the implementation of various best management practices.

Cumulative Impacts: Provide a brief list/description, including estimated adverse impacts, of any projects implemented by the applicant within the last five years or planned for implementation by the applicant within the next five years that are in any way related to the proposed activity or that may impact the same receiving water body(ies) as the proposed activity. For purposes of this item, the water body extends to a named source or stream segment identified in the relevant Basin Plan. (CCR § 3856(h)(8).)

There are no known cumulative impacts.

Depending on the quantity of new or replaced impervious surface area resulting from the project, a post-construction stormwater control plan and/or an operations and maintenance plan may be required to mitigate potential post-construction stormwater impacts. The plan may include drainage maps, detailed designs for Low Impact Development or other post-construction stormwater treatment and control measures, and design calculations. Contact Water Board staff for specific criteria.

Does the proposed project create or replace impervious surface? Yes ☒ No ☐

If yes, provide the total impervious surface area created or replaced in square feet:	508,791 square feet

Section Eight: Avoidance and Minimization Measures

Applicants must describe actions that have been taken (or will be taken) to avoid and minimize impacts to waters of the state (Procedures section IV.B.a.). Unless an exemption applies, an applicant must submit an alternatives analysis to demonstrate that the propose project is the least environmentally damaging practicable alternative (LEDPA; Procedures section IV.A.1.h. and IV.B.). In cases where the Corps requires an alternatives analysis, the Water Boards will defer to the Corps' determination except in certain circumstances. For guidance on how to prepare an alternatives analysis or to determine if an exemption may apply, reference the Procedures Implementation Guidance (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/dredge_fill/revised_guidance.pdf).

Alternatives Analysis

Has an alternatives analysis been prepared? Yes ☒ No ☐

See Attachment A (Supplemental Information).

Does the U.S. Army Corps of Engineers require an alternatives analysis for this project?

Yes ☐ No ☒

If yes, submit alternatives analysis documentation consistent with that provided to the Corps.

If an alternatives analysis is not provided, indicate which Procedures section IV.A.1.g exemption applies and include any relevant supporting information, if needed (e.g., watershed plan, relevant permit number, etc.):

Check which Procedures section IV.A.1.h alternatives analysis tier applies to the project:

Water Board staff will evaluate the project information to verify the appropriate alternatives analysis tier:

Tier 1 ☒ **Tier 2 ☐** **Tier 3 ☐**

Avoidance and Minimization Measures

Describe the efforts to avoid and minimize direct impacts to waters of the state including actions/BMPs to be implemented during construction to avoid and minimize impacts including, but

not limited to, preservation of habitats, erosion control measures, project scheduling, flow diversions, etc.

A description may include actions or methods proposed for erosion control, including winterization strategies to stabilize bare soils and revegetation proposals. A map may be included to indicate the approximate location and area of soil, land, and vegetation disturbance, and proposed erosion and sediment control best management practices.

Reference the Procedures' state supplemental Dredge or Fill Guidelines, subpart H for potential actions to minimize adverse impacts to waters of the state.

Direct Impact Avoidance and Minimization:

See Attachment A (Supplemental Information).

Indirect Impact Avoidance and Minimization:

See Attachment A (Supplemental Information).

Water Quality Monitoring, Diversions and Dewatering

Does the proposed project include any dewatering, work in standing or flowing water, and/or constructing diversions of water?

Yes ☐ **No** ☒

If yes, a water quality monitoring plan to monitor compliance with water quality objectives of the applicable water quality control plan may be required.

Describe the water diversion and dewatering plan, or indicate where information is located within an attachment (Procedures section IV.A.2.c):
If there are proposed discharges of water to surface waters, include receiving water body name, estimated volume, flow rates and proposed management measures; if there are discharges to detention ponds or upland treatment facilities (such as temporary settling basins, filters bags, storage and/or treatment containers, etc.) then include their location and indicate if detention pond or treatment facility is on-site or off-site; if there are stream-channel diversions, include estimated flow rates, diversion system capacity, location, including upstream diversion points and downstream discharge point, and a diversion plan that provides measures to prevent erosion and turbidity, maintain fish passage, etc.

Section Nine: Ecological Restoration and Enhancement Projects (EREPs)

Is this application for a project that meets the definition of an Ecological Restoration and Enhancement Project (Procedures section V)?

Yes ☐ **No** ☒

Applications for Ecological Restoration and Enhancement Projects require an assessment plan with the following information (Procedures section IV.A.2.e):

☐ Project objectives
☐ Description of performance standards used to evaluate attainment of objectives
☐ Protocols for condition assessment
☐ The timeframe and responsible party for performing condition assessment
☐ Assessment schedule
☐ A draft restoration plan for restoring temporarily impacted areas to pre-project conditions, if a draft restoration plan is not provided as part of a binding stream or wetland enhancement or restoration agreement

Section Ten: Restoration of Temporary Impacts

If temporary impacts are proposed, applicants are required to submit a draft restoration plan for a complete application. Temporary impact restoration includes activities that are undertaken to restore the temporarily impacted area to pre-project conditions. A draft restoration plan should outline design, implementation, assessment, and maintenance activities. When active restoration is proposed, components of a draft restoration plan should include project objectives, plans for grading impacted areas to pre-project contours, a planting palette with plant species native to the area, seed collection locations, an invasive species management plan. Maintenance and assessment components of a draft restoration plan often includes performance measures, performance standard descriptions, attainment objectives, and timing proposed to reach attainment objectives. When passive restoration is proposed, a draft restoration plan should include an explanation of how passive restoration will restore the area to pre-project conditions, assessment components, and an estimated date for expected restoration.

If the draft restoration plan is part of a larger document, identify the specific section and page number where the requested information may be found in the attached document in the text box provided. If restoration of temporary impacts will occur through natural ecological processes, provide that information in the text box below.

Restoration Plan
Is a restoration plan attached? Yes ☐ No ☒
Describe the restoration plan and/or indicate where information is located within an attachment:

Section Eleven: Compensatory Mitigation

Compensatory mitigation means the restoration, establishment, enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved (Procedures Appendix A, Subpart J § 230.92). **When compensatory mitigation is required, a draft compensatory mitigation plan is required for a complete application.**

Proposed Compensatory Mitigation

Complete this table for each aquatic resource type proposed as compensatory mitigation; if more than two aquatic resource types will be provided, attach additional tables to your application.

Proposed Compensatory Mitigation Type, Choose one of the following:

☐ **Mitigation Bank** ☐ **In-Lieu Fee Program** ☒ **Permittee Responsible**

Mitigation Aquatic Resource Type. Choose one of the following aquatic resource type(s):

☐ **Lake/Reservoir** ☐ **Ocean/Bay/Estuary** ☐ **Riparian Zone**

☒ **Stream Channel** ☐ **Vernal Pool** ☐ **Wetlands**

Mitigation Method and Quantity for the Selected Mitigation and Resource Type:

Unit	Establishment	Re-establishment	Rehabilitation	Enhancement	Preservation	Unknown
Acres					0.12	
Linear Feet						

Proposed Compensatory Mitigation

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Complete this table for each aquatic resource type to be provided as compensatory mitigation; if more than two aquatic resource types will be provided attach additional tables to your application.		
Proposed Compensatory Mitigation Type. Choose one of the following:		
☐ **Mitigation Bank**	☐ **In-Lieu Fee Program**	☐ **Permittee Responsible**
Mitigation Aquatic Resource Type. Choose one of the following aquatic resource type(s):		
☐ **Lake/Reservoir**	☐ **Ocean/Bay/Estuary**	☐ **Riparian Zone**
☐**Stream Channel**	☐ **Vernal Pool**	☐ **Wetlands**

Mitigation Method and Quantity for the Selected Mitigation and Resource Type:

Unit	Establishment	Re-establishment	Rehabilitation	Enhancement	Preservation	Unknown
Acres						
Linear Feet						

Draft Compensatory Mitigation Plan

Using a watershed approach, a draft compensatory mitigation plan should be provided and be consistent with the requirements listed in Procedures Appendix A, Subpart J, and contain the items listed in section IV.A.2.b of the Procedures.

For mitigation bank or in-lieu fee program proposals, only the first three items below are required (i, ii, and iii). For permittee responsible mitigation, items one through seven are required. Item eight (climate change assessment) is required on a case-by-case basis; you may contact Water Board staff to determine if a climate change assessment will be required for your proposed mitigation project.

Indicate the attached document name and page number where each draft compensatory mitigation plan item may be found: See Attachment A, Supplemental Information.

i. A watershed profile for the project evaluation area for both the project activity and the proposed compensatory mitigation location (section IV.A.2.b.i).

document name and page number

ii. An assessment of the overall condition of aquatic resources proposed to be impacted by the project and their likely stressors, using an assessment method approved by the Water Boards (section IV.A.2.b.ii).

document name and page number

iii. A description of how the project impacts and compensatory mitigation would not cause a net loss of the overall abundance, diversity, and condition of aquatic resources, based on the watershed profile. If the compensatory mitigation is located in the same watershed as the project, no net loss will be determined on a watershed basis. If the compensatory mitigation and project impacts are located in multiple watersheds, no net loss will be determined considering all affected watershed collectively. The level of detail in the plan shall be sufficient to accurately evaluate whether compensatory mitigation offsets the adverse impacts attributed to the project (section IV.A.2.b.iii).

document name and page number

iv. Preliminary information about ecological performance standards, monitoring, and long-term protection and management, as described in the state supplemental dredge or fill guidelines (section IV.A.2.b.iv).

document name and page number

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v. A timetable for implementing the compensatory mitigation plan (section IV.A.2.b.v.) **document name and page number**
vi. If the compensatory mitigation plan includes buffers, design criteria and monitoring requirements for those buffers (section IV.A.2.b.vi). **document name and page number**
vii. If compensatory mitigation involves restoration or establishment as the form of mitigation, applicants shall notify, as applicable, state and federal land management agencies, airport land use commission, fore control districts, flood control districts, local mosquito-vector control district(s), and any other interested local entities prior to initial site selection. These entities should be notified as early as possible during the initial compensatory mitigation project design stage (section IV.A.2.b.vii). (Applicants are not required to submit documentation for this requirement.)
viii. If applicable, an assessment of reasonably foreseeable impacts to the compensatory mitigation associated with climate change, and any measures to avoid or minimize those potential impacts (section IV.A.2.b.viii). **document name and page number**

Compensatory Mitigation Contact Information
Name of Mitigation Bank or In-Lieu Fee Program:
Service Area:
Contact Name:
Contact Phone:
Contact Email:
Mitigation Location County:
Mitigation Site Latitude:
Mitigation Site Longitude:

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Section Twelve: Legally Responsible Person Attestation and Optional Duly Authorized Representative Assignment

The attestation below must be signed by the Legally Responsible Person (LRP).

1) **LRP eligibility is as follows:**

   a. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

      i. A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function; or

      ii. The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.

   c. For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official. This includes the chief executive officer of the agency or the senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of the U.S. EPA).

Legally Responsible Person Attestation

I certify under penalty of law that this application and all attachments were prepared under my direction or supervision in accordance with a process designed to assure that qualified personnel properly gather and evaluate the information submitted. The information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Patrick Leitch

DocuSigned by:

X 63EEC8FAADC44AC...

Legally Responsible Person's Signature

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2) **DAR assignment is as follows (optional):**
   a. The authorization shall specify that a person designated as a DAR has responsibility for the overall operation of the regulated facility or activity, such as a person that is a manager, operator, superintendent, or another position of equivalent responsibility, or is an individual who has overall responsibility for environmental matters for the company.

Optional Duly Authorized Representative (DAR) Assignment

I hereby authorize Naomi Schowalter to act on my behalf as the DAR in the processing of this application, and to furnish upon request, supplemental information in support of this permit application.

Patrick Leitch

DocuSigned by:

X 63EEC8FAADC44AC...

Legally Responsible Person's Signature

Section Thirteen: Fee Information

Fee amounts are determined according to the Cal. Code Regs., tit. 23, § 2200(a)(2) fee schedule (https://govt.westlaw.com/calregs/Document/IEEE14760D45A11DEA95CA4428EC25FA0?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.DefaDef) and are subject to change.

Submit the Application Fee based on the activity type and according to the appropriate fee category. Application fees are required to determine an application complete. Additional Project and/or Annual Fees may be imposed upon application review.

An excel fee calculator (https://www.waterboards.ca.gov/resources/fees/water_quality/docs/dredgefillcalculator.xlsm) may be used to estimate fees for budgeting purposes only.

Fees may be paid online or by check. Information on how to make an online payment is available at the State Water Board's webpage (https://www.waterboards.ca.gov/make_a_payment/). If fees are paid online prior to application submission, attach payment receipt to this application. Make checks, money orders, and cashier checks payable to the State Water Resources Control Board. Mailed payments should be attached to the application and remitted to the appropriate Water Board. See the Staff Directory (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/wqc_staffdir.pdf) for a list of State and Regional Water Board addresses.

Table for Internal Use Only	
Date Received	**Reg Measure ID**
WDID No.	**ECM Handle**
Check No.	**Check Amount**
Place ID	

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Potentia-Viridi Battery Energy Storage System (BESS) Project

Attachment A. Section 401 Water Quality Certification (WQC) Application Supplemental Information

Prepared for

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Prepared by

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433 Visitacion Avenue
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June 2025

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Appendix C. Civil Plans
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Appendix E. Mitigation Site Biological Resources Assessment Report

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ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
AMM	Avoidance and Minimization Measure
APE	Area of Potential Effect
BESS	Battery Energy Storage System
BMP	Best Management Practice
BMS	Battery Management System
BRA	Biological Resources Assessment
CWA	Clean Water Act
DC	Direct Current
DESCP	drainage, erosion, and sediment control plan
DPS	Distinct Population Segment
EACCS	Eastern Alameda County Conservation Strategy
ESA	Endangered Species Act
HVAC	Heating, Ventilation, and Air Conditioning
kV	KiloVolt
LFP	lithium iron phosphate
LID	low impact development
MV	Megawatt
NEMA	National Electrical Manufacturers Association
OWHM	ordinary high water mark
PCS	Power Conversion System
PG&E	Pacific Gas and Electric
SWPPP	Storm Water Pollution Prevention Plan
USFWS	U.S. Fish and Wildlife Service

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1 PROJECT DESCRIPTION (SECTION 2)

The Potentia-Viridi Battery Energy Storage System (BESS) Project (Project) proposes to construct, operate, and eventually repower or decommission a 400-megawatt (MW) BESS on approximately 85 acres in eastern Alameda County (Appendix A, Figure 1). The primary components of the Project include an up to 3,200-megawatt-hour (MWh) BESS facility, an operations and maintenance (O&M) building, a project substation, a 500 kilovolt (kV) overhead intertie transmission (gen-tie) line, and interconnection facilities within the Pacific Gas and Electric (PG&E) owned and operated Tesla Substation (Appendix A, Figures 2).

The Project would draw electricity from the power grid to charge and store electrical energy and discharge back to the power grid when the stored energy is needed. The Project would provide several benefits to the power grid, including reducing the need to operate natural gas power plants to balance intermittent renewable generation and serving as an additional capacity resource that would enhance grid reliability.

The Project would be remotely operated and monitored year-round and be available to receive or deliver energy 24 hours a day and 365 days a year. During the operational life of the Project, qualified technicians would routinely inspect the Project facilities and conduct necessary maintenance to ensure reliable and safe operational readiness.

The Project is in unincorporated Alameda County, California, within a portion of Assessor Parcel Number (APN) 99B-7890-2-4, located at 17257 Patterson Pass Road, southwest of Interstate 580 and Interstate 205. Development of the BESS facility would occur on about 70 acres of APN 99B-7890-002-04, which is currently comprised of fallowed annual grasslands suitable for grazing. The gen-tie line would extend southeast from the Project substation, crossing Patterson Pass Road and then proceeding east to the Point of Interconnection (POI) at the Tesla Substation. The Project's gen-tie line would be sited on APNs 99B-7890-2-4, 99B-7890-2-6, and 99B-7885-12. Land uses in the immediate vicinity of the Project include undeveloped rural agricultural lands, multiple high-voltage transmission lines and electrical substations, rural roads, and railroad lines. The nearest municipality to the Project site is the City of Tracy approximately 2.5 miles to the northeast. There are a few single-family residences near the Tesla Substation's southern and eastern boundaries. The nearest residence is about 1,500 feet southeast of the Project site and 560 feet south of the proposed gen-tie line; it is owned by the same landowner leasing the lands for the Project.

The Project location was selected due to it being large enough to support development of the Project, its close proximity to existing electrical infrastructure and the Tesla Substation, thereby minimizing length of the proposed gen-tie line to the POI, and because it is located immediately adjacent to existing roadways for construction and O&M access.

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The BESS Facility would total 57.7 acres and include the following components:

- BESS Enclosures
- Power Conversion Systems (PCS)
- Medium voltage Collection System
- Project Substation, Control Building, and Telecommunications Facilities
- Access Roads
- Laydown Yards
- Stormwater Facilities and Outfall
- Site Security and Fencing, including fire detection system
- Operations and Maintenance Building

The transmission and interconnection facilities would total 1.9 acres. Construction of these facilities would require 6.7 acres of temporary disturbance for tension and pulling sites.

The Project includes two components that will require Clean Water Act (CWA) authorization: improvements to an existing stormwater culvert and outfall that discharges to a jurisdictional water of the United States (Patterson Run), and the construction of a permanent ford (i.e., low-water crossing) across the same feature. A delineation map is provided in Appendix A, Figure 3, and an OHWM [ordinary high water mark] Data Sheet is provided in Appendix B.

The following description of the proposed project components is provided to allow the RWQCB to have a comprehensive understanding of the Project; proposed discharges to jurisdictional waters are included in the descriptions of "Access Roads" and "Stormwater Facilities and Outfall." Project plans are provided in Appendix C, and site photos are provided in Appendix D.

Battery Energy Storage System

The energy storage facility would utilize a modular and containerized BESS. There are several battery cell technologies commercially available, with one of the most common at present being lithium iron phosphate (LFP) cells (often colloquially referred to as 'lithium-ion'). LFP technology is considered one of the safest, most efficient, and commercially financeable energy storage technologies available on the market. The initial Project concept has been developed assuming an LFP technology.

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The BESS enclosures would be prefabricated off-site and arrive at the site ready to be installed and commissioned. Each modular BESS enclosure would include battery packs on racks, a battery management system (BMS), fire protection, and ancillary power electronics within a specialized steel-framed, non-occupiable container. The BESS enclosures would not exceed approximately 15 feet in height. The BESS enclosures may also have a heating, ventilation, and air conditioning (HVAC) system for optimal performance and safety. Power for the HVAC system, lighting, and other electrical systems would be provided through separate auxiliary power connection to the on-site project substation with connection lines installed above and/or below ground.

Power Conversion System

A PCS is a packaged and integrated system consisting of a bi-directional inverter, medium voltage transformers, protection equipment, direct current (DC) and alternating current (AC) circuit breakers, harmonic filters, equipment terminals, and a connection cabling system. A PCS functions to both convert between DC/AC and change the voltage level from the MV collection voltage to the voltage output of the BESS enclosures.

The PCS would convert electric energy from AC to DC when the energy is transferred from the grid to the battery, and from DC to AC when the energy is transferred from the battery to the grid. Each PCS would also include transformers that convert the AC side output of the inverter between low and medium AC voltage to increase the overall efficiency of the BESS. Inverters within the PCS units would be unattended systems designed to operate in all conditions. The inverters would be monitored and controlled remotely, and there would be on-site disconnects for use in case of an emergency or a situation requiring unscheduled maintenance.

PCS units would be installed on concrete foundations and connected to multiple BESS enclosures with wiring and cables installed underground. All outside electrical equipment would be housed in the appropriate National Electrical Manufacturers Association (NEMA) rated enclosures.

Medium Voltage Collection System

The medium voltage collection system would include multiple components that connect the PCS units to the project substation, including underground conductor circuits, switchboards, switchgear, and panels at 34.5kV voltage. The conductors for the MV collection system would be installed underground during construction using trenching.

Project Substation

The project substation would include three main power transformers (MPTs) – two active and a live spare. When the BESS facility is charging, power from the regional electric transmission

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grid would be stepped down from 500kV to 34.5kV and sent from the project substation through the MV collection system and PCS units into the battery packs within the BESS enclosures. When the BESS facility is discharging, power from the battery packs within the BESS enclosures would be sent to the PCS units, stepped up to 34.5kV, and transported to the project substation through the MV collection system before being stepped up to 500kV at the MPTs and delivered back to the regional electric transmission grid. A prefabricated control building would be installed within the project substation area and contain an energy management system, metering and telecommunication equipment for communication with PG&E/CAISO facilities and to support remote Project operations monitoring. The project substation area would also include five static masts for lightning protection and a wireless communication tower mounted with an antenna up to 15 feet in diameter for external telecommunications.

Access Roads

The Project's roadway system would include two new facility access roads and driveways, a perimeter road, internal access roads, and a gen-tie access road. One of the new site access roads and driveways would be constructed from an existing private road near the northeastern portion of the site, and the other would be constructed from Patterson Pass Road near the southwestern portion of the site. A project substation access road would be constructed outside of the perimeter fence, connecting the northeast and southwest driveways, to facilitate substation access by third parties during operations. The gen-tie access road would provide access from Patterson Pass Road to the PG&E Tesla Substation, within the transmission corridor. All new access roads, driveways, internal and perimeter roads would be bladed, compacted, and surfaced with aggregate. All internal roadways and private driveways would be constructed to meet access requirements for construction, O&M, and emergency response requirements.

The gen-tie access road would require construction of a ford (i.e., low-water crossing) across Patterson Run, a water of the United States. This will require excavation and grading of the bed and banks followed by placement of approximately 17 cubic yards of imported fill and 30 cubic yards of riprap to accommodate the maintenance vehicle crossing.

Laydown Yards

The Project would include up to 4 laydown yards for equipment and material staging and storage during construction. These areas would also be used for worker parking during construction. The primary laydown yard would be located directly adjacent to the project substation area. The primary laydown yard would be bladed, compacted, and surfaced with aggregate, while additional laydown yards would be cleared of vegetation and surfaced with aggregate or other soil stabilizing materials. Portions of additional laydown yards may also be graded, if necessary. Landscape fabric may also be installed under the surface of all laydown

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yards to prevent vegetation growth, if required to comply with fire prevention standards. The O&M building, and required parking spaces for O&M staff, would be constructed within the primary laydown following construction of the BESS facility components.

Stormwater Facilities

The proposed BESS facility site currently consists of annual grassland with rolling topography. Regulatory standards require that volumes and flow rates of stormwater discharge after construction not exceed pre-development conditions. Stormwater generated on-site would flow to stormwater detention basins located along the periphery of the BESS facility site. Stormwater treatment and storage sizing would be designed to hold the anticipated runoff from a 100-year, 24-hour storm event in compliance with applicable regulations. In the event stormwater basins reach capacity, stormwater would be discharged from the detention basins via storm drainpipes and sheet flow at rates no greater than pre-development conditions following natural drainage patterns.

A stormwater drainage outfall utilizing a new 15-inch corrugated metal pipe would be constructed from a detention basin located in the southwest portion of the site to the inlet of an existing culvert on the north side of Patterson Pass Road. This existing culvert carries storm water from the north side of Patterson Road to the south side where it discharges to Patterson Run. To accommodate additional stormwater runoff and to bring the existing culvert into compliance with current code, the existing outfall would be excavated followed by placement of approximately 3 cubic yards of native fill and 5 cubic yards of riprap to stabilize the existing slope and provide for energy dissipation.

Site Security

The BESS facility site would be enclosed with an 8-foot-tall chain link fence topped with 1 foot of three-strand barbed wire or razor wire. The fence would be installed on the outside of the perimeter road. An additional fence with the same specifications would be installed around the project substation area. The fences would be required to prevent unauthorized access and to comply with human health and safety regulations. Gates would be installed at various access points along the fence lines and equipped with lock boxes to allow for authorized personnel (e.g., transmission service provider, O&M staff, emergency response) to access appropriate portions of the BESS facility site.

Lighting would only be in areas where it is required for safety, security, or operations. All lighting would be shielded and directed downward to minimize the potential for glare or spillover onto adjacent properties, compliant with applicable codes and regulations. Security cameras would be placed on site and monitored 24/7.

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Fire Protection System

Fire protection would include multiple fire detection systems on-site and within the individual BESS enclosures. An infrared camera system would be installed throughout the BESS facility to over 100% of electrical infrastructure and trigger an alarm in case of an onsite fire. Each BESS enclosure would have a fire rating in conformance with the California Fire Code 2022. In addition, each BESS enclosure would contain an onboard monitoring system to track the state of individual battery cells and relay information 24/7. In the event of an anomaly, the system is designed to shut down and mitigate the hazard.

The Project's fire protection design would comply with California Fire Code 2022, Section 1207 Electrical Energy Storage Systems, which adopts the National Fire Protection Association's Standard for the Installation of Stationary Energy Storage Systems (NFPA 855). BESS enclosures would be Underwriters Laboratories (UL) listed, tested, and certified to the most rigorous international safety standards. UL independently tests equipment for compliance with the latest fire safety code requirements, and the methods were developed to minimize fire risk and safety concerns about battery storage equipment raised by fire departments and building officials in the United States.

Faults, mechanical damage, or manufacturing defects in lithium-ion batteries can cause thermal runaway, which can lead to fires or other hazards. Should a thermal runaway event occur, the BESS enclosures are designed and constructed in such a way that fire would not propagate from one enclosure to a neighboring enclosure. The Project's BESS enclosures, as part of the testing and listing process, would be subjected to destructive testing including fire testing. The Project's BESS enclosures would include the following UL certifications:

- UL 1642 – Standard for Lithium Batteries (cell level certification).
- UL 1973 – Standard for Batteries for Use in Stationary Applications (module level certification).
- UL 9540 – Standard for Energy Storage Systems and Equipment (system level certification).
- UL 9540A – Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems.
- IEC 62619 – Standard for Battery Safety in Stationary Applications.

The Alameda County Fire District would review and comment on the facility fire protection and suppression plans.

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Operations and Maintenance Building

Following construction of the BESS facility, an O&M building would be constructed within the primary laydown yard for the Project's anticipated three full-time operations staff. The O&M building would include parking, outside equipment and laydown areas, basic offices, meeting rooms, washroom facilities and climate-controlled storage for certain equipment and materials. A potable water storage tank would provide water for washroom and sanitary facilities, and sewage/wastewater would be collected in a separate tank. Potable water would be trucked to the water storage tank periodically during O&M, and sewage/wastewater would be pumped from the storage tank, transported offsite via truck, and disposed of at a sanitary dump station, as needed, during operations. The O&M building would be powered via a distribution line from the project substation.

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2 AVOIDANCE AND MINIMIZATION MEASURES (SECTION 8)

This section fulfills the alternatives analysis requirement for Tier 1 projects under the "State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State." The Project would directly impact less than 0.1 acre and 100 linear feet of waters of the State. The following steps would be taken to avoid and minimize loss of, or significant adverse impacts to, beneficial uses of waters of the State.

- A Storm Water Pollution Prevention Plan (SWPPP) would be prepared and implemented, requiring implementation of Best Management Practices (BMPs) to control stormwater run-on and runoff from construction work sites. BMPs may include, but may not be limited to, physical barriers to prevent erosion and sedimentation, construction of stormwater detention basins to control runoff and reduce potential sedimentation, limitations on work periods during storm events, and protection of stockpiled materials, which would substantially reduce or prevent erosion from occurring during construction.

- A drainage, erosion, and sediment control plan (DESCP) would be implemented to reduce the impact of run-off during construction, operation, maintenance, and decommissioning. Erosion control facilities to be shown on the final grading plan would control and contain erosion-induced silt deposits and provide for the safe discharge of silt free stormwater into existing and proposed storm drain facilities after rough grading has been completed. These erosion control facilities would be operable prior to October 1st of any year grading operations have resulted in areas unprotected from erosion. All erosion control measures would be maintained until disturbed areas are stabilized. Grading would be completed in conformance with the Alameda County Grading Ordinance unless otherwise approved and in compliance with the Project-specific geotechnical report. BMPs required by the Project-specific SWPPP and DESCP would be properly implemented and maintained to control water quality of stormwater runoff. Implementation of the Project-specific SWPPP and DESCP would minimize potential for sedimentation of downstream water bodies.

- Appropriate spill containment and cleanup kits would be maintained during operation of the Project. A spill prevention control and countermeasures plan would be developed for site construction, operations, and decommissioning. In addition, a hazardous materials business plan would be prepared, which would include all hazardous materials used or stored on site exceeding threshold volumes and appropriate procedures to be implemented in the event of an accidental spill.

- The Project would include stormwater detention and low impact development (LID) features, constructed in compliance with the Stormwater Technical Guidance Manual, to minimize off-site stormwater runoff velocities and minimize off-site water quality

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impacts. Preliminary LID calculations are conservatively based on 10% of the total impervious area. The Stormwater Technical Guidance Manual requires a 4% method, which is based on rainfall and soil infiltration rates. Post-construction runoff rate would be 5 cubic feet per second, resulting in no requirements for a separate stormwater runoff detention plan (per the Stormwater Technical Guidance Manual). The LID features would consist of bioretention basins consisting of permeable gravel with a perforated underdrain pipe, overlain by a permeable bioretention soil mix. A riser outlet structure would allow for overflow of excessive stormwater flows. Ten stormwater outlets would be constructed around the perimeter of the facility. These outlets would include riprap to further reduce (in addition to the bioretention basins) off-site stormwater flow velocities. Stormwater treatment and storage sizing would be designed to hold the anticipated runoff from a 24-hour, 25-year storm event and a 24-hour, 100-year storm event, in compliance with Stormwater Technical Guidance Manual regulations. In the event stormwater basins reach capacity, stormwater would be discharged from the detention basins via storm drainpipes and sheet flow at rates no greater than pre-development conditions following natural drainage patterns. Minimal off-site stormwater flow velocities would prevent off-site erosive scour of sediments, which in turn would prevent siltation of downstream water bodies, off-site flooding, and off-site exceedance of stormwater drainage facilities.

Additionally, the following measures have been adopted from the Eastern Alameda County Conservation Strategy (EACCS). Note that mitigation outlined in EACCS is expected to be required by U.S. Fish and Wildlife Service (USFWS) and is expected to include wetlands and/or waters to offset impacts to aquatic features.

General

- GEN - 01 Employees and contractors performing construction activities will receive environmental sensitivity training. Training will include review of environmental laws and Avoidance and Minimization Measures (AMMs) that must be followed by all personnel to reduce or avoid effects on covered species during construction activities.

- GEN - 02 Environmental tailboard trainings will take place on an as needed basis in the field. The environmental tailboard trainings will include a brief review of the biology of the covered species and guidelines that must be followed by all personnel to reduce or avoid negative effects to these species during construction activities. Directors, Managers, Superintendents, and the crew foremen and forewomen will be responsible for ensuring that crewmembers comply with the guidelines.

- GEN - 03 Contracts with contractors, construction management firms, and subcontractors will obligate all contractors to comply with these requirements, AMMs.

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- GEN - 04 The following will not be allowed at or near work sites for covered activities: trash dumping, firearms, open fires (such as barbecues) not required by the activity, hunting, and pets (except for safety in remote locations).
- GEN - 05 Vehicles and equipment will be parked on pavement, existing roads, and previously disturbed areas to the extent practicable.
- GEN - 06 Off-road vehicle travel will be minimized.
- GEN - 07 Vehicles will not exceed a speed limit of 15 mph on unpaved roads within natural land cover types, or during off-road travel.
- GEN - 08 Vehicles or equipment will not be refueled within 100 feet of a wetland, stream, or other waterway unless a bermed and lined refueling area is constructed.
- GEN - 09 Vehicles shall be washed only at approved areas. No washing of vehicles shall occur at job sites.
- GEN - 10 To discourage the introduction and establishment of invasive plant species, seed mixtures/straw used within natural vegetation will be either rice straw or weed free straw.
- GEN - 11 Pipes, culverts, and similar materials greater than four inches in diameter, will be stored so as to prevent covered wildlife species from using these as temporary refuges, and these materials will be inspected each morning for the presence of animals prior to being moved.
- GEN - 12 Erosion control measures will be implemented to reduce sedimentation in wetland habitat occupied by covered animal and plant species when activities are the source of potential erosion problems. Plastic monofilament netting (erosion control matting) or similar material containing netting shall not be used at the project. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.
- GEN - 13 Stockpiling of material will occur such that direct effects to covered species are avoided. Stockpiling of material in riparian areas will occur outside of the top of bank, and preferably outside of the outer riparian dripline and will not exceed 30 days.
- GEN - 14 Grading will be restricted to the minimum area necessary.
- GEN - 15 Prior to ground disturbing activities in sensitive habitats, project construction boundaries and access areas will be flagged and temporarily fenced during construction to reduce the potential for vehicles and equipment to stray into adjacent habitats.

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- GEN - 16 Significant earth moving activities will not be conducted in riparian areas within 24 hours of predicted storms or after major storms (defined as 1 inch of rain or more).
- GEN - 17 Trenches will be backfilled as soon as possible. Open trenches will be searched each day prior to construction to ensure no covered species are trapped. Earthen escape ramps will be installed at intervals prescribed by a qualified biologist.

Amphibians: CTS, CRLF

AMPH-2. Habitat: Riparian habitat and grasslands within 2 miles of aquatic habitat

- A qualified biologist will conduct preconstruction surveys before groundbreaking. If individuals are found, work will not begin until they are moved out of the construction zone to a USFWS/CDFW approved relocation site.
- A Service–approved biologist should be present for initial ground disturbing activities.
- If the work site is within the typical dispersal distance (contact USFWS/CDFW for latest research on this distance for species of interest) of potential breeding habitat, barrier fencing will be constructed around the worksite to prevent amphibians from entering the work area. Barrier fencing will be removed within 72 hours of completion of work.
- No monofilament plastic will be used for erosion control.
- Construction personnel will inspect open trenches in the morning and evening for trapped amphibians.
- A qualified biologist possessing a valid ESA Section 10(a)(1)(A) permit or Service approved under an active biological opinion will be contracted to trap and to move amphibians to nearby suitable habitat if amphibians are found inside fenced area.
- Work will be avoided within suitable habitat from October 15 (or the first measurable fall rain of 1″ or greater) to May 1.

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3 COMPENSATORY MITIGATION (SECTION 11)

The proposed compensatory mitigation site is described in the Biological Resources Assessment Report (BRA), prepared by Westervelt Ecological Services and dated January 2025 (Appendix E). The proposed mitigation lands include 213 acres of the Mulqueeney Ranch, which is located immediately west of the proposed BESS facility. The BRA describes the ecological values, which includes the proposed preservation of 2.80 acres of waters and wetlands, including:

- Ephemeral Drainage: 0.74 acre
- Pond: 0.73 acre
- Swale: 0.97 acre
- Wetland: 0.36 acre

The BESS project proposes to impact a total of 0.04 acre of seasonal stream and proposes to provide mitigation values equivalent to 0.12 acre of waters as mitigation (i.e., a 3:1 mitigation ratio). These waters are a sub-set of those that are proposed to be preserved in perpetuity within the 213-acre Mulqueeney Ranch property.

The entirety of the 2.80 acres of waters and wetlands with the Mulqueeny Ranch mitigation area will be managed in perpetuity along with the rest of the mitigation area in order to preserve existing ecological functions and values. The applicant proposes to apply 0.12 acre to the proposed BESS project and to hold the remaining 2.68 acres of preserved waters and wetlands in reserve to mitigate for a future project. We understand that this proposed mitigation at the Mulqueeney Ranch is not an approved mitigation bank, and as such, request that these held mitigation values could be applied to a future project for a period of no longer than 5 years. If the project owners are not able to propose a new project within 5 years, the mitigation values would be relinquished, and the remaining 2.68 acres of waters and wetlands would continue to be managed a part of the 213-acre preserve in perpetuity.

Note that the USFWS and the CDFW are currently processing the permit applications for the BESS facility. Should the mitigation requirements of these agencies cause the protected waters and wetlands within the mitigation area to either increase or decrease in total acreage, we will inform the RWQCB of this change. In no case will the proposed mitigation for the RWQCB be reduced below 0.12 acre of preserved waters.

POVI 0003664

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Appendix A – Figures

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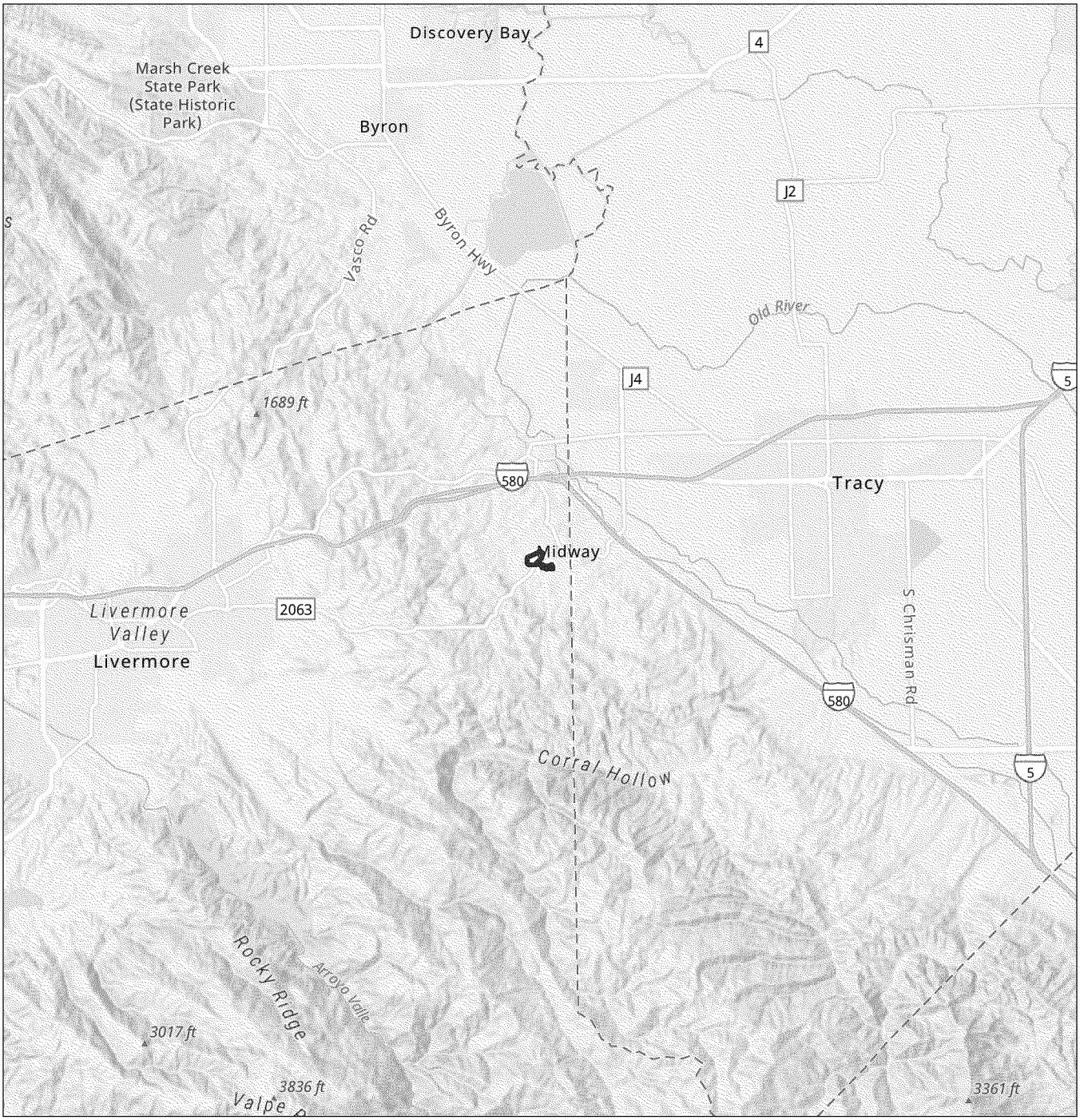

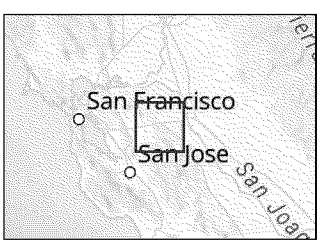

Project Location

0 1.5 3 Miles
(At original document size of 8.5x11)
1:250,000

N

Stantec

Project Location
Midway
Alameda County, CA

Prepared by KDLP on 2024-06-03
IR by SE on 2024-06-04

Client/Project
185706735

Potentia-Viridi Battery Energy Storage System
Biological Assessment

Figure No.
Figure 1

Title
Project Location

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: California State Parks, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, Esri, NASA, NGA, USGS, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS, Esri, USGS

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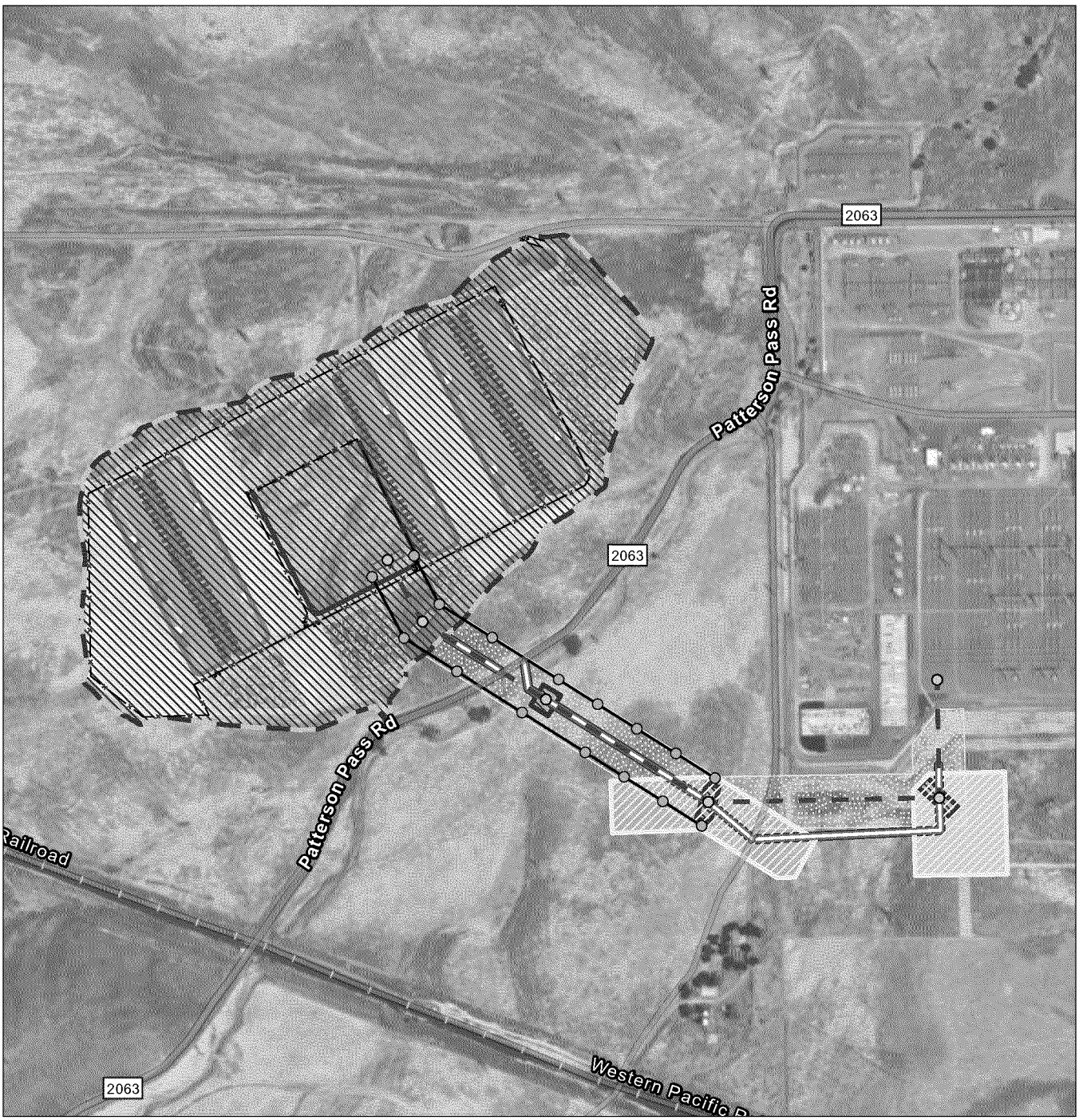

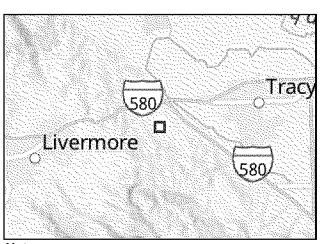

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: Esri Community Maps Contributors, San Joaquin County GIS/Planning, San Joaquin County Public Works, California State Parks, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, USFWS, Esri, CGIAR, USGS, Maxar, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS,

- Telecomm Pole
- HV Structure
- Telecomm Line
- Gen-Tie
- Gen-Tie Corridor
- PG&E Temporary Work Area
- Tension Pulling Area
- Transmission Access Path
- Laydown Yard
- BESS Yards
- BESS Enclosures
- DC/DC Converters
- PCS Units
- Auxilary Transformers and Panels
- Primary Laydown Yard
- Project Substation Area
- Fence Line
- Stormwater Areas
- Roads
- Grading Limits
- Temporary Distrubance
- Permanent Disturbance

0 250 500 Feet
(At original document size of 8.5x11)
1:7,000

N

Stantec

Project Location
Midway
Alameda County, CA

Prepared by KDLP on 2024-06-03
IR by SE on 2024-06-04

Client/Project
185706735
Potentia-Viridi Battery Energy Storage System
Biological Assessment

Figure No.
Figure 2

Title
Project Design Features

V:\18571Active\185706735\Pro\PV_BESS_BA\PV_BESS_BA.aprx Revised: 2024-06-04 By: kdelapena

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PV - BESS

Battery Storage Project - Alameda County CA

Figure 3. Delineation Map

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Appendix B – OHWM Data Sheet

Docusign Envelope ID: 32EF3236-2C00-496D-9AA0-BD9F98B0DE35

Potentia Viridi

OHWM DATA SHEET

Project: BESS Facility Date: 01/18/24 Feature ID: EPH-01

Investigator(s): MRB & ECF Transect ID: T-01

Site Location:

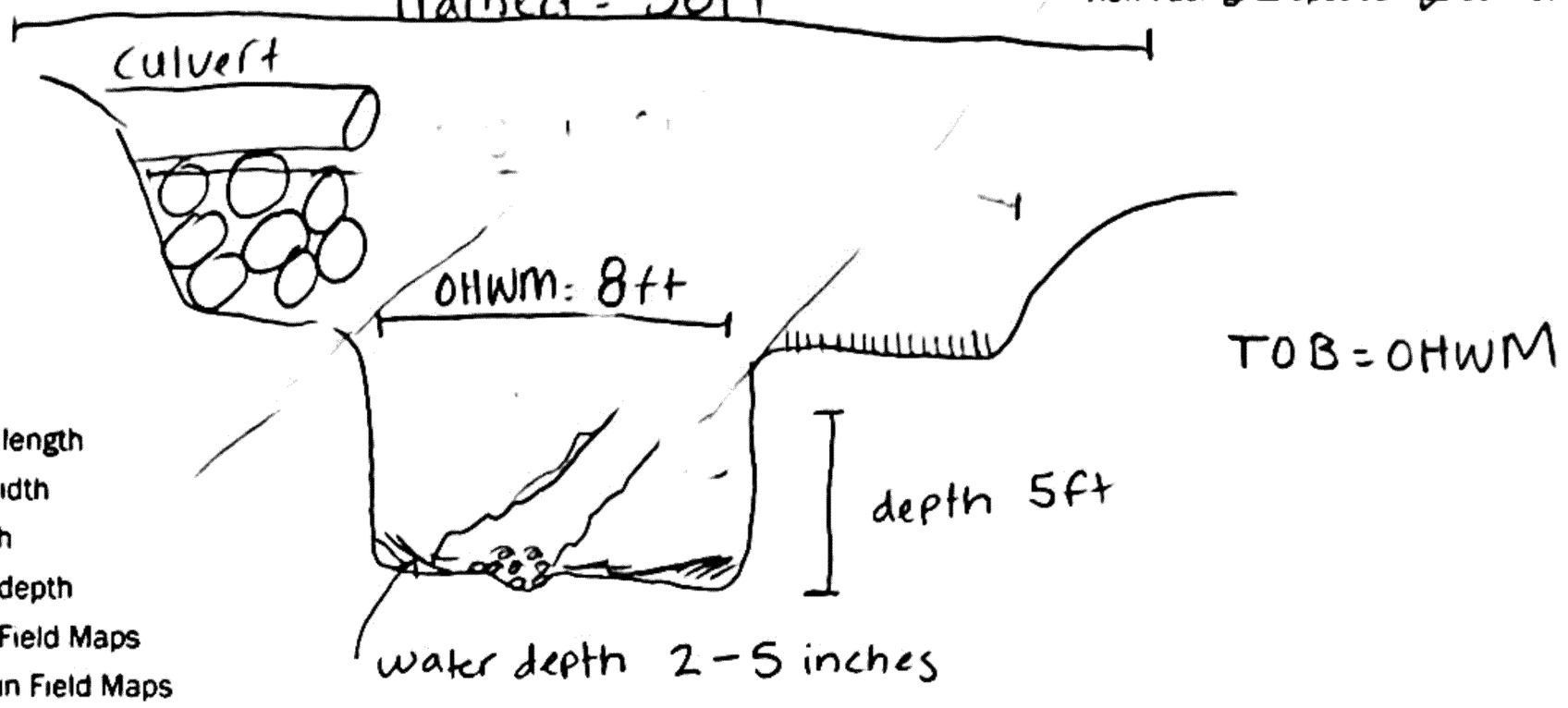
Alameda County, northwest portion of site

Stream Flow: ☒ Ephemeral ☐ Intermittent ☐ Perennial ☐ Controlled/Other

Transect (cross-section) drawing(s):

View Facing: S

View Facing: ☐ upstream ☒ downstream



☒ Transect length
☒ OHWM width
☒ TOB width
☒ Channel depth
☒ Photo in Field Maps
☐ Mapped in Field Maps

OHWM Indicators (at OHWM; primary indicators indicated with *)

- ☐ Natural line impressed on the bank
- ☒ Shelving
- ☐ Changes in the character of soil (texture)*
- ☐ Destruction of terrestrial vegetation
- ☐ Presence of litter and debris
- ☐ Wracking
- ☒ Vegetation matted down, bent, or absent
- ☐ Sediment sorting
- ☐ Leaf litter disturbed or washed away
- ☐ Scour
- ☐ Deposition
- ☐ Bed and banks
- ☐ Water staining
- ☒ Change in plant community and/or cover*

☐ Break in Slope at OHWM*: ☒ Sharp (>60°) ☐ Moderate (30-60°) ☐ Gentle (<30°)

Soil Texture

	Clay/Silt (%)	Sand (%)	Gravel (%)	Cobbles (%)	Boulders (%)
Above OHWM	30	30	10	5	25
Below OHWM	70	20	10	-	-

Vegetation Cover

	Tree (%)	Shrub (%)	Herb (%)	Bare (%)
Above OHWM	0	15	5	80
Below OHWM	0	0	5	95

Veg Stage: ☐ Early (herbs & seedlings) ☑ Mid (herbs, shrubs, saplings) ☐ Late (herbs, shrubs, mature trees)

Upland Species:	*Bank Species:*	*Emergent Species:*
Silybum marianum Centaurea solstitialis Centaurea calcitrapa Senescent grasses Brassica sp. Erodium cicutarium	Senescent grasses	None

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OHWM DATA SHEET

Condition/Disturbances/Anthropogenic Influences (e.g., erosion, grazing, culverts, etc.):

Culvert & Roadside

Hydrology:

☒ Flowing water	Min. depth: 2 inches	☒ No
☐ Standing water	Max. depth: 5 inches	☐ Yes ☐ Continuous ☐ Intermittent
☐ Saturated	Avg. depth:	
☐ Dry		

Riparian:

Checklist of resources used to evaluate OHWM:

☒ Aerial photography	☒ Vegetation maps	☐ Other:
☒ GPS unit	☒ Geologic/soil maps	
☐ Rainfall data	☐ Gage data	
☐ Topographic maps	☐ LiDAR	

Other drawings (aerial view):

None

Connectivity notes:

None

Other forms related to this feature: ☐ Yes ☒ No

☐ Terrace, fringe, or floodplain wetland (wetland datasheet)

☐ Low flow channel or other representative section (OHWM datasheet)

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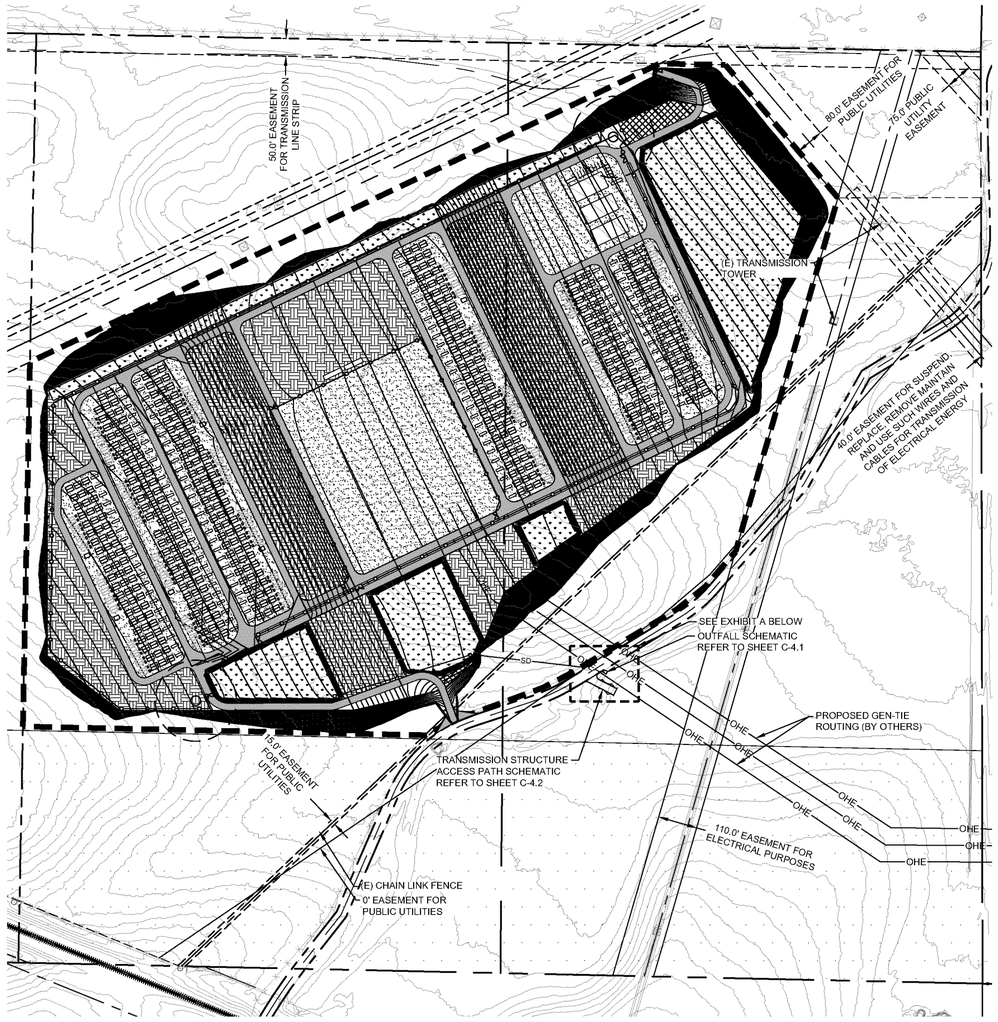
Appendix C – Civil Plans

Docusign Envelope ID: 32EF3236-2C00-496D-9AA0-BD9F98B0DE35



SITE MAP
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SCALE: 1 INCH = 200 FEET

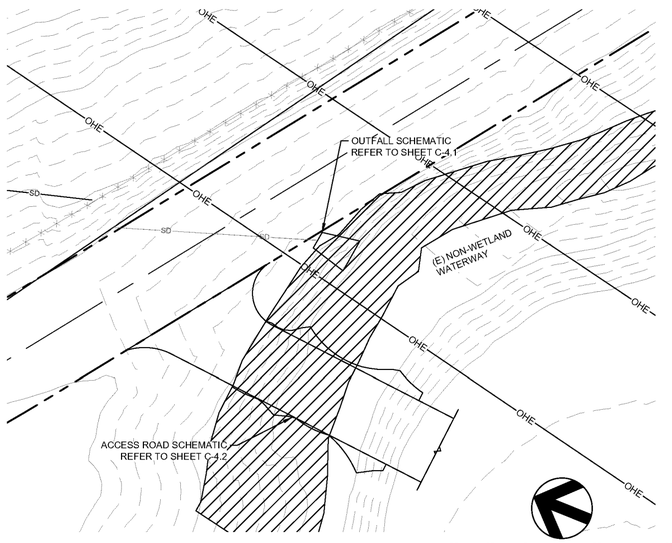

EXHIBIT A
SCALE: 1"=20'

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SCALE: 1 INCH = 20 FEET

SHEET INDEX

C-4.0 - 401 PERMIT COVER
C-4.1 - CONCEPTUAL CIVIL HYDROLOGY HYDRAULIC OUTFALL SCHEMATIC
C-4.2 - CONCEPTUAL ACCESS ROAD SCHEMATIC

LEGEND

- CENTERLINE
- EASEMENT LINE
- PROPERTY LINE
- PROPOSED LEASE LINE
- DRAINAGE MANAGEMENT AREA
- EXISTING CHAIN LINK FENCE
- PROPOSED FENCE
- STORM DRAIN PIPE (SD)
- RAILROAD
- EXISTING UTILITY POLE
- EXISTING CONTOURS (200)
- PROPOSED CONTOURS (200)
- ORDINARY HIGH WATER MARK
- STORMWATER/LID AREA

UTILITY STATEMENT
LOCATION OF EXISTING UNDERGROUND UTILITIES HAVE BEEN TAKEN FROM DRAWINGS AND FIELD LOCATES SUPPLIED BY THE APPROPRIATE UTILITY COMPANIES. UTILITY LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY. PRIOR TO BEGINNING ANY CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF EACH UTILITY.

811 Know what's below. Call before you dig.

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Oakland, CA 94612
ph 510.251.9578
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POTENTIA-VIRIDI BATTERY ENERGY STORAGE SYSTEM

LEVY ALAMEDA, LLC

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION
2	5/5/25	REV 2
1	1/17/25	REV 1

PROJ. NO.	232059
DRAWN	LB
CHECKED	RB
DATE	6/7/24

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SHEET TITLE:

401 PERMIT COVER

SHEET NO:

C-4.0

SHEET OF 7

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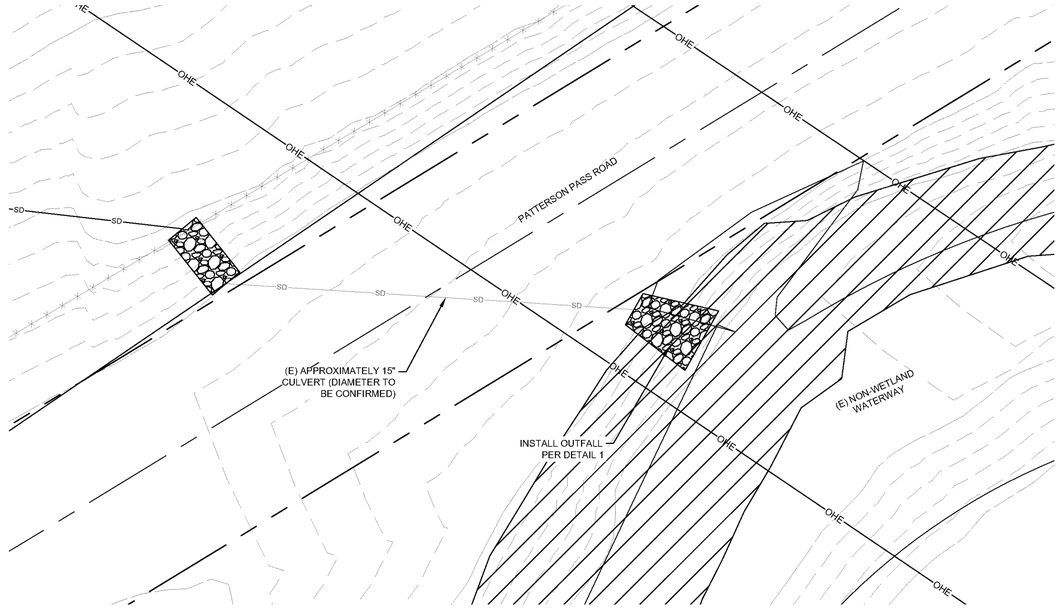

EXHIBIT A
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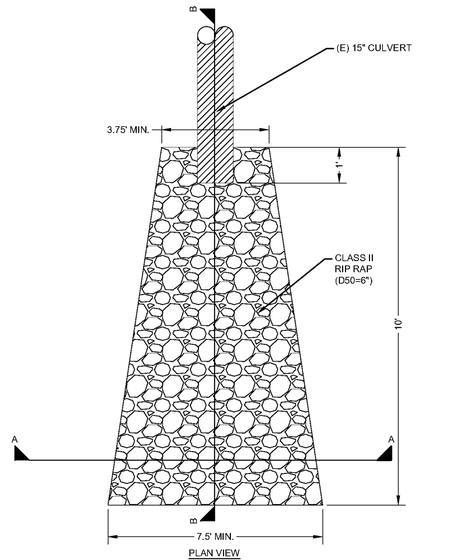
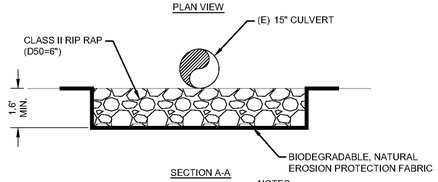
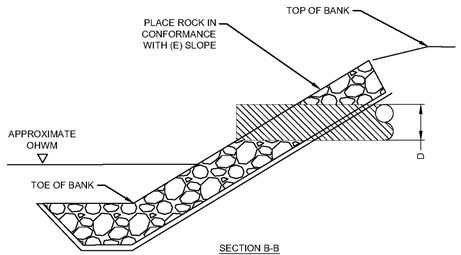


PLAN VIEW



SECTION A-A

NOTES:
ENERGY DISSIPATER SIZED PER FEDERAL HIGHWAY ADMINISTRATION HYDRAULIC ENGINEERING MANUAL

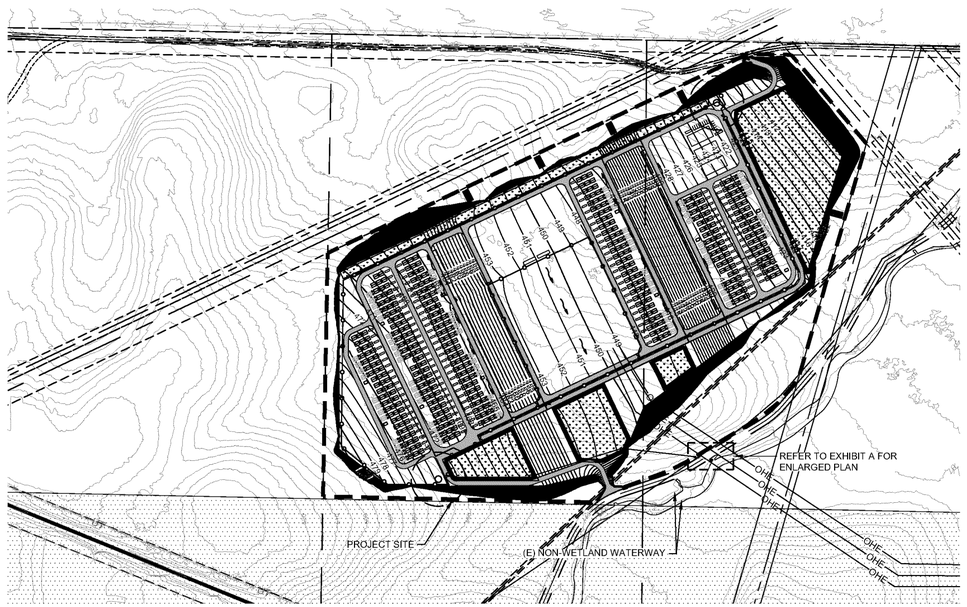


SECTION B-B

1 - OUTFALL DETAIL
SCALE: NTS

LEGEND

- CENTERLINE
- EASEMENT LINE
- PROPERTY LINE
- PROPOSED LEASE LINE
- DRAINAGE MANAGEMENT AREA
- EXISTING CHAIN LINK FENCE
- PROPOSED FENCE
- STORM DRAIN PIPE (SD)
- RAILROAD
- EXISTING UTILITY POLE
- EXISTING CONTOURS (200)
- PROPOSED CONTOURS (200)
- ORDINARY HIGH WATER MARK
- STORMWATER/LID AREA



SITE MAP
SCALE: 1"=300'

OUTFALL TOTAL QUANTITIES

DISTURBED AREA (SF)	EXCAVATED VOLUME (CY)	TOTAL CUT VOLUME (CY)	TOTAL NATIVE FILL VOLUME (CY)	RIP RAP VOLUME (CY)	NET EXPORT (CY)
80	16	8	3	5	5

OUTFALL OHWM QUANTITIES

DISTURBED AREA (SF)	EXCAVATED VOLUME (CY)	CUT VOLUME (CY)	NATIVE FILL VOLUME (CY)	RIP RAP VOLUME (CY)	NET EXPORT (CY)
60	12	6	2	4	4

200 100 0 200 400
SCALE: 1 INCH = 200 FEET

UTILITY STATEMENT
LOCATION OF EXISTING UNDERGROUND UTILITIES HAVE BEEN TAKEN FROM DRAWINGS AND FIELD LOCATES SUPPLIED BY THE APPROPRIATE UTILITY COMPANIES. UTILITY LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY. PRIOR TO BEGINNING ANY CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF EACH UTILITY.

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COFFMAN ENGINEERS
1939 Harrison Street, Suite 320
Oakland, CA 94612
ph 510.251.9578
www.coffman.com

POTENTIA-VIRIDI BATTERY ENERGY STORAGE SYSTEM

LEVY ALAMEDA, LLC

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION
2	5/5/25	REV 2
1	1/17/25	REV 1

PROJ. NO. 232059
DRAWN LB
CHECKED RB
DATE 5/30/24

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SHEET TITLE:
CONCEPTUAL CIVIL HYDROLOGY HYDRAULIC OUTFALL SCHEMATIC

SHEET NO:
C-4.1

SHEET 4 OF 7

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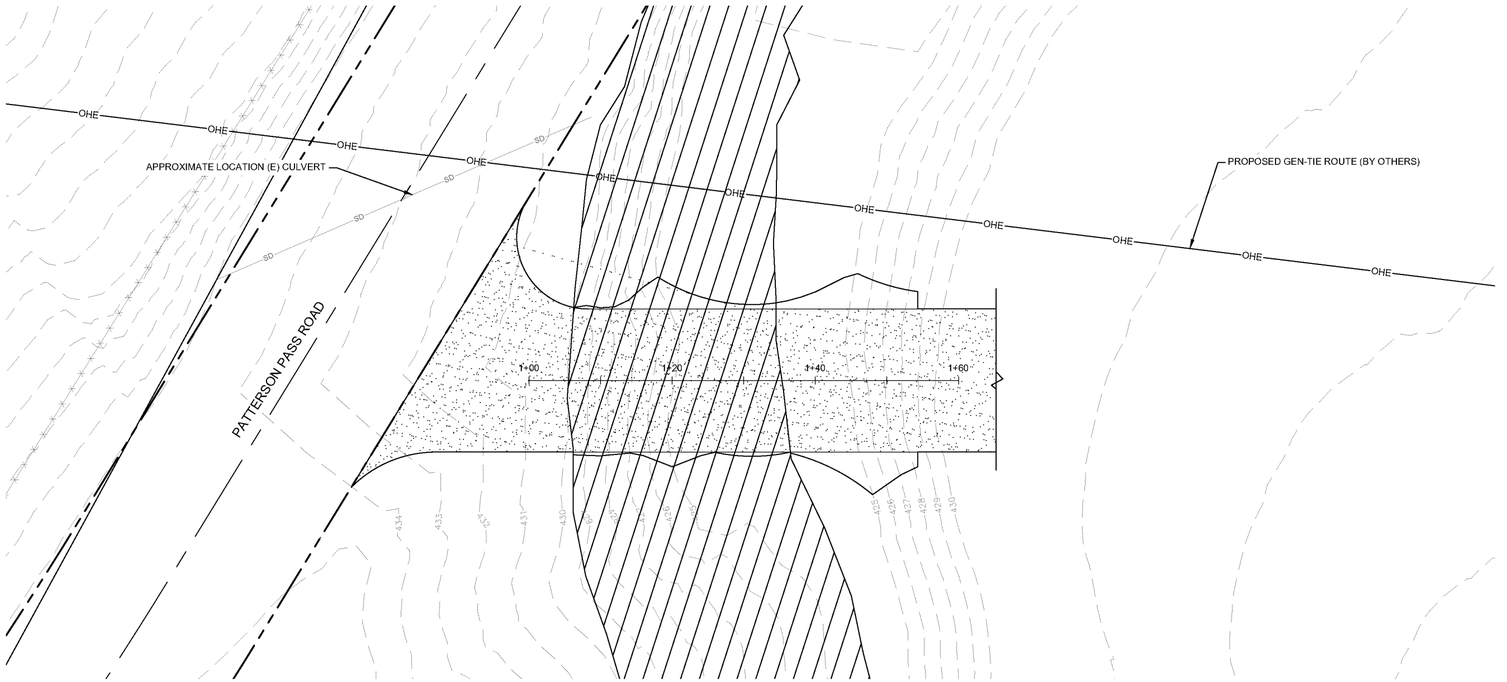
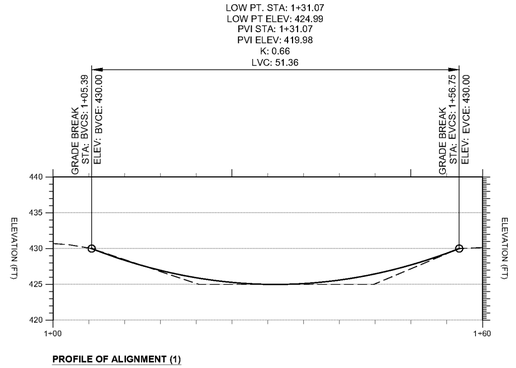


10 5 0 10 20

SCALE: 1 INCH = 10 FEET



PROFILE OF ALIGNMENT (1)

LOW-WATER CROSSING TOTAL QUANTITIES

DISTURBED AREA (SF)	EXCAVATED VOLUME (CY)	TOTAL CUT VOLUME (CY)	TOTAL IMPORTED FILL VOLUME (CY)	RIP RAP VOLUME (CY)
1,600	18	1	17	30

LOW-WATER CROSSING OHWM QUANTITIES

DISTURBED AREA (SF)	EXCAVATED VOLUME (CY)	CUT VOLUME (CY)	IMPORTED FILL VOLUME (CY)	RIP RAP VOLUME (CY)
650	7	1	6	12

LEGEND

- CENTERLINE
- EASEMENT LINE
- PROPERTY LINE
- PROPOSED LEASE LINE
- EXISTING CHAIN LINK FENCE
- PROPOSED FENCE
- STORM DRAIN PIPE
- EXISTING CONTOURS
- PROPOSED CONTOURS
- ORDINARY HIGH WATER MARK
- PROPOSED CONSTRUCTION ACCESS

UTILITY STATEMENT
LOCATION OF EXISTING UNDERGROUND UTILITIES HAVE BEEN TAKEN FROM DRAWINGS AND FIELD LOCATES SUPPLIED BY THE APPROPRIATE UTILITY COMPANIES. UTILITY LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY. PRIOR TO BEGINNING ANY CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF EACH UTILITY.

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REV	DATE	DESCRIPTION
2	5/5/25	REV 2
1	1/17/25	REV 1

PROJ. NO. 232059
DRAWN LB
CHECKED RB
DATE 6/7/24

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SHEET TITLE:

CONCEPTUAL ACCESS ROAD SCHEMATIC

SHEET NO:

C-4.2

SHEET OF 7

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Appendix D – Site Photos

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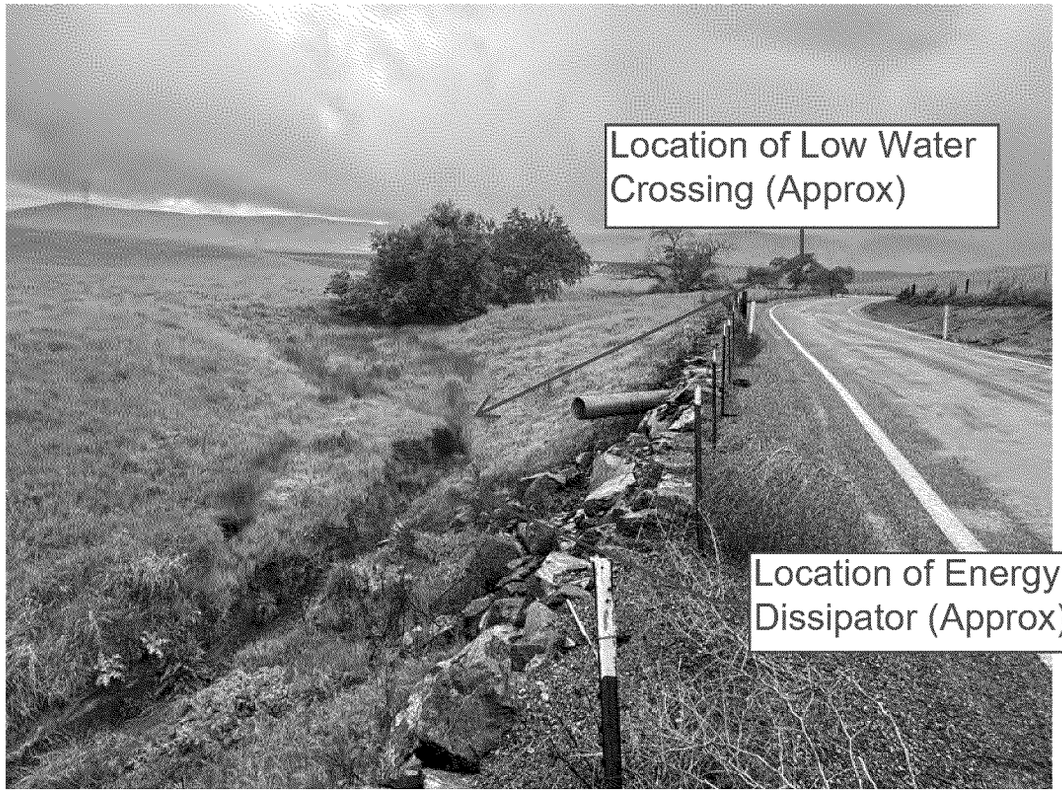

South Side of Patterson Pass road – facing SW

Note existing culvert under roadway. Crossing to be installed Immediately upstream of culvert.

South Side of Patterson Pass road – facing NE

Downstream of proposed outfall improvements. Note flowing feature in foreground and Altamont Pass Wind Farm Substation in the background

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Appendix E – Mitigation Site Biological Resources Assessment Report

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Westervelt
ECOLOGICAL SERVICES

BIOLOGICAL RESOURCES ASSESSMENT REPORT

Potentia Viridi Battery Energy Storage System Project Mitigation Site

Alameda County, California

Prepared by:
Westervelt Ecological Services
Western Region
3636 American River Drive, Suite 120
Sacramento, CA 95864
T: (916) 646-3644

wesmitigation.com

January 2025

Docusign Envelope ID: 32EF3236-2C00-496D-9AA0-BD9F98B0DE35

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1. Introduction

1.1. Introduction

Levy Alameda, LLC, a wholly owned subsidiary of Obra Maestra Renewables, LLC is in the process of developing a battery storage facility (project) in Alameda County, California. Westervelt Ecological Services (WES) has teamed with Levy Alameda, LLC to help provide mitigation for their project. WES has identified an approximate 213 acre area (mitigation site) that would be suitable mitigation for the project. The final mitigation site acreage will be based on permitting requirements as identified in project permits. This Biological Resources Assessment detailed the species and habitat that are present in the mitigation site.

1.2. Study Area Location

The proposed mitigation site is located in Alameda County (Figure 1, all figures are located in Appendix A) and consists of a portion of the approximately 4,869-acre Mulqueeney Ranch (Ranch, Figure 2). The Ranch is located immediately southwest of the Altamont Pass Wind Farm substation along the north and south sides of Patterson Pass Road within the Altamont Hills, approximately 6 miles east of the City of Livermore, Alameda and San Joaquin counties, California. More specifically, the mitigation site occurs in Sections 31 and 36, Township 2 South, Ranges 3 and 4East, and Mount Diablo Base & Meridian on the Midway U.S. Geological Survey 7.5-minute topographical quadrangle map (Figure 3). Approximate center coordinates of the mitigation site in decimal degrees of the World Geodetic System 1984 (WGS84) are: Latitude: 37.715336°, Longitude: -121.590078°.

1.3. Study Objective

The primary objective of this study was to assess the biological resources and resource value of the mitigation site and to determine the presence, or presumed absence, of sensitive biological resources (i.e., special-status species and sensitive plant communities or habitats) occurring within the mitigation site.

Reconnaissance-level field surveys were conducted to:

- provide a description of the biological resources and natural communities present within the mitigation site;
- compile species lists descriptive of plant communities;
- locate special-status plant species or habitat suitable for such species; and
- determine wildlife use and current habitat values for wildlife, including special-status species.

1.4. Definitions

Several terms relating to the biological resources used in the report are described briefly below.

COMMUNITY- A community is an assemblage of populations of plants, animals, bacteria, and fungi that live in an environment and interact with one another, forming a distinctive living system with its own composition, structure, environmental relationships, development, and functions (Whittaker 1975).

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HABITAT- Habitat is the place or type of site where a plant or animal naturally or normally lives and grows.

SENSITIVE NATURAL COMMUNITY - Sensitive natural communities are communities that are of limited distribution statewide or within a county or region and are often vulnerable to environmental effects of projects. These communities may or may not contain special-status plants or their habitat. A sensitive community has particularly high ecological value or functions and are considered important because their degradation or destruction could threaten populations of dependent plant and wildlife species and significantly reduce the regional distribution and viability of the community. As the number and extent of sensitive natural communities continue to diminish, the endangerment status of dependent special-status (i.e., rare, threatened, or endangered) species could become more precarious, and populations of currently stable species (i.e., non-special-status species) could become rare. Loss of sensitive natural communities can also eliminate or reduce important ecosystem functions, such as water filtration by wetlands and bank stabilization by riparian forests or wetlands.

SPECIAL-STATUS SPECIES - For the purposes of this assessment, special-status species were defined as being species that are legally protected or otherwise regulated or tracked by federal or state resource agencies. Special-status species are species, subspecies, or varieties that fall into one or more of these categories.

- Listed as threatened or endangered under the federal Endangered Species Act (ESA).
- Proposed or candidates for listing under the ESA.
- Listed as threatened or endangered under the California Endangered Species Act (CESA).
- Candidates for listing under the CESA.
- California species of special concern.
- California Fully Protected Species.
- Plants ranked as "rare, threatened, or endangered in California" (California Rare Plant Rank [CRPR] 1B and 2).
- Plants listed as rare under the Native Plant Protection Act.

WILDLIFE - For the purposes of this document wildlife includes mammals, birds, reptiles, amphibians, fish, and invertebrates.

WETLANDS - For the purposes of this document wetlands are defined as transitional areas between aquatic habitats and upland habitats and generally includes habitats such as marshes and swamps. Under the U.S. Army Corps of Engineers jurisdiction wetlands general must possess the following three mandatory criteria: 1) A prevalence or dominance of hydrophytes (water-loving plants); 2) Hydric soils (e.g., water-logged soils); and 3) Wetland hydrology (i.e., soils that are inundated or saturated to the surface for extended periods during the growing season).

The remainder of this report discusses the methods and results of the 2024 special-status species and sensitive habitat assessment at the mitigation site.

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2. Methods

The assessment of the mitigation site for biological resources included both desktop background information gathering and analysis and a summary of previously conducted biological surveys and mapping as described below.

2.1. Desktop Analysis

The desktop analysis portion of this assessment included reviewing existing databases and other publicly available information on biological and related resources, as well as current and historical aerial photographs and topographic maps. The following information was reviewed as part of the desktop analysis:

- A species records search of California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB; CDFW 2024) using a 5-mile radius centered on the mitigation site (Figure 4);
- Information available on rare plants on the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants Database (CNPS 2024) and the Jepson eFlora (Jepson Flora Project 2024);
- Soils information from the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA 2024);
- EcoAtlas (CWMW 2024);
- Biogeographic Information and Observation System (BIOS) (CDFW 2024);
- aerial imagery available on Google Earth (1985 through 2024); and
- topographic maps.

2.2. Field Surveys

Since 2019, Helm Biological Consulting (HBC 2019, 2021, 2022, 2023a and 2023b) and WES (2024) staff have visited the mitigation site and larger Ranch to survey for California tiger salamander (CTS, *Ambystoma californiese*) and California red-legged frog (CRLF, *Rana draytonii*), assessed the general site conditions, making notes on land cover, hydrology, soils, dominant vegetation, and observed wildlife.

Specific surveys methods are described below for each.

2.2.1. Community Mapping

All landcovers were mapped, including aquatic resources (Figure 5). However, a formal aquatic resources delineation study was not conducted.

2.2.2. Special-status Species

A list of special-status plant and wildlife species with potential to occur in the mitigation site (Table 2) was developed from the Desktop Analysis (see above). This list was used to focus the site investigation on the special-status species and associated plant communities/habitats with potential to be present at the mitigation site. Survey methods are described below for plants and wildlife.

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2.2.2.1. Botanical Resources

Botanical surveys concentrated on nonnative invasive plants during the late summer and fall of 2023 (HBC 2023b). Specific special-status plant species surveys were not conducted. The entire mitigation site was surveyed by foot or by an all-terrain vehicle. All plants observed were identified to the taxonomic level necessary to determine rarity status using The Jepson Manual: Vascular Plants of California, 2nd Edition (Baldwin et al. 2012) and internet resources such as CNPS (2024) and Calflora (2022). Scientific nomenclature follows The Jepson Manual (Baldwin et al. 2012) and updates published online by the Jepson Flora Project, Jepson Online Interchange (University of California, Berkeley 2024). Common names followed Calflora (2022). Species not readily identifiable in the field were collected and later identified using The Jepson Manual (Baldwin et al. 2012). A list of all plant species encountered during the botanical field survey was compiled. Each plant was assigned a wetland indicator status using The National Wetland Plant List: 2016 Update of Wetland Ratings (NWPL) (Lichvar et al. 2016) as follows:

- OBL - Obligate wetland plants. Almost always occurs in wetlands;
- FACW - Facultative wetland plants. Usually occurs in wetlands, but may occur in non-wetlands;
- FAC - Facultative plants. Occurs in wetlands and non-wetlands;
- FACU - Facultative upland plants. Usually occurs in non-wetlands, but may occur in wetlands;
- UPL - Obligate upland plants. Almost never occurs in wetlands; and
- NL – Not listed.

In addition, every plant was categorized as native or nonnative (introduced) based on Calflora (2022). All nonnative plant species were further evaluated for any invasive status using California Invasive Plant Council (Cal-IPC 2022) ratings as follows:

- High - These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically;
- Moderate - These species have substantial and apparent, but generally not severe, ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread; and
- Limited - These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

A list of all plant species encountered during the botanical field survey is included in Appendix B. A rare plant survey in the mitigation site will occur in Spring 2025.

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2.2.2.2. *Wildlife*

All wildlife species observed were identified based on WES Staffs' knowledge and following field guides: Reid (2006) for mammals, Peterson (2020) for birds, Stebbins (2018) for reptiles and amphibians, and Gross et al. (2020) for insects. Common and scientific names of birds followed the Working Group on Avian Nomenclature of the International Ornithologists' Union's. Common and scientific names for reptiles and amphibians followed nomenclature of Nafis (2022) California Herps (www.californiaherps.com). Common and scientific names of mammals followed the American Society of Mammologists. All wildlife species, or sign (scat, prints, etc.), observed onsite were recorded in field notes.

A list of all wildlife species observed during the wildlife survey is included in Appendix C.

2.2.2.3. *Special-Status Species Habitat Assessment*

For species that were not identifiable at the time of the field survey, plant communities were assessed for potential to support the targeted species. The habitat assessed was based on habitat suitability comparisons with reported occupied habitats. The following definitions were utilized:

- None – Species distribution is restricted by substantive habitat requirements which do not occur onsite; therefore, no further survey or study is necessary to determine likely presence or presumed absence of this species;
- Not Probable/Likely – Species distribution is restricted by substantive habitat requirements which are negligible onsite; therefore, it is assumed that no further survey or study is necessary to determine likely presence or presumed absence of this species;
- Low – The species has a Low probability of occurrence within the mitigation site;
- Moderate – The species has a Moderate probability of occurrence within the mitigation site;
- High – The species has a High probability of occurrence within the mitigation site;
- Present – Species or species sign were observed onsite or historically has been documented within the mitigation site;
- Critical Habitat – The mitigation site is located within a USFWS-designated critical habitat unit; and
- Unknown – There is not presently sufficient information on substantive habitat requirements of the species or other data to determine its potential for occurrence within the mitigation site.

2.3. Wildlife, Habitat Connectivity, and Conservation Opportunities

The mitigation site was evaluated for its overall conservation value under existing conditions by reviewing several datasets including:

- CDFW's Biogeographic Information and Observation System (BIOS6 version 6.24.1120);
- CDFW's Areas of Conservation Emphasis (ACE); and
- California Essential Habitat Connectivity Project "Essential Connectivity Areas" and "Natural Landscape Block".

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CDFW's ACE is an effort to gather spatial data on wildlife, vegetation, and habitats from across California and then combine this information into maps to inform conservation of biodiversity, habitat connectivity, and climate change resiliency (CDFW 2019).

The California Essential Habitat consists of a statewide network of relatively intact blocks of land connected by essential connectivity areas (Spencer et al. 2010). The purpose of the Natural Landscape Block is to focus attention on large areas important to maintaining ecological integrity at the broadest scale (Spencer et al. 2010).

3. Results

3.1. Environmental Setting

3.1.1. Overview

The mitigation site straddles the Western Pacific Railroad and consists of fairly steep rolling hills covered with grass and herbs with stock ponds occurring within the low-lying drainages and some grassy plains to the northeast.

3.1.2. Climate

The mitigation site has a Mediterranean climate characterized by warm dry summers and cool wet winters. Average high temperatures range from the mid-50s in winter to the mid-80s in summer, while average low temperatures range from the mid-30s to the upper 50s. Rainfall in the Ranch area averages about 15 inches per year, with most of it coming during the winter months. Temperatures typically remain mild year-round due to its location on the east side of California's Central Valley. Summers tend to be sunny and dry, with occasional breezes from the nearby mountains providing some relief from the heat. Winters are typically wet and cool, with air temperatures often dropping below freezing at night. However, snow is rare. (Best Places 2024)

3.1.3. Topography and Hydrology

Topography within the mitigation site varies from relatively flat plains around 500-foot elevations above mean sea level (amsl) near the eastern edge to fairly steep hilly terrain above 600 foot elevation amsl along the western edge. In general, the mitigation site is sloped to the northeast. The raised Western Pacific Railroad bed transverses the mitigation site from the northwest corner to the southeast corner. Several drainages occur in the mitigation site (Figure 5). Most of these drainage headwaters occur to the off site to the west and transverse the mitigation site in a eastern direction. At least one stock pond has been constructed within each of the major drainages. All aquatic features are shown in Figure 5[1].

The steep terrain allows for a lot of surface area and the clayey soil restricts (see Soils section below) the amount of ground water recharge creating a lot of storm runoff into the drainages during and shortly after rain events. As previously mentioned, most of the major drainages have stock ponds constructed to detain this storm runoff water for watering livestock. Additionally, the huge watersheds that occur, mostly offsite, allow some ground water recharge which eventually moves downslope and discharges from the various seeps/springs located at the hill toe slopes or within the drainages.

3.1.4. Geology and Soils

The geology within the mitigation site area (Figure 7) is composed of Upper Cretaceous aged marine sedimentary and metasedimentary rocks consisting of sandstone, shale, and conglomerate (KU) as well as Miocene aged marine sedimentary rocks consisting of moderately

[1] Please note a formal wetland delineation has not been completed on the mitigation site, these acreages have not been field verified.

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to well consolidated sandstone, shale, siltstone, conglomerate, and breccia (M), and Quaternary aged nonmarine sedimentary rocks consisting of loosely considated sandstone, shale, and gravel deposits from the Pleistocene epoch (QPc) (Jennings et al. 1977).

Soils within the mitigation site are diverse but generally consist of clays to clay loams textures within eight soil series types and four mixed soil series complex types:

- Altamont clays;
- Diablo clays;
- Linne clays; and
- Pescadero clay loam (Figure 8 and Table 1).

Table 1. Natural Resource Conservation Service Soil Mapping Units occurring within the Mitigation Site

Map Unit Symbol	Soil Unit
	Alameda County
AmE2	Altamont clay, moderately deep, 30 to 45 percent slopes
ArD	Altamont rocky clay, moderately deep, 7 to 30 percent slopes
DbD	Diablo clay, 15 to 30 percent slopes, MLRA 15
DbE2	Diablo clay, 30 to 45 percent slopes, eroded
DbC	Diablo clay, 7 to 15 percent slopes
LaC	Linne clay loam, 3 to 15 percent slopes
LaD	Linne clay loam, 15 to 30 percent slopes, MLRA 15
Pd	Pescadero clay loam, 0 to 6 percent slopes, MLRA 14

3.1.5. Land Cover

The landcover on the mitigation site is dominated by annual grasslands, with seeps/springs, stock ponds, swales and other wetlands associated with the various drainages (Figure 5).

3.1.5.1. Annual Grassland

Annual grasslands within the mitigation site are characterized by the dominance of non-native but naturalized annual grassland species with a subcomponent of native and nonnative forbs. The annual grassland habitat dominates the mitigation site landscape occurring on the well-drained uplands.

Vegetation. Dominant grasses observed include wild oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), hare barley (*Hordeum murinum* ssp. *leporinum*), and soft brome (*Bromus hordeaceus*). Dominant forbs include common fiddleneck (*Amsinckia intermedia*), field bind weed (*Convolvulus arvensis*), dove weed (*Croton setiger*), and filaree (*Erodium* ssp.).

As the grassland habitats in the mitigation site approach drainages, stock ponds, and other aquatic features the vegetation composition changes to a greater percentage of hydrophytes ("water-loving" plants) including Italian ryegrass (*Festuca perennis*), Mediterranean barely (*Hordeum marinum* ssp. *gussoneanum*), and annual bluegrass (*Poa annua*) for the grasses and narrowleaf

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plantain (*Plantago laceolota*), few-seeded bitter-cress (*Cardamine oligosperma*), clovers *(Trifolium* ssp.) and tall annual willow herb (*Epilobium branchycarpum*) representing the forbs.

In addition, annual grassland habitats near roads, neighboring parcels, or other areas of disturbance (e.g., stock pond berms) tend to have a higher percentage of weedy nonnatives including thistles such as yellow starthistle (*Centaurea solstistialis*), Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), and bull thistle (*Cirsium vulgare*).

Wildlife. Annual grasslands provide breeding habitat for a variety of grassland birds. Among those observed during field surveys include western meadowlark (*Sturnella neglecta*), lark sparrow (*Chondestes grammacus*), and savannah sparrow (*Passerculus sandwichensis*). Annual grasslands also provide foraging habitat for many bird species that breed in adjacent habitats.

Annual grasslands provide important habitat for many mammal species, particularly small rodents and their larger predators. Mammals or their signs (i.e., scat, tracks, dens) observed in the annual grasslands onsite include black-tailed hare (*Lepus californicus*), California ground squirrel (*Otospermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), California deer mouse (*Peromyscus maniculatus*), California vole (*Microtis californicus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), Virginia opossum (*Didelphis marsupialis*), and coyote (*Canis latrans*).

Representative photographs of the habitats occurring onsite are provided in Appendix D.

3.1.5.2. Drainages

Drainages are characterized by seasonally flowing waterways that convey storm water. These drainages are general U-shaped in cross-section with earthen bed and banks. The drainages onsite are ephemeral in nature and flow only during and shortly after storm events. Most of the drainages are fairly narrow (1-4 wide) and shallow (1 to 4 deep) (Figure 5).

Vegetation. The vegetation composition of the drainages depends on slope and soil thickness. Steeper slopes sections of the drainage support many of the same species associated with the grasslands but favor those with root systems that can withstand the fast-flowing water for short periods. Those sections of the drainages that are flat and/or near the onsite stock ponds and seep habitats tend to support more hydrophytes especially grasses such as Italian ryegrass, Mediterranean barely, and annual bluegrass. Portions of these drainages have thin soils or eroded bedrock support a sparse assemblages of plant species varying from nonhydrophytes to hydrophytes depending on slope.

Wildlife. Due to their ephemeral nature. The drainages do not offer much habitat for wildlife except for their hydrologic contributions to stock ponds and wetland habitats (e.g., seep, swale, etc.) (See below).

3.1.5.3. Stock Ponds

Stock ponds are characterized by human-constructed ponds generally within drainageways to capture seasonal water for livestock. In the mitigation site and Ranch, several of these stock ponds have been constructed below seep/spring habitats (see Seep/Spring section below). Stock ponds associated with seep/spring habitats are perennial ponded with maximum depths of three to five

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feet (Figure 5). The stock ponds without hydrologic inputs from seep/spring habitat are seasonally ponded and may not pond at all, or only for brief periods, during droughts.

Vegetation. Stock ponds associated with seep/spring habitats in the mitigation site generally have patches of emergent narrowleaf cattail (*Typha angustifolia*) with the submerged stonewort (*Chara* sp.) with occasional blooms of fishnet algae (*Hydrodictyon* sp.) and free-floating smaller duckweed (*Lemna minor*) and mosquito fern (*Azolla filiculoides*). The vegetation along the stock ponds edges are highly variable in cover, and to a lesser extent composition, depending on hydrology (drought and flood conditions) and livestock intensity. During drought conditions, the edges of the stock ponds are sparsely vegetated and during high livestock use, denuded of vegetation. Overall, the stock ponds within the mitigation site are dominated by hydrophytes including brass buttons (*Cotula coronopifolia*), tall flat sedge (*Cyperus eragrostis*), willow herbs (*Epilobium* ssp.), rushes *(Juncus* ssp.), purple sandspurry (*Spergularia rubra*), Italian ryegrass, Mediterranean barely, and annual bluegrass.

Wildlife. The stock ponds onsite offer excellent habitat for California tiger salamander (*Ambystoma californiense*) and California red-legged frogs (*Rana draytonii*). Although they are perennial in nature the lack predators such as fish and American bull frog (*Lithobates catesbeianus*) and support abundance food sources in the form of aquatic invertebrates.

While not all of these species have been observed within the mitigation site, the emerging insects provide forage for swallows (Tree swallow [*Tachycineta bicolor*], violet-green swallow [*Tachycineta thalassina*], northern rough-winged swallow [*Stelgidopteryx serripennis*], barn swallow [*Hirundo rustica*], cliff swallow [*Petrochelidon pyrrhonota*]) and flycatchers (western kingbird, ash-throated flycatcher [*Myiarchus cinerascens*], and black phoebe [*Sayornis nigricans*]) as well as bats. A variety of bird species forage at the edge of these ponds including shorebirds (e.g., killdeer [*Charadrius vociferus*] and greater yellowlegs [*Tringa melanoleuca*]) and various wading birds (great blue heron [*Ardea herodias*], great egret [*Ardea alba*]). Mallards (*Anas platyrhynchos*) and the occasional American wigeon (*Mareca americana*) forage through the algae for food items.

3.1.5.4. Seeps /Springs

Seep/Spring habitats are characterized by ground water that flows or seeps from the ground. In the mitigation site seeps/springs are associated with the drainageways where thinner soils prevail allowing subsurface storm water flows to daylight near bedrock sources.

Vegetation. Seeps/springs within the mitigation site are dominated by hydrophytes consisting of grasses and forbs including willow herbs, streamside monkey flower (*Erythranthe guttata*), Italian ryegrass, common spikerush (*Eleocharis macrostachya*), rabbits foot grass (*Polypogon monspeliensis*), and toad rush (*Juncus bufonius*) with occasional patches of saltgrass (*Distichilis spicata*) and curly dock (*Rumex crispus*).

Wildlife. Because of the small size and depth of water within this habitat, wildlife use is limited. Wildlife species observed in this habitat include greater yellow legs (*Tringa melanoleuca*), killdeer (*Charadrius vociferus),* black phoebe (*Sayornis nigricans*), Brewer's blackbird (*Euphagus cyanocephalus*), European starling (*Sturnus vulgaris*), and mourning dove (*Zenaida macroura*).

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While not observed, other wildlife including racoon, Virginia opossum, grey fox (*Urocyon cinereoargenteus*) and coyote probably visit this habitat to forage or drink during the summer and fall.

3.1.5.5. Wetland

Wetland habitat is characterized by small depressional areas within the grassland habitat that have impervious subsurface soils (i.e., clays, hardpan [duripan] or bedrock) that seasonally inundate from stormwater flows from upslope ephemeral drainages. Three wetlands occur within the mitigation site. Two are located in the southeast corner and have been inadvertently created from the construction of the adjacent elevated Western Pacific Railroad bed that detains storm water flows. The third wetland is associated with the largest and more intermittent drainage located in the northwest corner. This wetland has resulted from stormwater restrictions from flowing through the undersized passage at bottom of the railroad berm.

Vegetation. The two southern located wetland habitats onsite were dominated by hyssop loosestrife (*Lythrum hyssopifolia*), Italian ryegrass, Mediterranean barely, common knotweed (*Polygonum aviculare*), and toad rush (*Juncus bufonius*) with some curly dock (*Rumex crispus*). The larger wetland located in the northwest corner is dominated by hydrophytic grasses and forbs similar to the seep/spring habitats discussed above.

Wildlife. Wildlife use within the largest wetland would be similar to that of the Seep/Spring habitat and offers temporary migration habitat for CRLF. Due to the ephemeral nature of the two smaller wetlands, only short-lived residence invertebrates and transitory migrating vertebrates utilize this habitat. Large numbers of crustaceans live in this habitat including seed shrimp (*Ostracods*), copepods *(Copepoda*), and water fleas (*Cladocerans*) and other aquatic invertebrates (e.g., water mites [*Hydroacarina*], flat worms [microturbularians], springtails [*Collembolla*]). These species are food for a variety of amphibians including Sierran tree frog larvae, western toad larvae, and young CRLF's who also use this habitat for dispersal.

3.1.5.6. Swale

Swale habitat is associated with the drainages onsite and are general continuations or sections of ephemeral drainages that lack a defined bed and bank due to erosional forces of flowing water. Swales are generally broad, shallow, slightly sloped water conveyance habitats.

Vegetation. Swales are generally vegetaion by dense cover of hydrophytic grasses consisting of Italian ryegrass, Mediterranean barely, and annual bluegrass. Forbs are subdominant and generally consisted of toad rush (*Juncus bufonius*) with some curly dock (*Rumex crispus*).

Wildlife. Wildlife use was similar to the ephemeral drainage habitats described above.

Representative photographs of habitats and species occurring within the mitigation site and Ranch occur in Appendix D.

3.2. Special-status Species

The results of the habitat assessment are summarized below in Table 2, which provides the status of the species, its range, general habitat requirements, and a brief discussion on its potential to occur within the mitigation site.

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Table 2. Special-status Species with a Potential to Occur within the Mitigation Site

Common Name Scientific Name	Federal Status	State Status	CNPS	Range	General Habitat	Potential To Occur Onsite
Wildlife						
California tiger salamander *Ambystoma californiense*	FT	ST	-	Occurs from Yolo County to Kern County in the Central Valley, up to 2,000 feet elevation in the Sierra Nevada foothills	In winter, breeds in vernal pools and seasonal wetlands with a minimum 10-week inundation period. In summer, occupies grassland habitat, primarily in small mammal burrows.	**Present.** CTS larvae have been observed in numerous stock ponds in the mitigation site.
California red-legged frog *Rana draytonii*	FT	-	-	Occurs Sonoma and Butte counties in the north to Riverside to the south.	In habits ponds, marshes, and creeks with still water for breeding. Riparian and upland habitat with dense vegetation and open areas for cover, aestivation, food and basking.	**Present.** Adults, juveniles, and larvae have been documented in the mitigation site.
Foothill yellow legged frog Central Coast DPS *Rana boylii pop. 4*	FT	CE	-	Occurs in the East Bay and south of Sac Francisco Bay in the Coast Ranges to San Benito and Monterey Counties.	Inhabits moderate to high gradient streams in woodland, forest, mixed chaparral, and wet meadow habitats with rock and gravel substrate and low overhanging vegetation along the edge; usually found near riffles with rocks and sunny banks nearby	**None.** Suitable habitat for this species (streams in woodlands, chaparral) is not present.
Western spadefoot *Spea hammondii*	FT	SSC	-	Species is found throughout the Central Valley and coastal lowlands from Shasta County in Northern California to Baja California in Mexico, at elevations ranging from sea level to 4,500 feet	In winter, breeds in vernal pools and seasonal wetlands with a minimum 3-week inundation period. In summer, aestivates in grassland habitat, in soil crevices, and rodent burrows	**Low.** Although suitable habitat is present, this species would have been detected during CTS and CRLF surveys if present.

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Golden eagle *Aquila chrysaetos*	-	FP	-	Winter range spans most of California; breeding range excludes the Central Valley floor	Forages in a variety of open habitats, including grassland, pasture, and cropland; Nests primarily on cliffs, rock outcrops, and in large trees	**Present.** This species has been observed foraging just outside the western edge of the mitigation site. However, no nesting habitat is present in the mitigation site.
Swainson's hawk *Buteo swainsoni*	-	ST	-	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley; the state's highest nesting densities occur near Davis and Woodland, Yolo County.	Nests in oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grain fields.	**Moderate**. The mitigation site provides suitable foraging habitat however this species has not been observed.
Northern harrier *Circus hudsonius*	-	SSC	-	Found throughout California, breeding range covers northeastern plateau, northern coast, Central Valley, central coast, and portion of the southern coast and southern deserts. Non-breeding season found in most lowland areas of California.	Breeding and foraging includes treeless habitats with adequate prey, cover, and perches. Suitable habitat includes freshwater marshes, brackish and saltwater marshes, wet meadows, margins of lakes, rivers, and streams, grasslands, weed fields, croplands, and desert sinks.	**Present**. Although this species has been observed foraging in the mitigation site, nesting has not been verified.
White tailed kite *Elanus leucurus*	-	FP	-	Occurs from west coast and Gulf Coast south to Mexico, Central American and eastern South America	Found in grasslands, open woodlands, savannas, marshes and cultivated fields.	**Moderate**. The mitigation site provides suitable foraging habitat however this species has not been observed.
Tricolored blackbird *Agelaius tricolor*	-	ST	-	Year-round residents throughout the Central Valley and the central and southern coasts, with additional scattered locations throughout California. Breeding occurs in the foothills of the Sierra Nevada south to Kern County, the	Nests colonially in large, dense stands of freshwater marsh, riparian scrub, and other shrubs and herbs; forages in grasslands and agricultural fields.	**Moderate.** Suitable foraging habitat is present in the mitigation site. This species has been observed foraging in mitigation site .

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				coastal slopes from Sonoma County to the Mexican border, and sporadically in the Modoc Plateau		
Loggerhead shrike *Lanius ludovicianus*	-	SSC	-	Occurs throughout California, except for the northwest, heavily forested higher mountains and higher areas of deserts.	Open habitats, including pastures, old orchards, cemeteries, golf courses, agricultural fields, riparian areas, and woodlands. In Central Valley, associated with grasslands, irrigated pasture, and grain and hay fields. Nests in trees and shrubs	**Present.** This species has been observed foraging on the mitigation site. Although nesting has not been verified.
Grasshopper sparrow *Ammodramus savannarum*	-	SSC	-	Occurs across North America and ranges from southern Canada to Ecuador.	Grassland, hayfields, prairies. Breeds in rather dry fields and prairies, especially those with fairly tall grass and weeds and a few scattered shrubs. Also nests in overgrown pastures and hayfields, and sometimes in fields of other crops	**Low.** Although the mitigation site has abundant annual grasslands that support potential breeding and foraging habitat for this species, it is associated more with fields (pastures and hayfields) and would have been observed during surveys if present.
Short eared owl *Asio flammeus*	-	SSC	-	Circumpolar from the Arctic to the North Temperate Zone, and is also found in Hawaii and much of South America. It is partially migratory, moving south in winter from the northern parts of its range.	Forages in grassland habitats and nests on the ground in prairie, tundra, savanna, meadow, and grassland habitats. Species will also nest and forage in shrubby habitats with grasses understory and in wheat fields.	**Low.** Although this species prefers tall grass or grasslike plants areas for nesting and foraging which occurs on site, it general prefers flat terrain which is more limited onsite. Additionally, this species would have been observed during the

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						numerous surveys, if present.
Burrowing owl *Athene cunicularia*	-	Candidate	-	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast.	Open, dry annual or perennial grasslands, deserts, and scrublands characterized with low vegetation, usually on gently sloping terrain.	**Present**. This species has been observed being flushed from burrows within the mitigation site.
Longhorn fairy shrimp *Branchinecta longiantenna*	FE	-	-	Occurs in five locations from Contra Costa County in the north to San Luis Obispo County in the south.	Found in clear, freshwater vernal pools, claypan pools or freshwater depressions in sandstone. Generally, prefers alkaline pools.	**Not likely.** No vernal pools, alkaline pools, or rock outcrop pools are present within the mitigation site.
Vernal pool fairy shrimp *Branchinecta lynchi*	FE	-	-	Endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains	Inhabits small, clear-water sandstone depression pools and grassed swale, earth slump, or basalt-flow depression pools.	**Low.** No vernal pools are present within the mitigation site. However, the seasonally inundated wetlands and the more ephemeral stock ponds within the mitigation site could provide suitable habitat.
Crotch's bumble bee *Bombus crotchii*	--	CE	G2 S2	Occurs throughout the Pacific Coast, Western Desert, and adjacent foothills throughout most of the state's southwestern region.	Inhabits grasslands and shrublands.	**Moderate.** Potential habitat for this species occurs onsite. However, this species has not been observed on the mitigation site.
Western bumble bee *Bombus occidentalis*	-	Candidate	-	Occurs in the Sierra Nevada and central coast of California north through British Columbia to Alaska and east to Idaho, Montana, western Nebraska, western North Dakota, western South Dakota, Wyoming, Utah, Colorado, northern Arizona, New Mexico and southwest Saskatchewan	Colonial ground nester in a wide variety of habitats generally in close proximity to nectar plants.	**Low.** Potential habitat for this species occurs onsite. However, the mitigation site is outside of the current known range and this species has not been observed on the mitigation site.

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Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT	-	-	Occurs in the Central Valley from Shasta County in the north through Madera County in the south.	Host plant is the elderberry shrub *(Sambucus spp.),* a shrub that grows in riparian areas and foothill oak woodlands.	**None.** The host plant is not present.
San Joaquin kit fox *Vulpes macrotis mutica*	FE	ST	-	Occurs in San Joaquin Valley extending from south Kern County north to Contra Costa, Alameda, and San Joaquin counties on the western side of the valley and to Stanislaus County on the eastern side.	Occurs in the desert and grasslands of the San Joaquin Valley, preferable areas with minimal shrubs and grasses.	**Moderate**. Current assessments by USFWS have assessed this part of the species range as having a "very low" condition and have determined there is no current population in this part of the range, though individuals may periodically disperse this far north. Nonetheless, suitable habitat is present and although the mitigation site is located at the northern distribution of the species range future occupation is possible.
Western mastiff bat *Eumops perotis californicus*	-	SSC	-	Uncommon resident in southeastern San Joaquin Valley and the Coastal Ranges specifically residing between Monterey County to Southern California and from the California coast east to the Colorado Desert.	Typically roosts in crevices in cliffs and rocky outcrops, in colonies of fewer than 100 individuals. May also roost in bridges, caves and buildings that allow sufficient height and clearance for dropping into flight. There is at least one record of this species roosting in an untrimmed palm tree. Forages in a variety of grassland, shrub, and wooded habitats, including riparian and	**Low.** No cliffs or rocky outcrops are present. However, this species may forage within the mitigation site.

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					urban areas, although most commonly in open, arid lands.	
American badger *Taxidea taxus*	-	SSC	-	Uncommon solitary species that is widely distributed throughout the state except in the northern North Coast area from below sea level to over 12,000 ft	Prefers drier open shrub, forest, and herbaceous habitats with friable soils. Home range typically varies in size between 5 and 1,800 acres but can become much larger during breeding season as males locate receptive females. Natal dens are constructed in dry, sandy soil with sparse overstory	**High.** Suitable habitat is present and this species is known to occur on adjacent properties. However, this species has not been observed in the mitigation site.
Pallid bat *Antrozous pallidus*	-	SSC	-	Occurs throughout California except for the high Sierra Nevada from Shasta to Kern Counties to northern Mendocino County.	Deserts, grasslands, shrublands, woodlands, and forests; most common in open, dry habitats; typically roosts in rock crevices, also in tree hollows, bridges, and buildings, in colonies ranging from 1 to more than 200 individuals	**Low.** No cliffs or rocky outcrops are present. However, this species may forage in the mitigation site.
Townsend's big eared bat *Corynorhinus townsendii*	-	SSC	-	Occurs throughout the west and is distributed from the southern portion of British Columbia south along the Pacific coast to central Mexico and east into the Great Plains, with isolated populations occurring in the central and eastern United States.	Habitat associations include coniferous forests, mixed meso-phytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types. Typically found in areas with caves and cave-like roosting habitat, with population centers occurring in areas dominated by exposed, cavity forming rock and/or historic mining districts	**Low.** No roosting habitat is present in the vicinity. However, this species may forage in the mitigation site.

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Northern California legless lizard *Anniella pulchra*	-	SSC	-	Occurs from the southern edge of the San Joaquin River in Contra Costa County south to Ventura County.	Inhabits sparsely vegetated area of bean dunes, chaparral, pine oak woodland, desert scrub, sandy washes and stream terraces.	**None.** Suitable habitat for this species (sandy or loose soils) is not present.
California glossy snake *Arizona elegans occidentalis*	-	SSC	-	Occurs from the eastern part of San Francisco Bay Area south to northwestern Baja.	Scrub, rocky washes, grasslands and chaparral, prefers open areas with loose soil for burrowing.	**None.** Suitable habitat for this species (sandy or loose soils) is not present.
San Joaquin coachwhip *Masticophis flagellum ruddocki*	-	SSC	-	Endemic to California, ranging from Kern County north to portions of Alameda County.	Dry, treeless areas with little to no cover, including valley grassland and saltbush scrub. Mammal burrows used for overwintering.	**Moderate.** Habitat is generally suitable though the species has not been observed in the mitigation site.
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT	ST	-	Occurs in Alameda and Contra Costa counties.	Found in northern coastal scrub and chaparral habitat. May also occur in grasslands, open woodlands, rocky slopes near scrub and chaparral.	**Not likely.** This species is associated with chapparal habitats which do not occur onsite.
Northwestern pond turtle *Actinemys marmorata*	PT	SSC	-	North of San Francisco Bay area and north Central Valley	Found in ponds, streams, lakes, rivers, creeks, marshes and irrigation ditches with abundant vegetation.	**Low.** Not observed during previous surveys of ponds. No suitable nesting habitat (friable soils) occurs in the mitigation site.
Coast horned lizard *Phrynosoma blainvillii*	-	SSC	-	From Baja California west of the Sierra Nevada, north to Bay Area and Shasta	Open areas with sandy soils and low vegetation in valleys, foothills, and semiarid mountain.	**Not likely.** Sandy soils are not present onsite and native ant colonies were not detected during surveys.
Plants						
Caper fruited tropidocarpum *Tropidocarpum capparideum*	-	-	1B.1	Alameda, Contra Costa, Monterey, San Joaquin and San Luis Obispo Counties	Occurs at elevations of at 5 – 1,495 feet amsl and is associated with valley and foothill grasslands.	**Low.** Although potential habitat occurs onsite, the mitigation site occurs just outside of the species known range.

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Large flowered fiddleneck *Amsinckia grandiflora*	-	-	1B.1	Alameda, Contra Costa, and San Joaquin counties	Occurs at elevations of 885 – 1,805 feet amsl; associated with cismonstane woodland and valley/foothill grasslands.	**Moderate.** Potential habitat occurs onsite.
Brittlescale *Atriplex depressa*	-	-	1B.2	Alameda, Colusa, Contra Costa, Fresno, Glenn, Kings, Merced, Solano, Tulare and Yolo counties	Occurs at elevations of 5 – 1,050 feet amsl; associated with chenopod scrub, meadows, seeps, playas, valley and foothill grassland.	**Not likely.** Saline and alkaline habitats are generally lacking onsite.
Lesser saltscale *Atriplex minuscula*	-	-	1B.1	Alameda, Butte, Fresno, Kern, Kings, Madera, Merced, Stanislaus, Tulare counties	Occurs at elevations of 50 – 655 feet amsl; associated with chenopod scrub, playas, valley and foothill grassland.	**Not likely.** Saline and alkaline habitats are generally lacking onsite.
Big tarplant *Blepharizonia plumosa*	-	-	1B.1	Alameda, Contra Costa, San Joaquim, Solano, Stanislaus counties	Occurs at elevations of 100 – 1,655 feet amsl; associated with clay areas of valley and foothill grassland.	**Moderate.** Potential habitat occurs onsite.
Lemmon's jewelflower *Caulanthus lemmonii*	-	-	1B.2	Alameda, Fresno, Kern, Kings, Merced, Monterey, San Joaquin, San Luis Obispo, Santa Barbara, Stanislaus, Ventura counties	Occurs at elevations of 260 – 5,185 feet amsl; associated with pinyon and juniper woodland and valley and foothill grasslands.	**Not likely.** The mitigation site occurs just outside of the species most northern distribution of its range.
Congdon's tarplant *Centromadia parryi ssp. congdonii*	-	-	1B.1	Alameda, Contra Costa, Monterey, San Luis Obispo, San Mater, Santa Clara, Santa Cruz, Solano counties	Occurs at elevations of 0 – 775 feet amsl; associated with valley and foothill grassland (alkaline).	**Not likely.** Associated with moist areas within nearly level alkaline grasslands that are absent onsite.
Hospital Canyon larkspur *Delphinium californicum ssp. interius*	-	-	1B.2	Alameda, Contra Costa, Merced, Monterey, San Benito, San Joaquin, Santa Clara, Stanislaus counties	Occurs at elevations of 640 – 3,595 feet amsl; associated with chaparral, cismonstane woodland, and coastal scrub.	**Not likely.** Associated with woody habitats that are absent onsite.
Diamond petaled California poppy *Eschscholzia rhombipetala*	-	-	1B.1	Alameda, Colusa, Contra Costa, Kern, San Joaquin, San Luis Obispo, Stanislaus counties	Occurs at elevations of 0 – 3,200 feet amsl; associated with valley and foothill grassland (alkaline, clay).	**Low- Moderate.** Although alkaline soils are generally absent, clay soils within annual

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						grasslands habitats are plentiful onsite.
San Joaquin spearscale *Extriplex joaquinana*	-	-	1B.2	Alameda, Colusa, Contra Costa, Fresno, Glenn, Merced, Napa, Sacramento, San Benito, San Joaquin, San Luis Obispo, Solano, Yolo counties	Occurs at elevations of 5 – 2,740 feet amsl; associated with chenopod scrub, meadows and seeps, playas, valley and foothill grassland.	**Not likely.** Alkaline soils are generally absent onsite.
Brewer's wester flax *Hesperolinon breweri*	-	-	1B.2	Alameda, Contra Costa, Napa, Solano counties	Occurs at elevations of 100 – 3,100 feet amsl; associated with chaparral, cismontane woodland and valley and foothill grasslands.	**Moderate.** Annual grasslands habitats are plentiful onsite.
California alkali grass *Puccinellia simplex*	-	-	1B.2	Alameda, Butte, Colusa, Contra Costa, Fresno, Glenn, Kern, Kings, Lake, Los Angeles, Madera, Merced, Napa, San Bernadino, San Luis Obispo, Santa Clara, Santa Cruz, Solano, Stanislaus, Tulare, Yolo counties	Occurs at elevations of 5 – 3,050 feet amsl; associated with chenopod scrub, meadows and seeps, valley and foothill grasslands, vernal pools.	**Not likely.** Alkaline soils are generally absent onsite.
Chaparral harebell *Ravenella exigua*	-	-	1B.2	Alameda, Contra Costa, Fresno, Merced, San Benito, Santa Clara, Stanislaus counties	Occurs at elevations of 900 – 4,100 feet amsl; associated with chaparral habitat.	**Not Likely.** Chapparal habitat is absent in the mitigation site.
Showy golden madia *Madia radiata*	-	-	1B.1	Contra Costa, Fresno, Kern, Kings, Monterey, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Stanislaus counties	Occurs at elevations of 80 – 3,985 feet amsl; associated with cismontane woodland, valley and foothill grassland.	**Moderate.** Potential habitat is present in the mitigation site.
Shining navarretia *Navarretia nigelliformis ssp. radians*	-	-	1B.2	Butte, Contra Costa, Colusa, Fresno, Madera, Merced, Monterey, San Benito, San Joaquin, San Luis Obispo, and Tulare counties.	Occurs at elevations of 213 – 3,281 feet amsl; associated with cismontane woodland, valley and foothill grassland, vernal pools, swales, and clay flats.	**Low.** This species generally occurs in vernal pools or other similar seasonal wetlands which are generally absent in the mitigation site.

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Long-styled sand spurrey *Spergularia macrotheca var. longistyla*	-	-	1B.2	Alameda, Contra Costa, Napa, Solano counties	Occurs at elevations of 0 – 835 feet amsl; associated with meadows, seeps, marshes and swamps.	**Moderate.** Suitable habitat (wetlands, including seeps) occurs in the mitigation site.

Definitions: *Federal Status* – FE = federally endangered, FT = federally threatened, FC = federal candidate; *State Status* – SE = state endangered, ST= state threatened, SSC= species of special concern, FP= fully protected. *CNPS Rare Plant Rank* - 1B = Rank 1B species: rare, threatened, or endangered in California and elsewhere, 1B.1 – seriously threatened in California, 1B.2 – Moderately threatened in California, 1B.3 – Not very threatened in California,

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3.2.1. Special-Status Plants

Although no special-status plant species were observed onsite during surveys, there are six special-status plants known that have a moderate potential to occur in the mitigation site:

- Large flowered fiddleneck;
- Big tarplant;
- Diamond petaled California poppy;
- Brewer's wester flax;
- Showy golden madia; and
- Long-styled sand spurrey.

Though, all these species are considered rare, threatened, or endangered in California and elsewhere under CNPS 1.B ranking; none are listed as threatened or endangered under state or federal Endangered Species Acts. Because species focused special-status plants surveys have not yet been conducted; the presence, or presumed absence, of the above plant species and other special-status plants that are not known to occur within the vicinity of the mitigation site is largely unknown.

3.2.2. Special-status Wildlife

A total of five of the 28 special-status wildlife species listed in Table 2 were observed in the mitigation site (Figure 6) and include:

- California tiger salamander;
- California red-legged frog;
- Northern harrier;
- Loggerhead shrike; and
- Burrowing owl.

Two special status species, golden eagle and tricolored blackbird have been observed foraging just outside the boundary of the mitigation site (Figure 6).

An additional seven special-status wildlife species have at least moderate potential occur on the mitigation site and include:

- Swainson's hawk;
- White tailed kite;
- Crotch's bumble bee;
- San Joaquin kit fox;
- American badger; and
- San Joaquin coachwhip.

The presence or potential of the above-mentioned species are briefly discussed below.

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3.2.2.1. California Tiger Salamander

California tiger salamander larvae were observed in SP-18, SP-19 and SP-21 in 2019 (Figure 6). CTS larvae were also observed in SP-16 in 2023 (Figure 6).

3.2.2.2. California Red-Legged Frog

Adult and immature CRLF have utilized various features throughout the mitigation site. CRLF were observed in SP-16 in 2014, SP-19 in 2024, SP-20 in 2023, and W-1[2] in 2023 and 2024

In addition, the mitigation site is within designated critical habitat for CRLF (Figure 9).

3.2.2.3. Golden Eagle

Golden eagles are viewed nearly every year during the winter and early spring season foraging on California ground squirrels and black tailed hares, and other wildlife prey (Figure 6). However, no suitable nesting habitat occurs within the mitigation site.

3.2.2.4. Tricolored Blackbird

Tricolored black birds are consistently observed year after year, foraging within the mitigation site. However, there is currently no nesting habitat within the mitigation site.

3.2.2.5. Northern Harrier

Although nesting has not been documented within the mitigation site, Northern harriers are consistently observed foraging over the stock ponds and annual grasslands within the mitigation site.

3.2.2.6. Loggerhead Shrike

Loggerhead shrikes have been documented foraging in the mitigation site. However, nesting of this species onsite has not been verified.

3.2.2.7. Burrowing Owl

Burrowing owls have been consistently observed within the mitigation site. Typically, individuals are observed after being flushed from burrows within the mitigation site. In particular, burrowing owls have been seen near SP-16 frequently during site visits (Figure 5). Individuals have been observed throughout the year; however, no nesting surveys have occurred.

3.2.2.8. Swainson's Hawk

Although Swainson's hawk has not been observed within the mitigation site, there is suitable foraging habitat present. Additionally, although nesting habitat for this species is absent in the mitigation site, numerous appropriate trees for nesting occur within the adjacent Ranch.

3.2.2.9. White Tailed Kite

Similar to Swainson's hawk, nesting habitat for white tailed kite is absent within the mitigation site; however, suitable foraging is abundant onsite and suitable nesting habitat (trees) occurs within the adjacent Ranch.

[2] This feature was not identified and surveyed until 2023.

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3.2.2.10. Crotch's Bumble Bee

Suitable habitat is abundant onsite for Crotch's bumble bee. Although this species has not been observed onsite, species-specific surveys have not been conducted.

3.2.2.11. San Joaquin Kit Fox

Although this species has not been detected within the mitigation site, no species-specific surveys have been conducted for SJKF. Given that this species is generally nocturnal and highly secretive and it would not be surprising if this species was to be present onsite because suitable habitat is present.

3.2.2.12. American Badger

Although the American badger has not been observed onsite, there are huge populations of California ground squirrels, which are its preferred prey in this area of California. In addition, this species has a fairy large home range and could easily move on to the mitigation site, if it is currently not present.

3.2.2.13. San Joaquin Coachwhip

Although this species has not been observed within the mitigation site, species specific surveys have not been conducted to date. However, the potential for this species to occur is based on the presence of suitable habitat and nearby species presence.

3.2.3. Critical Habitat

Although the mitigation site supports a plethora of special-status species, the mitigation site occurs only within critical habitat for the California red-legged frog (Figure 9).

3.3. Wildlife, Habitat Connectivity, and Conservation Opportunities

The mitigation site and larger Mulqueeney Ranch provide habitat for many common wildlife species (i.e., non-special status), which include amphibians, reptiles, birds, and small to moderate-sized mammals. Generally, the mitigation site is situated in a transitional area between the Great Central Valley and the Coast Range, specifically the Diablo Range. This area is dominated by annual grasslands interspersed with ephemeral and intermittent drainages, some of which support riparian vegetation, seasonal wetlands, and ponds constructed to support cattle grazing. A list of all wildlife species observed on or adjacent to the mitigation site is included as Appendix C.

The mitigation site was evaluated for its overall conservation value under existing conditions by reviewing several datasets within CDFW's Biogeographic Information and Observation System (BIOS; BIOS6 version 6.24.1120). A discussion of the relevant conservation datasets in relation to the mitigation site is provided below.

The mitigation site is situated in area identified by the California Essential Habitat Connectivity Project as being part of a "Natural Landscape Block", which consists of a statewide network of relatively intact blocks of land connected by essential connectivity areas (Spencer et al. 2010). The purpose of the Natural Landscape Block is to focus attention on large areas important to maintaining ecological integrity at the broadest scale (Spencer et al. 2010). The northwestern

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most half of the mitigation site also falls within Mountain House-Brushy Peak Essential Connectivity Area, which joins natural landscape blocks on either side of the Altamont Pass.

CDFW's ACE is an effort to gather spatial data on wildlife, vegetation, and habitats from across California and then combine this information into maps to inform conservation of biodiversity, habitat connectivity, and climate change resiliency (CDFW 2019). The mitigation site is situated in an area identified in the ACE Terrestrial Connectivity dataset as having "Conservation Planning Linkages – Rank 4" and is immediate west of an area ranked as having "Irreplaceable and Essential Corridors – Rank 5".

Other ACE data layers show the mitigation site occurring in an area identified as having a high value (Rank 5) for *Statewide Terrestrial Rare Species Richness* and moderately high value (Rank 4) for *Aquatic Amphibian Irreplaceability*.

Habitat in the area surrounding the mitigation site provide suitable habitat for various special status species. CTS breeding has been documented in ponds located on the nearby conserved Jess Ranch and Haera Conservation Bank (Figure 10). Additionally, in 2019 CTS were observed by WES staff in stock ponds located on the Ranch, within 1 mile of the mitigation site (Figure 6). Additional surveys on these ponds have not been completed since 2019. WES staff have observed CRLF in a seep just north of the mitigation site in 2019 and 2023. This seep is hydrologically connected to the mitigation by one of the ephemeral drainages. Tricolored blackbird and golden eagles have been seen foraging in various locations of the Ranch.

The proposed mitigation site is directly adjacent to the Shell N20 Mitigation Site, which is expected to be approved by USFWS and CDFW in early 2025. The Shell N20 Mitigation Site connects the Jess Ranch, a Contra Costa Water District conservation easement, and Haera Wildlife Conservation Bank. Permanent protection of the mitigation site would increase the amount of conserved habitat and preserving connectivity to the conserved habitat.

The conservation of the mitigation site would contribute to regional conservation efforts by helping maintain and improve wildlife connectivity in the Diablo Range, from north to south, and protect areas deemed of statewide importance for terrestrial and aquatic species.

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APPENDICES

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APPENDIX A
Figures

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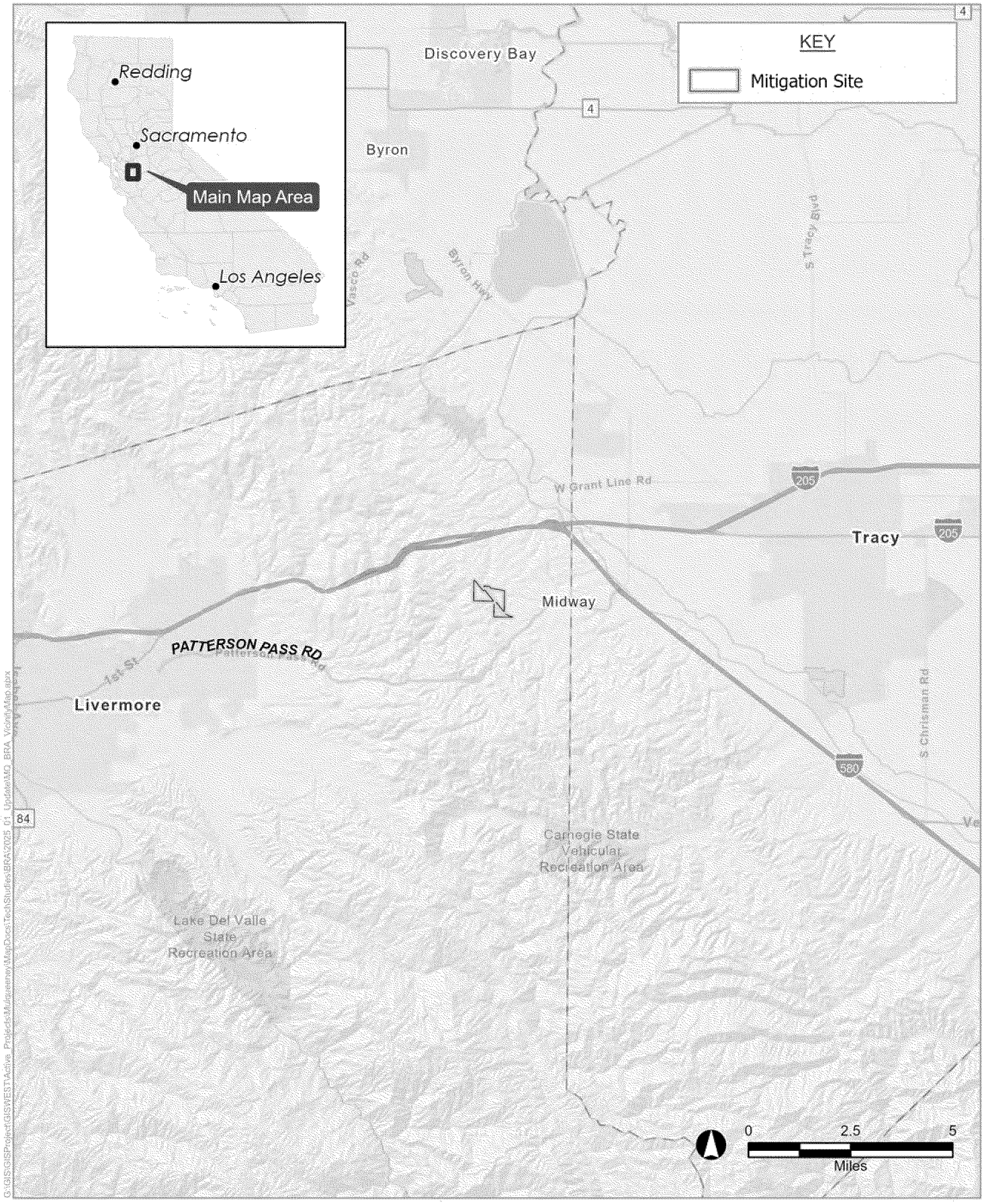

Figure 1
Vicinity Map
January 16, 2025

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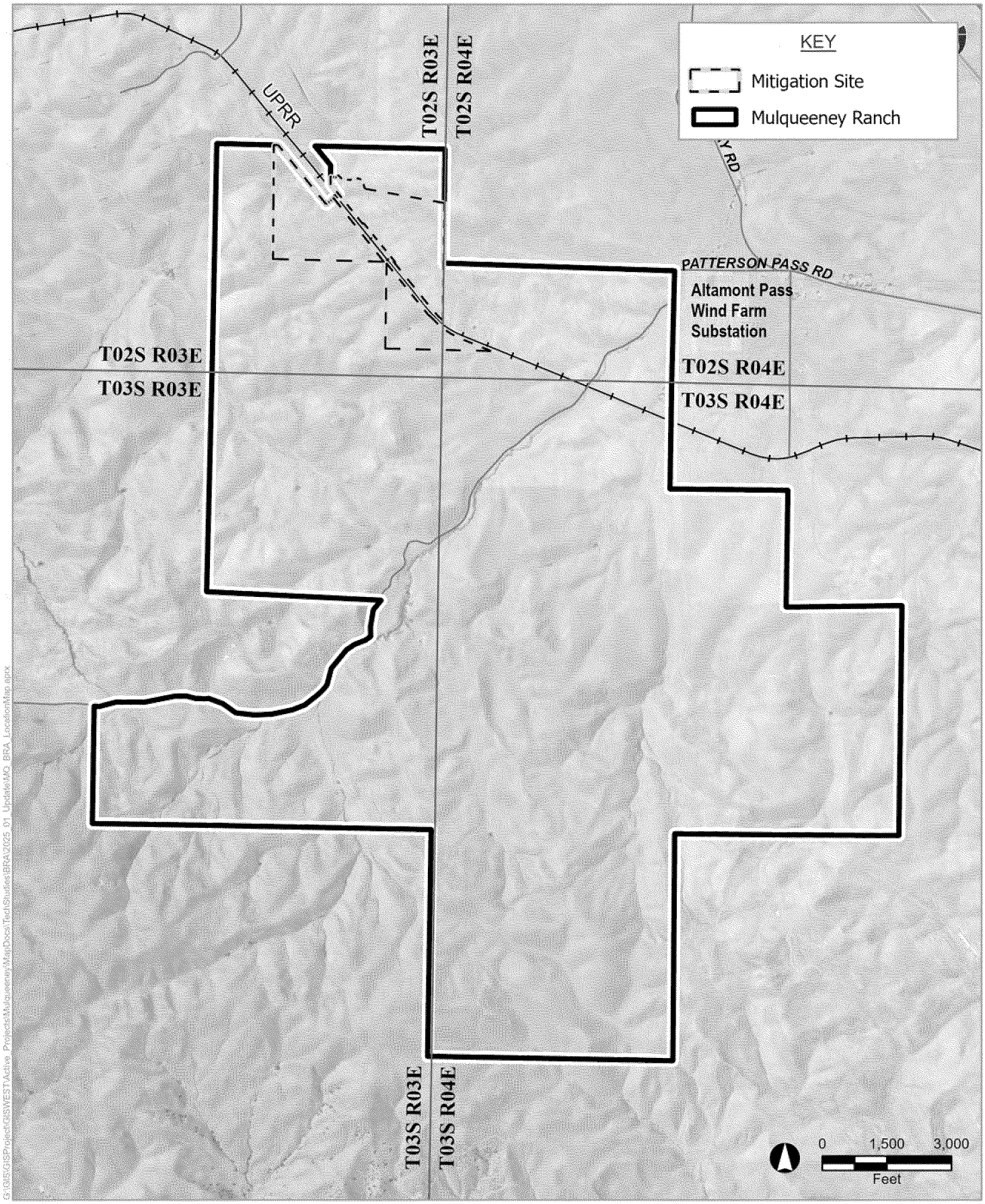

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USGS 7.5' Quadrangle: MIDWAY, 1980

Figure 2
Project Location
January 15, 2025

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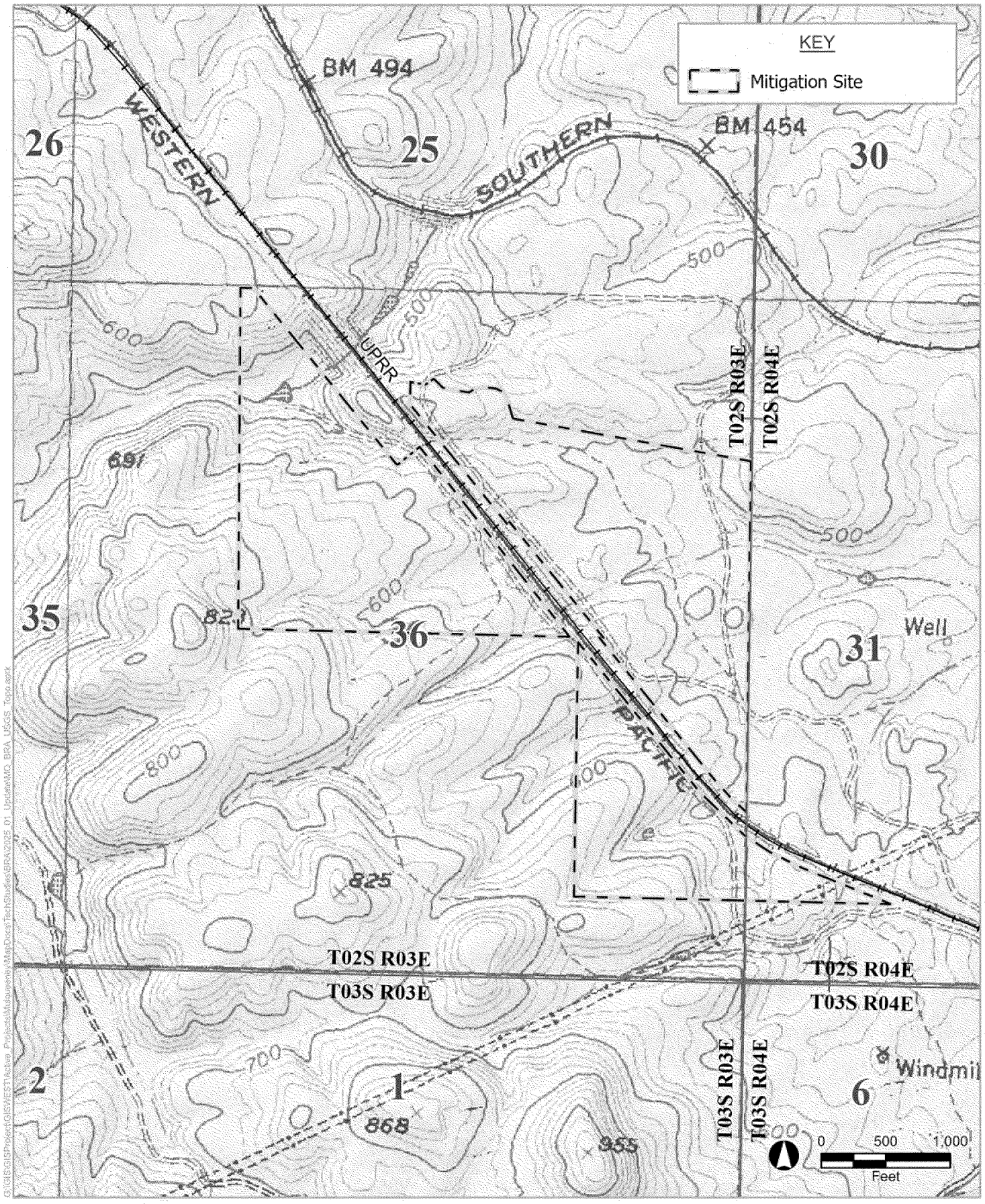

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USGS 7.5' Quadrangle: MIDWAY, 1980

Figure 3
USGS Topographic Quadrangle
January 16, 2025

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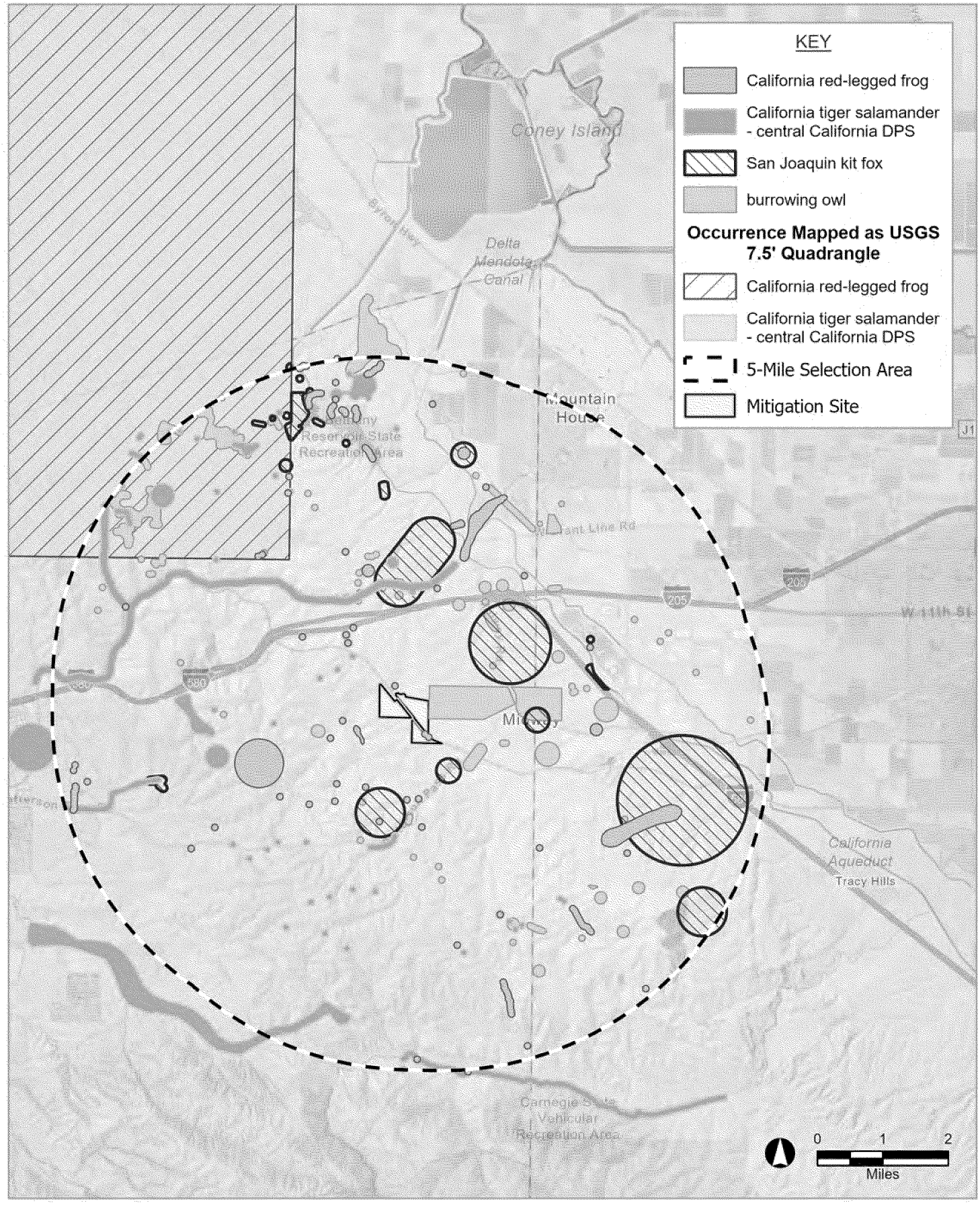

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Source: California Department of Fish and Wildlife, California Natural Diversity Database

Figure 4
CNDDB Occurrences
January 16, 2025

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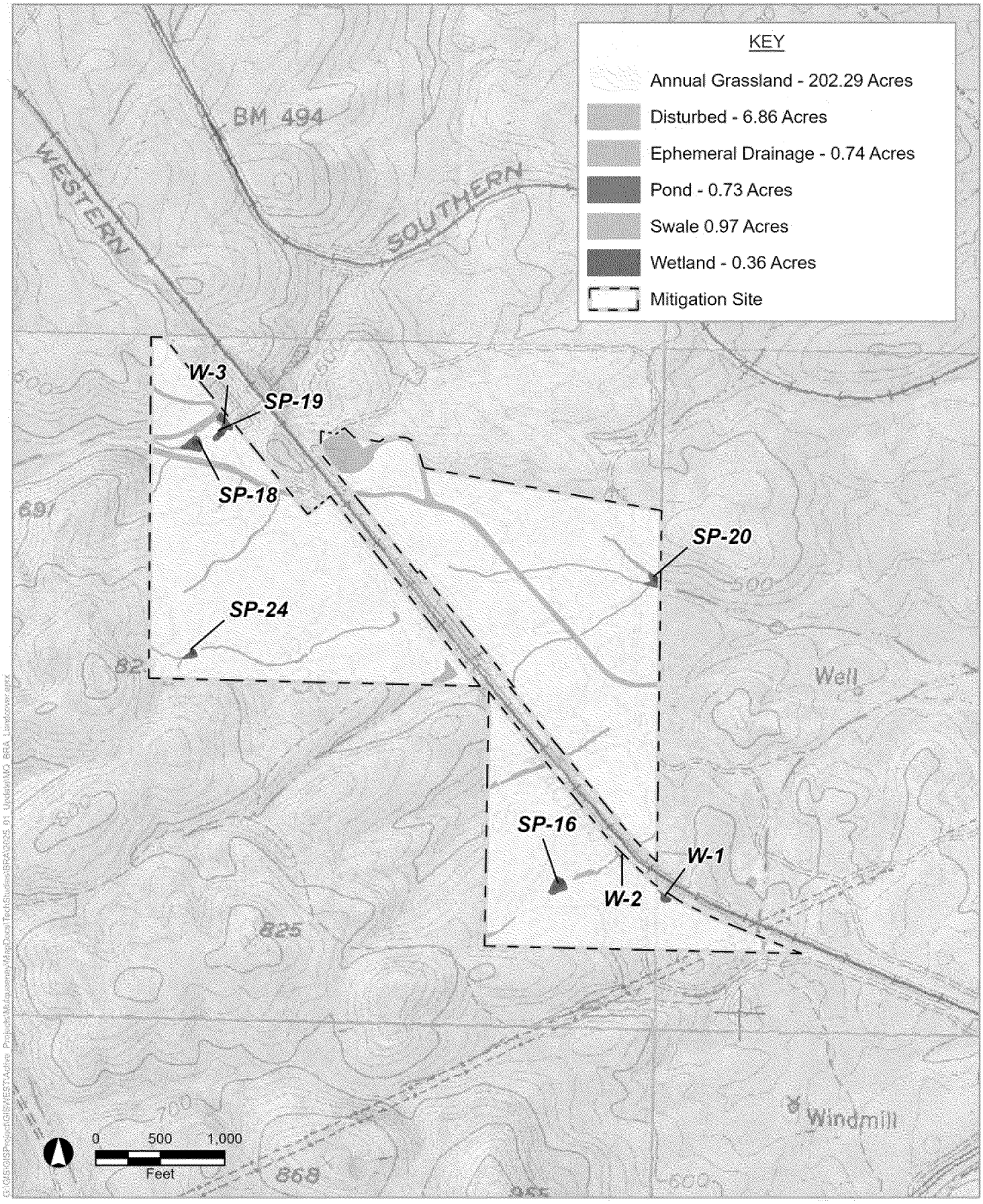

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Figure 5
Landcover
January 16, 2025

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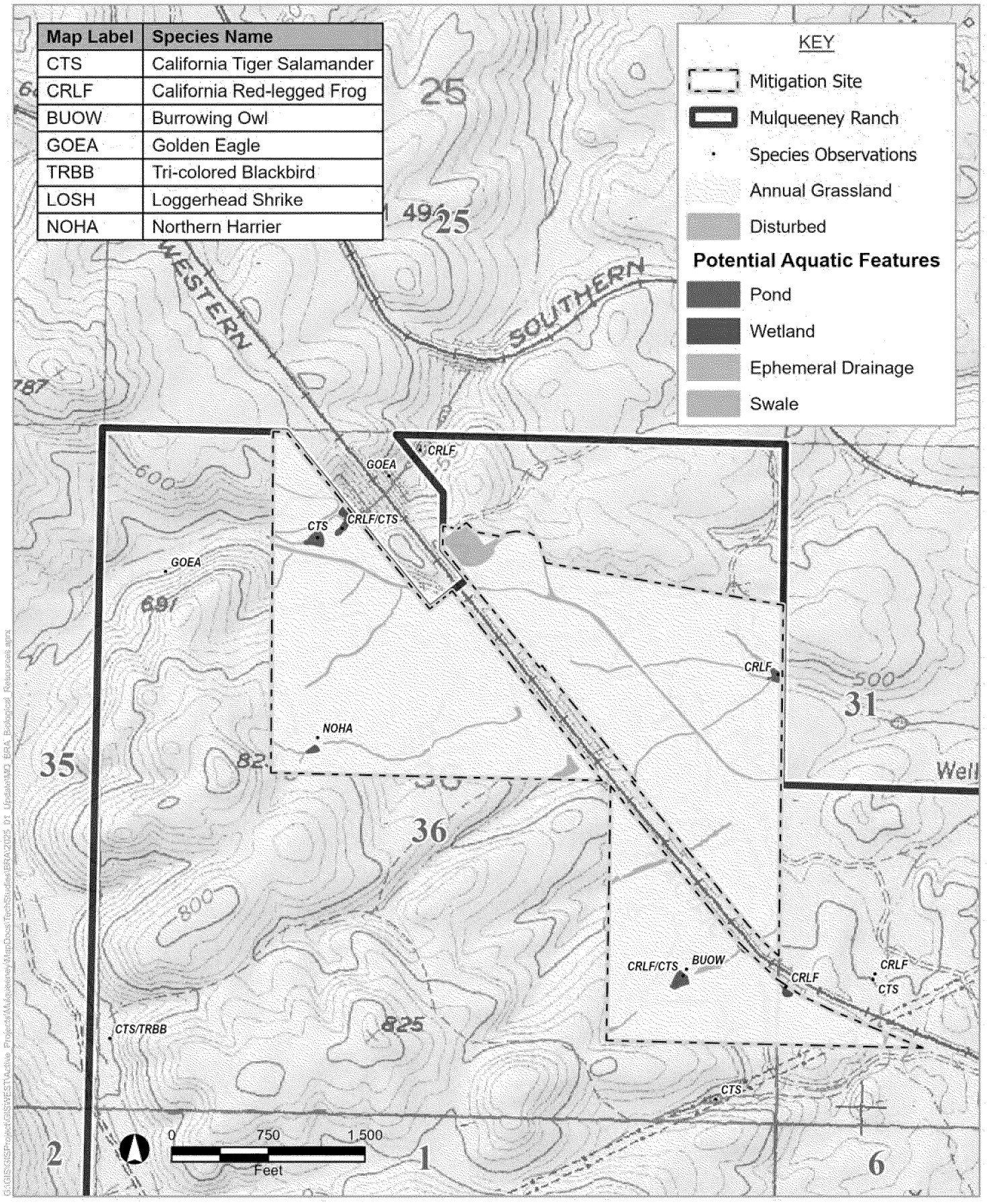

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Figure 6
Biological Resources
January 21, 2025

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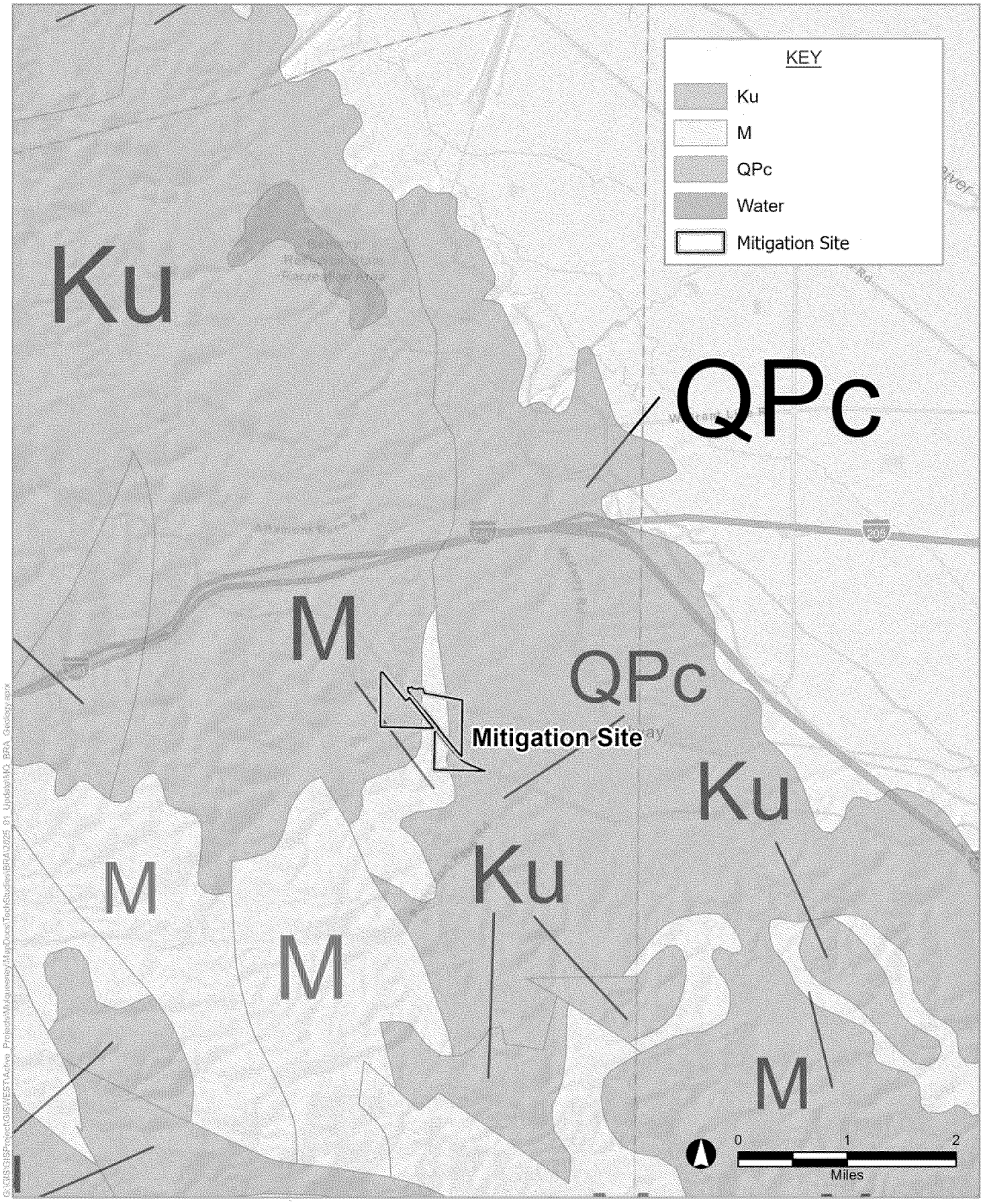

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Figure 7
Geology
January 16, 2025

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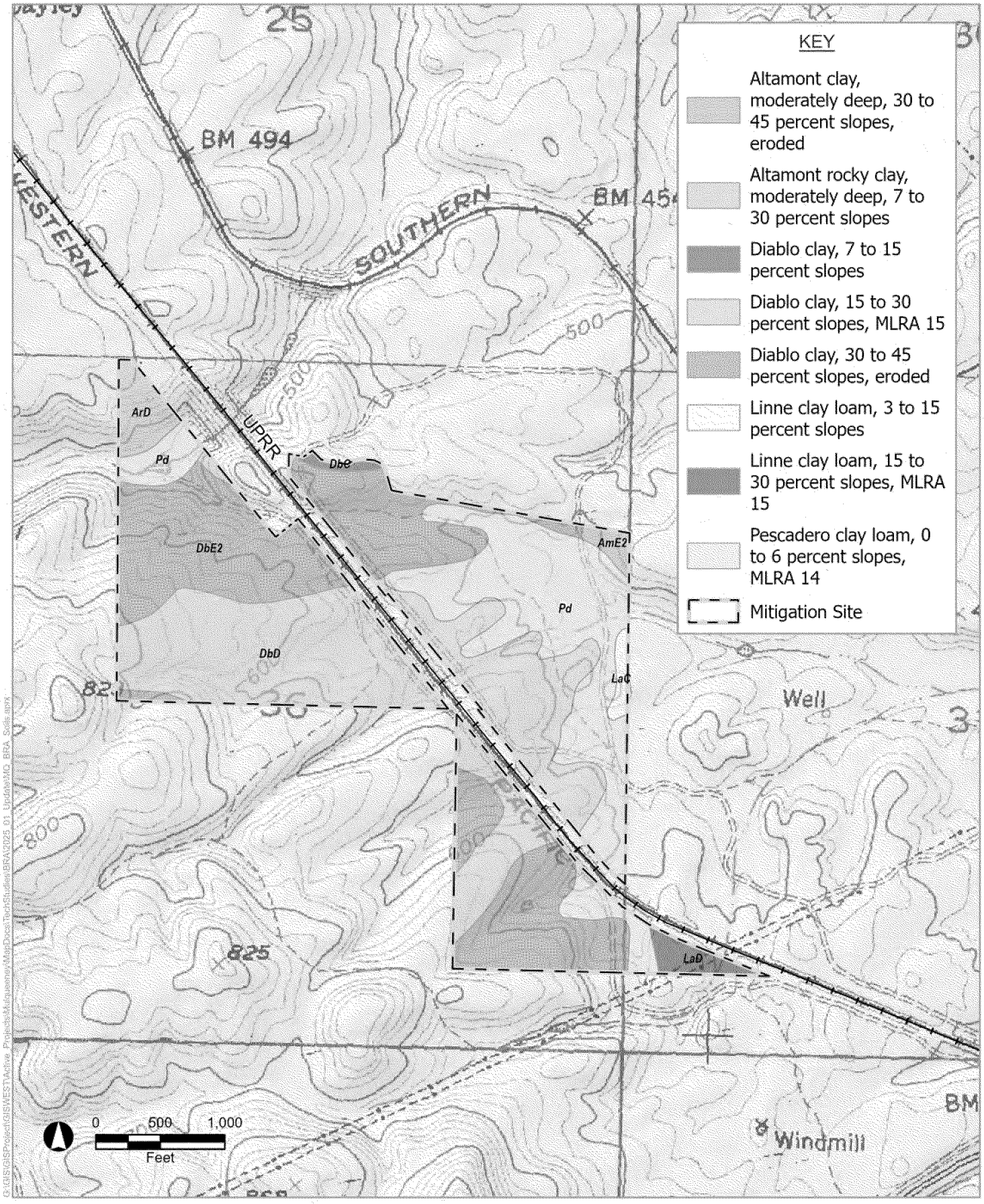

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Figure 8
Soils
January 14, 2025

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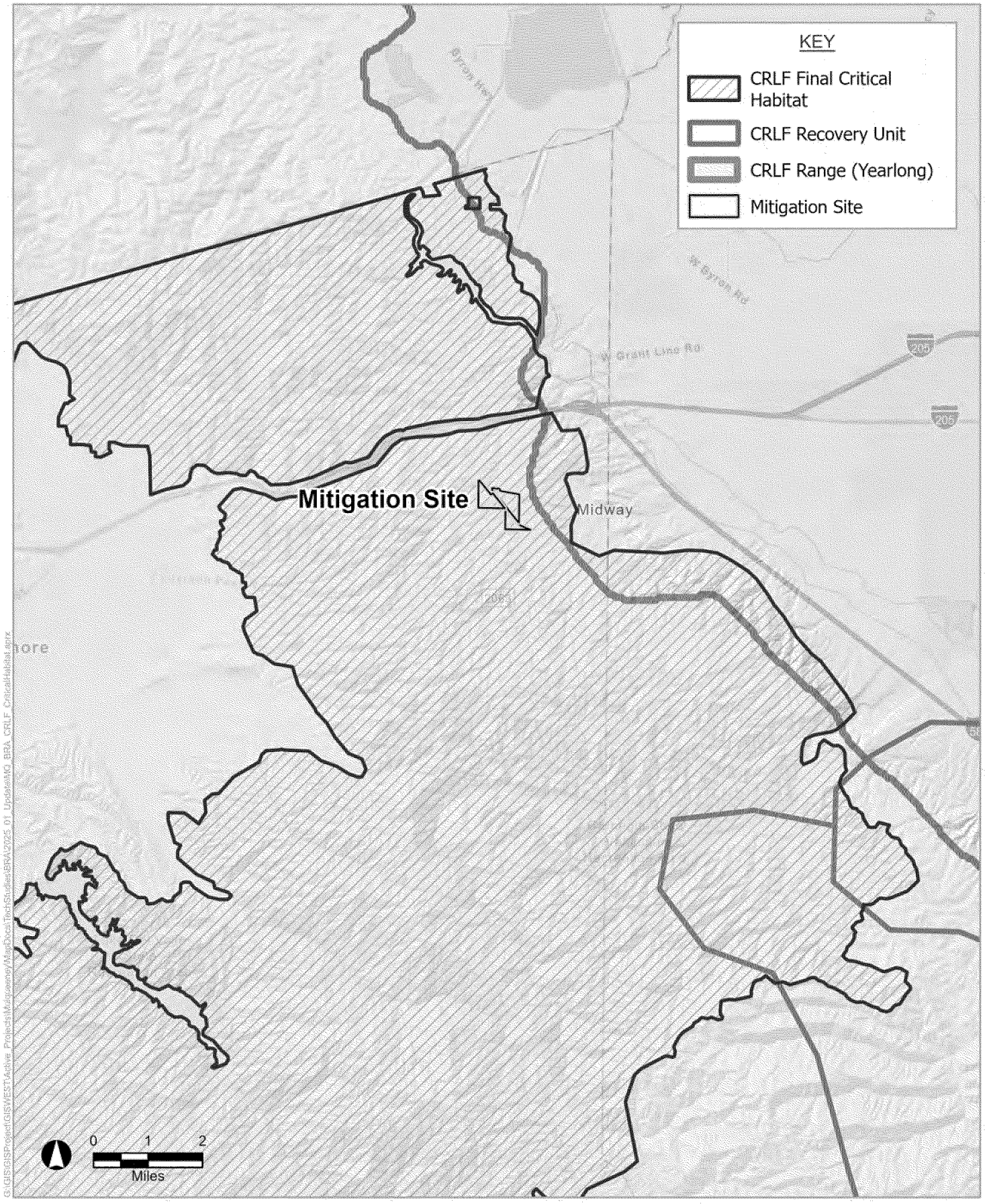

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Source: U.S. Fish and Wildlife Service

Figure 9
CRLF Critical Habitat
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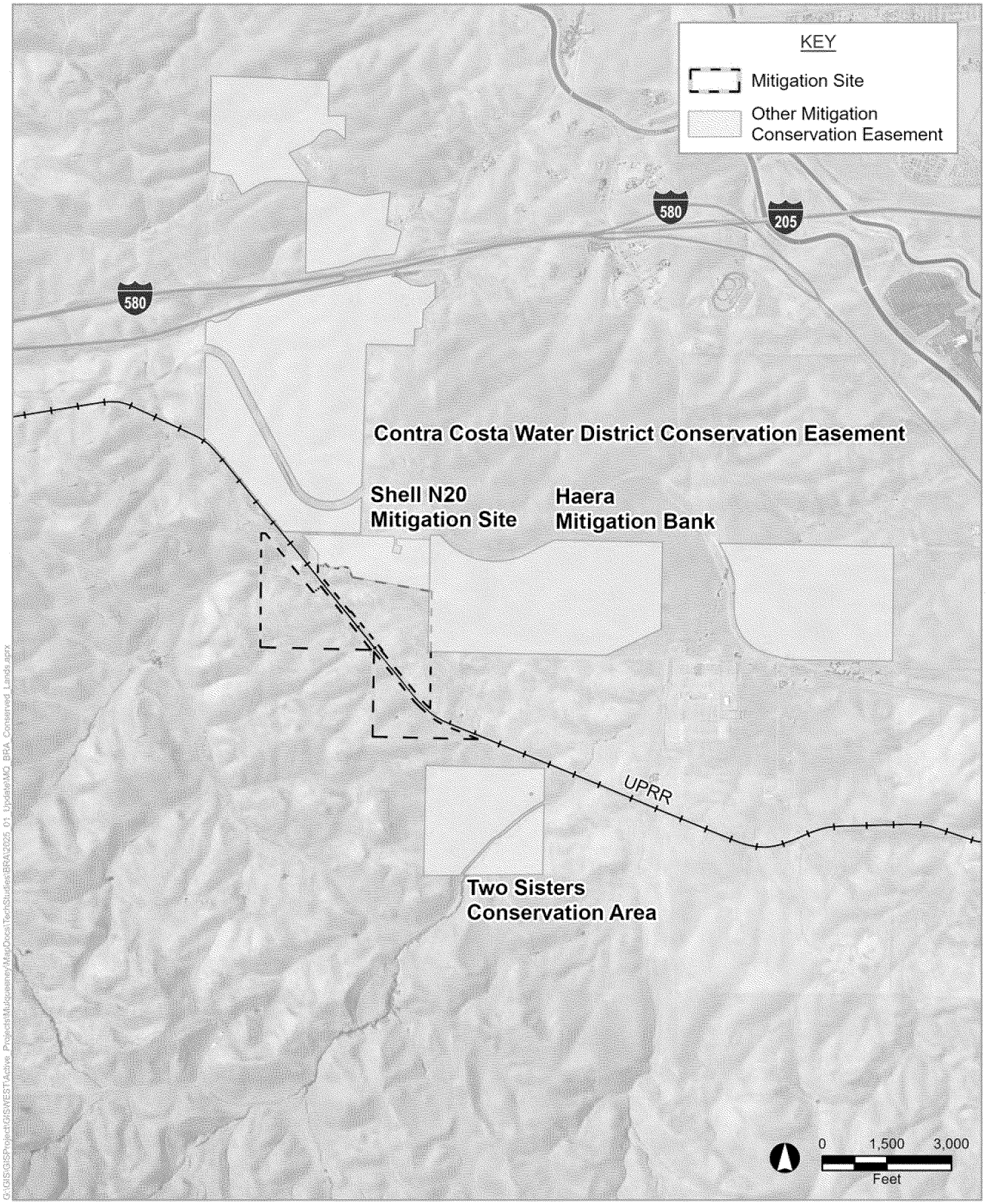

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USGS 7.5' Quadrangle: MIDWAY, 1980

Figure 10
Conservation Easements
January 14, 2025

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APPENDIX B

Plant Species List

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Table 1. Vascular Plant Species Observed at the Mitigation Site

Plant Species Names		Wetland Indicator Status	Cal-IPC Rating	Ha	
Scientific Name	Common Name			Annual Grassland	Stockpond
*Agrostis stolonifera**	Creeping bentgrass, Redtop	FACW	L		X
*Aira caryophyllea**	Silver hairgrass	FACU		X	
Alisma triviale (A. plantago-aquatica)	Northern water plantain	OBL			X
*Amaranthus albus**	Pigweed amaranth	FACU		X	
Amsinckia intermedia	Common fiddleneck	NL		X	
*Anthemis cotula**	Mayweed	FACU		X	
*Avena barbata**	Slender oats	NL	M	X	X
Azolla filiculoides	American water fern, mosquito fern	OBL			X
*Brassica nigra**	Black mustard	NL	M	X	
*Bromus diandrus**	Ripgut brome, Ripgut grass	NL	M	X	X
*Bromus hordeaceus**	Soft brome	FACU	L	X	X
Calandrinia menziesii	Red maids	FACU		X	
Callitriche marginata	California water starwort	OBL			X
*Capsella bursa-pastoris**	Shepard's purse	FACU		X	
Cardamine oligosperma	Few-seeded bitter-cress	FAC		X	
*Carduus pycnocephalus**	Italian thistle	NL	M	X	X
Castilleja densiflora?+	Dense flower owl's clover	NL		X	
Castilleja exserta+	Purple owl's clover	NL		X	
*Centaurea melitensis**	Tocalote	NL	M		
*Centaurea solstitialis**	Yellow star-thistle	NL	H	X	X
*Cerastium glomeratum**	Mouse-ear chick-weed	UPL		X	
Chara sp.	Stonewort	OBL			X
*Chenopodium album**	Goosefoot	FACU		X	
Chlorogalum angustifolium+	Narrow leaved soaproot	NL		X	
*Cichorium intybus**	Chicory	FACU		X	
*Cirsium vulgare**	Bull thistle	FACU	M	X	X
Clarkia purpurea+	Purple clarkia	NL		X	
*Convolvulus arvensis**	Field bindweed	NL		X	
*Cotula coronopifolia**	Brass buttons	OBL	L		X
Crassula aquatica	Aquatic pygmy weed	OBL			X
Croton setiger	Dove weed	NL		X	X
*Crypsis schoenoides**	Swampgrass, swamp timothy	FACW			X
*Cynodon dactylon**	Bermuda grass	FACU	M	X	X
Cyperus eragrostis	Tall flatsedge, Umbrella-sedge	FACW			X
Deschampsia danthonioides	Annual hairgrass, silverhair grass	FACW			X
Distichlis spicata	Salt grass	FAC		X	
Downingia pulchella	Flatface downingia	OBL			X
*Echinochloa crus-galli**	Watergrass	FACW			X
Eleocharis macrostachya	Common spike rush	OBL			X
*Elymus caput-medusae**	Medusa-head grass	NL	H	X	
Epilobium branchycarpum	Tall annual willow herb	FAC		X	X

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Epilobium ciliatum	Slender willow herb	FACW			X
Erigeron canadensis	Canada horseweed	FACU		X	X
Eriogonum fasciculatum+	California buckwheat	NL		X	
*Erodium botrys**	Broad leaf filaree	FACU		X	
*Erodium cicutarium**	Red-stem filaree	NL	L	X	
*Erodium moschatum**	White stemmed filaree	NL		X	
Erythranthe guttata (*Mimulus guttatus*)	Streamside monkey flower	OBL			X
Eschscholzia californica	California poppy	NL		X	
*Festuca bromoides**	Six-weeks grass	FACU		X	
Festuca microstachya	Small fescue	NL		X	
*Festuca myuros**	Foxtail grass	FACU	M	X	
*Festuca perennis**	Italian ryegrass	FAC	M	X	X
*Geranium dissectum**	Cut leaved geranium	NL	L	X	
Grindelia camporum	Great valley gumweed	FACW			X
Heliotropium curassavicum	Heliotrope	FACU		X	
*Hirschfeldia incana**	Short podded mustard	NL	M	X	X
Hordeum marinum ssp. *gussoneanum**	Mediterranean barley	FAC	M	X	X
Hordeum murinum ssp. *leporinum**	Hare barley	FACU	M	X	
Hydrodictyon sp	Fishnet algae	OBL			X
Juncus balticus	Baltic rush	FACW			X
Juncus bufonius	Toad rush	FACW			X
Juncus xiphioides	Iris leaved rush	OBL			X
*Lactuca serriola**	Prickly wild lettuce	FACU		X	
Lemna minor	Smaller duckweed	OBL			X
Lupinus bicolor	Bicolored lupine	NL		X	
Lupinus pachylobus?+	Big pod lupine	NL		X	
Lupinus succulentus	Succulent lupine	NL		X	
*Lysimachia arvensis**+	Scarlet pimpernel	FAC		X	X
*Lythrum hyssopifolia**	Hyssop loosestrife	OBL	L		X
*Malva parviflora**	Cheeseweed mallow	NL		X	
Malvella leprosa+	Alkali mallow	FACU		X	
Matricaria discoidea	Pineapple weed	FACU		X	
*Medicago polymorpha**	Bur clover	FACU	L	X	
*Melilotus indicus**	Sourclover	FACU			X
*Mollugo verticillata**	Green carpetweed	FACU		X	
Nasturtium officinale+	Watercress	OBL			X
*Paspalum dilatatum**	Dallis grass	FAC			X
Plagiobothrys nothofulvus	Rusty haired popcorn flower	FAC		X	
*Plantago lanceolata**	Narrow leaf plantain	FAC		X	X
*Poa annua**	Annual bluegrass	FAC		X	X
*Polygonum aviculare**	Common knotweed	FAC			X
*Polypogon monspeliensis**	Rabbitsfoot grass	FACW	L		X
*Pseudognaphalium luteoalbum**	Jersey cudweed	FAC			X
Ranunculus aquatilis	White water buttercup	OBL			X
*Ranunculus muricatus**	Spinyfruit buttercup	FACW			X
*Raphanus sativus**	Wild radish	NL	L	X	
*Rumex crispus**	Curly dock	FAC	L		X

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Salix sp.	Willow	FACW			X
*Silybum marianum**	Milk thistle	NL	L	X	X
*Spergularia rubra**	Purple sandspurry	FAC			X
Stuckenia pectinata (Potomogeton pectinatus)	Sago pondweed	OBL			X
*Trifolium dubium**	Shamrock	UPL		X	
*Trifolium hirtum**	Rose clover	UPL	L	X	
Triphysaria eriantha+	Butter 'n' eggs	NL		X	
Triteleia hyacinthina+	White brodiaea	FAC		X	
*Typha angustifolia**	Narrowleaf cattail	OBL			X
Urtica dioica	Stinging nettle	FAC			X
Veronica anagallis-aquatica+*	Water speedwell	OBL			X
Veronica peregrina	Neckweed	FAC			X
Vicia sativa	Common vetch	FACU		X	
*Vicia villosa**	Hairy or winter vetch	NL		X	
Xanthium strumarium	Cocklebur	FAC			X

* = non native , + = observed on the Ranch but outside the Mitigation Site

Docusign Envelope ID: 32EF3236-2C00-496D-9AA0-BD9F98B0DE35

APPENDIX C

Wildlife Species List

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Table 4. List of Wildlife Observed within the Mitigation Site and Mulqueeney Ranch

Common Name	Scientific Name
Mammals	
Audubon's cottontail	*Sylvilagus audubonii*
Black-tailed jackrabbit	*Lepus californicus*
Botta's pocket gopher	*Thomomys bottae+*
California ground squirrel	*Otospermophilus beecheyi*
Coyote	*Canis latrans*
Gray fox*	*Urocyon cinereoargenteus+*
Raccoon	*Procyon lotor+*
Virginia opossum	*Didelphis virginiana+*
Birds	
American cliff swallow	*Petrochelidon pyrrhonota*
American crow	*Corvus brachyrhynchos*
American kestrel	*Falco sparverius*
American wigeon*	*Mareca americana*
Bald eagle*	*Haliaeetus leucocephalus*
Barn swallow	*Hirundo rustica*
Black phoebe	*Sayornis nigricans*
Brewer's blackbird	*Euphagus cyanocephalus*
Bufflehead	*Bucephala albeola*
Canada goose	*Branta canadensis*
Common starling	*Sturnus vulgaris*
Golden eagle	*Aquila chrysaetos*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Greater yellowlegs	*Tringa melanoleuca*
Horned lark	*Eremophila alpestris*
Killdeer	*Charadrius vociferus*
Loggerhead shrike	*Lanius ludovicianus*
Mallard	*Anas platyrhynchos*
Mourning dove	*Zenaida macroura*
Northern harrier	*Circus hudsonius*
Northern raven	*Corvus corax*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Savannah sparrow	*Passerculus sandwichensis*
Tricolored blackbird	*Agelaius tricolor*
Turkey vulture	*Cathartes aura*
Western burrowing owl	*Athene cunicularia hypugaea*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
Reptiles	
Northern Pacific rattlesnake*	*Crotalus oreganus oreganus*

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Northwestern fence lizard	*Sceloporus occidentalis occidentalis*
Amphibians	
California red-legged frog	*Rana draytonii*
California tiger salamander	*Ambystoma californiense*
California toad	*Anaxyrus boreas halophilus*
Sierran treefrog	*Pseudacris sierra*

+ = sign (tracks, burrows, etc.)

* = Observed outside of Mitigation Site

Docusign Envelope ID: 32EF3236-2C00-496D-9AA0-BD9F98B0DE35

APPENDIX D

Representative Photographs

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Photo 1 (S): Stock pond where BUOW are present in adjacent burrows located in the mitigation site.

Photo 2 (W): Stock pond within the mitigation site where CTS larvae and adult CRLF have been observed.

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Photo 3 (N): Drainage in the mitigation area.

Photo 4: CRLF found in a stock pond in the mitigation site.

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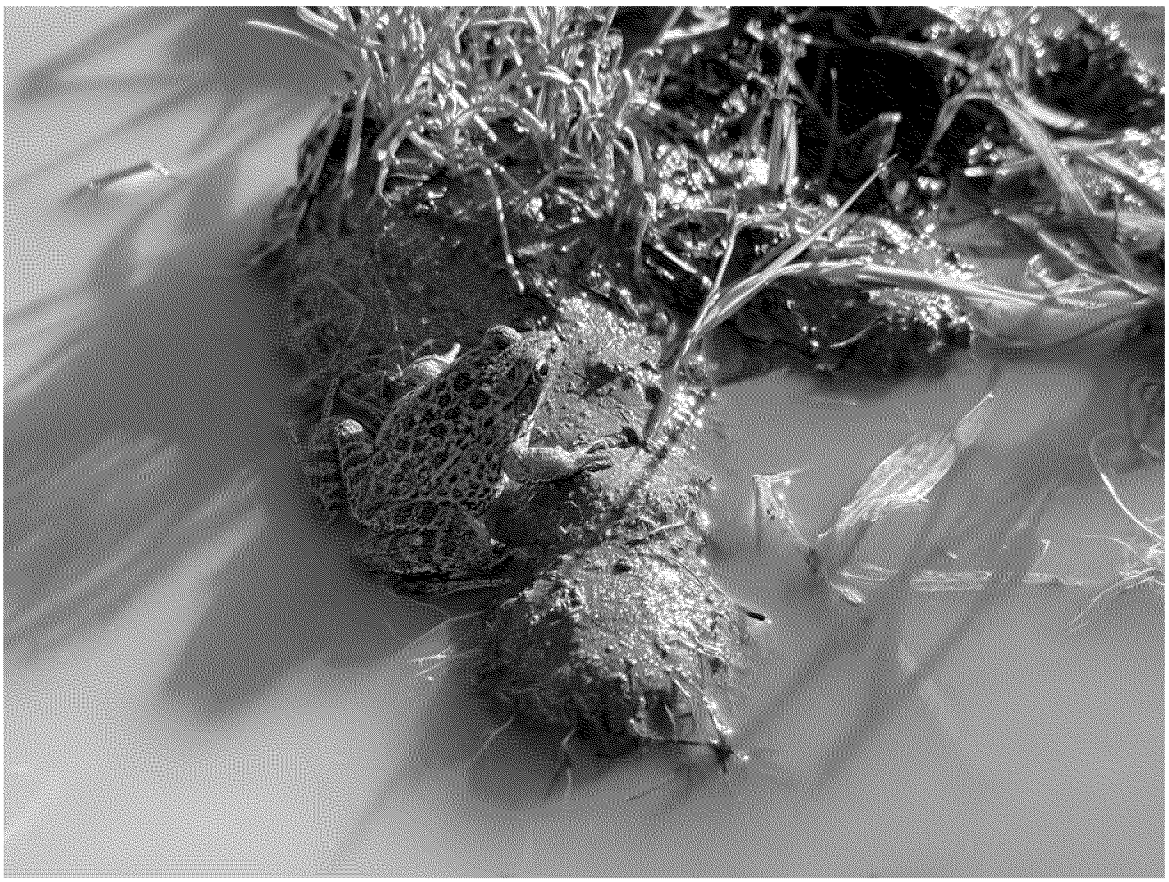

Photo 5: CRLF found in drainage in the mitigation site.

Photo Point 6: CTS larvae detected during aquatic surveys in the mitigation site.

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Photo Point 7: CTS larvae detected during aquatic surveys in the mitigation site.

Photo Point 8: Bald Eagle (*Haliaeetus leucocephalus)* observed in the mitigation site.

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Photo Point 9: Burrowing Owl (*Athene cunicularia)* observed in the mitigation site.

Docusign Envelope ID: 32EF3236-2C00-496D-9AA0-BD9F98B0DE35

Westervelt
ECOLOGICAL SERVICES

REGIONAL LOCATIONS

Rocky Mountain Region

625 Park Point Drive, Suite 265
Golden, Colorado 80401
T: (303) 927-0037

Southeastern Region

ALABAMA
MAIN OFFICE
2128 Moores Mill Road, Suite B
Auburn, Alabama 36830
T: (334) 821-1999

FLORIDA
1400 Village Square Blvd., Suite #3-135
Tallahassee, Florida 32312
T: (850) 661-4292

TENNESSEE
220 Bridge Street
Franklin, Tennessee 37064
T: (615) 807-2194

Western Region

3636 American River Drive, Suite 120
Sacramento, California 95864
T: (916) 646-3644

Message

From: Nicola Park [Nicola.Park@clearwayenergy.com]
Sent: 1/30/2026 11:19:28 PM
To: Yang, Jenna@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e41e549c7a4a4634bdb4de7fcb65914d-Waterboards]; Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]
CC: Aarty Joshi [Aarty.Joshi@clearwayenergy.com]; Tadlock, Stephanie@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8c816f7cdb324c09b5cbd2d6ecf38a6a-Waterboards]
Subject: RE: Potentia-Viridi 401 Application

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Thanks Jenna,

Much appreciated on confirming these next steps. Please let us know if any questions come up in your review of the draft EIR.

Looping in Eric for his information.

Best,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Sent: Friday, January 30, 2026 12:47 PM
To: Nicola Park <Nicola.Park@clearwayenergy.com>
Cc: Aarty Joshi <Aarty.Joshi@clearwayenergy.com>; Tadlock, Stephanie@Waterboards <Stephanie.Tadlock@waterboards.ca.gov>
Subject: Re: Potentia-Viridi 401 Application

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Good afternoon,

Thank you for this information. I did not know that the Draft EIR was published. I will start reviewing the draft EIR and include any applicable information in the 401 Certification. Once the final EIR is published, we will need a copy of the Notice of Determination. Shortly after receiving the Notice of Determination, we will be able to issue the 401 Certification.

Jenna Yang
Water Resource Control Engineer

R5 CENTRAL VALLEY - SACRAMENTO
R5 Point Source Permitting

Email: Jenna.Yang@Waterboards.ca.gov
Phone: +1 (916) 464-4764

Regional Water Quality Control Boards
11020 Sun Center Drive, Suite 200, Rancho Cordova CA 95760
Website: www.waterboards.ca.gov

Follow: X | YouTube | Facebook | LinkedIn

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Friday, January 30, 2026 2:17 PM
To: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Cc: Aarty Joshi <Aarty.Joshi@clearwayenergy.com>; Tadlock, Stephanie@Waterboards <Stephanie.Tadlock@waterboards.ca.gov>
Subject: Potentia-Viridi 401 Application

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Hi Jenna,

The Potentia Viridi project Staff Assessment was published by CEC on 1/26/26. As such, we wanted to confirm next steps on the 401 permit and ensure that you have everything you need to process this? Eric indicated that per the attached coordination plan we should check with you on next steps.

Thanks,

Nicola

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

Message

From: Veerkamp, Eric@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=A16598E8714E422FB3216B7B05602C48-VEERKAMP, E]
Sent: 1/30/2026 11:07:09 PM
To: Nicola Park [Nicola.Park@clearwayenergy.com]; Aarty Joshi [Aarty.Joshi@clearwayenergy.com]
CC: Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]
Subject: RE: Potentia-Viridi, Staff Assessment publication
Attachments: 5B01CR00050_NOCA PoVI Water Board application2025July.pdf

Hi Nicola,
For your information, in case you have not seen it, is a letter from the Water Boards sent to Levy Alameda noting the completeness of the 401 application for Potentia. This got misdirected in a mailbox here so I was unaware of it until today. I have requested this be posted to our docket either today or tomorrow.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Friday, January 30, 2026 2:10 PM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>
Subject: RE: Potentia-Viridi, Staff Assessment publication

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Thanks Eric,

We will certainly reach out to Waterboard and confirm they have what they need. Thanks for following up on this!

Nicola

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Friday, January 30, 2026 11:22 AM
To: Aarty Joshi <Aarty.Joshi@clearwayenergy.com>; Nicola Park <Nicola.Park@clearwayenergy.com>
Cc: Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>
Subject: RE: Potentia-Viridi, Staff Assessment publication

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Hi Nicola and Aarty,
After speaking with our in-house counsel Erika Giorgi, she provided me with the attached coordination plan governing the CEC and SWRCB inter-agency cooperation for the opt-in program. After a read-through I do not see any requirement for

a subsequent application submittal or for any action steps on the part of the applicant, Clearway in this case. Probably the best thing you could do is to make sure the water board has everything they need.

Let me know if you still have any questions and I will do my best. Including Kaycee for awareness.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Sent: Thursday, January 29, 2026 4:32 PM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Nicola Park <Nicola.Park@clearwayenergy.com>
Subject: RE: Potentia-Viridi, Staff Assessment publication

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Hi Eric – My thought is that this application needs to be submitted separately and directly to the Water Board as they retained their permitting authority and because this permit falls under the federal Clean Water Act as opposed to state regulation. If you'd like us confirm with Annie Mudge at CCN, we'd be happy to do so.

Aarty Joshi
(D) 415-627-4656
(M) 415-699-5913

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Thursday, January 29, 2026 4:11 PM
To: Nicola Park <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Subject: RE: Potentia-Viridi, Staff Assessment publication

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Hi Nicola,
Currently, I do not have any additional information to share. I will let you know as soon as I do.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Thursday, January 29, 2026 1:32 PM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Subject: RE: Potentia-Viridi, Staff Assessment publication

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Hi Eric,

Thanks for looking into this for us. If you have a minute was hoping to jump on the phone with you and Aarty to confirm the nuances between the 401 and 404 aspect of the permit and make sure we are on the same page.

Do you have time 1-4pm PT tomorrow for a quick touch base?

Thanks,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Wednesday, January 28, 2026 12:16 PM
To: Nicola Park <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Subject: RE: Potentia-Viridi, Staff Assessment publication

CAUTION: This message originated from an external sender.

Hi Nicola, I am working on getting an answer for you on this. I believe the permitting process would continue to work through the CEC without you as the applicant needing to be involved, but I am trying to confirm.

Eric W. Veerkamp
Project Manager
California Energy Commission
916-661-8458
STEPSiting@energy.ca.gov
www.energy.ca.gov

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Tuesday, January 27, 2026 9:37 AM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Subject: RE: Potentia-Viridi, Staff Assessment publication

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good Morning Eric,

Yes, and thanks for sharing! We have been pouring over the Staff Assessment and digesting key pieces as a team. May have some questions for you soon.

In the meantime, we were hoping to kickoff the 401 application with Waterboard as submitted with our application. Is that something we should pursue directly with Waterboard or will CEC be engaged in that process? (TN264361 and revised

figures on TN264903). It is my understanding that the Water Board is a MOU agency so they would be working the CEC to process the 401 application as it was submitted to the CEC. Would a second submittal be required? The only detail I believe we need to change is the contact information.

Thanks,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Tuesday, January 27, 2026 6:33 AM
To: Nicola Park <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Subject: Potentia-Viridi, Staff Assessment publication

CAUTION: This message originated from an external sender.

Good Morning Nicola,
Just a quick note. You have probably already seen the posting, but if not, the Potentia-Viridi BESS staff assessment along with the notice of availability were filed to the project docket late yesterday, https://efiling.energy.ca.gov/GetDocument.aspx?tn=268314&DocumentContentId=105489.

Have a good week.

Eric W. Veerkamp
Project Manager
California Energy Commission
916-661-8458
STEPSiting@energy.ca.gov
www.energy.ca.gov

9 July 2025

Patrick Leitch
Levy Alameda, LLC
155 Wellington Street, Suite 2930
Toronto, Ontario, M5V 3H1, Canada
PLeitch@capstoneinfra.com

NOTIFICATION OF A COMPLETE SECTION 401 WATER QUALITY CERTIFICATION APPLICATION; LEVY ALAMEDA, LLC, POTENTIA-VIRIDI BATTERY ENERGY STORAGE SYSTEM PROJECT (PV-BESS) (WDID#5B01CR00050), ALAMEDA COUNTY

Thank you for submitting an application for Section 401 Water Quality Certification (Certification) for the Potentia-Viridi Battery Energy Storage System Project (PV-BESS) (Project) dated 17 June 2025. Based on review of the above materials submitted, the application appears to be complete. Central Valley Regional Water Quality Control Board staff will be preparing a Certification for the Project.

Pursuant to title 23, section 3856, subdivision (b) of the California Code of Regulations, "[a] full, technically accurate description, including the purpose and final goal, of the entire activity" must be provided before an application will be considered "complete." If there are any changes to the Project, your application may be deemed incomplete, and we may contact you for other information to assist us in preparing the Certification.

Pursuant to California Code of Regulations, Title 23, section 3856, subdivision f, a copy of any draft CEQA document(s) prepared for the activity shall be submitted to the certifying agency. A valid CEQA document, which includes the final CEQA document and a Notice of Determination filed with the State Clearinghouse, while not required for a complete application, must be provided and the certifying agency shall have ample time to properly review a final copy of valid CEQA documentation before taking a certification action.

Failure to submit valid CEQA documentation may result in a denial without prejudice. The denial without prejudice is issued for procedural rather than substantive reasons, and carries with it no judgement on the technical merits of the activity.

When submitting materials related to this application, please reference the Project name and WDID number as shown in the subject line. The materials must be converted to a searchable portable document in PDF format. Please submit the required materials

electronically to CentralValleySacramento@waterboards.ca.gov. Documents that are 50 MB or larger should be transferred to a disk and mailed to the address listed below.

Attention: Jenna Yang
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670-6114

Please contact Jenna Yang immediately at (916) 464-4764 or at Jenna.Yang@waterboards.ca.gov if you have any questions or if there are changes to the project description.

Stephanie Tadlock
Senior Environmental Scientist
401 Water Quality Certification Unit

cc: [Via email only]

Matthew Di Loreto (SPK-2024-00486)
United States Army Corps of Engineers
Sacramento District Office
Regulatory Division
Matthew.J.DiLoreto@usace.army.mil
SPKRegulatoryMailbox@usace.army.mil

United States Environmental Protection Agency
R9CWA401@epa.gov

CWA Section 401 WQC Program
State Water Resources Control Board
StateBoard401@waterboards.ca.gov

Ann Crisp
California Energy Commission
Ann.Crisp@energy.ca.gov

Naomi Schowalter
Integral Consulting Inc.
NSchowalter@integral-corp.com

Message

Sent: 2/26/2026 11:51:22 PM
To: Lopez, Albert, CDA [albert.lopez@acgov.org]
CC: Knight, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=be42548337f44852a291a9845f226f62-Knight, Eri]
Subject: Potentia-Viridi Staff Assessment Public Meeting

Hi Albert.

We wanted to let you know of a public meeting for Potentia-Viridi next Monday if you're interested in attending in person or virtually to provide comments. Here's the info!

Potentia-Viridi Battery Energy Storage System CEC Staff Assessment Public Meeting

Please let us know if you have any questions. Thanks!

Andrea

Andrea Koch
Environmental Planning Specialist
Land Use & Public Services Unit
Siting and Environmental Branch
Siting, Transmission and Environmental Protection Division
Phone: 1-279-226-1028
California Energy Commission
www.energy.ca.gov/

Message

From: Crisp, Ann@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=B89C4DE7ECE742679D19E1E3EE713DC2-CRISP, ANN@]
Sent: 7/30/2025 6:45:31 PM
To: Yang, Jenna@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e41e549c7a4a4634bdb4de7fcb65914d-Waterboards]; pleitch@capstoneinfra.com
CC: Di Loreto, Matthew J CIV USARMY CESPK (USA) [matthew.j.diloreto@usace.army.mil]; SPKRegulatoryMailbox [spkregulatorymailbox@usace.army.mil]; R9cwa401 [r9cwa401@epa.gov]; WB-DWQ-Stateboard401 [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=99458b7784134f4184ab349a6fd7a6e5-Waterboards]; Naomi Schowalter [nschowalter@integral-corp.com]; Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]
Subject: Re: Notice of Complete Application - Potentia-Viridi Battery Energy Storage System - 5B01CR00050
Attachments: 5B01CR00050_NOCA.pdf

Hi Jenna,

Thank for the email, I am looping in Eric Veerkamp the project manager and the Kaycee Chang, PM supervisor. Please include on future emails.

Talk soon,

Ann

From: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Sent: Thursday, July 10, 2025 12:14 PM
To: pleitch@capstoneinfra.com <pleitch@capstoneinfra.com>
Cc: Di Loreto, Matthew J CIV USARMY CESPK (USA) <matthew.j.diloreto@usace.army.mil>; SPKRegulatoryMailbox <spkregulatorymailbox@usace.army.mil>; R9cwa401 <r9cwa401@epa.gov>; WB-DWQ-Stateboard401 <Stateboard401.Stateboard401@waterboards.ca.gov>; Crisp, Ann@Energy <Ann.Crisp@energy.ca.gov>; Naomi Schowalter <nschowalter@integral-corp.com>
Subject: Notice of Complete Application - Potentia-Viridi Battery Energy Storage System - 5B01CR00050

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Good afternoon,

Thank you for submitting an application to enroll under Section 401 Water Quality Certification for the Potentia-Viridi Battery Energy Storage System Project (PV-BESS), WDID: 5B01CR00050. See attached for a Notification of Complete Section 401 Water Quality Certification Application.

Please let me know if you have any questions.

Jenna Yang
Water Resource Control Engineer

R5 CENTRAL VALLEY - SACRAMENTO
R5 Point Source Permitting

Email: Jenna.Yang@Waterboards.ca.gov
Phone: +1 (916) 464-4764

Regional Water Quality Control Boards
11020 Sun Center Drive, Suite 200, Rancho Cordova CA 95760
Website: www.waterboards.ca.gov

Follow: X | YouTube | Facebook | LinkedIn

9 July 2025

Patrick Leitch
Levy Alameda, LLC
155 Wellington Street, Suite 2930
Toronto, Ontario, M5V 3H1, Canada
PLeitch@capstoneinfra.com

NOTIFICATION OF A COMPLETE SECTION 401 WATER QUALITY CERTIFICATION APPLICATION; LEVY ALAMEDA, LLC, POTENTIA-VIRIDI BATTERY ENERGY STORAGE SYSTEM PROJECT (PV-BESS) (WDID#5B01CR00050), ALAMEDA COUNTY

Thank you for submitting an application for Section 401 Water Quality Certification (Certification) for the Potentia-Viridi Battery Energy Storage System Project (PV-BESS) (Project) dated 17 June 2025. Based on review of the above materials submitted, the application appears to be complete. Central Valley Regional Water Quality Control Board staff will be preparing a Certification for the Project.

Pursuant to title 23, section 3856, subdivision (b) of the California Code of Regulations, "[a] full, technically accurate description, including the purpose and final goal, of the entire activity" must be provided before an application will be considered "complete." If there are any changes to the Project, your application may be deemed incomplete, and we may contact you for other information to assist us in preparing the Certification.

Pursuant to California Code of Regulations, Title 23, section 3856, subdivision f, a copy of any draft CEQA document(s) prepared for the activity shall be submitted to the certifying agency. A valid CEQA document, which includes the final CEQA document and a Notice of Determination filed with the State Clearinghouse, while not required for a complete application, must be provided and the certifying agency shall have ample time to properly review a final copy of valid CEQA documentation before taking a certification action.

Failure to submit valid CEQA documentation may result in a denial without prejudice. The denial without prejudice is issued for procedural rather than substantive reasons, and carries with it no judgement on the technical merits of the activity.

When submitting materials related to this application, please reference the Project name and WDID number as shown in the subject line. The materials must be converted to a searchable portable document in PDF format. Please submit the required materials

electronically to CentralValleySacramento@waterboards.ca.gov. Documents that are 50 MB or larger should be transferred to a disk and mailed to the address listed below.

Attention: Jenna Yang
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670-6114

Please contact Jenna Yang immediately at (916) 464-4764 or at Jenna.Yang@waterboards.ca.gov if you have any questions or if there are changes to the project description.

Stephanie Tadlock
Senior Environmental Scientist
401 Water Quality Certification Unit

cc: [Via email only]

Matthew Di Loreto (SPK-2024-00486)
United States Army Corps of Engineers
Sacramento District Office
Regulatory Division
Matthew.J.DiLoreto@usace.army.mil
SPKRegulatoryMailbox@usace.army.mil

United States Environmental Protection Agency
R9CWA401@epa.gov

CWA Section 401 WQC Program
State Water Resources Control Board
StateBoard401@waterboards.ca.gov

Ann Crisp
California Energy Commission
Ann.Crisp@energy.ca.gov

Naomi Schowalter
Integral Consulting Inc.
NSchowalter@integral-corp.com

Message

From: Crisp, Ann@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=B89C4DE7ECE742679D19E1E3EE713DC2-CRISP, ANN@]
Sent: 2/10/2026 3:04:58 PM
To: Yang, Jenna@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e41e549c7a4a4634bdb4de7fcb65914d-Waterboards]; pleitch@capstoneinfra.com
CC: Di Loreto, Matthew J CIV USARMY CESPK (USA) [matthew.j.diloreto@usace.army.mil]; SPKRegulatoryMailbox [spkregulatorymailbox@usace.army.mil]; R9cwa401 [r9cwa401@epa.gov]; WB-DWQ-Stateboard401 [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=99458b7784134f4184ab349a6fd7a6e5-Waterboards]; Naomi Schowalter [nschowalter@integral-corp.com]; Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]
Subject: Re: Notice of Complete Application - Potentia-Viridi Battery Energy Storage System - 5B01CR00050

From: Crisp, Ann@Energy <Ann.Crisp@energy.ca.gov>
Sent: Wednesday, July 30, 2025 11:45 AM
To: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>; pleitch@capstoneinfra.com <pleitch@capstoneinfra.com>
Cc: Di Loreto, Matthew J CIV USARMY CESPK (USA) <matthew.j.diloreto@usace.army.mil>; SPKRegulatoryMailbox <spkregulatorymailbox@usace.army.mil>; R9cwa401 <r9cwa401@epa.gov>; WB-DWQ-Stateboard401 <Stateboard401.Stateboard401@waterboards.ca.gov>; Naomi Schowalter <nschowalter@integral-corp.com>; Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>
Subject: Re: Notice of Complete Application - Potentia-Viridi Battery Energy Storage System - 5B01CR00050

Hi Jenna,

Thank for the email, I am looping in Eric Veerkamp the project manager and the Kaycee Chang, PM supervisor. Please include on future emails.

Talk soon,

Ann

From: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Sent: Thursday, July 10, 2025 12:14 PM
To: pleitch@capstoneinfra.com <pleitch@capstoneinfra.com>
Cc: Di Loreto, Matthew J CIV USARMY CESPK (USA) <matthew.j.diloreto@usace.army.mil>; SPKRegulatoryMailbox <spkregulatorymailbox@usace.army.mil>; R9cwa401 <r9cwa401@epa.gov>; WB-DWQ-Stateboard401 <Stateboard401.Stateboard401@waterboards.ca.gov>; Crisp, Ann@Energy <Ann.Crisp@energy.ca.gov>; Naomi Schowalter <nschowalter@integral-corp.com>
Subject: Notice of Complete Application - Potentia-Viridi Battery Energy Storage System - 5B01CR00050

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good afternoon,

Thank you for submitting an application to enroll under Section 401 Water Quality Certification for the Potentia-Viridi Battery Energy Storage System Project (PV-BESS), WDID: 5B01CR00050. See attached for a Notification of Complete Section 401 Water Quality Certification Application.

Please let me know if you have any questions.

CALIFORNIA
Water Boards

Jenna Yang
Water Resource Control Engineer

R5 CENTRAL VALLEY - SACRAMENTO
R5 Point Source Permitting

Email: Jenna.Yang@Waterboards.ca.gov
Phone: +1 (916) 464-4764

Regional Water Quality Control Boards
11020 Sun Center Drive, Suite 200, Rancho Cordova CA 95760
Website: www.waterboards.ca.gov

Follow: X | YouTube | Facebook | LinkedIn

Message

From: Yang, Jenna@Waterboards [Jenna.Yang@Waterboards.ca.gov]
Sent: 2/4/2026 6:43:53 PM
To: Nicola.Park@clearwayenergy.com [nicola.park@clearwayenergy.com]
CC: Aarty.Joshi@clearwayenergy.com [aarty.joshi@clearwayenergy.com]; Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Ackerman, James@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cc35de240cf4253af9cc7d3d2cbb643-Ackerman, J]
Subject: Fw: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

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Good morning,

Can I get an estimated date on when CEQA is anticipated to be complete and a Notice of Determination filed? We are past the reasonable period of time allotted by the USACE to certify this project and will need to request an extension. Is May 2026 still the anticipated date of completion?

CALIFORNIA Water Boards

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Water Resource Control Engineer

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R5 Point Source Permitting

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Follow: X | YouTube | Facebook | LinkedIn

From: Di Loreto, Matthew J CIV USARMY CESPK (USA) <Matthew.J.DiLoreto@usace.army.mil>
Sent: Wednesday, February 4, 2026 10:30 AM
To: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Cc: Pakenham-Walsh, Mary R CIV USARMY CESPK (USA) <Mary.R.Pakenham-Walsh@usace.army.mil>; Tadlock, Stephanie@Waterboards <Stephanie.Tadlock@waterboards.ca.gov>
Subject: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

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anticipating a decision around May 2026.

Please let me know if you have requested an extension, and if so, the duration of that extension. From a procedural standpoint, I will need to send a 401-waiver notification within 7 days of a waiver decision in accordance with the current 401 MOU if no extension was requested within the categorical RPOT.

Thank you for your assistance, and my apologies for the short response suspense.

Respectfully sent,

Matthew Di Loreto
Regulatory Project Manager, CA Delta Section
Regulatory Division, Sacramento District
U.S. Army Corps of Engineers
Office: (916) 557-7882
Mobile: (919) 356-6179
matthew.j.diloreto@usace.army.mil
* Our customer service hours are 9am to 3pm Monday through Friday.
* Visit our website at www.spk.usace.army.mil/Missions/Regulatory.aspx for more info and to sign up for public notices.
* If requested, please provide all information indicated in an information request within 30 days to avoid unnecessary delays in processing a request for a Regulatory Division product.

Message

From: Aarty Joshi [Aarty.Joshi@clearwayenergy.com]
Sent: 2/4/2026 6:57:36 PM
To: Yang, Jenna@Waterboards [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e41e549c7a4a4634bdb4de7fcb65914d-Waterboards]; Nicola Park [Nicola.Park@clearwayenergy.com]
CC: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Ackerman, James@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cc35de240cf4253af9cc7d3d2cbb643-Ackerman, J]
Subject: RE: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

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Hi Jenna – Nicola is on PTO right now so I'll jump in. Yes, May is the anticipated approval timeframe.

Eric – How quickly does CEC issue the NOD after the business meeting? Are you still targeting the May 13 business meeting?

Aarty Joshi
(D) 415-627-4656
(M) 415-699-5913

From: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Sent: Wednesday, February 4, 2026 10:44 AM
To: Nicola Park <Nicola.Park@clearwayenergy.com>
Cc: Aarty Joshi <Aarty.Joshi@clearwayenergy.com>; Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Ackerman, James@Energy <james.ackerman@energy.ca.gov>
Subject: Fw: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

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CALIFORNIA
Water Boards

Jenna Yang
Water Resource Control Engineer

R5 CENTRAL VALLEY - SACRAMENTO
R5 Point Source Permitting

Email: Jenna.Yang@Waterboards.ca.gov
Phone: +1 (916) 464-4764

Regional Water Quality Control Boards
11020 Sun Center Drive, Suite 200, Rancho Cordova CA 95760

Website: www.waterboards.ca.gov

Follow: X | YouTube | Facebook | LinkedIn

From: Di Loreto, Matthew J CIV USARMY CESPK (USA) <Matthew.J.DiLoreto@usace.army.mil>
Sent: Wednesday, February 4, 2026 10:30 AM
To: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Cc: Pakenham-Walsh, Mary R CIV USARMY CESPK (USA) <Mary.R.Pakenham-Walsh@usace.army.mil>; Tadlock, Stephanie@Waterboards <Stephanie.Tadlock@waterboards.ca.gov>
Subject: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

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Regulatory Project Manager, CA Delta Section
Regulatory Division, Sacramento District
U.S. Army Corps of Engineers
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* Our customer service hours are 9am to 3pm Monday through Friday.
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* If requested, please provide all information indicated in an information request within 30 days to avoid unnecessary delays in processing a request for a Regulatory Division product.

Message

From: Yang, Jenna@Waterboards [Jenna.Yang@Waterboards.ca.gov]
Sent: 2/5/2026 9:46:46 PM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Nicola.Park@clearwayenergy.com
CC: Aarty.Joshi@clearwayenergy.com; Ackerman, James@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cc35de240cf4253af9cc7d3d2cbb643-Ackerman, J]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]
Subject: Re: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

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Thank you for that information. I inform everyone that the Water Boards have 1 year to act on the 401 Certification request. We received the 401 Certification application on 16 June 2025, so we only have until 15 June 2026 to issue the Certification. Please inform us as soon as possible when the EIR is finalized and NOD is submitted since we will then only have a couple of weeks to finalize and issue the 401 Certification.

Thank you,

CALIFORNIA Water Boards

Jenna Yang
Water Resource Control Engineer

R5 CENTRAL VALLEY - SACRAMENTO
R5 Point Source Permitting

Email: Jenna.Yang@Waterboards.ca.gov
Phone: +1 (916) 464-4764

Regional Water Quality Control Boards
11020 Sun Center Drive, Suite 200, Rancho Cordova CA 95760
Website: www.waterboards.ca.gov

Follow: X | YouTube | Facebook | LinkedIn

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Wednesday, February 4, 2026 11:02 AM
To: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>; Nicola.Park@clearwayenergy.com <nicola.park@clearwayenergy.com>
Cc: Aarty.Joshi@clearwayenergy.com <aarty.joshi@clearwayenergy.com>; Ackerman, James@Energy <james.ackerman@energy.ca.gov>; Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>
Subject: RE: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

Hi Jenna,
Thanks for the inquiry, and thanks for sharing the information. We are targeting and are currently on course to bring this project for a decision to the Energy Commission at the end of May, 2026. The filing of the NOD would be expected to occur in the days after, likely to occur before May expires.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Sent: Wednesday, February 4, 2026 10:44 AM
To: Nicola.Park@clearwayenergy.com
Cc: Aarty.Joshi@clearwayenergy.com; Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Ackerman, James@Energy <james.ackerman@energy.ca.gov>
Subject: Fw: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

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CALIFORNIA
Water Boards

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Water Resource Control Engineer

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From: Di Loreto, Matthew J CIV USARMY CESPK (USA) <Matthew.J.DiLoreto@usace.army.mil>
Sent: Wednesday, February 4, 2026 10:30 AM
To: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Cc: Pakenham-Walsh, Mary R CIV USARMY CESPK (USA) <Mary.R.Pakenham-Walsh@usace.army.mil>; Tadlock, Stephanie@Waterboards <Stephanie.Tadlock@waterboards.ca.gov>
Subject: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

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Thank you for your assistance, and my apologies for the short response suspense.

Respectfully sent,

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Regulatory Project Manager, CA Delta Section
Regulatory Division, Sacramento District
U.S. Army Corps of Engineers
Office: (916) 557-7882
Mobile: (919) 356-6179
matthew.j.diloreto@usace.army.mil
* Our customer service hours are 9am to 3pm Monday through Friday.
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* If requested, please provide all information indicated in an information request within 30 days to avoid unnecessary delays in processing a request for a Regulatory Division product.

Message

From: Energy - STEP Siting [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=14E6AC2919EC428BB3378E30CE9A58E9-ENERGY - ST]
Sent: 2/25/2026 9:26:32 PM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]
Subject: FW: Potentia-Viridi Battery Energy Storage System

From: Rank, Elke <erank@zone7water.com>
Sent: Tuesday, February 24, 2026 1:31 PM
To: Energy - STEP Siting <STEPsiting@energy.ca.gov>
Subject: Potentia-Viridi Battery Energy Storage System

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Could you please point me to the Draft Environmental Impact Report for the Proposed Potentia-Viridi Battery Energy Storage System?
I found the Docket but cannot locate the DEIR.

Elke Rank | **Senior Water Resources Planner**
direct: (925) 454-5005 | e-mail: erank@zone7water.com
zone7water.com

Message

From: Rank, Elke [erank@zone7water.com]
Sent: 2/25/2026 9:39:14 PM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]
Subject: RE: Potentia-Viridi Battery Energy Storage System

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Much appreciated.
Elke

Elke Rank | Zone 7 Water Agency | E-mail: erank@zone7water.com | Tel: 925-454-5005

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Wednesday, February 25, 2026 1:37 PM
To: Rank, Elke <erank@zone7water.com>
Subject: RE: Potentia-Viridi Battery Energy Storage System

You don't often get email from eric.veerkamp@energy.ca.gov. Learn why this is important

CAUTION – This email came from outside of Zone 7 Water Agency. Do not open attachments or click on links in suspicious emails.

Hi,
Here is a link to the staff assessment on the CEC docket. Let me know if you experience any other issues.

https://efiling.energy.ca.gov/GetDocument.aspx?tn=268314&DocumentContentId=105489

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Energy - STEP Siting <STEPsiting@energy.ca.gov>
Sent: Wednesday, February 25, 2026 1:27 PM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Subject: FW: Potentia-Viridi Battery Energy Storage System

From: Rank, Elke <erank@zone7water.com>
Sent: Tuesday, February 24, 2026 1:31 PM
To: Energy - STEP Siting <STEPsiting@energy.ca.gov>
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CC: Aarty.Joshi@clearwayenergy.com [aarty.joshi@clearwayenergy.com]; Ackerman, James@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cc35de240cf4253af9cc7d3d2cbb643-Ackerman, J]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]
Subject: RE: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

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Sent: Wednesday, February 4, 2026 10:30 AM
To: Yang, Jenna@Waterboards <Jenna.Yang@Waterboards.ca.gov>
Cc: Pakenham-Walsh, Mary R CIV USARMY CESPK (USA) <Mary.R.Pakenham-Walsh@usace.army.mil>; Tadlock, Stephanie@Waterboards <Stephanie.Tadlock@waterboards.ca.gov>
Subject: Potentia-Viridi Battery Energy Storage System Project (SPK-2024-00486/WDID#5B01CR00050)

Caution: External Email. Use caution when clicking links or opening attachments. When in doubt, contact DIT or use the Phish Alert Button.

Good Morning Jenna,

I wanted to check in on the 401 Certification for the Potentia-Viridi Battery Energy Storage System project (WDID#5B01CR00050). Our office received a NOCA on July 10th, 2025, with a categorical RPOT of 180 days expiring on January 6th, 2026. In recent correspondence, the applicant indicated that they are anticipating a decision around May 2026.

Please let me know if you have requested an extension, and if so, the duration of that extension. From a procedural standpoint, I will need to send a 401-waiver notification within 7 days of a waiver decision in accordance with the current 401 MOU if no extension was requested within the categorical RPOT.

Thank you for your assistance, and my apologies for the short response suspense.

Respectfully sent,

Matthew Di Loreto
Regulatory Project Manager, CA Delta Section
Regulatory Division, Sacramento District
U.S. Army Corps of Engineers
Office: (916) 557-7882
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matthew.j.diloreto@usace.army.mil
* Our customer service hours are 9am to 3pm Monday through Friday.
* Visit our website at www.spk.usace.army.mil/Missions/Regulatory.aspx for more info and to sign up for public notices.
* If requested, please provide all information indicated in an information request within 30 days to avoid unnecessary delays in processing a request for a Regulatory Division product.

Appointment

From: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]
Sent: 3/18/2026 4:46:08 PM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Crisp, Ann@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b89c4de7ece742679d19e1e3ee713dc2-Crisp, Ann@]; Field @EnergyVeterans.org [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=028b79d1e64c47218ca23229d1319826-3859a5b7-75]; Giorgi, Erika@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d171e5d706e34c26ad9d13c230f2349f-1324b266-6e]; Borkowski, Barbara@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ab8f496b4b784ff199bebeb01ec055e2-51690376-8e]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]; Single, Alex@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=67f4b571beab4b189c77463bdbcdc018-cfdcc901-02]
CC: Knight, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=be42548337f44852a291a9845f226f62-Knight, Eri]; Sinclair, Crystal@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=bbf6367d6e8e43139c891b332054ee8b-9ba716bc-ec]; Quillman, Gabriele@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=7969b5d45d3043fea1e3d78b9b437206-4344d983-6c]; nicola.park@clearwayenergy.com; Aarty Joshi [aarty.joshi@clearwayenergy.com]; raisa.lee@clearwayenergy.com; Robbie Hull [rhull@coxcastle.com]; Mudge, Annie E. [amudge@coxcastle.com]

Subject: Potentia-Viridi, meet with BIO team for feedback prior to applicant comment letter submission
Location: Microsoft Teams Meeting

Start: 3/25/2026 9:30:00 PM
End: 3/25/2026 10:15:00 PM
Show Time As: Busy

Required Attendees: Crisp, Ann@Energy; Julie Myrah; Giorgi, Erika@Energy; Borkowski, Barbara@Energy; Chang, Kaycee@Energy; Single, Alex@Energy
Optional Attendees: Knight, Eric@Energy; Sinclair, Crystal@Wildlife; Gabriele.Quillman@wildlife.ca.gov; Nicola Park; Aarty Joshi; raisa.lee@clearwayenergy.com; Robbie Hull; Mudge, Annie E.

Hello Potentia BIO team,

The applicant, Clearway, is requesting feedback on some of the BIO concerns they propose to highlight in their written comments. Early input via a Teams meeting would assist them in crafting their comments. I can plan to request a list of items for discussion from them prior to the meeting.

For Potentia Viridi BESS, our staff assessment comment deadline is March 27, next Friday. I realize getting something else on the schedule is difficult with Soda Mountain being the priority. Let me know if the timing is simply undoable.

Once I hear back from staff on availability I will forward the invite to the applicant, Nicola Park and her team, including legal.

Thank you.

Microsoft Teams meeting

Join:

https://teams.microsoft.com/meet/26460346204252?p=d4C86oSGesFU7EIv79

Meeting ID: 264 603 462 042 52

Passcode: kE62g4gR

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For organizers: Meeting options | Reset dial-in PIN

Potentia Viridi BIO team feedback on applicant pre-comments
Wednesday, March 25, 2026 – 2:30 pm–3:15 pm

Invitees: Kaycee Chang, Barbara Borkowski, Erika Giorgi, Ann Crisp, Eric Knight, Alex Single, Julie Myrah, Crystal Sinclair, Gabriele Quillman, Nicola Park, Aarty Joshi, Raisa Lee, Robbie Hull, Annie Mudge

Meeting Objectives: The applicant is requesting feedback from the CEC staff team prior to filing the comment letter on the staff assessment. The deadline for written comments is Friday, March 27.

A. Applicant Pre-Staff Assessment Letter filing discussion points, Biological Resources. Please note the items are arranged in priority order, the first six being those that the applicant has elevated for discussion , if time constraints are limiting. Underline and strikethrough indicate proposed language revisions.

1. **BIO-26** Habitat Management Land Acquisition for Crotch's Bumble Bee, Western Burrowing Owl, California Tiger Salamander and San Joaquin Kit Fox - revised to align compensatory mitigation requirements with the EACCS. As discussed in application materials and in accordance with mitigation ratios in the EACCS, compensatory mitigation of 182.1 acres is proposed. The mitigation requirements of the EACCS that have been applied to the Project exceed those typically imposed for these species, especially considering the low likelihood of occurrence for San Joaquin kit fox in this region, and that no burrowing owls or Crotch's bumble bee were detected within the Project footprint. Approximately 6.7 acres of lands would be temporarily disturbed; however, because this land would be restored and revegetated, and returned to pre-construction condition following construction, full recovery of ecological function is anticipated. Due to the relatively short period of disturbance and the higher permanent impact mitigation requirements set by the EACCS, CDFW's fully mitigated standard has been met and the Project requests that mitigation requirements align what is being required by USFWS in the Biological Opinion for the Project. Additional edits remove unnecessary specificity that may conflict with requirements of the ITP and associated mitigation for all Covered Species. The mitigation lands for the project have already been identified, as included in the application. In lieu of security amounts as estimated by CDFW, propose the security amount be set at the full value of the mitigation lands purchase agreement, which includes the long-term management plan for the lands.

BIO-26 Proposed Revisions:

The project owner shall either 1) purchase 182.1 acres of Covered Species credits from a CDFW-approved mitigation or conservation bank pursuant to Item 2 below within the East Alameda County Conservation Strategy (EACCS) CTS North mitigation area (Chapter 3, Figure 3-10, dated October 2010), 2) shall provide for the permanent protection and management of 182.1acres of Habitat Management (HM) lands for Covered Species pursuant to Item 3 below and the calculation and deposit of the management funds pursuant to Item 5 below, or 3) shall complete mitigation obligations for 182.1 acres of covered species habitat using a combination of purchasing covered species credits and providing for the permanent protection and management of habitat.

Purchase of Covered Species credits at a CDFW-approved conservation bank or permanent protection and funding for perpetual management of HM lands must be complete prior to initiation of Covered Activities, or within 18 months of the effective date of this certification. If Security is provided pursuant to Item 12 below for all uncompleted obligations, such Security shall be secured prior to initiation of Covered Activities, and if project owner is unable to purchase credits or provide permanent protection and funding for perpetual management of HM lands within the allowed timeframe, an Amendment to this certification may be required.

12.a. Security Amount. The Security shall be in the amount of $5,256,850.00 or in the amount identified in Item 1 (Cost Estimates) specific to the obligation that has not been completed. This amount is determined by the CPM and is based on cost estimates identified in Item 1 above, sufficient for the CEC or its contractors to complete land acquisition, property enhancement, startup costs, initial management, long-term management, and monitoring. In lieu of cost estimate provided in item 1 above, Applicant may provide a cost estimate based on a Purchase and Sale Agreement for mitigation land that covers land acquisition costs, start-up costs, interim management costs, long term management funding, restoration costs and any costs associated with fee title, recordation and other similar administrative costs.

2. **BIO-1** Designated Biologist Selection - specifying that an individual who has previously served as a Designated Biologist (DB) or has implemented any CDFW Incidental Take Permit (ITP) would meet the requirement. Limiting eligibility only

to individuals who have served as a DB specifically for Crotch's bumble bee or burrowing owl—or who have implemented an ITP for those species—would be overly restrictive and potentially infeasible, given the very small number of ITPs issued for these species to date and could significantly impact the ability to start construction on-time.

BIO-1 Proposed Revisions:

3. Demonstrable experience implementing conditions of a CDFW Incidental Take Permit or acting as a DB for any species, or other experience implementing a CDFW Incidental Take Permit as a Biological Monitor.

3. **BIO-2** Designated Biologist Duties - DB's reporting responsibilities for the Conditions of Approval (COCs) are limited to biological resources. The DB is not responsible for implementing or reporting on non-biological COCs, ensuring their duties remain aligned with their technical expertise. Subparagraph #6 is also proposed for revision to clarify that notification should not be required for species for which petitions for listing have been submitted but only for species that have achieved candidate status. Being petitioned for candidate status which requires no discretionary agency action and does not convey any protections for the species.

BIO-2 Proposed Revisions:

The Designated Biologist Duties shall include the following:

2. Ensure that all biological resource conditions of certification are met and that all reporting standards for each biological resource COC are completed and submitted to the CPM and any other regulatory agencies in compliance with specified timelines;

6. Notify the CPM and CDFW of any observation of an unanticipated sensitive biological resource(s) encountered during all phases of the project. Unanticipated resources include sensitive species not addressed in the environmental document because of a perceived low potential to occur, species that are known to occur but have become candidates for state listing as threatened or endangered, or proposed for federal listing as threatened or endangered or state or federal listing after the approval

of the project, and common species whose range is unexpected in the project area. Notifications shall occur immediately and no later than the following morning, or Monday morning in the case of a weekend, or the next business day in the case of a state or federal holiday. The initial notification shall be followed by a formal written notification submitted to the CPM and CDFW within 48 hours of the observation;

4. **BIO-3** Biological Monitor Selection - Revisions to BIO-3 Biological Monitor Selection are recommended to expedite selection of biological monitors. Establishing this timeline is essential, as the absence of a defined response period could delay or hinder project construction.

BIO-3 Proposed Revisions:

The project owner's CPM-approved DB shall submit the resume, at least three references, and contact information of the proposed Biological Monitor(s) to the CPM for approval and CDFW for review and comment. If CDFW doesn't respond in 30 days, the Biological Monitor(s) can be approved by the CPM without further consultation with CDFW and CPM's determination shall occur no later than 45 days after submission of the resume. The resume shall demonstrate, to the satisfaction of the CPM, the appropriate education and experience to accomplish the assigned biological resource tasks.

5. **BIO-9** Special-Status Plant Avoidance Measures - to provide clearer documentation of the protocol level survey results from 2023 and 2024. These surveys identified one special status species—big tarplant—which will serve as the primary focus for detection and avoidance efforts within the primary project area. Since repeated protocol-level botanical surveys were conducted in 2023 and 2024, it is unnecessary to conduct repetitive annual surveys when special-status plants have already been identified and mapped on the site. Furthermore, additional floristic surveys are proposed for those areas that were not covered in the 2023 and 2024 surveys. In the *Compensatory Mitigation* section, the description of compensation lands for occupied habitat is recommended for revision to remove duplicative references to CRPR 1- or 2 ranked species and to incorporate the correct mitigation ratio for the affected resources. This revision provides clearer guidance on the appropriate level of compensatory mitigation required. We also recommend revisions to the *Monitoring* section of this COC to

clarify that the annual report prepared for salvaged plants may be combined with the annual restoration monitoring report. This revision streamlines reporting requirements while maintaining consistency in documentation.

BIO-9 Proposed Revisions:

The DB and/or Biological Monitor(s) shall conduct focused floristic pre-construction surveys for special status plants big tarplant (*Blepharizonia plumosa* ssp. *plumosa*) prior to the start of ground or vegetation disturbing project activities, including site mobilization or construction. Surveys shall be conducted with the appropriate protocols approved by the CPM during the appropriate season in all suitable habitat within the project disturbance areas and access roads and within 100 feet of disturbance areas, where accessible. Surveys shall be conducted by qualified botanists or biologists approved by the CPM, pursuant to BIO-1 and/or BIO-3. Other rare plants observed during the focused surveys shall be documented and reported to the CPM. For areas directly disturbed during the construction of the generation tie-line that were not surveyed in 2023 and 2024, floristic protocol surveys shall be conducted consistent with current CDFW botanical field survey protocol (CDFW 2018) or more recent updates and are required for areas that have not previously been surveyed by the project owner to date. The field surveys and reporting shall be consistent with current CDFW botanical field survey protocol (CDFW 2018) or more recent updates. With respect to areas potentially directly disturbed during the construction of the generation tie-line, protocol surveys shall be consistent with current CDFW botanical field survey protocol (CDFW 2018) and are required for areas that have not previously been surveyed by the project owner to date. The survey plan shall identify proposed survey areas and the rationale for any areas not proposed for surveys. The survey plan shall include maps, at an approved scale, clearly defining each proposed survey area. Surveys shall be conducted by qualified botanists or biologists approved by the CPM, pursuant to BIO-1 and/or BIO-3.

During either the focused survey of the full project area or the floristic protocol-level survey of the generation-tie area, any special-status plant species (including state and federally listed threatened or endangered species, candidates for listing, and all CRPR 1A, 1B, 2, 3, and 4 ranked species) detected shall be documented in the pre-construction survey reports. The results shall be submitted to CPM for review and approval, as well as CDFW and USFWS (should federally listed plants be discovered). The reports shall describe any conditions that may have prevented target species from being located or identified, even if they are present as dormant seeds or below-ground root stock (e.g., poor rainfall, disturbance, or wildfire). In some cases following detection of previously unknown locations of special-status plants, follow-up surveys may be

necessary to adequately evaluate impacts. Pre-construction field survey reports shall include maps, at an approved scale, showing locations of survey areas, reference populations, and special-status plants.

8. Monitoring. Annual monitoring and documentation of salvaged plants shall include, but not be limited to, details of plants salvaged, stored, and transplanted (salvage and transplanting locations, species, number, size, condition, etc.); adaptive management efforts implemented (date, location, type of treatment, results, etc.); and evaluation of success of transplantation. Transplanted species may not be placed in areas subject to future land disturbance and must be protected by a conservation easement that prohibits disturbance and ensures conservation of the site in perpetuity. Conservation lands would be acquired consistent with the specifications identified above under Section b. Title /Conveyance. Annual monitoring shall occur for a minimum of three years post-relocation to ensure the plants become established and are not at risk from weeds or other impacts, unless approved by the CPM. The results of annual monitoring shall be reported in an Annual Monitoring Report specific to salvage of propagated plants for a minimum of three years of annual reports. This annual monitoring report can be combined with the annual report for project restoration. Additional monitoring may be necessary if determined upon review of the annual reports by the CPM that the success criteria are not met. Success criteria shall include maintaining habitat occupied by the impacted species at the identified ratios and number of plants for any occupied habitat affected by the project.

6. **BIO-10** Crotch's Bumble Bee Measures for Take - based on the lack of species found during focused CBB habitat assessments in 2023 and 2024 and the absence of CNDDB records for the species within 5 miles of the Project. The Project does assume potential presence of the species due to the suitable foraging floral resources detected during the habitat assessment. Language has been clarified throughout the COC that routine mowing is not considered "vegetation removal" for the purposes of survey triggers during operations unless the CPM determines otherwise. The problematic sentence in the "Pre Construction Survey and Observation Submittal" section should be replaced with a complete, coherent description of the submittal requirements: namely, that the project owner shall submit the Item 3 (Colony Active Period) or Item 2 (Overwintering Season) survey results to the CPM no more than 10 days prior to

initiating or resuming project activities in each work area, unless an alternative is approved. Additionally, the Overwintering Site Buffer needs a clear mechanism for removal once the biological risk has passed, stating that the 50-foot buffer may be lifted upon CPM approval when the DB confirms the overwintering individual has departed or the hibernaculum is no longer occupied, or if a nest has been appropriately relocated.

BIO-10 Proposed Revisions

Overwintering Season Surveys (Pre-Construction and During Operation). If initial ground disturbing construction activities in any given work area occurs during the overwintering season (November 1 through January 31), the CPM approved DBs(s) and/or Biological Monitor(s) shall conduct overwintering season surveys described below within areas of suitable habitat (i.e., where suitable vegetation and floral resources occur) in each area planned for project activities no more than 10 days in advance of vegetation removal (exclusive of mowing) or ground disturbance in that area of the project site. If ground disturbing activities during operation occur within areas of suitable habitat ~~(i.e., where vegetation and floral resources occur)~~ during the overwintering season, the CPM-approved DB(s) shall conduct overwintering season surveys described below throughout the project site in areas planned for ground disturbance no more than 10 days in advance of ground or vegetation removal activities (exclusive of mowing), unless approved by the CPM.

If ground disturbing activities (exclusive of vegetation management) occur during operation within areas of suitable habitat during the colony active period, the CPM-approved DB(s) and/or Biological Monitor(s) shall search for Crotch's bumble bee throughout the areas planned for ground disturbance in accordance with the Crotch's Bumble Bee Mortality Reduction and Relocation Plan.

Pre-Construction Survey and Observation Submittal (Construction and Operation). The project owner shall provide the Colony Active Period Season- Pre-Construction Survey (Item 3) results or Overwintering Survey Results to the CPM no more than ten days prior to initiating ~~project activities in each work area~~ or resuming (Item 2), if initial disturbance not complete, project activities in each work area, unless alternate timing is approved by the CPM. The CPM-approved DB(s) and/or Biological Monitor(s) shall notify the CPM if an overwintering individual and/or nest is observed within 100 feet of the project site during site mobilization, construction, or operation. Pre-construction surveys and observational submittals shall include a Keyhole Markup Language (KML) map, or KML-Zipped (KMZ) map, and Geographic Information System (GIS) shapefiles of all Crotch's bumble bee detections and/or nests found during survey efforts or during

any incidental observations, and photographs of the individual or nest. The map shall include an outline of the project site, and any distinct work area(s) surveyed within the project site, title, north arrow, scale bar, and legend.

Overwintering Site Buffer (Construction and Operation). If any overwintering Crotch's bumble bee are found during focused overwintering surveys, during ground and/or vegetation disturbing activities (exclusive of mowing), including site mobilization or construction activities, or during operation of the project, the project owner, in consultation with the CPM approved DB(s) and/or Biological Monitor(s) shall immediately stop and prohibit all ground disturbing activities within 50 feet of the queen and/or hibernaculum. The project owner shall delineate the 50-foot buffer and notify all workers not to enter the environmentally sensitive area. This buffer may be adjusted with the approval of the CPM based on project activities and potential to disturb the nest. Buffers shall remain in place until the nest has senesced, project activities are complete, or the nest has been relocated in accordance with the Crotch's Bumble Bee Mortality Reduction and Relocation Plan. This buffer may be adjusted with the approval of the CPM based on project activities and potential to disturb the nest.

OTHERS:

BIO-18 Burrowing Owl Impact Avoidance, Minimization, and Mitigation Measures for Take

Subparagraph #1 is recommended for revision to remove mention of artificial burrow construction. The Burrowing Owl Burrow Replacement Plan requires the creation of artificial burrows, which is double mitigation, as the project is already applying for a take permit and securing offsite mitigation. Further, eight protocol-level survey passes for burrowing owl in 2024 and 2025 did not detect any existing populations on site or in the immediate vicinity.

Subparagraph #2 Burrowing Owl Burrow Replacement Plan is recommended for revision to remove for similar reasoning as under Bullet #1, that negative results from protocol-level surveys.

Subparagraph #6 is recommended for revision to change how "potential" burrows found during preconstruction surveys are treated if they show no sign of occupation or use by burrowing owls. This subparagraph was also revised to provide a mechanism by which the buffer assigned to a "potential" nesting burrow can be reduced if monitoring demonstrates nesting is not occurring.

Bullet #11 is recommended for revision to clarify the DB response during daytime hours versus nighttime hours, that is applies only if active burrowing owl burrows are present, and that it excludes routine mowing activities

BIO-19 Swainson's Hawk Surveys and Avoidance - revision to clarify that surveys would only happen during construction. The buffers mentioned are only focused around construction, so surveys during construction only is implied but not expressly stated.

BIO-13 Western Spadefoot - modifications are proposed to the pre-construction survey timing from 48 hours prior to one week prior to allow more chance detecting movement during rain or higher humidity events. Verification was revised to clarify the type of survey results provided within 7 days, and full reporting at 60 days.

BIO-6 Biological Resources Mitigation Implementation and Monitoring Plan - other text in the conditions requires a final accounting of impacted acreage which cannot be provided in the initial BRMIMP. "The BRMIMP shall be prepared in consultation with the DB and shall include the following: 9. In a final version of the BRMIMP, provide a final accounting of the before/after whole acreages and a determination of whether more or less habitat compensation is necessary."

BIO-7 General Impact Avoidance and Minimization Measures - to specify a 2:1 slope. The previously recommended 3:1 slope can be impractical in constrained construction areas, whereas the 2:1 slope remains both feasible and appropriate for the species present within the project site. Additionally, the reference to "(protected: impacted)" appeared to be a copy and paste error and has been corrected to read "horizontal: vertical." Subparagraph #5 has been revised to clarify that the concern is for vertical pipes and similar features that prevent animals from escaping. Entrapment issues for other types of stored materials are addressed in other species measures.

BIO-8 Vegetation Restoration and Enhancement Plan - requirements outlined in the second paragraph apply specifically to the annual monitoring reports. These requirements do not pertain to the initial six-month report described in the first paragraph. "2. Monitoring and Maintenance. The project owner is responsible for monitoring and maintaining the restored areas for a period of three years or until the Restoration Plan success criteria have been met, whichever is longer. Following the initial six-month period after restoration activities conclude, the project owner shall submit a brief monitoring report (10 pages or less, not including figures) to the CPM. This report detailing vegetation establishment, percent invasive plant cover, and other observations regarding restoration success. The annual reports shall include the following: i) monitoring results (including methods and a discussion of modifications since the previous monitoring period, if applicable); ii) evaluation of conditions relative to success criteria; iii) remedial measures identified and implemented following the previous monitoring period; and iv) overall site progress."

BIO-11 California Tiger Salamander Measures for Take - Subparagraph #1d: is proposed for revision to qualify the requirement to cover/cap stored materials. Not all materials are accessible to CTS (i.e. climbing pallets in a battery container).

Subparagraph #2c: A 3:1 slope can be impractical in constrained construction areas, whereas the 2:1 slope remains both feasible and appropriate for the species present within the project site.

Subparagraph #3 has been moved to Bullet #4 as specifications to the Relocation Plan, rather than its own item, for clarity.

Subparagraph #4 and 5 having DB as the only person who can handle CTS if found could be challenging because they may not always be onsite, and ignores the potential for other biologists with federal and state authorizations to safely and adequately handle in compliance with state and federal law.

Proposed revisions to subparagraph #7 are to clarify that the CTS exclusion fencing is intended to remain intact during construction and would not be maintained through project operation.

Subparagraph #8 is recommended for revision in regards to the DB handling requirement above and to acknowledge that 8:00 AM may not be feasible to check coverboards every day because of site conditions. Also removed the requirement to handle CTS on the outside of the fence (refugia along fence), as it places unnecessary

stress on the CTS unless they are at risk of desiccation or predation and is better left to the discretion of the biologist.

Subparagraph #12 is recommended for revision to specify daytime humidity, as daytime and overnight humidity are very different values.

Subparagraph #14 The survey is assumed to be a clearance survey, so specification was added to include the full work area and areas underneath cover of all types.

BIO-12 California Red-Legged Frog Measures for Take - subparagraph #1 is proposed for revision to reflect the fact that a protocol-level habitat assessment was conducted for this species in 2023, and additional habitat assessment is not necessary.

Revisions are proposed to subparagraph #2 to remove duplicative language within the measure regarding notification.

Subparagraph #3 is proposed for revision to allow potential for relocation by other individuals with appropriate federal and state authorizations.

Proposed revisions to subparagraph #4 are to clarify that specific stored materials which should be capped to avoid entrapment.

Proposed revisions to subparagraph #5 are to focus on the timing of work start rather than time of day.

Subparagraph #6 is recommended for revision to make the relocation measure appropriate for the species; before it appears to be appropriate for California tiger salamander but not necessarily California red-legged frog.

Subparagraph #10 is recommended for revision to clarify that a single Fence Plan could be prepared for all species; and to remove reference to installation of pitfall traps because these have a greater potential for incidental take. Also revised to add flexibility on inspection if site conditions do not allow access.

Verification was revised to clarify the type of survey results provided within 7 days, and full reporting at 60 days.

BIO-14 Western Pond Turtle - The pre-construction survey timing is proposed for modification from 48 hours prior to one week prior to allow for scheduling of appropriately qualified staff and to allow for variations in weather that may limit when it is appropriate to conduct surveys (i.e., for sunny weather). In addition, the original COC

does not include a protocol. This COC has been revised to include a protocol because this species is difficult to detect when in uplands and their nests are cryptic. Given that there is no requirement to submit methods ahead of time, there is a risk that CPM or CDFW could reject the findings and require a re-survey. Removed language referring to the BRMIMP since they appear out of place and not necessary.

Also added specification that turtles can only be moved out of harm's way as long as they are not nesting, as relocating nesting individuals could interfere with nesting behavior and reduce reproductive success. The verification has also been revised to clarify the type of reporting expected within 7 days of survey completion and to allow sufficient time to compile a complete report of survey results.

BIO-15 Coast Horned Lizard and San Joaquin Coachwhip - revision to extend the 48-hour prior survey requirement to one week to allow for scheduling of appropriately qualified staff and to allow for variations in weather that may limit when it is appropriate to conduct surveys (i.e., for sunny weather when reptiles are more likely to be detected). The verification has also been revised to clarify the type of reporting expected within 7 days of survey completion and to allow sufficient time to compile a complete report of survey results (60 days).

BIO-16 Nesting Birds and Bird Buffers - All birds with dedicated COCs (golden eagles, western burrowing owls, Swainson's hawks, white-tailed kits, and California condors) are addressed in in COC BIO-17, BIO-18, BIO-19, BIO-20, and BIO-21, respectively. This COC is proposed for revision to stipulate that their respective measures take precedence over the general NBMP because these listed or otherwise protected species have specific requirements for survey methods, buffers, and reporting and we wish to avoid any potential conflicts or confusion.

The nesting bird season is proposed for modification from January to February to accurately reflect the typical California nesting season when golden eagles are not included, and a single end time has been provided since "to September" and "until August 31" are essentially the same time.

Under subparagraph #1. Survey Requirements, eagles are proposed for removal to reflect above-changes in regards to species-specific COC.

Under subparagraph #2. Survey Schedules, survey repetition is proposed for has been removal for redundancy, as it is addressed in #3, below.

In subparagraph #3, Nest and Avian Monitoring and Surveys During Construction, the survey area is proposed to be clarified because ground-nesting birds within the project site are the primary concern during lapses in construction.

In subparagraph #4 text is proposed for revision regarding the ability to adjust a nest buffer so that it was not tied to a default NBMP buffer since that is the purpose of the adjustment.

Under subparagraph #7 nest deterrents, the content was moved under subparagraph #6, NBMP content, because it describes a requirement of the NBMP rather than anything separate.

BIO-20 White-Tailed Kite Nesting Preconstruction Surveys and Nest Protection Buffers - revision to specify the nesting season time, which is currently vague (months) compared to other species (days). Under Nest Protection Buffers, the text has been revised to at-least 0.25 miles because it was assumed to be missing text. The requirement for baseline monitoring was removed. It is an unusual requirement not included for any other species, the species may not be accessible for monitoring if they are off-site, and they are relatively tolerant of human presence compared to many other raptor species.

BIO-21 California Condor - revision to specifically exclude overflights (where California condors may fly or soar above the project site but not land or interact with any ground-based features) as this species would not be affected by ground-level activities during soaring flight.

BIO-23 American Badger Avoidance and Minimization Measures - revision to allow sufficient time to identify badger dens. The 48-hour requirement would be difficult to achieve and unnecessary, as preconstruction surveys for the American Badger are often combined with San Joaquin Kit Fox clearance surveys for more efficient use of time for qualified personnel, and burrow construction time is unlikely to differ substantially between the two species.

BIO-25 Lake and Streambed Equivalency Conditions - Subparagraph 4g is recommended for revision to insert a missing word: “located within or adjacent to the stream,”

BIO-27 Post BESS Fire Monitoring and Management Plan - revision to clarify subparagraphs # 1 through 6 to better define post-fire monitoring triggers, monitoring design elements, decontamination measures, and restoration requirements associated with the Post BESS Fire Monitoring and Management Plan (PBFMMP). The revisions also clarify geographical scope, application of toxicity thresholds, and verification timing. These updates improve clarity and enforceability while maintaining the biological resource protection intent of the condition.

B. Additional items or discussion? Questions?

Meeting ended at _____

Message

From: Lopez, Albert, CDA [albert.lopez@acgov.org]
Sent: 3/12/2026 5:49:25 PM
To: Koch, Andrea@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8024cfdec6344412812ea6c8320f29b2-Koch, Andre]
CC: Knight, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=be42548337f44852a291a9845f226f62-Knight, Eri]
Subject: RE: Potentia-Viridi Staff Assessment Public Meeting

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Hi there, I was not able to attend this meeting but provided written comments yesterday, Eric has them. Thanks for keeping the County in the loop! Albert

---

From: Koch, Andrea@Energy <Andrea.Koch@energy.ca.gov>
Sent: Thursday, February 26, 2026 3:55 PM
To: Lopez, Albert, CDA <albert.lopez@acgov.org>
Cc: Knight, Eric@Energy <Eric.Knight@energy.ca.gov>
Subject: Potentia-Viridi Staff Assessment Public Meeting

Hi Albert.

We wanted to let you know of a public meeting for Potentia-Viridi next Monday if you're interested in attending in person or virtually to provide comments. Here's the info!

Potentia-Viridi Battery Energy Storage System CEC Staff Assessment Public Meeting

Please let us know if you have any questions. Thanks!

Andrea

Andrea Koch
Environmental Planning Specialist
Land Use & Public Services Unit
Siting and Environmental Branch
Siting, Transmission and Environmental Protection Division
Phone: 1-279-226-1028
California Energy Commission
www.energy.ca.gov/

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Message

From: Knight, Eric@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=BE42548337F44852A291A9845F226F62-KNIGHT, ERI]
Sent: 3/12/2026 10:46:55 PM
To: Lopez, Albert, CDA [albert.lopez@acgov.org]; Koch, Andrea@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8024cfdec6344412812ea6c8320f29b2-Koch, Andre]
Subject: Re: Potentia-Viridi Staff Assessment Public Meeting

Hi Albert - We appreciate you taking the time to review the staff assessment and providing the County's supportive letter.

Some future milestones are:

4/24/26 - target date for filing CEC Executive Director's Recommendation, and Updated Staff Assessment (if necessary)
5/26/26 - Commission Business Meeting for decision (on whether to certify the EIR and issue a certificate to build/operate the project)

Eric Knight
Program Manager
Siting, Transmission, and Environmental Protection Division

From: Lopez, Albert, CDA <albert.lopez@acgov.org>
Sent: Thursday, March 12, 2026 10:49 AM
To: Koch, Andrea@Energy <Andrea.Koch@energy.ca.gov>
Cc: Knight, Eric@Energy <Eric.Knight@energy.ca.gov>
Subject: RE: Potentia-Viridi Staff Assessment Public Meeting

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Sent: Thursday, February 26, 2026 3:55 PM
To: Lopez, Albert, CDA <albert.lopez@acgov.org>
Cc: Knight, Eric@Energy <Eric.Knight@energy.ca.gov>
Subject: Potentia-Viridi Staff Assessment Public Meeting

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Andrea

Andrea Koch

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Phone: 1-279-226-1028
California Energy Commission
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Message

From: Lopez, Albert, CDA [albert.lopez@acgov.org]
Sent: 3/16/2026 6:47:40 PM
To: Koch, Andrea@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8024cfdec6344412812ea6c8320f29b2-Koch, Andre]
CC: Knight, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=be42548337f44852a291a9845f226f62-Knight, Eri]
Subject: RE: Potentia-Viridi Staff Assessment Public Meeting

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Great, keep us posted!

From: Koch, Andrea@Energy <Andrea.Koch@energy.ca.gov>
Sent: Thursday, March 12, 2026 5:51 PM
To: Lopez, Albert, CDA <albert.lopez@acgov.org>
Cc: Knight, Eric@Energy <Eric.Knight@energy.ca.gov>
Subject: RE: Potentia-Viridi Staff Assessment Public Meeting

Thank you very much for your detailed comment letter, Albert! We appreciate your coordination and review, and we are pleased that the County felt the Land Use section accurately captured the relevant LORS.

Take care, and thanks again!

Andrea

Andrea Koch
Environmental Planning Specialist
Siting, Transmission and Environmental Protection Division

From: Lopez, Albert, CDA <albert.lopez@acgov.org>
Sent: Thursday, March 12, 2026 10:49 AM
To: Koch, Andrea@Energy <Andrea.Koch@energy.ca.gov>
Cc: Knight, Eric@Energy <Eric.Knight@energy.ca.gov>
Subject: RE: Potentia-Viridi Staff Assessment Public Meeting

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Sent: Thursday, February 26, 2026 3:55 PM
To: Lopez, Albert, CDA <albert.lopez@acgov.org>
Cc: Knight, Eric@Energy <Eric.Knight@energy.ca.gov>
Subject: Potentia-Viridi Staff Assessment Public Meeting

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Potentia-Viridi Battery Energy Storage System CEC Staff Assessment Public Meeting

Please let us know if you have any questions. Thanks!

Andrea

Andrea Koch
Environmental Planning Specialist
Land Use & Public Services Unit
Siting and Environmental Branch
Siting, Transmission and Environmental Protection Division
Phone: 1-279-226-1028
California Energy Commission
www.energy.ca.gov/

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Appointment

From: Veerkamp, Eric@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=A16598E8714E422FB3216B7B05602C48-VEERKAMP, E]
Sent: 3/26/2026 4:21:51 PM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Brenda Blinn [Brenda.Blinn@wildlife.ca.gov]; Quillman, Gabriele@Wildlife [gabriele.quillman@wildlife.ca.gov]; Sinclair, Crystal@Wildlife [crystal.sinclair@wildlife.ca.gov]; Julie Myrah [field@energyveterans.org]; Crisp, Ann@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b89c4de7ece742679d19e1e3ee713dc2-Crisp, Ann@]; Grefsrud, Marcia@Wildlife [marcia.grefsrud@wildlife.ca.gov]; Giorgi, Erika@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d171e5d706e34c26ad9d13c230f2349f-1324b266-6e]; Borkowski, Barbara@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ab8f496b4b784ff199bebeb01ec055e2-51690376-8e]; Nicola Park [nicola.park@clearwayenergy.com]; Aarty Joshi [aarty.joshi@clearwayenergy.com]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]
CC: Knight, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=be42548337f44852a291a9845f226f62-Knight, Eri]; Vorters, Dian@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2c5604e712a74c029e412542e0db72ac-Vorters, Di]; Germinario, Lena@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cb69a208a7b4ce4acd54c35b7d7c8b9-962051a8-59]

Subject: Potentia, Clearway (applicant) comment letter, review BIO comments, NEW DATE AND TIME
Location: Microsoft Teams Meeting

Start: 4/14/2026 8:00:00 PM
End: 4/14/2026 9:30:00 PM
Show Time As: Busy

Required Attendees: Veerkamp, Eric@Energy; Brenda Blinn; Quillman, Gabriele@Wildlife; Sinclair, Crystal@Wildlife; Julie Myrah; Crisp, Ann@Energy; Grefsrud, Marcia@Wildlife; Giorgi, Erika@Energy; Borkowski, Barbara@Energy; Nicola Park; Aarty Joshi; Chang, Kaycee@Energy
Optional Attendees: Knight, Eric@Energy; Vorters, Dian@Energy; Germinario, Lena@Wildlife

To accommodate staff schedules, this meeting is being pushed to a later date.

Good Morning all,

The Clearway team has requested a meeting to go over the BIO comments contained in their forthcoming comment letter on Potentia. The comment deadline for Potentia-Viridi is tomorrow, Friday, March 27.

I would like to leave this open to staff's discretion to make a final decision to meet once they have an opportunity to review/digest the Clearway comment letter.

Thank you so much.

Microsoft Teams meeting

Join:

https://teams.microsoft.com/meet/27816314646286?p=gVy6B1vCGmeaGNTsJW

Meeting ID: 278 163 146 462 86

Passcode: Ky7DL24W

Need help? | System reference

Dial in by phone

+1 916-562-1816,,155890572# United States, Sacramento

Find a local number

Phone conference ID: 155 890 572#

For organizers: Meeting options | Reset dial-in PIN

Message

From: Sierra, Jessica@Wildlife [Jessica.Sierra@Wildlife.ca.gov]
Sent: 3/25/2026 10:36:13 PM
To: Crisp, Ann@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b89c4de7ece742679d19e1e3ee713dc2-Crisp, Ann@]
CC: state.clearinghouse@lci.ca.gov; Quillman, Gabriele@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=7969b5d45d3043fea1e3d78b9b437206-4344d983-6c]; Blinn, Brenda@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=35d13e8c62424b8a96837fec8ad35259-1dc2fa29-35]; Farinha, Melissa@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=09ffe255ea8d4d67a752d0a91f7744d2-28787b2d-9b]
Subject: Potentia-Viridi Battery Energy Storage System Project-SCH2025090227
Attachments: Potentia-Viridi Battery Energy Storage System Project-SCH2025090227-Crisp-QUILLMAN03252026.pdf

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Good afternoon,

Please see the attached letter for your records. If you have any questions, contact Gabriele Quillman, cc'd above.

Thank you,

Jessica Sierra
Analyst I/ Administrative Support Analyst
California Department of Fish and Wildlife – Bay Delta Region

2109 Arch Airport Rd., Stockton, CA 95206
209-616-6011
jessica.sierra@wildlife.ca.gov

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STATE OF CALIFORNIA
DEPARTMENT OF FISH AND WILDLIFE

GAVIN NEWSOM, Governor
MEGHAN HERTEL, Director

Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534
wildlife.ca.gov

March 25, 2026

Ann Crisp, Project Manager
California Energy Commission
715 P Street, MS 40
Sacramento, CA 95814
Ann.Crisp@energy.ca.gov

Subject: Potentia-Viridi Battery Energy Storage System Project, Notice of Preparation of a Draft Environmental Impact Report, SCH No. 2025090227, Alameda County

Dear Ann Crisp:

The California Department of Fish and Wildlife (CDFW) received a Notice of Availability of a Draft Environmental Impact Report (EIR) from the California Energy Commission (CEC) for the Potentia-Viridi Battery Energy Storage System Project (Project) pursuant to the California Environmental Quality Act (CEQA) and CEQA Guidelines.[1] CDFW previously submitted comments to the CEC in a letter dated October 6, 2025 in response to the Notice of Preparation of the draft EIR.

CDFW is taking this opportunity to provide comments and recommendations regarding proposed Project activities that may affect fish and wildlife resources.

CDFW ROLE

CDFW is California's **Trustee Agency** for fish and wildlife resources and holds those resources in trust by statute for all the people of the state. (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; CEQA Guidelines § 15386, subd. (a).) CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. (*Id.*, § 1802.) Similarly, for purposes of CEQA, CDFW is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

[1] CEQA is codified in the California Public Resources Code in section 21000 et seq. The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

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The proposed Project would ordinarily require one or more discretionary approvals by CDFW because it may result in substantial adverse impacts to fish and wildlife resources such as Lake and Streambed Alteration (LSA) (Fish & G. Code, § 1602); and incidental take of species protected under the California Endangered Species Act (CESA). (*Id*., § 2081, subds. (b)-(c).) CDFW would typically submit comments as a **Responsible Agency** under CEQA. (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381.) However, because the Project proponent opted into the Assembly Bill (AB) 205 certification process, the CEC has exclusive jurisdiction over the proposed Project and is responsible for ensuring any certification of the proposed Project includes all conditions necessary to ensure compliance with the Fish and Game Code and its implementing regulations found in Title 14 of the California Code of Regulations. (Pub. Resources Code, §§ 25545.1, subd. (b), & 25545.5, subd. (a).) Thus, CDFW does not have a direct permitting role in the process that would ordinarily trigger a Responsible Agency role. CDFW instead submits these comments as a Trustee Agency under CEQA.

Pursuant to AB 205, the CEC and CDFW developed a coordination plan through a Memorandum of Understanding (MOU) to ensure that all potential impacts to fish, wildlife, and plant resources, and the habitats upon which they depend, including, but not limited to incidental take of species protected under CESA, are consistent with the Fish and Game Code and its implementing regulations found in Title 14 of the California Code of Regulations. (Pub. Resources Code, § 25545.5, subd. (a).) The MOU also ensures timely and effective consultation between the CEC and CDFW with respect to any proposed CEC findings and actions regarding potential impacts to fish, wildlife, and plant resources. (*Ibid*.) CDFW is thus also submitting these comments in its **consultation role** under AB 205 and the MOU.

PROJECT DESCRIPTION AND LOCATION SUMMARY

Proponent: Levy Alameda, LLC, a wholly owned subsidiary of Obra Maestra Renewables, LLC

Objective: The Project proposes to construct a 400-megawatt (MW) Battery Energy Storage System (BESS) facility on approximately 102 acres of mostly annual grasslands. Primary components of the proposed BESS facility include an Operations and Maintenance (O&M) building, a project substation, a 500-kilovolt overhead intertie transmission (gen-tie) line, and interconnection facilities within the Pacific Gas and Electric Company (PG&E) owned and operated Tesla Substation. The BESS would have an energy storage capacity of up to 3,200 MW-hours.

Location: The proposed Project is located at 17257 Patterson Pass Road, approximately 2.5 miles southwest of the City of Tracy in Alameda County; southwest of Interstate 580 and Interstate 205, within Assessor's Parcel Number (APN) 99B-7890-002-04; latitude 37.711434, longitude -121.573156. The Project's gen-tie line would run approximately 2,500 feet, extending southeast from the Project substation, crossing Patterson Pass Road, and then

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proceeding east to the Point of Interconnection at the Tesla Substation, approximately 500 feet east of the Project site. The gen-tie would be located on APNs 99B-7890-2-4, 99B-7890-2-6 and 99B-7885-12.

Timeframe: The Project is anticipated to be built over an approximately 15 to 18-month period from late 2026 through 2028.

Consultation with CDFW: CDFW appreciates the opportunity to have engaged with CEC staff and/or the Project proponent in numerous meetings, phone calls and other communications for the Project, including a pre-filing meeting on March 22, 2024, and meetings following CEC's notice to CDFW of receipt of the Opt-in Application on August 8, 2024. CDFW and CEC met frequently to discuss the Project's data requests until the application was deemed complete by the CEC on August 29, 2025. CDFW also participated in the public informational and scoping meeting on September 18, 2025 and the public meeting on the Staff Assessment for the proposed Project on March 2, 2026. CDFW provided recommended avoidance, minimization, and mitigation measures to the CEC for preparation of the draft EIR in October 2025 and provided a comment letter on the Notice of Preparation for the draft EIR on October 6, 2025. CDFW will continue to collaborate with, and provide support to, the CEC throughout the AB 205 certification process.

COMMENTS AND RECOMMENDATIONS

CDFW offers the comments and recommendations below to assist the CEC in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct and indirect impacts on fish and wildlife (biological) resources. Editorial comments or other suggestions may also be included to improve the document.

COMMENT 1: Proposed Mitigation Ratios for Animal Species Protected under the California Endangered Species Act

The draft EIR states that the proposed mitigation ratio for 60.7 acres of permanent impacts and 6.7 acres of temporary impacts to habitat for Crotch's bumble bee (*Bombus crotchii*), California tiger salamander (*Ambystoma californiense*), western burrowing owl (*Athene cunicularia hypugaea*), and San Joaquin kit fox (*Vulpes macrotis mutica*) is 3:1 (pages 5.2-73, 5.2-79, 5.2-101 and 5.2-105, respectively and Condition of Certification [COC] BIO-26. However, the draft EIR also states that the Project will offset the total permanent impacts and temporary impacts to habitat for Crotch's bumble bee, western burrowing owl and San Joaquin kit fox by mitigating with a total of 188.8 acres of mitigation lands (or equivalent mitigation bank credits). For California tiger salamander, the draft EIR indicates that the 6.7 acres of temporary impacts would be restored but does not include compensatory mitigation for those impacts.

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Please clarify in the EIR the specific calculations for determining the 188.8 acres of compensatory mitigation for both the permanent and temporary impacts. For example, 188.8 acres of mitigation could result from a 3:1 mitigation ratio for 60.7 acres of permanent impacts and a 1:1 ratio for 6.7 acres of temporary impacts.

COMMENT 2: Proposed Compensatory Mitigation for Impacts to Wetland, Riparian, and Streambed Habitat

Pages 5.2-119 and 5.2-120 of the draft EIR state that the Project will mitigate for impacts to wetland, riparian, and streambed habitat with compensatory mitigation including 0.12 acre for impacts identified in consultation with the Central Valley Regional Water Quality Control Board, 2.80 acres for impacts identified in an Army Corps of Engineers Nationwide Permit application, and 2,100 square feet for impacts to ephemeral streambed identified in consultation with CDFW. However, the draft EIR does not clarify whether mitigation for impacts to these habitat types overlap and whether this mitigation is required in addition to compensatory mitigation required for permanent and temporary impacts to habitat for special-status animal species. On page 5.2-120, the draft EIR states that "[m]itigation shall include permanent protection of habitat through placement of a conservation easement and funding of an endowment for long-term management of the mitigation site as outlined in COC BIO-26". The draft EIR also states that COC BIO-26 "would offset the permanent loss of and degradation to jurisdictional waters, including riparian habitat, by mitigating at a 3:1 ratio". However, COC BIO-26 specifies a mitigation land area of 188.8 acres, which corresponds to the amount proposed to mitigate for impacts to animal species protected under CESA as discussed in Comment 1 above.

CDFW typically does not accept compensatory mitigation that uses the same area to mitigate for different permits (i.e., for LSA and CESA Incidental Take Permits), unless the mitigation is addressing the same project impacts and the proposed compensatory mitigation lands have sufficient habitat values and protections to meet both CESA and LSA mitigation standards.

CDFW recommends that the EIR include a detailed description of impact amounts (both permanent and temporary) to stream and wetland habitat and required compensatory mitigation for each type of habitat impact. The EIR should also clearly describe any overlapping mitigation areas, explain how any overlapping mitigation areas will meet applicable CESA, LSA, and CEQA mitigation requirements, and describe the total combined area of compensatory mitigation land proposed to offset these impacts.

The draft EIR states on page 5.2-115 that no riparian habitat is present on-site but also states that COC BIO-26 would "offset the permanent loss of and degradation to jurisdictional waters, including riparian habitat". Please clarify whether the Project area supports riparian habitat and avoid conflicting information in the EIR. If riparian habitat is present, please describe the specific impacts to that habitat type and related mitigation.

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Page 5.2-120 states that impacts to 2,100 square feet of stream habitat resulting from placement of rip rap at the outfall structure and installation of the low water crossing will be mitigated at a 1:1 ratio. Please note that CDFW evaluates mitigation necessary to meet LSA requirements on a project by project basis and may require a higher ratio than 1:1 (for example, a 2:1 or 3:1 ratio) for streambed and other habitat impacts such as wetlands in LSA Agreements in order to account for project-specific factors such as temporal loss of habitat, distance between impact areas and mitigation areas, and indirect impacts. However, a 1:1 mitigation ratio may be considered on a project by project basis if the proposed mitigation is significantly ecologically superior to the impacted habitat. CDFW recommends that the EIR provide a detailed justification for a 1:1 mitigation ratio for sensitive habitat types such as streambed and wetlands or consider a higher mitigation ratio such as 3:1 similar to the required mitigation in the draft EIR for riparian habitat if appropriate based on project-specific factors including, but not limited to, temporal loss of habitat and habitat value of the proposed mitigation compared to the habitat being impacted.

COMMENT 3: Special-Status Plant Avoidance Measures

COC BIO-9.2 (page 5.2-153) states that, if avoidance of special-status plants is not feasible, the Project proponent will provide compensatory mitigation at a ratio of 3:1 for "any state or federally listed plants and CRPR [California Rare Plant Rank] 1 or 2 ranked species" or 2:1 for "CRPR 1 or 2 ranked species". However, the draft EIR does not clarify which mitigation ratio will apply to a plant that is not state or federally listed but is a CRPR 1 or 2 ranked species would fall into. CDFW recommends revising COC BIO-9.2 to clarify the mitigation ratio that will apply to CRPR 1 and 2 ranked species that are not state or federally listed.

The draft EIR does not state that the Project proponent is requesting take authorization for any state-listed plant species as part of the AB 205 certification process. If the Project proponent is not seeking take coverage for any plant species as part of the AB 205 certification process, the Project may not legally take any state-listed plant species unless later take authorization is obtained through amendment to the certification or take is otherwise authorized under the Fish and Game Code. However, COCs BIO-9.2 through BIO-9.9 describe compensatory mitigation measures that will be taken should a state-listed plant species be found on the Project site and avoidance of the plant species is not feasible. CDFW recommends that COC BIO-9.2 clarify that the Project proponent will demonstrate compliance with CESA, either by completely avoiding take or by obtaining incidental take authorization, in the event a state-listed plant species is found on or near the Project site.

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COMMENT 4: Golden Eagle

On page 5.2-97, the draft EIR discusses potential direct impacts to golden eagle (*Aquila chrysaetos*), including loss of foraging habitat and disturbance of nesting, and states that COCs BIO-1 through BIO-7 and BIO-17 would avoid or reduce impacts to golden eagle. The draft EIR also mentions on page 5.2-99 that Project activities during operations could affect nesting golden eagle. BIO-17 appears to require full avoidance of golden eagle nests, but it is not stated explicitly that this is the case.

CDFW recommends that COC BIO-17 explicitly state that take of golden eagle and their nests must be fully avoided. CDFW also recommends that COC BIO-17 include language clarifying whether nesting surveys and buffers will be implemented and maintained during operations, and if not, how disturbance of nesting golden eagle will be avoided.

In addition, MM BIO-11 requires pre-construction surveys within 30 days prior to the start of ground disturbance and coordination with the U.S. Fish and Wildlife Service on a mitigation plan if the species or active nests are found within a 1-mile radius of the Project site. Because golden eagle is a fully protected species (Fish & G. Code § 3511(b)(5)), CDFW recommends that MM BIO-11 also require consultation with CDFW and full avoidance of take.

COMMENT 5: Project Conformance with Applicable Laws, Ordinances, Regulations, and Standards

Table 5.2-8: Conformance With Applicable Laws, Ordinances, Regulations, and Standards (LORS) includes CEC's determination regarding the Project's compliance with CESA in the section for compliance with the Federal Endangered Species Act (16 USC §§ 1531 et seq. and 50 CFR part 17.1 et seq.). CDFW recommends correcting this error in the EIR.

ENVIRONMENTAL DATA

CEQA requires that information developed in environmental impact reports and negative declarations be incorporated into a database which may be used to make subsequent or supplemental environmental determinations. (Pub. Resources Code, § 21003, subd. (e).) Accordingly, please report any special-status species and natural communities detected during Project surveys to the California Natural Diversity Database (CNDDB). The CNDDB field survey form can be filled out and submitted online at the following link: https://wildlife.ca.gov/Data/CNDDB/Submitting-Data. The types of information reported to CNDDB can be found at the following link: https://www.wildlife.ca.gov/Data/CNDDB/Plants-and-Animals.

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ENVIRONMENTAL DOCUMENT FILING FEES

The Project, as proposed, would have an impact on fish and/or wildlife, and assessment of environmental document filing fees is necessary. Fees are payable upon filing of the Notice of Determination by the Lead Agency and serve to help defray the cost of environmental review by CDFW. Payment of the environmental document filing fee is required in order for the underlying project approval to be operative, vested, and final. (Cal. Code Regs, tit. 14, § 753.5; Fish & G. Code, § 711.4; Pub. Resources Code, § 21089.)

CONCLUSION

CDFW appreciates the opportunity to comment on the draft EIR to assist the CEC in identifying, analyzing, and mitigating Project impacts on biological resources.

If you have any questions regarding this letter, please contact Gabriele Quillman, Senior Environmental Scientist (Specialist), at (707) 815-9867 or Gabriele.Quillman@wildlife.ca.gov; or Brenda Blinn, Senior Environmental Scientist (Supervisory) at (707) 339-0334 or Brenda.Blinn@wildlife.ca.gov.

Sincerely,

DocuSigned by:
Erin Chappell
B77E9A6211EF486...

Erin Chappell
Regional Manager
Bay Delta Region

ec: Office of Land Use and Climate Innovation (SCH No. 2025090227)
Melissa Farinha, CDFW Bay Delta Region – Melissa.Farinha@wildlife.ca.gov

Message

From: Lopez, Albert, CDA [Albert.Lopez@acgov.org]
Sent: 3/12/2026 2:53:23 AM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Energy - Docket Optical System [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e924f373b3334346968cd56f6914ac02-Energy - Do]
Subject: Comment letter on Staff Assessment - docket number 24-OPT-04 and Potentia-Viridi Battery Energy Storage System
Attachments: Comment on Staff Assessment for Potentia Viridi BESS project .pdf

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Hi Eric, I tried to use the State portal for submitting docs but kept getting an error message, so I'm attaching the County's letter here. Thank you for forwarding this to the appropriate staffers.

Albert V. Lopez (He/Him) | Planning Director
ALAMEDA COUNTY | Community Development Agency
Planning Department
224 W. Winton Avenue, Room 111 • Hayward, CA 94544
Office 510-670-5426 | Fax 510-785-8793
albert.lopez@acgov.org | www.acgov.org/cda

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ALAMEDA COUNTY COMMUNITY DEVELOPMENT AGENCY
PLANNING DEPARTMENT

Sandra Rivera
Agency Director

Albert Lopez
Planning Director

224 West Winton Ave
Room 111

Hayward, California
94544-1215

phone
510.670.5400
fax
510.785-8793

www.acgov.org/cda

March 11, 2026

California Energy Commission

Project#: **24-OPT-04 / Potentia-Viridi Battery Energy Storage System**

Via email and e-filing

The following comments are submitted in response to the Staff Assessment for the above listed project located in unincorporated Alameda County. The local Planning Department has been following the application process for the past several months and most recently reviewed the staff assessment prepared pursuant to CEQA.

Local Planning staff appreciates the opportunity to provide comments on the Draft EIR, specifically the section related to Land Use and impacts to local ordinances regulations and standards (LORS). Local staff believes the CEC staff has accurately portrayed the project in light of current LORS affecting the project. Like many jurisdictions, a BESS project is a new land use type that does not have a long project review history like other alternative energy systems. That said, the County has adopted policies for BESS that anticipates more interest in this land use type, and that the unincorporated East (and rural) County is geographically located attractive to new BESS developments.

Specific to the **Potentia-Viridi** project, the County was early to identify that compliance with our local Williamson Act program was a concern given our Uniform Rules which does limit projects on Williamson Act contracted lands. Table 1-1 of the Staff Assessment correctly identifies Land Use as one of the topic areas where there is a LORS compliance concern, as well as Visual Resources. Local staff is aware that CEC staff has concluded there is a significant and unavoidable impact to visual resources, and that CEC staff concludes there is substantial and compelling evidence in the record to support a CEC decision to approve the project by issuing a statement of overriding considerations.

Relative to the Williamson Act, the CEC staff assessment goes into detail about the County's local WA program, as well as the policies the County has adopted to regulate, and ostensibly allow for, electrical facilities such as a BESS project [See **§5.8 Land Use, Agriculture, and Forestry**]. The County's 10/10 rule (compatible use limited to 10% of the parcel or ten acres, whichever is less) is mentioned several times in the staff assessment, and determines the conflict to be minor given the project site is not prime agricultural land.

The Policies for Commercial Solar and Battery Storage adopted by our Board of Supervisors in 2022 acknowledges that BESS projects are likely to be located in the East County Area Plan (ECAP), and are best suited in the Large Parcel Agriculture designation of the Plan area. As the project is located in Large Parcel Agriculture, staff concurs with the conclusions of CEC staff. Also, County agrees with the interpretation

of Policy 13 in ECAP which does allow for infrastructure to be located beyond a two-acre building envelope. There is discussion of public and quasi-public uses and utility corridors which is also consistent with the County prior analysis for electrical related projects.

County staff acknowledges this project is the first of its kind to be approved through the Opt-In process, and had a local land use permit be required, it would be a Conditional Use Permit (CUP) approved by our East County Board of Zoning Adjustments. Since the CEC Opt-in process assumes jurisdiction over land use with the current project, Staff notes on page 5.8-10 that the staff assessment believes the findings for a CUP could be made if the County held local control, and there is detail about the findings therein. Staff appreciates the analysis provided on the County's Uniform Rules, and acknowledges that **Condition of Certification (COC) Land-2** is being required to address a LORS nonconformance, and does provide mitigation for inconsistencies with the County's WA program.

As it relates to **Visual Resources**, staff understands there are three Key Observation Point (KOP) Locations where there is a substantial impact, described as a substantial degradation from existing conditions at the project site. County staff has not used the KOP analysis completed by CEC staff for the project, and is not qualified to determine its completeness or conclusions. However, the statement on page 11-1 states:

> *While CEC staff concludes there is a significant and unavoidable impact to visual resources, staff concludes there is substantial and compelling evidence in the record to support a CEC decision to approve the project by issuing a statement of overriding considerations.*

County staff agrees that impacts to visual resources can be deemed substantial, given there is no effective way to screen such a large energy project. Given the general land use visual theme in the area is utility related, the statement above from CEC staff does not seem unreasonable or faulty.

Section **11.2 CEC's Authority to Approve Projects that are Inconsistent with Local and State Laws** provides the conclusory analysis and statements that lie at the heart of the CEC opt-in process and form the basis for approving the project. Given the CEC sole authority in this area, County staff does not second-guess or disagree with the conclusions reached in this section.

This concludes the County's comment on the Staff Assessment for **24-OPT-04 / Potentia-Viridi Battery Energy Storage System** project.

Sincerely,

Albert Lopez
Planning Director

Message

From: Energy - Docket Optical System [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=E924F373B3334346968CD56F6914AC02-ENERGY - DO]
Sent: 3/12/2026 3:28:49 PM
To: Lopez, Albert, CDA [Albert.Lopez@acgov.org]; Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Energy - Docket Optical System [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e924f373b3334346968cd56f6914ac02-Energy - Do]
CC: Camberos, Blanca@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=9a468cc1041442469599fcd37b1744b6-9d3be3a1-fb]; Brewer, Marianna@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c039786a84774bf4b196875ecd262646-5409b387-13]
Subject: Re: Comment letter on Staff Assessment - docket number 24-OPT-04 and Potentia-Viridi Battery Energy Storage System

Good morning.

Thank you for your email. We are aware that the system is sending error message to filers and currently addressing the issue. I have located your submission in the queue, and it is pending approval.

If you should have any further questions or concerns, please let me know.

KASEY SINCLAIR
Senior Legal Analyst
Chief Counsel's Office
California Energy Commission
(916) 909.2545
www.energy.ca.gov

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From: Lopez, Albert, CDA <Albert.Lopez@acgov.org>
Sent: Wednesday, March 11, 2026 7:53 PM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Energy - Docket Optical System <docket@energy.ca.gov>
Subject: Comment letter on Staff Assessment - docket number 24-OPT-04 and Potentia-Viridi Battery Energy Storage System

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Hi Eric, I tried to use the State portal for submitting docs but kept getting an error message, so I'm attaching the County's letter here. Thank you for forwarding this to the appropriate staffers.

Albert V. Lopez (He/Him) | Planning Director
ALAMEDA COUNTY | Community Development Agency
Planning Department
224 W. Winton Avenue, Room 111 • Hayward, CA 94544
Office 510-670-5426 | Fax 510-785-8793
albert.lopez@acgov.org | www.acgov.org/cda

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Message

From: Veerkamp, Eric@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=A16598E8714E422FB3216B7B05602C48-VEERKAMP, E]
Sent: 3/12/2026 5:01:46 PM
To: albert.lopez@acgov.org
Subject: RE: Comment letter on Staff Assessment - docket number 24-OPT-04 and Potentia-Viridi Battery Energy Storage System

Thanks Albert. I have been away on jury service, but I will run this down. It sound like IT is on the issue.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Energy - Docket Optical System <docket@energy.ca.gov>
Sent: Thursday, March 12, 2026 8:29 AM
To: Lopez, Albert, CDA <Albert.Lopez@acgov.org>; Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Energy - Docket Optical System <docket@energy.ca.gov>
Cc: Camberos, Blanca@Energy <Blanca.Camberos@Energy.ca.gov>; Brewer, Marianna@Energy <Marianna.Brewer@Energy.ca.gov>
Subject: Re: Comment letter on Staff Assessment - docket number 24-OPT-04 and Potentia-Viridi Battery Energy Storage System

Good morning.

Thank you for your email. We are aware that the system is sending error message to filers and currently addressing the issue. I have located your submission in the queue, and it is pending approval.

If you should have any further questions or concerns, please let me know.

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From: Lopez, Albert, CDA <Albert.Lopez@acgov.org>
Sent: Wednesday, March 11, 2026 7:53 PM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Energy - Docket Optical System <docket@energy.ca.gov>
Subject: Comment letter on Staff Assessment - docket number 24-OPT-04 and Potentia-Viridi Battery Energy Storage System

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Hi Eric, I tried to use the State portal for submitting docs but kept getting an error message, so I'm attaching the County's letter here. Thank you for forwarding this to the appropriate staffers.

Albert V. Lopez (He/Him) | Planning Director

ALAMEDA COUNTY | Community Development Agency

Planning Department

224 W. Winton Avenue, Room 111 • Hayward, CA 94544

Office 510-670-5426 | Fax 510-785-8793

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Appointment

From: Veerkamp, Eric@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=A16598E8714E422FB3216B7B05602C48-VEERKAMP, E]
Sent: 4/14/2026 7:14:39 PM
To: Blinn, Brenda@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=35d13e8c62424b8a96837fec8ad35259-1dc2fa29-35]; Quillman, Gabriele@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=7969b5d45d3043fea1e3d78b9b437206-4344d983-6c]; Sinclair, Crystal@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=bbf6367d6e8e43139c891b332054ee8b-9ba716bc-ec]; Field @EnergyVeterans.org [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=028b79d1e64c47218ca23229d1319826-3859a5b7-75]; Crisp, Ann@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b89c4de7ece742679d19e1e3ee713dc2-Crisp, Ann@]; Grefsrud, Marcia@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=4cae2e4113054707a12ac17d6a0d49fe-d65dd704-b3]; Giorgi, Erika@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d171e5d706e34c26ad9d13c230f2349f-1324b266-6e]; Borkowski, Barbara@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ab8f496b4b784ff199bebeb01ec055e2-51690376-8e]; nicola.park@clearwayenergy.com; Aarty Joshi [aarty.joshi@clearwayenergy.com]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]
CC: Knight, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=be42548337f44852a291a9845f226f62-Knight, Eri]; Vorters, Dian@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2c5604e712a74c029e412542e0db72ac-Vorters, Di]; Germinario, Lena@Wildlife [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cb69a208a7b4ce4acd54c35b7d7c8b9-962051a8-59]; Sean O'Brien [sobrien@dudek.com]; Raisa Lee [Raisa.Lee@clearwayenergy.com]

Subject: Potentia, Clearway (applicant) comment letter, review BIO comments, NEW DATE AND TIME
Location: Microsoft Teams Meeting

Start: 4/15/2026 10:00:00 PM
End: 4/15/2026 11:00:00 PM
Show Time As: Tentative

Required Attendees: Brenda Blinn; Quillman, Gabriele@Wildlife; Sinclair, Crystal@Wildlife; Julie Myrah; Crisp, Ann@Energy; Grefsrud, Marcia@Wildlife; Giorgi, Erika@Energy; Borkowski, Barbara@Energy; Nicola Park; Aarty Joshi; Chang, Kaycee@Energy
Optional Attendees: Knight, Eric@Energy; Vorters, Dian@Energy; Germinario, Lena@Wildlife; Sean O'Brien; Raisa Lee

Dudek biologists have an unexpected conflict for today, Tuesday at 1:00 PM. Let's try to reschedule. TY.

Good Morning all,

The Clearway team has requested a meeting to go over the BIO comments contained in their forthcoming comment letter on Potentia. The comment deadline for Potentia-Viridi is tomorrow, Friday, March 27.

I would like to leave this open to staff's discretion to make a final decision to meet once they have an opportunity to review/digest the Clearway comment letter.

Thank you so much.

Microsoft Teams meeting

Join:

https://teams.microsoft.com/meet/27816314646286?p=gVy6B1vCGmeaGNTsJW

Meeting ID: 278 163 146 462 86

Passcode: Ky7DL24W

Need help? | System reference

Dial in by phone

+1 916-562-1816,,155890572# United States, Sacramento

Find a local number

Phone conference ID: 155 890 572#

For organizers: Meeting options | Reset dial-in PIN

Message

From: Ted Harris [tharris@calstrat.com]
Sent: 4/17/2026 12:57:03 AM
To: Bohan, Drew@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=7dd07a25fcbc49b0bbb219cc3b788983-Bohan, Drew]
Subject: Follow-up - PoVi Response to Comments

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Hi Drew,

Hi Drew, Hope you're doing well and that work is ramping down for the evening!

Thank you coordinating a couple weeks on PoVi Response to Comments regarding conditions and mitigation measures. I'm happy to report that the team is in agreement with nearly everything in 90+ pages of conditions! Yesterday afternoon Ann Crisp and your bio consultant, Chris Huntley, were very helpful and they emphasized that "CEC doesn't want to see anything derail the start of construction on this project by May 1st, 2027," which is great!

There are a couple conditions that they said they would reconsider, per below, which hopefully will be folded into the Response to Comments being posted tomorrow.

• **For BIO-9** – Regarding time-consuming, protocol level plant survey your team agreed to revise, which is good. It's super important to not require complete full protocol level plant surveys for all species, which can't by May 1st next year. This would kill the schedule if not amended accordingly.

• **LAND-1** – Currently allows for indefinite County review. Your team is *thinking* about adding a time restriction on the County review, such as 30 days (whereby CPM could move forward if applicant has not received any comments from County within the 30 days). This amendment would move things along an avoid potentially stalling the project.

• **LAND-2** - Requires additional Ag easement mitigation, even though no impact under CEQA Do you mind seeing if LAND-2 can be contingent, stating—in the event Williamson Act is not petitioned locally, then the Ag easement will be required?

Thank you!

Ted
(916) 997-7715

Message

From: Nicola Park [Nicola.Park@clearwayenergy.com]
Sent: 4/21/2026 12:26:29 AM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]; Aarty Joshi [Aarty.Joshi@clearwayenergy.com]
CC: Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]
Subject: RE: TriValley CBA

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Hi Eric,

Yes, will do. We also have drafted the confidentiality application and just waiting for signatures. Will get that over to you asap.

Thanks,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Monday, April 20, 2026 1:43 PM
To: Nicola Park <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>
Subject: RE: TriValley CBA

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Hi Nicola,
Just a quick follow up. We will need to insert the TN number (CEC docket) into our updated staff assessment.

If you are still working on your internal process for the confidential filing of the unredacted version, perhaps in the short term you could docket the redacted version. That way we will have record of the CBA and we can reference it in our document. Could you docket it by tomorrow afternoon?

TY.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Veerkamp, Eric@Energy
Sent: Friday, April 17, 2026 3:12 PM
To: 'Nicola Park' <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Borkowski, Barbara@Energy <Barbara.Borkowski@energy.ca.gov>; Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>; Knight, Eric@Energy <Eric.Knight@energy.ca.gov>; Giorgi, Erika@Energy <Erika.Giorgi@energy.ca.gov>
Subject: RE: TriValley CBA

Thank you Nicola. Please file an application for confidentiality for the CBA to facilitate filing the unredacted version. Thanks again.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Friday, April 17, 2026 1:56 PM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Borkowski, Barbara@Energy <Barbara.Borkowski@energy.ca.gov>; Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>; Knight, Eric@Energy <Eric.Knight@energy.ca.gov>; Giorgi, Erika@Energy <Erika.Giorgi@Energy.ca.gov>
Subject: RE: TriValley CBA

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Hi Eric,

Ran this by the team and determined that we do not think it's appropriate to share the unredacted CBA with TriValley Haven publicly at this point given where we are at with the other CBA which is before the non-profit's Board, and the other non-profit to which we are making separate, smaller donations outside of a CBA [redacted]

We could share an unredacted version under confidential filing due to sensitive nature of other negotiations so that CEC Commissioners can see but not the public if that is an option you'd be open to?

Thanks,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Friday, April 17, 2026 6:45 AM
To: Nicola Park <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Borkowski, Barbara@Energy <Barbara.Borkowski@energy.ca.gov>; Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>; Knight, Eric@Energy <Eric.Knight@energy.ca.gov>; Giorgi, Erika@Energy

<Erika.Giorgi@Energy.ca.gov>
Subject: RE: TriValley CBA

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Good Morning Nicola and Happy Friday,
Getting back to you on this. I hope you have had an opportunity to confer with your team and have the green light to file to the project docket the unredacted (corrected and dated) CBA with Tri-Valley. Please let me know if that is the case. As I mentioned before, if you could allow us one last opportunity to review it prior to docketing, it would be much appreciated. TY.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Monday, April 13, 2026 10:12 AM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Cc: Borkowski, Barbara@Energy <Barbara.Borkowski@energy.ca.gov>; Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>; Knight, Eric@Energy <Eric.Knight@energy.ca.gov>
Subject: RE: TriValley CBA

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Hi Eric,

Thanks for catching this. Conferred with Tri-Valley Haven and appears that when we were not able to redact the final executed copy as sent to you (signature protections for changing/redacting documents after final Docusign by both parties), Christine at TVH (exec director) sent me another PDF with component pages from a different version with a Section 9 that included 'termination without cause' language. The valid version is the one with the Section 9 that does not allow for termination without cause, which was duly executed.

Point taken on the redaction in the public record. Will have to confer with the team. Our compelling reason not to has been related to discussions with other nonprofits. As shared with you, we decided not to pursue a CBA with a smaller organization that demonstrated it did not have the capacity to enter into such an agreement. We selected another organization for the second CBA and it's pending Board approval with the nonprofit organization. Perhaps when that second CBA is signed it's less of a concern with submitting unredacted versions into the docket, but some concern may remain related to the dollar amounts being seen by organizations for which we did not pursue a CBA.

Thanks,

Nicola

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

From: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Sent: Friday, April 10, 2026 2:27 PM
To: Nicola Park <Nicola.Park@clearwayenergy.com>; Aarty Joshi <Aarty.Joshi@clearwayenergy.com>

Cc: Borkowski, Barbara@Energy <Barbara.Borkowski@energy.ca.gov>; Nicola Park <Nicola.Park@clearwayenergy.com>; Chang, Kaycee@Energy <kaycee.chang@energy.ca.gov>; Knight, Eric@Energy <Eric.Knight@energy.ca.gov>
Subject: RE: TriValley CBA

CAUTION: This message originated from an external sender.

Ni Nicola,

Thank you for sharing both the redacted and unredacted versions of the Community Benefits Agreement (CBA) with Tri-Valley. After reviewing both executed documents, we noticed that they are different documents. Specifically, please see Section 9 of both agreements. Further, the unredacted agreement is undated. Please provide us with a fully executed CBA between the parties. If you provide counterparts, please ensure that the same agreement is signed by both parties.

If the redacted version of the agreement you provided is used, the CEC cannot make the required findings in Public Resources Code section 25545.10 to approve the project unless the agreement is amended. The CBA includes the following termination language "Levy may terminate this Agreement for convenience by providing Tri-Valley with advance notice no less than five (5) business days prior to the effective date of any such termination." In other projects, the CEC has not accepted CBA agreements with similar unilateral, unqualified, early termination language. We recommend that the CBA be amended to allow termination based on mutual agreement between the parties, similar to other projects. For an example of an amendment to similar termination language please see the Darden docket 23-OPT-02 (TN 259219).

Further, to address your question regarding redaction, unless there is a compelling reason not to, we would like you to docket one fully executed, unredacted CBA that meets the obligations of PRC 25545.10 for the public to review, please allow us an opportunity to review it one last time before you file it to the docket. Also, keep in mind that anything you send via e-mail will be included in the administrative record.

Please let me know if you have any questions.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Veerkamp, Eric@Energy
Sent: Thursday, March 12, 2026 8:01 AM
To: 'Nicola Park' <Nicola.Park@clearwayenergy.com>
Subject: RE: TriValley CBA

Thanks Nicola,
That appears to be the direction we will go, docketing a redacted version, for dollar amounts and contact information. Would you please send over a redacted version and we can get this on the docket. TY.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Thursday, March 5, 2026 12:59 PM

To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Subject: RE: TriValley CBA

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Hi Eric,

Can you confirm if you will be docketing this CBA and if so can we send the redacted version over?

Thanks,

Nicola

From: Nicola Park
Sent: Monday, March 2, 2026 3:50 PM
To: Veerkamp, Eric@Energy <eric.veerkamp@energy.ca.gov>
Subject: TriValley CBA

Hi Eric,

Staff meeting today went super smoothly as I'm sure you heard. You were missed, but so great to meet some of your team and Commissioner Gallardo and others in person. They all did a great job.

Please see attached the TriValley CBA. We would like to redact contact info and $ amounts before docketing if possible, as discussed.

Thanks,

Nicola

Nicola Park
Clearway Energy Group LLC
Director, Hawaii

+1 (949) 439-3349 cell

Message

From: Nicola Park [Nicola.Park@clearwayenergy.com]
Sent: 3/18/2026 11:06:54 PM
To: Veerkamp, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a16598e8714e422fb3216b7b05602c48-Veerkamp, E]
Subject: Community Benefits Agreement (CBA) with Tri-Valley Haven for Potentia Viridi Project
Attachments: PSA_Tri-Valley-LA_Execution Version_251010 FINAL REDACTED.pdf

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Eric,

Thanks for the patience here. Redacted CBA attached.

Thanks,

Nicola

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell

Docusign Envelope ID: AB94BFA0-6B39-4CB2-AB2A-E85C525A28F2

PROJECT SUPPORT AGREEMENT

This Project Support Agreement (this "Agreement"), is dated as of _____, 20____ , and sets forth certain agreements by and between Levy Alameda, LLC, a Delaware limited liability company ("**Levy**"), and Tri-Valley Haven for Women, a California non-profit corporation ("**Tri-Valley**"), together Levy and Tri-Valley may be referred to herein as the "Parties," and, individually, as a "Party," as the context may require.

RECITALS:

A. Levy is currently developing the Potentia Viridi Project, a battery energy storage project, which is to be constructed in Alameda County, California;

B. Tri-Valley is a 501 (c)(3) tax exempt organization that provides services and other forms of assistance to survivors of sexual assault, victims of domestic violence, and homeless individuals and families;

C. Levy desires Tri-Valley's support for the Potentia Viridi Project in order to progress the project to completion; and,

D. Levy wishes to make multiple individual payments to Tri-Valley, which collectively constitute the "**Project Support Payments**", and Tri-Valley desires to accept the Project Support Payments in furtherance of its exempt purpose in accordance with the terms and conditions contained herein.

WITNESSETH:

For good and valuable consideration, the receipt, adequacy and sufficiency of which, both Parties acknowledge, the Parties agree as follows:

1. Project Support Payments. It is the intent of the Parties that the Project Support Payments be made and used in compliance with all applicable federal and state laws governing payments made to charitable organizations. The Parties acknowledge that they may be required by law to report information about the Project Support Payments and each Party agrees to report such information as legally required and to cooperate with the other Party to fulfill such reporting obligations.

2. Condition Precedent. Notwithstanding anything to the contrary contained in this Agreement, the obligation of Levy to make the Project Support Payments set forth in **Section 3**, hereinbelow, is subject to the satisfaction of the following condition precedent: the achievement of the Commercial Operation Date ("**COD**") of the Potentia Viridi Project (the "**Condition Precedent**"). For purposes of the preceding sentence the Commercial Operation Date of the Potentia Viridi Project is the date after the Potentia Viridi Project shall have successfully completed all commissioning tests and begins to sell electric power or receive payments for capacity attributes of the project to an unrelated third-party. Levy's obligation

to make the Project Support Payments, as set forth herein, shall not be effective until such time as the Condition Precedent has been met. The Parties acknowledge that assistance to be provided by Tri-Valley as set forth in **Section 3.2**, below, is a critical element to the fulfillment of the Condition Precedent.

3. Funding the Project Support Payments. Levy agrees to make the Project Support Payments in the following individual payments to Tri-Valley, for a total amount of [redacted]

Funding Milestone Schedule	Amount (USD$)
Initial Payment – Upon COD	[redacted]
Annual Payment – 1st Anniversary of COD	[redacted]
Annual Payment – 2nd Anniversary of COD	[redacted]
Annual Payment – 3rd Anniversary of COD	[redacted]
Annual Payment – 4th Anniversary of COD	[redacted]
Annual Payment – 5th Anniversary of COD	[redacted]
Annual Payment – 6th Anniversary of COD	[redacted]
Annual Payment – 7th Anniversary of COD	[redacted]
Annual Payment – 8th Anniversary of COD	[redacted]
Annual Payment – 9th Anniversary of COD	[redacted]
Annual Payment – 10th Anniversary of COD	[redacted]
Annual Payment – 11th Anniversary of COD	[redacted]
Annual Payment – 12th Anniversary of COD	[redacted]
Annual Payment – 13th Anniversary of COD	[redacted]
Annual Payment – 14th Anniversary of COD	[redacted]
Annual Payment – 15th Anniversary of COD	[redacted]
Total Project Support Payments:	[redacted]

Each individual Project Support Payment shall be paid within thirty (30) days of the applicable milestone described above. Levy grants Tri-Valley irrevocable ownership, right, title, and interest in the Project Support Payments, when and as paid in compliance herewith, upon and subject to the terms and conditions set forth in this Agreement and without monetary payment to Levy or any other type of remuneration. The Project Support Payments will be transferred to Tri-Valley free and clear of any liens, claims, restrictions, or encumbrances on or after the dates set forth above. Tri-Valley will determine the use of the Project Support Payments subject to Section 3.1, below.

3.1 Conditions of Use. Tri-Valley shall not use the Project Support Payments for the benefit of any owner, shareholder, officer, director, or employee of Tri-Valley.

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Tri-Valley shall use the Project Support Payments solely in furtherance of its exempt purpose and in full compliance with all applicable laws and regulations and shall be provided as unrestricted funds. It is the intent of the Parties for the Project Support Payments made pursuant to this Agreement to be made in compliance with all of the applicable provisions of the Internal Revenue Code of 1986, as amended (the "**Code**"), and accompanying Treasury Regulations governing charitable organizations formed in accordance with the Code, as interpreted and applied by the Internal Revenue Service. For the avoidance of doubt, Levy shall have no right to direct the management, personnel, or affairs of Tri-Valley or the disposition the Project Support Payments.

3.2 Evidence of Support. Tri-Valley agrees to provide a statement, letter of support, or similar evidence indicating its support for the Potentia Viridi Project, and to provide representatives to attend regulatory hearings in respect of the Potentia Viridi Project, at the request of Levy.

4. Confidentiality. The Parties agree to take all reasonable measures to keep in confidence the execution, terms and conditions as well as performance of this Agreement, and the confidential data and information of any Party (including such Party's Affiliates (as defined in paragraph 6 below) that the other Party may know or gain access to in relation to this Agreement (hereinafter referred to as "**Confidential Information**"), and shall not disclose such Confidential Information to any third party without the prior written consent of the disclosing party. Notwithstanding the foregoing, either Party may disclose any Confidential Information, including this Agreement: (i) to any relevant local, state, and/or federal government entity for purposes of obtaining a permit or regulatory approval, if required; or (ii) to its Affiliates and its and their respective directors, officers, members, employees, representatives, consultants, accountants, advisors, legal counsel, potential sources of debt or equity financing or agents, who have a need to know such information and who have agreed to maintain the confidentiality of such information (collectively, "**Representatives**"); .or if such Party or its Representatives is otherwise required by law (including stock exchange rules) to disclose such information

5. Public Announcements. Levy reserves the right to make public announcements and communicate with any news or other media organizations regarding this Agreement without prior consent of, or notice to, Tri-Valley("Permitted Announcements"). Such Permitted Announcements may be made to demonstrate Levy's commitment to provide support to the communities surrounding the Potentia Viridi Project, but no such Permitted Announcements may imply that Tri-Valley endorses Levy, its operations or business practices. Tri-Valley shall not make any public announcements concerning this Agreement, or the transactions contemplated hereby or otherwise communicate with any news or other media organizations concerning this Agreement without the prior written consent of Levy.

6. Waiver and Release. Tri-Valley itself and its respective present and former parents, subsidiaries, Affiliates, officers, directors, shareholders, members, successors, and assigns hereby expressly releases, waives, and forever discharges Levy and its respective present and former, direct and indirect, parents, subsidiaries, Affiliates, employees, officers, directors, shareholders, members, agents, representatives, permitted successors, and

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permitted assigns from any and all claims, actions, causes of action, suits, losses, expenses, liabilities, obligations, damages, and demands, of every kind and nature whatsoever, whether now known or unknown, foreseen or unforeseen, matured or unmatured, suspected or unsuspected, in law, or equity arising out of or in connection with this Agreement whether arising out of the negligence of Levy or Tri-Valley or otherwise, except for any claims relating to rights and obligations preserved by, created by, or otherwise arising out of this Agreement and any liabilities that cannot be released or waived under applicable law. For purposes of this Agreement, an "**Affiliate**" means any legal or natural person that directly or indirectly controls, is controlled by, or is under common control with another person through one or more intermediaries or otherwise. The term "control(s)" means having the power, directly or indirectly, to direct or cause the direction of the management and policies of a person, whether through ownership, by contract, or otherwise.

7. **Insurance.** Tri-Valley will maintain insurance coverage sufficient to cover its activities, risks, and potential omissions in the operation of the charity in accordance with generally-accepted industry standards and as required by law. Such insurances will at a minimum include Commercial General Liability Insurance, Commercial Auto Insurance, and Workers Compensation and Employers Liability with limits at least equal to statutory minimums.

8. **Limitation of Liability. IN NO EVENT SHALL EITHER PARTY BE LIABLE FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, PUNITIVE, OR ENHANCED DAMAGES, LOST PROFITS OR REVENUES, OR DIMINUTION IN VALUE, ARISING OUT OF, OR RELATING TO, OR IN CONNECTION WITH THE PROJECT SUPPORT PAYMENTS, OR ANY BREACH OF THIS AGREEMENT, REGARDLESS OF: (A) WHETHER SUCH DAMAGES WERE FORESEEABLE, (B) WHETHER OR NOT A PARTY WAS ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, (C) THE LEGAL OR EQUITABLE THEORY (CONTRACT, TORT, OR OTHERWISE) UPON WHICH THE CLAIM IS BASED, AND (D) THE FAILURE OF ANY AGREED OR OTHER REMEDY OF ITS ESSENTIAL PURPOSE.**

9. **Term and Termination.** This Agreement shall remain in effect until, and shall automatically terminate upon, the final payment of sums comprising the Project Support Payments has been made, unless terminated earlier by either Party in accordance with this Section 9. Levy may terminate this Agreement for convenience by providing Tri-Valley with advance notice no less than five (5) business days prior to the effective date of any such termination. Either Party may terminate this Agreement if the other Party is in breach of any of its material obligations hereunder and fails to remedy such breach within ten (10) business days of receipt of a notice of breach from the non-breaching Party. For purposes of this Agreement, a "business day" shall be any day other than a Saturday, Sunday, a federally recognized holiday or California State holiday, on which the banks located in San Franciso, California are open for business. Upon any expiry or termination of this Agreement, the Parties shall have no further obligations to one another.

10. **Notices.** All notices or other communications required under this Agreement shall

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be in writing and shall be deemed effective when received and made in writing by either (i) hand delivery, (ii) registered mail, (iii) certified mail, return receipt requested, (iv) overnight mail, addressed to the Party to be notified, (v) by electronic mail, provided that the sending party obtains confirmation of delivery from the recipient, at the following addresses or to such other address as such Party shall specify by like notice hereunder:

If to Levy:

Levy Alameda, LLC
[redacted]

If to Tri-Valley:

Tri-Valley Haven for Women
3663 Pacific Avenue
Livermore, CA 94550
[redacted]

11. Warranties and Representations:

11.1 Tri-Valley represents and warrants:

(a) That it is a non-profit corporation duly incorporated, duly organized, validly existing, and in good standing under the laws of the state of California.

(b) That it is a tax-exempt entity pursuant to Section 501(c)(3) of the Code and/or other applicable sections of the Code.

(c) That it has the full legal right, power, and authority to enter into and perform this agreement.

(d) That its execution, delivery and performance of this Agreement do not violate any law or governmental rule, regulation, or order applicable to Tri-Valley, and do not and will not contravene any provision, or constitute a default under, any instrument to which it is bound.

11.2 Levy represents and warrants:

(a) That it is a limited liability company duly incorporated, duly organized, validly existing, and in good standing under the laws of the state

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of Delaware.

(b) That it has the full legal right, power, and authority to enter into and perform this Agreement.

(c) That its execution, delivery and performance of this Agreement do not violate any law or governmental rule, regulation, or order applicable to Levy, and do not and will not contravene any provision, or constitute a default under, any instrument to which it is bound.

(d) That it will develop the Potentia Viridi Project in compliance with all applicable legal and regulatory requirements ("Requirements").

12. Severability. If any term or provision of this Agreement is invalid, illegal, or unenforceable in any jurisdiction, such invalidity, illegality, or unenforceability shall not affect any other term or provision of this Agreement or invalidate or render unenforceable such term or provision in any other jurisdiction. Upon such determination that any term or other provision is invalid, illegal, or unenforceable, the Parties hereto shall negotiate in good faith to modify this Agreement so as to effect the original intent of the Parties as closely as possible in a mutually acceptable manner in order that the transactions contemplated hereby be consummated as originally contemplated to the greatest extent possible.

13. Governing Law. This Agreement shall be governed by and construed in accordance with the internal laws of the State of California without giving effect to any choice or conflict of law provision or rule (whether of the State of California or any other jurisdiction).

14. Counterparts. This Agreement may be executed in one or more counterparts, each of which will be deemed to be an original, but all of which together will constitute one and the same instrument, without necessity of production of the others. An executed signature page delivered via facsimile transmission or electronic signature shall be deemed as effective as an original executed signature page. Counterpart signature pages may be assembled to form a single executed copy, provided that they are delivered affixed to an identical counterpart copy.

15. Force Majeure. No Party shall be liable or responsible to the other Party, or be deemed to have defaulted under or breached this Agreement, for any failure or delay in fulfilling or performing any term of this Agreement, when and to the extent such Party's (the "**Impacted Party**") failure or delay is caused by or results from the following force majeure events ("**Force Majeure Event(s)**"): (a) acts of God; (b) flood, fire, earthquake, epidemics, or explosion; (c) war, invasion, hostilities (whether war is declared or not), terrorist threats or acts, riot or other civil unrest; (d) government order, law, or action, specifically including a government's response to any of the events set forth in this paragraph; (e) embargoes or blockades in effect on or after the date of this Agreement; (f) national or regional emergency; and (g) strikes, labor stoppages or slowdowns or other industrial disturbances; and (i) other

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similar events beyond the control of the Impacted Party.

The Impacted Party shall give Notice within seven (7) business days of the Force Majeure Event to the other Party, stating the period of time the occurrence is expected to continue. The Impacted Party shall use diligent efforts to end the failure or delay and ensure the effects of such Force Majeure Event are minimized. The Impacted Party shall resume the performance of its obligations as soon as reasonably practicable after the removal of the cause. In the event that the Impacted Party's failure or delay remains uncured for a period of 30 consecutive days following Notice given by it under this **Section 15**, the other Party may thereafter terminate this Agreement upon seven (7) business days' Notice.

16. Entire Agreement; Modification. This Agreement is the entire agreement between the Parties with respect to the subject matter hereof and supersedes any prior agreement or communications between the Parties, whether written, oral, electronic or otherwise (including, for certainty, the Conditional Term Sheet dated May 3, 2024 signed by Obra Maestra Renewables, LLC). No change, modification, amendment, or addition of or to this Agreement or any part thereof shall be valid unless in writing and signed by authorized representatives of the Parties. Each Party hereto has received independent legal advice regarding this Agreement and their respective rights and obligations set forth herein. The Parties acknowledge and agree that they are not relying upon any representations or statements made by the other Party or the other Party's employees, agents, representatives or attorneys regarding this Agreement, except to the extent such representations are expressly set forth in this Agreement.

17. Assignment. Tri-Valley may not assign or otherwise transfer this Agreement, in whole or in part, without the prior written consent of Levy, which consent shall be at Levy's sole but reasonable discretion. Levy shall provide five business days' notice to Tri-Valley of any assignment or transfer of this Agreement to any entity. Without obtaining the prior consent of Tri-Valley, Levy may assign its rights and obligations under this Agreement to: (i) an entity into or with which Levy is merged or consolidated into; (ii) an entity that purchases the Potentia Viridi Project or to which all or substantially all of Levy's business or assets are transferred to; (iii) an Affiliate of Levy. The foregoing are "Permitted Transfers". Permitted Transfers shall be allowed, irrespective of whether multiple transfers may be required to effectuate the same. Upon any such Permitted Transfer by Levy, it shall be relieved of any further performance hereunder and shall be relieved of any liabilities after the date of such Permitted Transfer. Any assignment in violation of this clause shall be null and void.

18. Survival. Each term and provision of this Agreement that should by its sense and context survive any termination or expiration of this Agreement (including, but not necessarily limited to: Paragraphs 4, 6, 7, 8), shall so survive regardless of the cause and even if resulting from the material breach of either Party to this Agreement.

19. Headings; Construction. The headings/captions appearing in this Agreement have been inserted for the purposes of convenience and ready reference, and do not purport to and shall not be deemed to define, limit or extend the scope or intent of the provisions to

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which they appertain. This Agreement is the result of negotiations between the Parties and their counsel. Accordingly, this Agreement shall not be construed more strongly against either Party regardless of which Party is more responsible for its preparation, and any ambiguity that might exist herein shall not be construed against the drafting Party and the Parties expressly disclaim any such cannons of construction that would construe this document more strongly against one Party.

[SIGNATURE PAGE FOLLOWS]

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IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the date first written above.

LEVY ALAMEDA, LLC

DocuSigned by:

By: _____
166561D94983484...

Andrew Kennedy

Chief Financial Officer

TRI-VALLEY HAVEN FOR WOMEN

By: _____

Christine Dillman, Executive Director

[SIGNATURE PAGE TO PROJECT SUPPORT AGREEMENT]

Docusign Envelope ID: 6124C025-FE8C-4577-84AC-BAA97B6004B5

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the date first written above.

LEVY ALAMEDA, LLC

[Executed in Counterparts]

By: _____

Andrew Kennedy

Chief Financial Officer

TRI-VALLEY HAVEN FOR WOMEN

By: DocuSigned by: Christine Dillman 13E7547465C24EF...

Christine Dillman, Executive Director

[SIGNATURE PAGE TO PROJECT SUPPORT AGREEMENT]

POVI 0003819

Message

From: Veerkamp, Eric@Energy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=A16598E8714E422FB3216B7B05602C48-VEERKAMP, E]
Sent: 2/26/2026 5:04:24 PM
To: Nicola Park [Nicola.Park@clearwayenergy.com]
CC: Aarty Joshi [Aarty.Joshi@clearwayenergy.com]; Chang, Kaycee@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=dd3d2fc8670840bda4acdc455903e787-Chang, Kayc]; Knight, Eric@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=be42548337f44852a291a9845f226f62-Knight, Eri]; Giorgi, Erika@Energy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d171e5d706e34c26ad9d13c230f2349f-1324b266-6e]
Subject: RE: PoVi - Follow up on community and WA

Thank you Nicola. We will tailor the slide presentation based on the information provided.

Are you able to provide the CEC with a copy of the CBA with TriValley prior to the meeting Monday.

Finally, look forward to talking tomorrow. TY.

Eric W. Veerkamp
Project Manager
Siting, Transmission, and Environmental Protection Division

From: Nicola Park <Nicola.Park@clearwayenergy.com>
Sent: Wednesday, February 25, 2026 4:53 PM
To: Veerkamp, Eric@Energy <Eric.Veerkamp@energy.ca.gov>
Cc: Aarty Joshi <Aarty.Joshi@clearwayenergy.com>
Subject: PoVi - Follow up on community and WA

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Eric,

When I was traveling, I know you touched base with Aarty regarding some matters and wanted to circle back with you on those now. You mentioned that you will speak to community benefits in your presentation on Monday, and had asked for some specific information.

In short, we can announce the TriValley Haven CBA at this time but not others. TriValley gave us their consent for the CBA to be announced. The other CBA with [redacted] is still in the works. They are moving slow on dedicating resources to getting the CBA in place, so it may take a while and don't think we should be announcing anything at this stage, though we do plan to sign another CBA.

Here is an updated summary with info on TriValley added:

Community Benefits for the Potentia Viridi (PoVi) Project
Clearway has executed one Community Benefit Agreement for the PoVi project and is close to executing a second agreement. The overall community benefits package for the project will exceed $1.1 million over 20 years.

Formalized CBAs: $925,000 total over 15 years, including $250,000 at COD

- $525,000 total over 15 years (including $150,000 upon commercial operation) to Tri-Valley Haven, an organization that provides services and other forms of assistance to survivors of sexual assault, victims of domestic violence, and homeless individuals and families. *Status: Executed Oct. 13, 2025.*
- $400,000 total over 15 years (including $100,000 upon commercial operation) to a local non-profit. *Status: Not yet executed, pending legal review.*

Additional Community Commitments: $200,000 total over 20 years
With projects in operation in 27 states, Clearway has a long track record of service to the communities where we operate. We are proud to be a force for good in the communities where we work and build on our reputation as a responsible, committed, and invested long-term neighbor.

- Under our signature Adopt-a-School program, all of Clearway's utility-scale sites provide support to local students and educational institutions, which can include financial support, volunteering, and/or educational programming tailored to meet local needs.
- Every operating site also makes annual donations to local organizations ranging from emergency services to schools to food banks and area nonprofits, with Clearway's local site team playing a leadership role in guiding donations. The PoVi project will contribute an estimated $200,000 over 20 years ($10,000 per year) through this locally guided program.

Regarding Williamson Act, wanted to let you know that we met with Albert Lopez from Alameda County Planning Dept last week. He thinks there is a path to Supervisor support and approval, it just may time some time as this is a new process to most at the County, including Albert. We are reaching out to all of the Supervisors on the Board to get on their radar regarding the petition. We have also discussed the approach with the landowner and do not anticipate any issues with the landowner petitioning for a partial cancellation at this time; they want to see the project successful most importantly.

Look forward to talking Friday but please do let me know if anything comes up in the meantime.

Thanks,

Nicola

Clearway

Nicola Park
Clearway Energy Group LLC
Director, Development

+1 (949) 439-3349 cell