Standard LSE Plan

PUBLIC VERSION

PENINSULA CLEAN ENERGY AUTHORITY

2020 INTEGRATED RESOURCE PLAN

SEPTEMBER 1, 2020

Table of Contents

Table of Figures

Table of Tables

I. Executive Summary

In accordance with the requirements of Senate Bill 350 and the California Public Utilities Commission (CPUC or Commission) Decision (D.) 20-03-028, Peninsula Clean Energy Authority (Peninsula Clean Energy) respectfully submits its 2020 Integrated Resource Plan (IRP). The IRP is comprised of this written narrative as well as the following attachments as provided by the CPUC:

i. Completed CPUC Resource Data Template (RDT) – 46 MMT Conforming;
ii. Completed CPUC Resource Data Template – 38 MMT Conforming A;
iii. Completed CPUC Resource Data Template – 38 MMT Conforming B;
iv. Completed CPUC Clean System Power Calculator (CSP Calculator) – 46 MMT Conforming
v. Completed CPUC Clean System Power Calculator – 38 MMT Conforming A; and
vi. Completed CPUC Clean System Power Calculator – 38 MMT Conforming B.

This IRP was approved by Peninsula Clean Energy's Board of Directors on July 23, 2020, and the resolution documenting this approval is attached as Appendix A.

For the purpose of the 2020 IRP Filing, Peninsula Clean Energy worked with Siemens Energy Business Advisory (Siemens) to conduct modeling for various portfolios. Together with Siemens, Peninsula Clean Energy developed and is submitting three Conforming Portfolios – one meeting the 46 million metric tons (MMT) 2030 greenhouse gas emissions (GHG) benchmark (46 MMT Conforming Portfolio), one meeting the 38 MMT 2030 GHG benchmark (38 MMT Conforming Portfolio A), and one with GHG emissions below the 38 MMT 2030 GHG benchmark (38 MMT Conforming Portfolio B) equivalent to a California Independent System Operator (CAISO)-wide target of 26.6 MMT. Peninsula Clean Energy's two preferred portfolios are the 46 MMT Conforming Portfolio and the 38 MMT Conforming Portfolio B.

The 46 MMT Conforming and 38 MMT Conforming A Portfolios produce 2030 emissions estimates (as calculated by the CSP Calculator) within 1% of the 2030 GHG benchmark assigned to Peninsula Clean Energy in *Administrative Law Judge's Ruling Correcting April 15, 2020 Ruling Finalizing Load Forecasts and Greenhouse Gas Benchmarks for Individual 2020 Integrated Resource Plan Filings* (ALJ Ruling) filed in Rulemaking (R.) 16-02-007 on May 25, 2020, as requested by Energy Division. In the sections below, we provide further details on the composition of these portfolios and discuss our methodology for developing these portfolios.

As part of its IRP analysis, Peninsula Clean Energy developed a number of alternative scenarios to meet internal renewable energy goals that are more aggressive than California's Renewables Portfolio Standard (RPS). Peninsula Clean Energy staff ultimately decided these analyses were not ready for submittal. Over the next 6-12 months, Peninsula Clean Energy will continue to analyze the details associated with this priority and these alternative portfolios to understand costs, reliability and strategies to reduce reliance on system power.

a. About Peninsula Clean Energy

Peninsula Clean Energy, a community choice energy aggregator (CCA), provides electricity service to residents and businesses in San Mateo County. Formed in February 2016, Peninsula Clean Energy is a joint powers authority, consisting of the County of San Mateo and all twenty of its towns and cities. Following a comprehensive feasibility study, consistent with AB 32 voluntary action pathways, elected officials from each member jurisdiction *unanimously* agreed to form Peninsula Clean Energy to meet their local climate action goals and for the benefit of San Mateo County.

Peninsula Clean Energy provides cleaner and greener electricity, and at lower rates, than the incumbent investor-owned utility (IOU), Pacific Gas & Electric Company (PG&E). Peninsula Clean Energy plans for and secures commitments from a diverse portfolio of energy-generating resources to reliably serve the electric energy requirements of its customers over the near-, mid-, and long-term planning horizons. Peninsula Clean Energy was assigned an investment-grade credit rating from Moody's in May 2019 and Fitch in April 2020, the second of the three CCAs in California to obtain investment-grade credit ratings. Peninsula Clean Energy's programs include advancing the adoption of electric transportation and transitioning building fossil fuel uses to low carbon electricity. For more information on Peninsula Clean Energy, please go to www.peninsulacleanenergy.com.

As part of its mission-driven, collaborative, not-for-profit, locally focused roots, Peninsula Clean Energy is committed to two key organizational priorities:

- Design a power portfolio that is sourced by 100% carbon-free energy by 2025 that aligns supply and consumer demand on a 24 x 7 basis;
- Contribute to San Mateo County reaching the state's goal to be 100% greenhouse gas-free by 2045;

and to the following strategic goals:

- Secure sufficient, low-cost, clean sources of electricity that achieve Peninsula Clean Energy's priorities while ensuring reliability and meeting regulatory mandates;
- Strongly advocate for public policies that support Peninsula Clean Energy's Organizational Priorities;
- Implement robust energy programs that reduce GHG emissions, align energy supply and demand, and provide benefits to community stakeholder groups;
- Develop a strong brand reputation that drives participation in Peninsula Clean Energy's programs while ensuring customer satisfaction;
- Employ sound fiscal strategies to promote long-term organizational sustainability; and
- Ensure organizational excellence by adhering to sustainable business practices and fostering a workplace culture of innovation, diversity, transparency, and integrity.

The importance of these goals for the communities of San Mateo County is underscored by the 2019 declaration of a climate emergency by the Board of Supervisors calling on local agencies and jurisdictions to work "to achieve carbon neutrality throughout San Mateo County and to implement other actions to address climate change."[1]

Peninsula Clean Energy is governed by its Board of Directors. Each member jurisdiction from San Mateo County has one seat on Peninsula Clean Energy's Board of Directors (except for San Mateo County, which has two) for a total of 22 elected officials acting as board members. The Board of Directors is

[1] San Mateo County Board of Supervisors Resolution 19-847, adopted September 17, 2019, available at: https://sanmateocounty.legistar.com/LegislationDetail.aspx?ID=4134897&GUID=6121741A-FB48-401A-BC1E-41DE639FFD1F&Options=&Search=

responsible for setting the overall strategy for Peninsula Clean Energy, including rate setting and energy procurement decisions. Board meetings are held on the fourth Thursday of each month at 6:30 PM at Peninsula Clean Energy's offices in Redwood City.[2] As prescribed by the Brown Act and the CCA institutional model, all Board meetings are open to the public and all meeting materials are posted online. The decisions of the Board are binding requirements for Peninsula Clean Energy.

In October 2016, Peninsula Clean Energy began serving its first phase of customers, which included all small and medium commercial customers and 20% of residential customers. The second phase of customers were enrolled in April 2017, consisting of all other customers, including large commercial and industrial, agricultural, and the remaining residential customers.

i. Enrolled Customers

Peninsula Clean Energy serves nearly 300,000 customer accounts representing approximately 765,000 residents. Table 1 shows the breakdown between commercial/industrial customers and residential customers in Peninsula Clean Energy's service territory.

Table 1: Peninsula Clean Energy Breakdown by Customer Type (CY 2019)

	Total Peninsula Clean Energy	Residential	Commercial, Industrial
Number of Customer Accounts	295,956	267,348	28,608
		90.3%	9.7%
Total Retail Sales (MWh)	3,564,214	1,394,703	2,169,511
		39.1%	60.9%

Customers are automatically enrolled in Peninsula Clean Energy and have the option to opt-out of Peninsula Clean Energy and return to PG&E for electric service. Customer participation rates are expressed as the proportion of customer accounts currently served by Peninsula Clean Energy relative to the total number of electric customer accounts in San Mateo County eligible for Peninsula Clean Energy service.[3] The remaining percentages of accounts reflects the subset of customer accounts who have voluntarily opted out of the Peninsula Clean Energy program, retaining bundled service by PG&E. As of publication, Peninsula Clean Energy's customer participation rate is approximately 97%.

ii. Retail Products

Peninsula Clean Energy customers can choose between two different product options, ECOplus and ECO100. Each product has a different amount of energy from renewable sources such as solar and wind. Table 2 summarizes customer product choice as of the end of 2019.

[2] Due to COVID-19, meetings are currently being held remotely over video conference and tele conference but remain open to the public. Details on Board meetings are available here: https://www.peninsulacleanenergy.com/board-of-directors/

[3] Direct Access customers are not automatically enrolled in a CCE program. The Direct Access (DA) Program allows a limited selection of non-residential consumers in California to purchase their electricity from an energy service provider (ESP) rather than from their investor owned utility (IOU) or default electricity supplier.

Table 2: Customer Product Choice (CY 2019)

	Total Peninsula Clean Energy	ECOplus	Eco100
Number of Customer Accounts	295,956	290,063	5,893
		98.0%	2.0%
Total Retail Sales (MWh)	3,564,214	3,305,673	258,540
		92.8%	7.2%

ECOplus is Peninsula Clean Energy's default electric option, in which new customers are automatically enrolled. ECOplus rates are set at 5% below PG&E's generation rates. Half of the electricity for this product comes from renewable sources and this product is 95% GHG-free in 2020 with plans to be 100% GHG-free in 2021.

Customers can choose to "opt up" to ECO100 and receive 100% of their electricity from renewable energy resources. ECO100 costs $0.01 per kilowatt-hour (kWh) more than ECOplus. As of the end of 2019, almost 6,000 accounts opted-up to ECO100. As part of their emission reduction targets and sustainability goals, 15 cities and the County of San Mateo enrolled their accounts in ECO100. The ECO100 option also provides an opportunity for corporate customers to meet their own sustainability goals. For example, Visa and Facebook have both chosen the ECO100 offering for their electricity use in San Mateo County.[4] As of January 2018, the ECO100 product is certified by the Center for Resource Solutions' (CRS) Green-e certification program.

II. Study Design

For the 2020 IRP Filing, Peninsula Clean Energy worked with Siemens to conduct modeling for various portfolios. Together with Siemens, Peninsula Clean Energy developed and is submitting three Conforming Portfolios. All portfolios use the "mid Baseline mid AAEE" version of Form 1.1c of the California Energy Commission's (CEC) 2019 Integrated Energy Policy Report (IEPR) demand forecast and use inputs and assumptions consistent with those used to develop the 2019-2020 Reference System Portfolio (RSP) and 38 MMT Scenario. Two of the portfolios achieve emissions within 1% of the assigned GHG Benchmark and one 38 MMT portfolio achieves emissions below the assigned GHG Benchmark. As described above, Peninsula Clean Energy declines to submit Alternative Portfolios at this time. The Conforming Portfolios are described in detail in Section III (Study Results) below.

Additionally, during the 2018 IRP cycle, the CPUC expressed concern that individual resource build out in plans did not sufficiently address renewables integration issues with respect to California's reliability requirements.[5] To address these concerns and improve planning, Peninsula Clean Energy worked jointly with two CCAs and collaborated with several other CCAs to develop their 2020 IRPs. The two CCAs that joined Peninsula Clean Energy in this effort were Clean Power Alliance and San José Clean Energy. The

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[4] Facebook ECO100 Press Release: https://www.peninsulacleanenergy.com/wp-content/uploads/2016/06/Facebook-is-Largest-ECO100-Customer-092117.pdf
Visa ECO100 Press Release: https://www.peninsulacleanenergy.com/wp-content/uploads/2018/05/050218-Peninsula Clean Energy-Release-v.8-Final.pdf

[5] D. 19-04-040 p.105

three joint CCAs represent approximately 8% of California's load and 40% of CCA load. In this coordinated process, the load, resources, power needs, and expansion plans of all participating CCAs were developed and assessed together to understand interactions between the plans and ensure that the CCAs do not all plan to use or build the same resources. The CCAs also developed disaggregated plans to accommodate local requirements and provide for submission of individual plans as required by the CPUC.

a. Objectives

Peninsula Clean Energy's primary objectives in submitting this IRP are as follows:

1. To demonstrate that Peninsula Clean Energy has a plan to meet its CEC 2019 IEPR load forecast through 2030;
2. To share with the CPUC Peninsula Clean Energy's Conforming Portfolios for the 46 MMT and 38 MMT scenarios for 2030 reflecting CPUC requirements and GHG benchmarks and Peninsula Clean Energy's 38 MMT Preferred Conforming Portfolio, which reflects Peninsula Clean Energy's GHG and renewable targets as described below, except for the goal of meeting all load on a 24 x 7 time coincident basis with 100% RPS eligible energy; and
3. To demonstrate that these plans meet the 2030 assigned emissions benchmark, net behind the meter (BTM) combined heat and power (CHP), of 0.630 MMT for the 46 MMT scenario and 0.503 MMT for the 38 MMT Conforming Portfolio A scenario, or exceed the benchmark (i.e., emit lower GHG emissions) in the case of the 38 MMT Conforming Portfolio B, as calculated using the CSP Calculator.

Further, we attempt to meet both the requirements set out by the CPUC as well as continue to meet the objectives set out by Peninsula Clean Energy's Board. In addition to regulatory mandates, Peninsula Clean Energy has set its own goals and policies that go beyond the RPS requirements.

Reducing electric utility-sector GHG emissions is one of Peninsula Clean Energy's charter objectives. Peninsula Clean Energy started with a 75% GHG-free supply portfolio in 2016 and increased the target by 5% per year, with the goal of achieving a 100% GHG-free supply portfolio by 2021.

Peninsula Clean Energy intends to replace the conventional and non-renewable GHG-free energy resources in its supply portfolio with renewable resources. Actual annual renewable content percentages may differ from projections, if resource availability or market conditions preclude cost-effective procurement, but the primary goal is to achieve a 100% RPS-eligible renewable supply no later than 2025.

Further, in providing customers with 100% renewable energy, Peninsula Clean Energy intends to match its electricity supply portfolio to its customer electricity demand profile on a time coincident basis. This means that for every hour of the year, Peninsula Clean Energy aims to procure energy from renewable generators equal to the amount of demand of Peninsula Clean Energy customers in that hour.

Finally, the Peninsula Clean Energy Board has adopted the following three specific policies to guide power procurement:

1. Peninsula Clean Energy shall not use unbundled renewable energy credits (RECs) for meeting its renewable energy goals.[6]
2. In sourcing electricity and resource adequacy (RA), Peninsula Clean Energy will not procure electricity or resource adequacy from coal facilities.[7]
3. Peninsula Clean Energy has published a Sustainable Workforce Policy.[8] Peninsula Clean Energy desires to facilitate and accomplish the following objectives through this policy:
    a. Support for and direct use of local businesses;
    b. Support for and direct use of union members from multiple trades;
    c. Support for and use of training and State of California approved apprenticeship programs, and pre-apprenticeship programs from within Peninsula Clean Energy's service territory; and
    d. Support for and direct use of green and sustainable businesses.

Peninsula Clean Energy's goal is to fulfill its open position with a diverse set of contracts. Peninsula Clean Energy uses a portfolio risk management approach in its power purchasing program, seeking low cost supply as well as diversity among technologies, production profiles, project sizes, project locations, counterparties, term lengths and timing of market purchases to cost average over time, including remaining cognizant of the value of open market positions. These factors are taken into consideration when Peninsula Clean Energy engages the market, and Peninsula Clean Energy has developed specific guidelines for each of these diversification factors. Specifically, Peninsula Clean Energy has set a guideline to target a minimum 50% of the portfolio be procured from new projects by 2025 and procure at least 50% of our portfolio from long-term contracts.

b. Methodology

i. Modeling Tool(s)

The modeling software used by Siemens to develop the IRP portfolios was Energy Exemplar's Aurora Forecasting Software (AURORA). The version used is 13.4.1024, released March 10, 2020. AURORA is a chronological unit commitment model which works to simulate the economic dispatch of power plants within a competitive market framework. The model uses a mixed integer linear programming (MIP) approach to capture details of power plant and transmission network operations, while observing real world constraints. Constraints include items such as emission reduction targets, transmission and plant operating limits, renewable energy availability and mandatory portfolio targets. AURORA is widely used by electric utilities, consulting agencies, and other stakeholders for the purpose of forecasting generator performance and economics, developing IRPs, forecasting power market prices, assessing detailed impacts of regulatory and market changes impacting the electric power industry, and to generate financially optimized generating portfolios. The model can assess the potential performance and capital costs of existing and prospective generation technologies and resources, and make resource addition and retirement decisions for economic, system reliability, and policy compliance reasons on a utility system.

[6] Peninsula Clean Energy policy on unbundled RECs: https://www.peninsulacleanenergy.com/wp-content/uploads/2017/01/Peninsula Clean Energy-Policy-11-final.pdf
[7] Peninsula Clean Energy policy excluding coal for power and resource adequacy: https://www.peninsulacleanenergy.com/wp-content/uploads/2017/01/Policy-12-Excluding-Coal-for-Power-and-Resource-Adequacy.pdf
[8] Peninsula Clean Energy Sustainable Workforce Policy: https://www.peninsulacleanenergy.com/wp-content/uploads/2017/01/Peninsula Clean Energy-Policy-10-final-1.pdf.

The CPUC used RESOLVE to develop the RSP and the 38 MMT Scenario, which identifies the new resources needed to meet the GHG emissions planning constraint. CPUC uses SERVM as a separate tool to examine system reliability and simulate production cost. AURORA is both a long-term capacity expansion (LTCE) tool and a production cost model.

AURORA and RESOLVE both optimize dispatch for a system under a given set of inputs. RESOLVE is a linear optimization model, which assesses dispatch based on representative days over a defined forecast horizon. AURORA differs in that it is a mixed integer program and hourly chronological dispatch simulation. Both RESOLVE and AURORA identify the optimal resources to meet needs based on the technology options offered including generation and storage. Both models also allow for the incorporation of different types of market and portfolio constraints including renewable generation, carbon emissions (or emission rates), reserve margin, and timing of new build requirements. All of the model runs in AURORA used the required inputs and assumptions supplied by the CPUC.

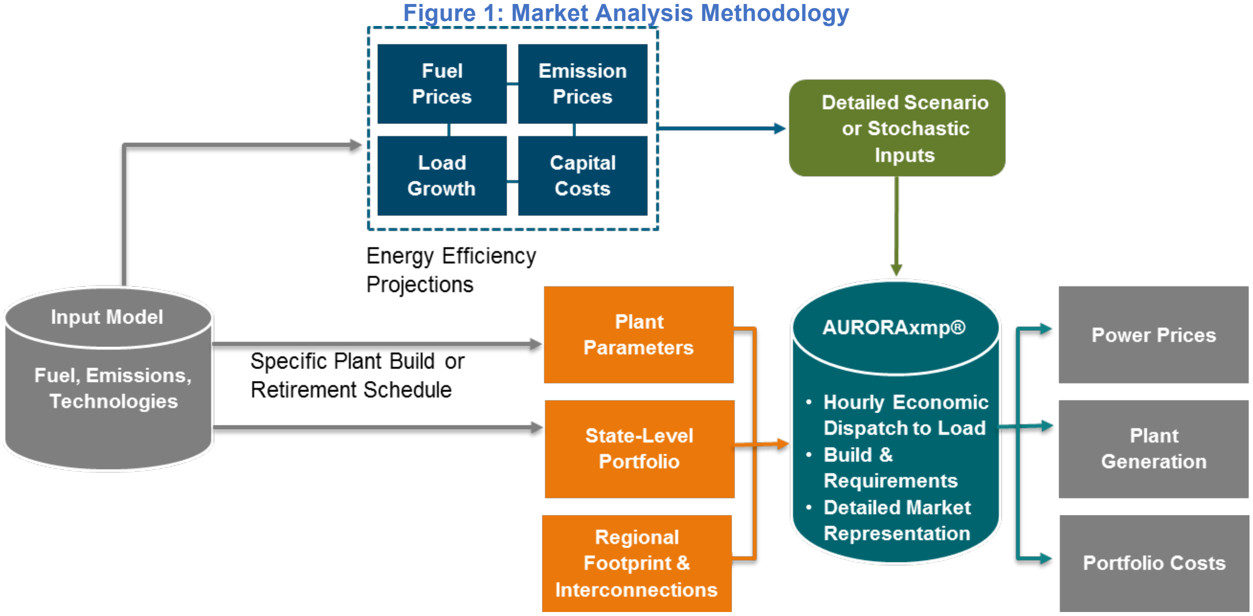
Table 3 below identifies the key differences between RESOLVE and AURORA.

Table 3: Differences Between RESOLVE / SERVM and AURORA Models

RESOLVE / SERVM	AURORA
Groups resources into categories with similar operational characteristics (e.g., nuclear, coal, gas CCGT, gas peaker, renewables) and models them collectively.	Models each generator independently.
Linearized unit commitment where the commitment variable for each class of generators is a continuous variable rather than an integer variable.	Models the operating cost and performance parameters on a plant-level basis, where the optimization method uses a MIP to determine unit commitment.
Run for a sampled 37 days in a year and only for a few years, therefore, only representative load and renewable profiles were selected to reflect system conditions.	In the LTCE process, Siemens used a sampling of 104 days and every other hour for each year of the 20-year study horizon (2020-2040). In the final simulation of the system (production cost simulation), AURORA simulates plant operating and market conditions for every hour, every day and every year of the study horizon.
Generally, focuses on a single market, reflecting high level interties and market interaction with neighboring regions.	AURORA can be set up in several different ways. For this analysis, AURORA was run for the entire Western Interconnection.

A summary of the methodology with key inputs, algorithms, and outputs is shown in Figure 1.

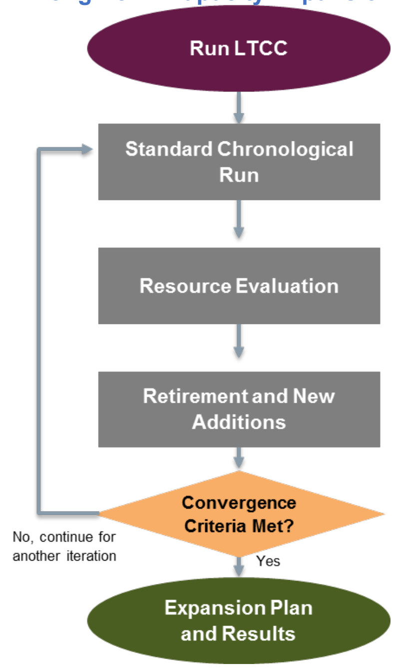
Figure 1: Market Analysis Methodology



As indicated above, AURORA is both a production model and a LTCE optimization model. AURORA is an hourly, chronological production cost model with an integrated LTCE feature. The LTCE produces a resource expansion plan given resource options and constraints around those options. The options can include supply and demand generic resources, including energy storage, existing resources and resources for economic retirement as desired. The full set of standard operational and cost parameters for new and existing resources are considered in the LTCE, providing a robust framework from which to evaluate different technologies with different operational (intermittent vs. baseload), cost and incentive profiles. The LTCE considers constraints such as reserve margin targets or requirements, RPS requirements, carbon limits, and operational constraints for providing ancillary services.

Siemens' LTCE logic is illustrated in Figure 2. The LTCE model makes use of an iterative logic to develop a regional capacity expansion plan. At the end of any given iteration, it has the information it needs to take retirement actions on existing uneconomic resources and to select economically viable new resource options. Convergence criteria reduce the total number of resource alternatives which are considered by the LTCE model through the iterations, with a converged solution being defined as one in which system prices remain stable even with change in resource alternatives. In other words, the solution reflects an expansion plan that is at once both economically rational and stable.

Figure 2: Long-Term Capacity Expansion Model



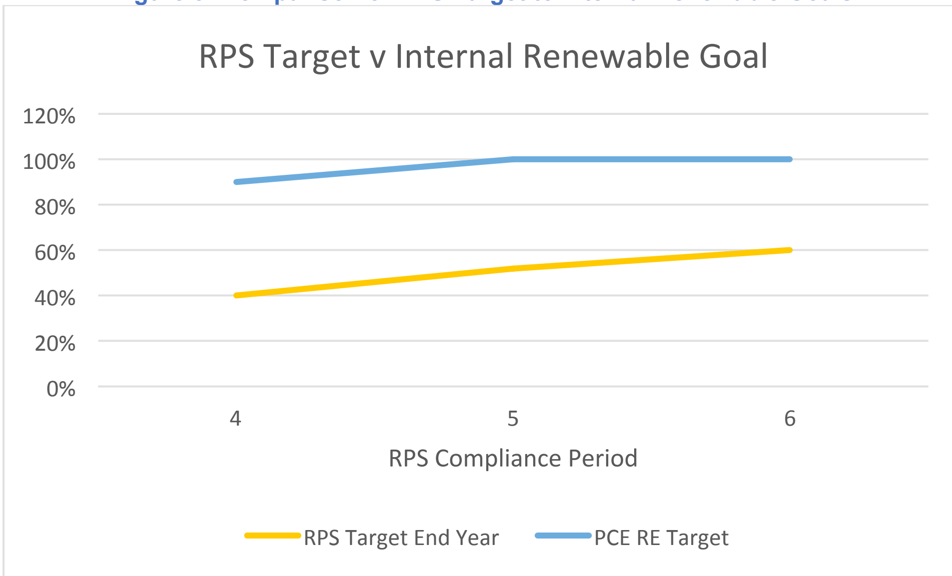
With this approach, AURORA performs an iterative future analysis where:

1. Resources that have negative going-forward value (revenue minus costs) are retired;
2. Resources with positive values are added to the system on a gradual basis, whereby a set of resources with the most positive net present value is selected from the set of new resource options and added to the study;
3. AURORA then uses the new set of resources to compute all the values again; and
4. The process of adding and retiring resources is continually repeated until the system price stabilizes, indicating that an optimal set of resources has been identified for the study.

ii. Modeling Approach

Applying the AURORA model described above, Siemens conducted an analysis on Peninsula Clean Energy's behalf to determine the most economical and desirable mix of renewable technologies to procure, subject to CPUC requirements and Peninsula Clean Energy's renewable and GHG-free goals indicated for the portfolio. As noted in Figure 3, Peninsula Clean Energy's internal goals target a higher level of renewable energy than the RPS requirement.

Figure 3: Comparison of RPS Target to Internal Renewable Goals



Siemens first analyzed the mix of renewable technologies required to meet Peninsula Clean Energy's renewable and GHG-free goals, specifically to serve customers with 100% renewable energy on an annual basis by 2025 within the context of the 46 MMT scenario and the 38 MMT scenario. This initial analysis generated a set of results consistent with Peninsula Clean Energy's RPS and GHG-free goals, but the results tended to result in lower emissions than the CPUC-mandated GHG Emissions Benchmark for Peninsula Clean Energy. Since the Production Cost Modeling optimizes the portfolio for cost to meeting energy needs, the modeling did not include contributions from cost allocation mechanism (CAM) capacity-only allocations. However, the resulting open RA positions can be partially or fully satisfied with the CAM allocations as assessed in evaluating the modeling output.

The Conforming Portfolios were developed through a combination of AURORA and the CSP Calculator. Siemens started with the portfolios developed to meet Peninsula Clean Energy's internal goals and then, based on CPUC guidance that the 46 MMT Conforming Portfolio must show GHG emissions within 1% of the individual load serving entity's (LSE's) GHG Emissions Benchmark, Siemens utilized the CSP calculator to incrementally back-down the least economic resources (i.e., last built) from the portfolio to arrive at a portfolio that results in GHG emissions that meet Peninsula Clean Energy's GHG benchmark within 1%. The same approach was used with the 38 MMT Conforming Portfolio A which meets the benchmark within 1%. The 38 MMT Conforming Portfolio B was developed to meet Peninsula Clean Energy's internal renewable energy goals. For this portfolio, Peninsula Clean Energy did not back-down any resources to increase the GHG emissions to meet the benchmark. We are submitting the 38 MMT Conforming Portfolio B with GHG emissions below the benchmark. As a result of this approach to target Peninsula Clean Energy's more aggressive renewable goals, the model selected new resources to add to Peninsula Clean Energy's portfolio prior to 2026 for all three portfolios.

The 38 MMT Conforming Portfolio B represents a resource build to achieve renewable generation equivalent to 100% of Peninsula Clean Energy's retail sales on an annual accounting basis while conforming to the CPUC's inputs and assumptions (and thus is a conforming portfolio). Peninsula Clean Energy's ultimate goal is to meet 100% of load with renewable generation on a time-coincident basis. Peninsula Clean Energy and Siemens started the analysis for this scenario including running a number of portfolios to reach this goal, but ultimately decided these analyses were not ready for submittal. Over the next 6-12 months, Peninsula Clean Energy will continue to analyze the details associated with this priority and these alternative portfolios to understand costs, reliability and strategies to increase the number of hours where we serve load with renewables and reduce reliance on system power.

Specific details on the modeling approach and assumptions are described in the sections below.

1. Load Assumptions

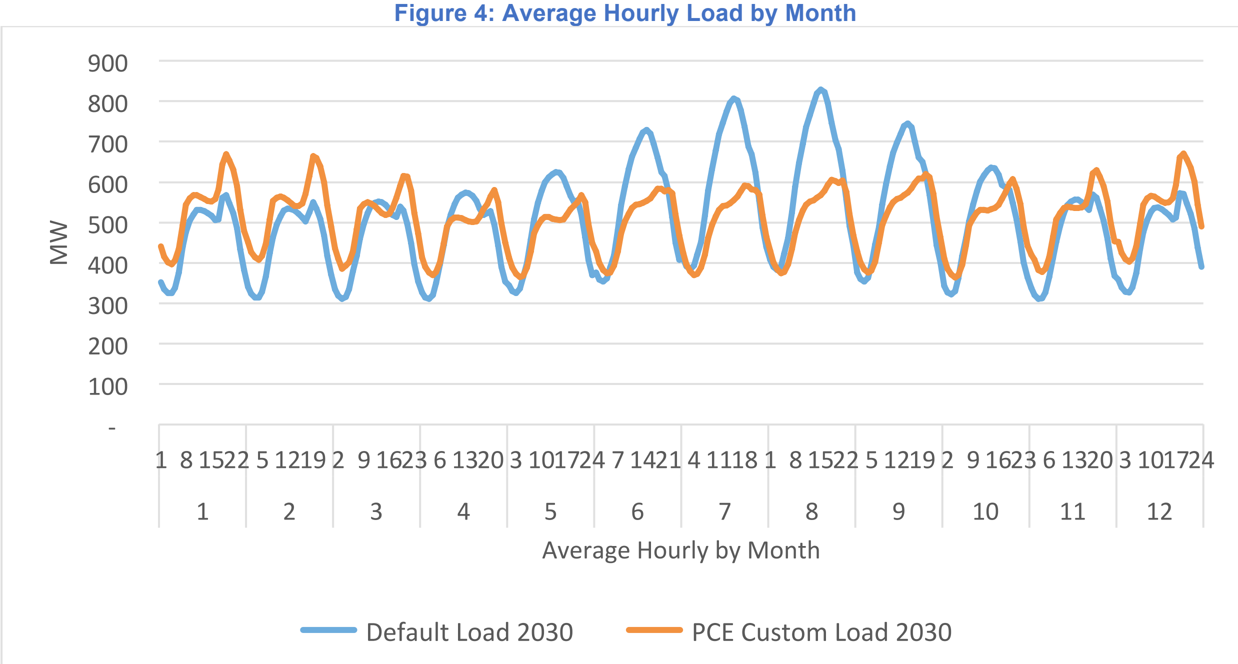
Peninsula Clean Energy's annual base load forecast and load modifiers were derived from the "mid Baseline mid AAEE" version of Form 1.1c of the CEC's 2019 IEPR as identified in Table 4 below.

Table 4: CEC 2019 IEPR Assigned Load Forecast for Peninsula Clean Energy

Peninsula Clean Energy	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Load Forecast (GWh)	3,610	3,571	3,552	3,546	3,550	3,555	3,558	3,558	3,560	3,559	3,560

Peninsula Clean Energy evaluated the projected load in the CEC 2019 IEPR demand forecast and the load profile in the CSP Calculator against internal forecasts. While the total GWh projected in the CEC 2019 IEPR forecast are in line with Peninsula Clean Energy's internal pre-COVID estimates, the shape of the load profile differed from Peninsula Clean Energy's internal load forecast and historical usage. Figure 4 demonstrates the differences in load shape between Peninsula Clean Energy and the default load shape in the CSP Calculator. This figure shows average hourly load for each month of the year. Peninsula Clean Energy's forecasted load shape is higher in the winter months and lower in the summer months than the default CSP Calculator load profile. This is due to Peninsula Clean Energy's territory being located in a more temperate region than the state average, requiring less air conditioning load in the summer.

Figure 4: Average Hourly Load by Month



As a result of these differences, Peninsula Clean Energy used its own load shape in the CSP Calculator applied to the 2019 IEPR total load forecast. Peninsula Clean Energy's load was modeled in AURORA to include all load modifiers. The reason for this approach is due to the inability to disaggregate load modifiers provided by CPUC down to individual LSEs. The data provided by the CPUC is aggregated by Transmission Access Charge (TAC) area.

To develop Peninsula Clean Energy's annual base load forecast into monthly and hourly data, historical hourly metered data was utilized from May 1, 2017 through December 31, 2019. The process for translating the annual energy forecast from Form 1.1c into hourly load inputs was as follows:

1. Extracted annual energy forecasts from 2020-2030 from the "mid Baseline mid AAEE" version of Form 1.1c of the CEC 2019 IEPR Release.
2. Developed monthly average load shapes from historic metered data and near-term modeling data from Peninsula Clean Energy. The monthly average load shapes were then applied to the annual energy forecasts to provide average demand on a monthly basis.
3. Developed monthly peak load shapes from historic metered data and near-term modeling data from Peninsula Clean Energy. The monthly peak load shapes were then applied to the monthly average energy forecasts to provide peak demand on a monthly basis.
4. Developed hourly load shapes from historic metered data and near-term modeling data from Peninsula Clean Energy. The hourly load shapes were then applied to the monthly average energy and monthly peak energy to provide load on an hourly basis.

The process used to derive hourly load from the CEC's IEPR data ensures that the total annual energy volumes for load remains consistent with Peninsula Clean Energy's assigned forecast.

The monthly peak load forecasts help evaluate the reliability of the portfolios analyzed. Table 5 identifies the forecasted peak loads for each of the reporting years.

Table 5: Forecasted Annual Peak Load

Reporting Year	2020	2022	2026	2030
[redacted]				

2. GHG Benchmark

Peninsula Clean Energy's LSE-specific GHG Benchmarks for the 46 MMT and 38 MMT targets as assigned in the ALJ Ruling and adjusted by the Energy Division in the CSP Calculator to account for Peninsula Clean Energy's share of BTM CHP emissions are identified in Table 6 below.

Table 6: LSE-Specific GHG Emissions Benchmark

	2030 46 MMT GHG Benchmark	2030 38 MMT GHG Benchmark
GHG Emissions Benchmark	0.630	0.503

3. Assumptions

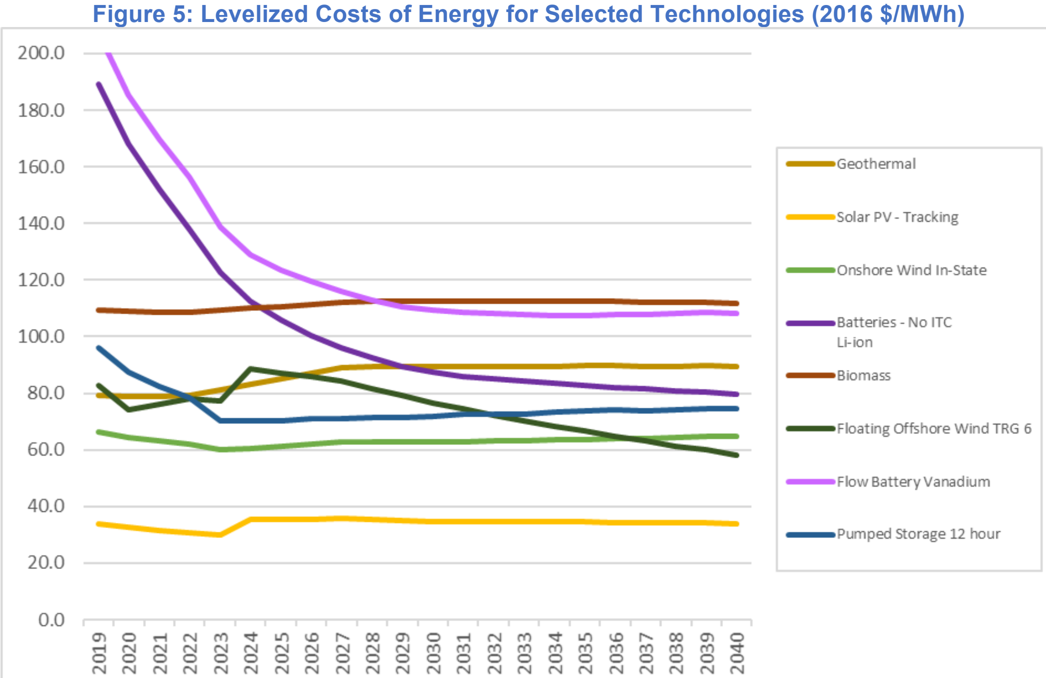
The inputs and assumption used to develop and analyze Peninsula Clean Energy's 2019-2020 IRP portfolios reflect those of the CPUC's 2019-2020 Inputs and Assumptions document. The following inputs and assumptions are the same:

- Load forecast,
- Fuel prices,
- Emissions costs,
- Technology costs and operational specifications,
- Baseline and candidate resources,
- Resource availability,
- Transmission constraints,
- State RPS target, and
- Electric sector 2030 GHG emissions targets for the 46 MMT and 38 MMT scenarios.

In developing the 2019-2020 IRP, Peninsula Clean Energy used CPUC assumptions wherever possible. The candidate resources' capital cost, operating cost, and levelized cost of energy used in the analysis were derived from the CPUC's 2019-2020 IRP assumptions. Cost values were taken from CPUC's released "RESOLVE_Resource Costs and Build_2020-02-07.xlsb" file, which are reported in 2016$.

Figure 5 below displays the levelized costs assumptions in dollar per megawatt-hour (MWh) for the set of critical technologies. These costs include Overnight Capital Costs, Interconnection Cost, and Investment Tax Credits as applicable to each technology. In addition, periodic replacement and augmentation costs for battery storage technologies are included as well. All costs are consistent with CPUC assumptions as provided in the "RESOLVE_Resource Costs and Build_2020-02-07.xlsb file.

Figure 5: Levelized Costs of Energy for Selected Technologies (2016 $/MWh)



Premiums for index-plus structured contracts for Portfolio Content Category 1 (PCC1) REC resources were developed based on S&P Platts North American Emissions Special Report and are identified in Table 7 below.

Table 7: PCC1 Premium Costs Assumptions for Index-Plus Structured Contracts

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
PCC 1 Premium ($/MWh)	$15.60	$15.84	$16.08	$15.36	$15.12	$14.40	$13.44	$12.24	$9.60	$5.76

4. Existing Contracts

Peninsula Clean Energy provided to Siemens a list of all power purchase agreements (PPAs) currently under contract or in negotiation as of June 30, 2020. The information provided included the technology, term, contracted generation, price and hourly shapes, among other variables. These PPAs are identified in Table 8 below. All Peninsula Clean Energy-executed PPAs were included in the simulations in the AURORA model along with new capacity selected by the LTCE model.

Table 8: Existing Project-Specific PPA Contracts

#	Asset Name	Generating Capacity (MW)	Storage Capacity (MW)	PPA Start Date	Contract Expiration	Technology
1.	Bidwell	2		3/9/2017	3/8/2034	Small Hydro
2.	Roaring	2		3/9/2017	3/8/2034	Small Hydro
3.	Hatchet	7.5		3/9/2017	3/8/2034	Small Hydro
4.	Clover	1		4/1/2018	3/31/2033	Small Hydro
5.	Wright	200	80	1/3/2020	12/31/2044	Solar + 4-hr Li-Ion
6.	Buena Vista	38		4/17/2017	4/16/2022	Wind
7.	Mustang	100		11/29/2020	11/28/2035	Solar
8.	Shiloh	150		1/1/2019	12/31/2023	Wind
9.	New Solar + Storage Project (under negotiation)	100	67	1/1/2023	12/31/2042	Solar + 4-hr Li-Ion

In addition to the executed PPAs, Peninsula Clean Energy provided information to Siemens on existing RA contracts and environmental products, which were included in the model.

5. Renewable Generation Profiles

Peninsula Clean Energy used inputs and assumptions consistent with those used by staff to develop the 2019-2020 RSP and the 38 MMT Scenario. For the existing PPA-contracted projects identified in the previous section, Siemens developed representative renewable generation shapes based on historical project-specific generation or project-specific forecasts. These representative shapes varied by hour, week and month of the year.

For modeling capacity expansion in the AURORA model, the Siemens team used representative hourly generation shapes for wind and solar assets in Northern and Southern California derived from the 2018 National Renewable Energy Laboratory (NREL) Annual Technology Baseline (ATB) report. The shapes differ to some extent with the location-specific shapes available in the CSP calculators. Figure 6 shows a comparison of the average hourly capacity factors for the representative solar shapes used in the AURORA model compared to the location specific solar shapes in the CSP calculators. Figure 7 shows an equivalent comparison of the average hourly capacity factors for wind resources.

Figure 6: Comparison of Solar Tracking Shapes

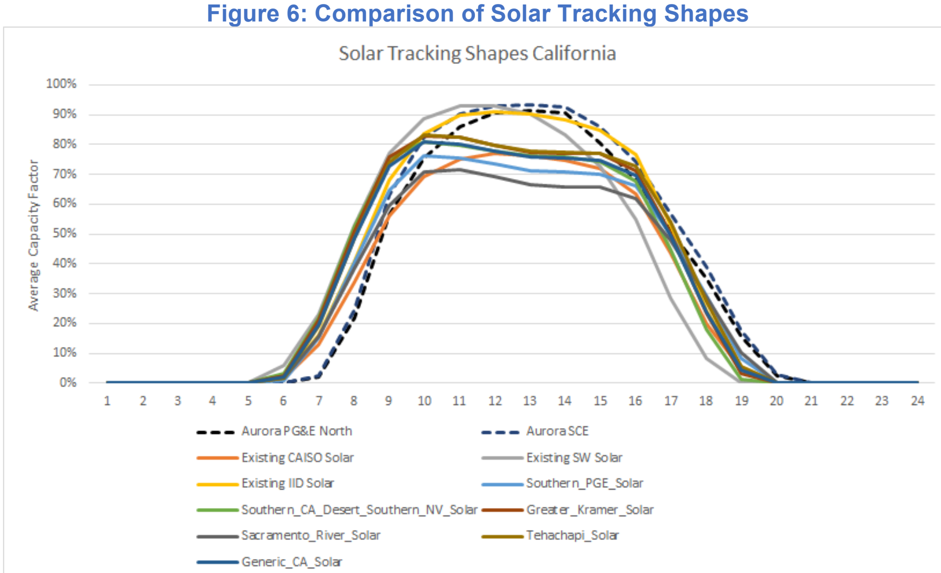
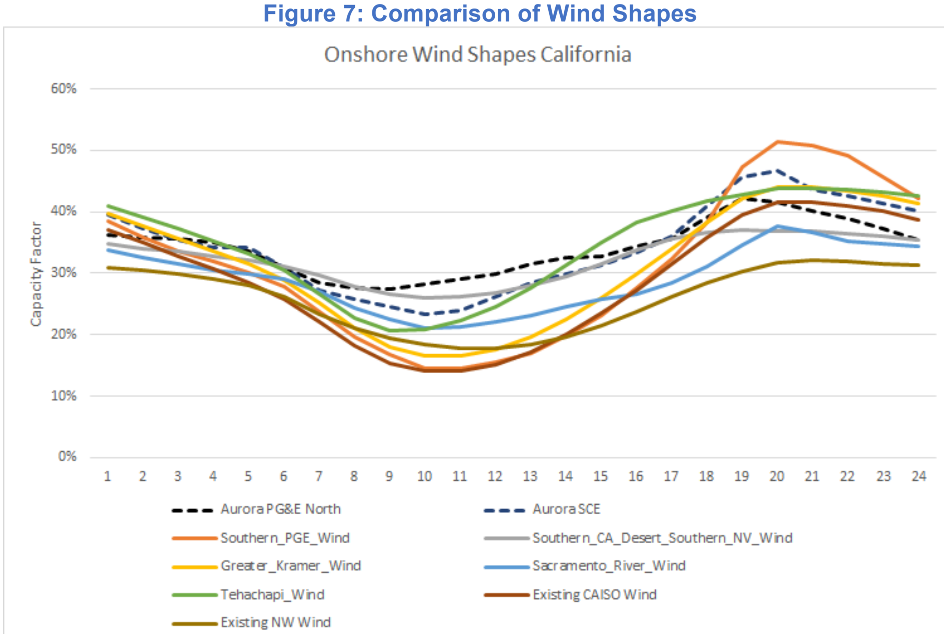


Figure 7: Comparison of Wind Shapes



For hydro resources, Peninsula Clean Energy used the CSP hourly shapes for in-state and imported hydro. The storage component was modeled independently using the AURORA chronological storage dispatch logic.

The AURORA chronological storage dispatch logic works during a particular modeling run, AURORA determines at the beginning of each week a charging and generation schedule for each storage project for the coming week. Within each day across the week, AURORA identifies the combination of hours in which it is cost-effective to store and to generate. It assures that revenue during the generation hours exceeds the cost of charging energy adjusted for cycle efficiency, plus any variable costs incurred. Once the hourly schedule for the week has been determined, it is locked in and used to modify zonal load for the hours being dispatched as the simulation proceeds through the week. In any individual dispatch hour, the actual hourly cost of recharge energy or the revenue from hourly generation is based on the zonal price determined by the full dispatch for that hour.

Renewable shapes for existing or in negotiation projects are aggregated with shapes for the short-term Solar Peak, Solar Non-Peak and Off-Peak contracts and incorporated into the CSP as a "Custom Hourly Profile for User-defined GHG-free power." For storage resources entered into the CSP, we used the storage shapes in the CSP calculator. For new renewable resources, please reference Section II.b.ii.6 below on the rationale for using these renewable shapes and the process undertaken to translate them to CSP resource locations.

6. Geographic Distribution of New Resources

As described in the previous section, the AURORA model used NREL-derived renewable generation profiles for new resources and AURORA's built in storage logic to administer charging and discharging on an hourly basis. In order to comply with CPUC requirements to provide contracted/built resources tied to the geographic regions represented in the CSP, specifically wind and solar resources, Peninsula Clean Energy applied the distribution from the RSP to the 46 MMT Conforming Portfolio and the distribution from the 38 MMT Scenario to the 38 MMT Conforming Portfolio A and to the 38 MMT Conforming Portfolio B.

The RESOLVE results viewer was used to extract the incremental capacity built from the RESOLVE model. Specifically, the 46MMT_20200207_2045_2GWPRM_NOOTCEXT_RSP_PD and 38MMT_20200117_2045 _2GWPRM_NOOTCEXT cases were used to estimate resource distributions for 46 MMT and 38 MMT portfolios, respectively. Data was extracted from the "Portfolio Analytics" tab and using the CSP to RESOLVE areas mapping listed in the Resource Data Template tab "cns_mapping" translated RESOLVE geographic areas to CSP geographic areas. There was one exception to this distribution; the Baja_California_Wind RESOLVE location was not included in the cns_mapping tab and the Baja_California_Wind RESOLVE location includes a resource that Peninsula Clean Energy believes should be tied to the Southern_CA_Desert_Southern_NV_Wind CSP category. Therefore, Peninsula Clean Energy included the Baja_California_Wind resource within the Southern_CA_Desert_Southern _NV_Wind category when projecting distribution of new wind resources.

Peninsula Clean Energy has assumed that new resources developed in future years will be distributed according to the distribution implied in the RESOLVE results viewer, summarized below. For years in which RESOLVE did not provide results (2025, 2027, 2028, and 2029), Peninsula Clean Energy used the distribution for the most recent year for which results were provided. Distributions for 2025 used 2024 results, and distributions for 2027, 2028, and 2029 used 2026 results.

Please refer to Table 9 through Table 12 below, which summarize the distribution of resources by CSP category that Peninsula Clean Energy is assuming for its new build in each year for the 46 MMT and 38 MMT Conforming Portfolios.

Table 9: 46 MMT Conforming Portfolio Geographic Distribution of New Solar Resources

Solar (46MMT)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Greater_Kramer_Solar	0%	0%	7%	5%	5%		5%				4%
Sacramento_River_Solar	0%	0%	0%	0%	0%		0%				0%
Southern_CA_Desert Southern_NV_Solar	60%	30%	34%	29%	29%		29%				39%
Southern_PGE_Solar	0%	0%	2%	24%	24%		24%				19%
Tehachapi_Solar	40%	70%	57%	43%	43%		43%				38%

Table 10: 46 MMT Conforming Portfolio Geographic Distribution of New Onshore CA Wind Resources

Wind (OnShore) (46MMT)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
New_Mexico_Wind	0%	0%	0%	0%	0%		0%				18%
Sacramento_River_Wind	0%	100%	74%	74%	53%		53%				42%
Southern_CA_Desert_ Southern_NV_Wind	0%				22%		22%				17%
Southern_PGE_Wind	0%	0%	12%	12%	15%		15%				15%
Tehachapi_Wind	0%	0%	14%	14%	10%		10%				8%

Table 11: 38 MMT Conforming Portfolios Geographic Distribution of New Solar Resources

Solar (38MMT)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Greater_Kramer_Solar	0%	0%	7%	5%	5%		5%				3%
Sacramento_River_Solar	0%	0%	0%	0%	0%		0%				0%
Southern_CA_Desert Southern_NV_Solar	61%	31%	35%	29%	29%		35%				32%
Southern_PGE_Solar	0%	0%	2%	23%	23%		21%				29%
Tehachapi_Solar	49%	69%	57%	43%	43%		39%				35%

Table 12: 38 MMT Conforming Portfolio Geographic Distribution of New Onshore CA Wind Resources

Wind (OnShore) (38MMT)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
New_Mexico_Wind	0%	0%	0%	0%	0%		0%				18%
Wyoming_Wind	0%	0%	0%	0%	0%		0%				18%
NW_Ext_Tx_Wind	0%	0%	18%	18%	14%		14%				18%
SW_Ext_Tx_Wind	0%	0%	0%	0%	0%		0%				6%
Sacramento_River_Wind	0%	100%	49%	49%	38%		38%				17%
Southern_CA_Desert_ Southern_NV_Wind	0%	0%	15%	15%	27%		27%				13%
Southern_PGE_Wind	0%	0%	8%	8%	14%		14%				6%
Tehachapi_Wind	0%	0%	9%	9%	7%		7%				3%

7. Short-Term Contracts

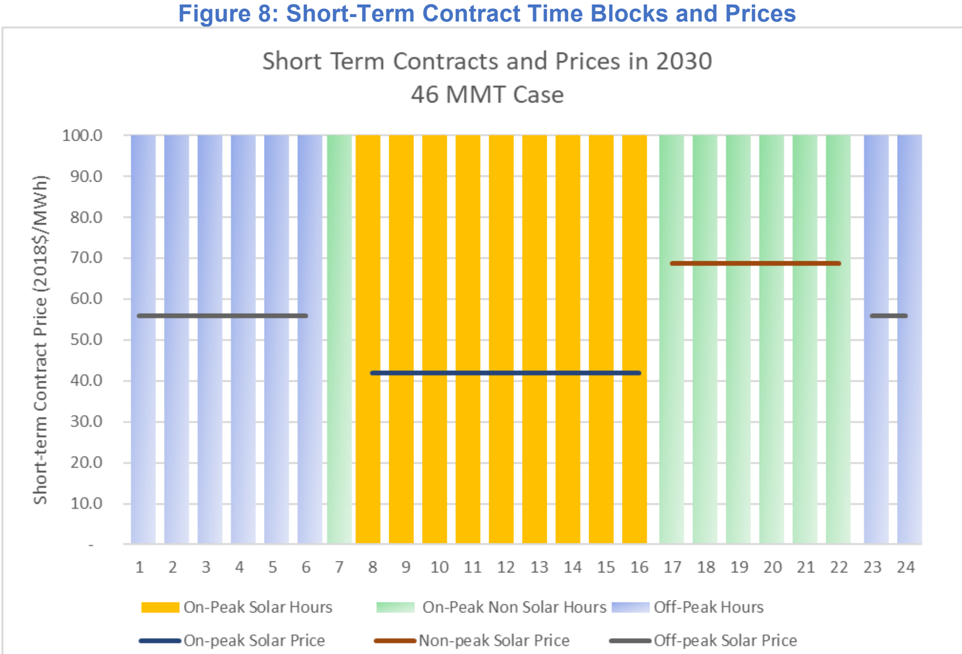
In order to account for Peninsula Clean Energy's ability to engage in short-term contracts with existing resources to fill short-term gaps in meeting load and/or meeting RPS and GHG-free targets, the analysis included three blocks of clean energy contracts that could be procured as part of the long-term capacity expansion. The three one-year duration short-term contract options included were:

1. Solar Peak,
2. Solar Non-Peak and
3. Off-Peak.

This nomenclature refers to the time of day when there is solar generation. These terms are not existing products in the market but products that can help manage a pure renewable portfolio. The three blocks of clean energy contracts represent the various dimensions of meeting load at different hours of the day. The three blocks of hours follow the energy profile of underlying assets that can be used to serve electricity and RPS needs in the future and are priced at forecast annual spot prices + REC prices on an annual basis. The first two fall within hours of solar radiation during weekdays, the off-peak is the standard WECC off-peak. More specifically, Solar Peak is defined as the period comprising weekday Hours Ending (HE) 08-16, Solar Non-Peak is the period comprised of weekday HE 07 & HE 17-22, and Off-Peak is the period comprised of HE 01-06 and HE 23-24 plus all hours during weekends.

Figure 8 illustrates the time of day periods for each short-term contract during a typical weekday and corresponding annual price in 2030 under the 46 MMT Conforming Portfolio.

Figure 8: Short-Term Contract Time Blocks and Prices



Under the LTCE simulations, these short-term contract options were included as alternatives for new capacity to meet load and/or environmental targets along with long-term wind, solar, geothermal, pumped storage and battery storage among others. However, unlike new capacity contracts, the short-term contracts were set-up to be procured in 1-year increments. The simulations displayed that, in general, contracting with long-term assets rather than through short-term contracts would result in the least-cost portfolio for Peninsula Clean Energy and is effective at reducing market exposure and risks to the portfolio. However, the short-term contracts helped to fulfill short-term gaps in serving load or meeting compliance targets. In particular, the short-term contracts were useful in the first three years of the forecast period when Peninsula Clean Energy is still building its portfolio.

8. Curtailment

The AURORA model determines curtailments for solar, wind and other non-dispatchable resources on an hourly basis based on load requirements, battery storage charging and economics. For example, during a specific hour of the day, if there is excess generation, the AURORA model determines how much of that excess generation should be used to charge batteries and how much should be economically curtailed.

The simulation results show curtailments mostly for wind during the solar hours. There are minimal or no curtailments of renewables during non-solar hours. The AURORA model selects to curtail wind over solar due to a small difference in variable operating costs, with wind having higher costs, based on CPUC assumptions. Most of the curtailments happen in the later periods of the study horizon when there is greater penetration of renewable generation in the portfolio and in the California market. Furthermore, after the mid-2020s, wind developers will no longer be eligible to receive the federal Production Tax Credit for newly constructed facilities, which currently allows wind facilities to bid at negative prices into the market and dispatch ahead of solar.

9. Post-Processing Analysis

Siemens developed several post-processing calculations on Peninsula Clean Energy's behalf that were used to generate metrics for the portfolio. The post-processing calculations encompassed cost metrics, reliability metrics, emissions metrics and a few other miscellaneous metrics. Almost all the calculations were based off outputs from the AURORA model.

Cost Metrics

To provide deeper insights into portfolio costs, several variations of cost to serve load on a $/MWh basis were developed. These cost metrics include the following:

- Weighted Average Cost New Capacity ($/MWh);
- Weighted Average PPA Costs ($/MWh);
- Weighted Average Cost of Short-term Contracts ($/MWh);
- Weighted Average Cost of Spot Purchases ($/MWh);
- Weighted Average Cost of RA Capacity Purchases ($/kW-year);
- Weighted Average Cost of RPS Attributes; and
- Weighted Average Cost of GHG-Free Attributes.

Reliability Metrics

To provide deeper insights into reliability, Peninsula Clean Energy evaluated each portfolio's ability to meet two different sets of reliability metrics. The first set of metrics were used to evaluate a portfolio's ability to meet Peninsula Clean Energy's peak demand, inclusive of a planning reserve margin. The second set of metrics identifies each portfolio's ability to meet load in all hours of the year.

For the first set of metrics, Peninsula Clean Energy compared its peak load plus a 15% planning reserve margin to the Effective Load Carrying Capability (ELCC) of its portfolio to determine the open RA balance per the calculations in the RDT. The reliability metrics include the following:

- Surplus/Short megawatt (MW) over Planning Reserve Margin Requirement (PRMR);
- Reserve Margin %; and
- Capacity Open Balance.

In the second set of metrics, Peninsula Clean Energy developed supplemental metrics to better address each portfolio's ability to meet load needs during all hours and not just peak hours. The second reliability metric is simply our net open energy position across hours, which is evaluated relative to our load share of energy production from the existing gas fleet. Finally, Peninsula Clean Energy applied an hourly net load duration curve methodology, similar to the methodology proposed by Southern California Edison and CalCCA in R.19-11-009,[9] with some modifications. This methodology evaluated the forecast load not served by our time-variant resources (solar and wind) and then evaluates the ability of our portfolio to meet that load either with dispatchable resources or with storage charged from our portfolio. The outcomes of these analyses are described in detail in Section III.f below.

GHG-Free and Renewable Metrics

To provide deeper insights into the generation and emission profiles of the portfolio, several metrics were developed to test compliance with regulatory requirements as well as Peninsula Clean Energy's internal goals. Calculations were applied to determine the percentage of the portfolio covered from long-term contracts to test compliance to SB 350's 65% long-term RPS contracting requirement. Additionally, post-processing calculations were considered for the RPS and GHG-free positions of the portfolio. The following metrics were considered:

- Long-term Contracting Requirements (MWh);
- RPS % of Load; and
- GHG-free % of Load.

III. Study Results

a. Conforming and Alternative Portfolios

i. Summary of All Portfolios

Peninsula Clean Energy is presenting the following three Conforming Portfolios in its submission:

1. 46 MMT Conforming Portfolio;
2. 38 MMT Conforming Portfolio A; and
3. 38 MMT Conforming Portfolio B.

All three Conforming Portfolios use the assigned load forecast and use inputs and assumptions consistent with those used by staff to develop the RSP and the 38 MMT Scenario to identify the least cost set of resources to meet the respective 2030 GHG Benchmark emissions, as calculated by the CSP Calculator. The 46 MMT Conforming Portfolio achieves emissions within 1% of Peninsula Clean Energy's proportional share of the 46 MMT GHG target. The 38 MMT Conforming Portfolio A achieves emissions

[9] See Southern California Edison Company (U 338-E) And California Community Choice Association's Track 3 Proposal (August 7, 2020), https://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=344809752

within 1% of Peninsula Clean Energy's proportional share of the 38 MMT GHG target. The 38 MMT Conforming Portfolio B achieves emissions less than Peninsula Clean Energy's proportional share of the 38 MMT GHG target. The load, 2030 GHG Benchmark and calculated GHG emissions for each of the portfolios are presented in Table 13 below.

Table 13: Conforming Portfolios

	2020	2022	2026	2030
Assigned Load Forecast (GWh)	3,610	3,552	3,558	3,560
46 MMT GHG Benchmark				0.630
46 MMT Conforming Portfolio Emissions	0.441	0.312	0.579	0.626
38 MMT GHG Benchmark				0.503
38 MMT Conforming Portfolio A Emissions	0.441	0.316	0.404	0.498
38 MMT Conforming Portfolio B Emissions	0.441	0.316	0.234	0.347

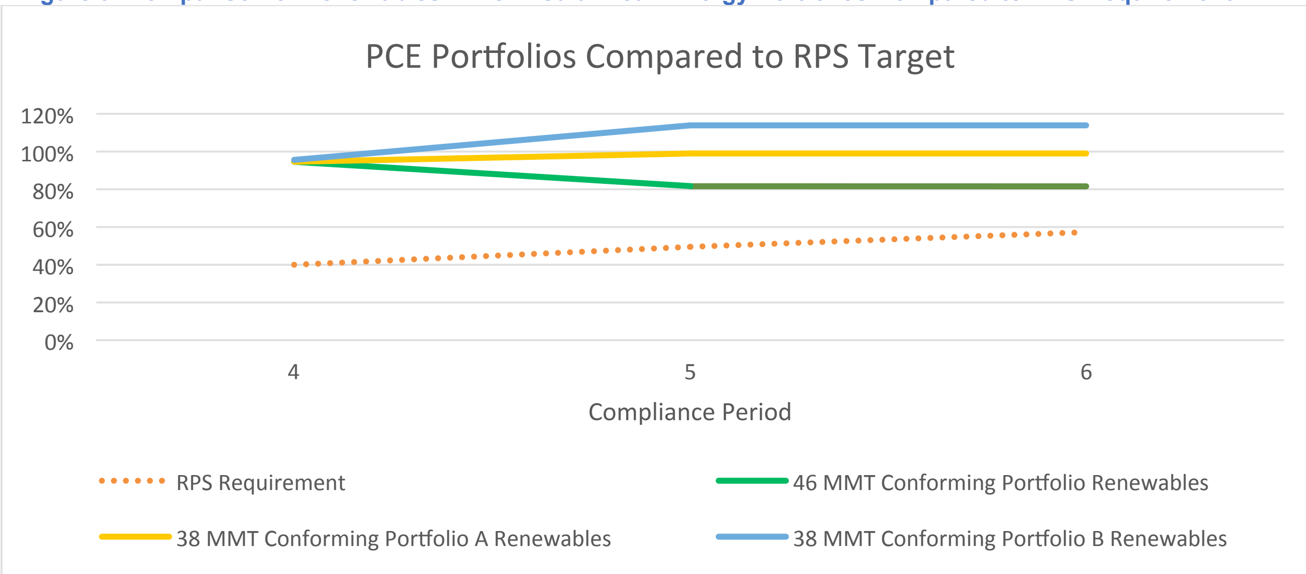
For each of the Portfolios developed, the set of existing resources that Peninsula Clean Energy contracts with are the same. Table 14 below, consistent with definitions provided in the Resource Data Template, represent the set of existing resources Peninsula Clean Energy had in contract or was in negotiation to contract as of June 30, 2020.

Table 14: Existing Project-Specific PPA Contracts

#	Asset Name	Generating Capacity (MW)	Storage Capacity	PPA Start Date	Contract Expiration	Technology
1.	Bidwell	2		3/9/2017	3/8/2034	Small Hydro
2.	Roaring	2		3/9/2017	3/8/2034	Small Hydro
3.	Hatchet	7.5		3/9/2017	3/8/2034	Small Hydro
4.	Clover	1		4/1/2018	3/31/2033	Small Hydro
5.	Wright	200	80	1/3/2020	12/31/2044	Solar + 4-hr Li-Ion
6.	Buena Vista	38		4/17/2017	4/16/2022	Wind
7.	Mustang	100		11/29/2020	11/28/2035	Solar
8.	Shiloh	150		1/1/2019	12/31/2023	Wind
9.	New Solar + Storage Project (under negotiation)	100	67	1/1/2023	12/31/2042	Solar + 4-hr Li-Ion

For each Portfolio, Peninsula Clean Energy determined the amount of new resource capacity required to meet the various objectives of the portfolio. Specifically, the analysis focused on meeting four primary objectives: serve load in all hours, meet RPS requirement, meet GHG targets, and meet Peninsula Clean Energy internal renewable goals. Figure 9 compares the level of renewable generation for each of Peninsula Clean Energy's three portfolios to the RPS requirement for each compliance period. The renewable generation is based on renewable energy reported in the RDTs and may be slightly overstated, since this does not take into account losses from battery roundtrip efficiency. The resources selected in the respective Conforming Portfolios are summarized in the sections below and itemized in the completed RDTs.

Figure 9: Comparison of Renewables in Peninsula Clean Energy Portfolios Compared to RPS Requirement



ii. 46 MMT Conforming Portfolio

For the 46 MMT Conforming Portfolio, AURORA added a total of 350 MW of Battery Storage (Li-ion), 450 MW of Solar PV, and 180 MW of Wind by 2030. The units were selected by the LTCE model as the most competitive resources based on cost. Table 15 identifies the cumulative new resources added to the portfolio by 2030. Figure 10 shows the annual cumulative capacity expansion to the portfolio.
Figure 11 show how Peninsula Clean Energy is meeting its load in each year from a combination of existing PPAs, new resources, shor- term renewable contracts and market purchases.

Table 15: 46 MMT Conforming Portfolio Total New Resources Added by 2030

Resource	Cumulative Added by 2030
Battery Storage (Li-ion)	350 MW
Solar PV	450 MW
Wind CA Onshore	180 MW

Figure 10: 46 MMT Conforming Portfolio Cumulative Capacity Expansion

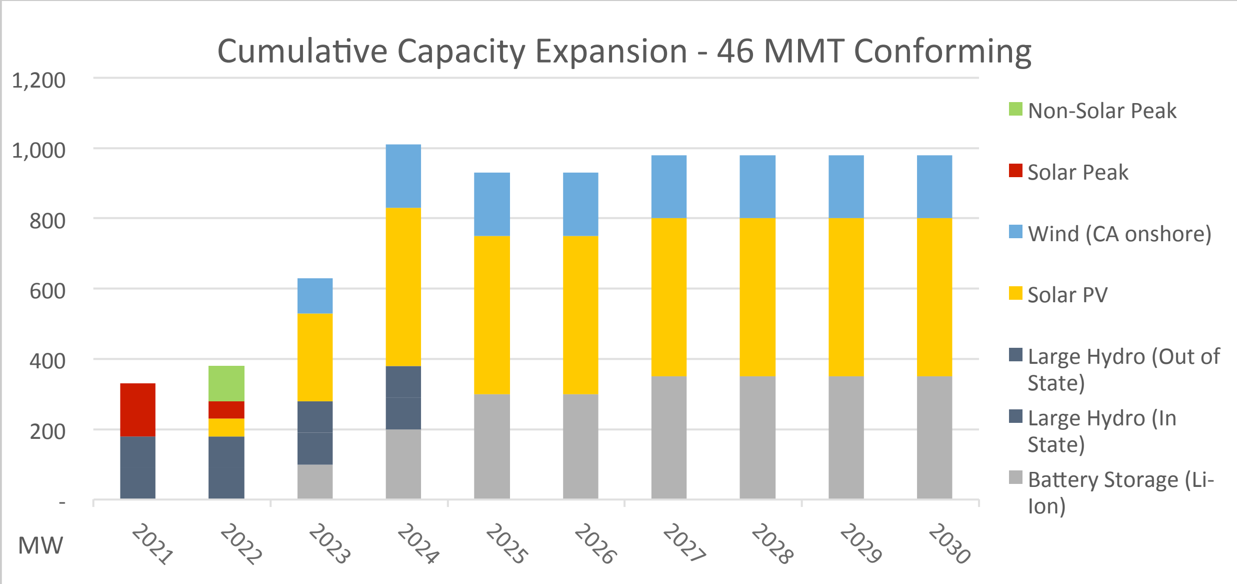
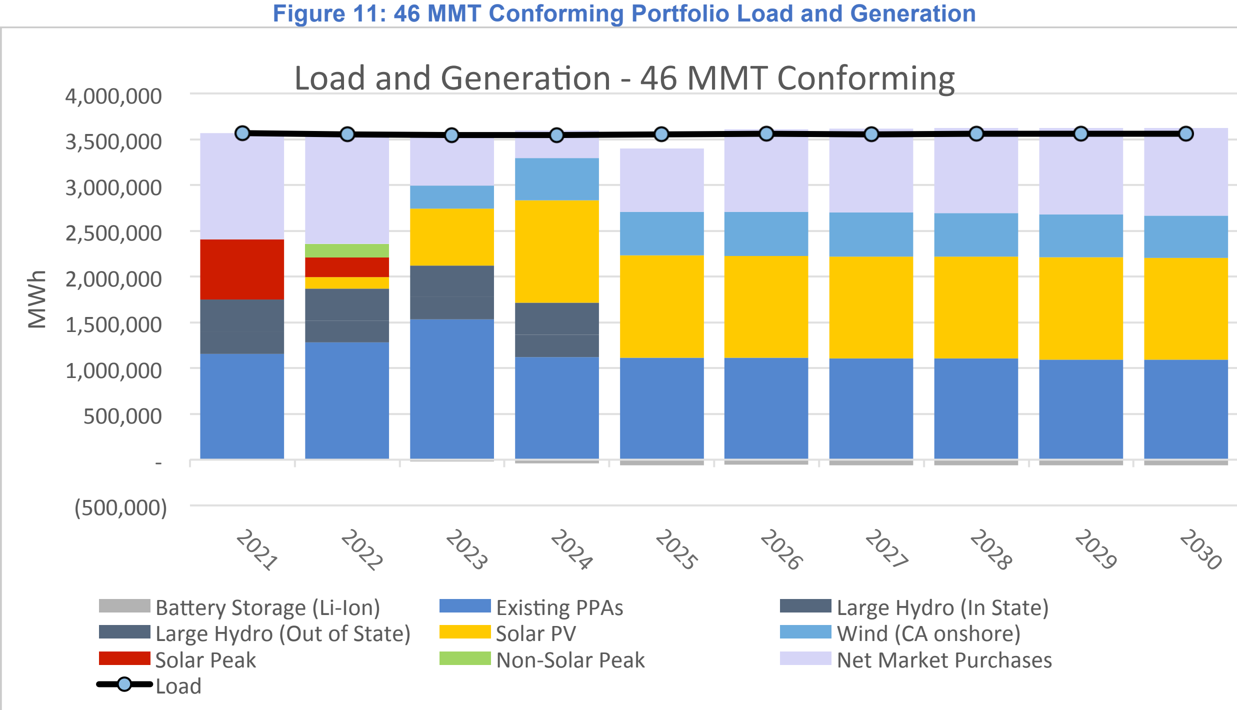


Figure 11: 46 MMT Conforming Portfolio Load and Generation



iii. 38 MMT Conforming Portfolio A

For the 38 MMT Conforming Portfolio A, AURORA added a total of 350 MW of Battery Storage (Li-ion), 650 MW of Solar PV, and 205 MW of Wind by 2030. The units were selected by the LTCE model as the most competitive resources based on cost. Table 16 identifies the cumulative new resources added to the portfolio by 2030. Figure 12 shows the annual cumulative capacity expansion to the portfolio. Figure 13 shows how Peninsula Clean Energy is meeting its load in each year from a combination of existing PPAs, new resources and market purchases.

Table 16: 38 MMT Conforming Portfolio A Total New Resources Added by 2030

Resource	Cumulative Added by 2030
Battery Storage (Li-ion)	350 MW
Solar PV	650 MW
Wind CA Onshore	205 MW

Figure 12: 38 MMT Conforming Portfolio A Cumulative Capacity Expansion

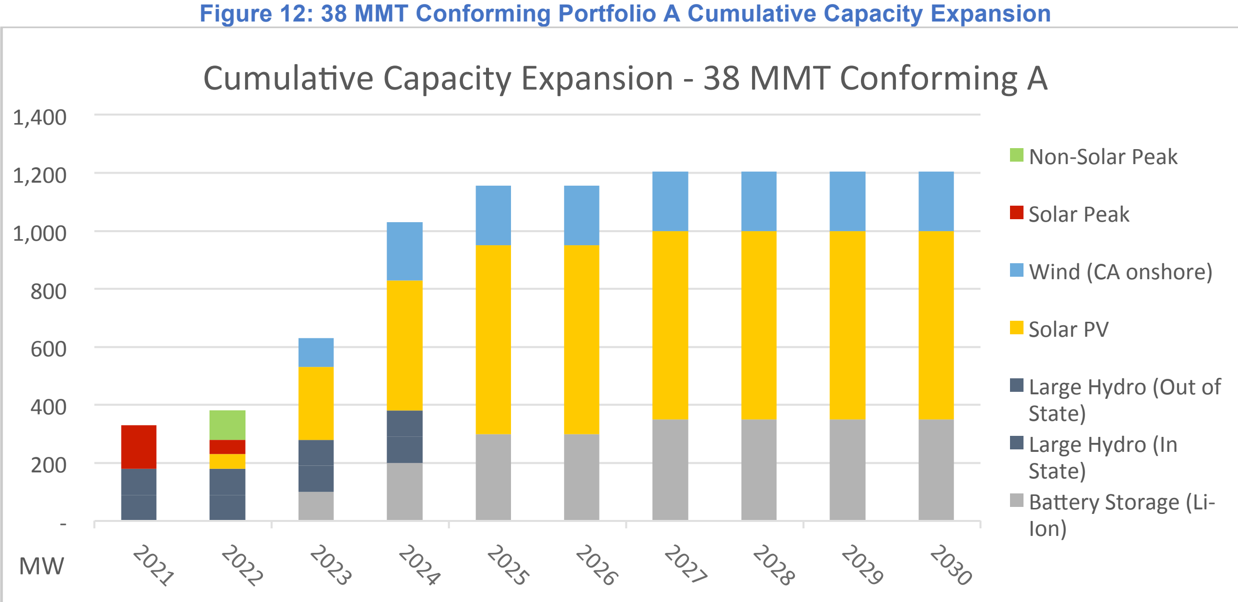
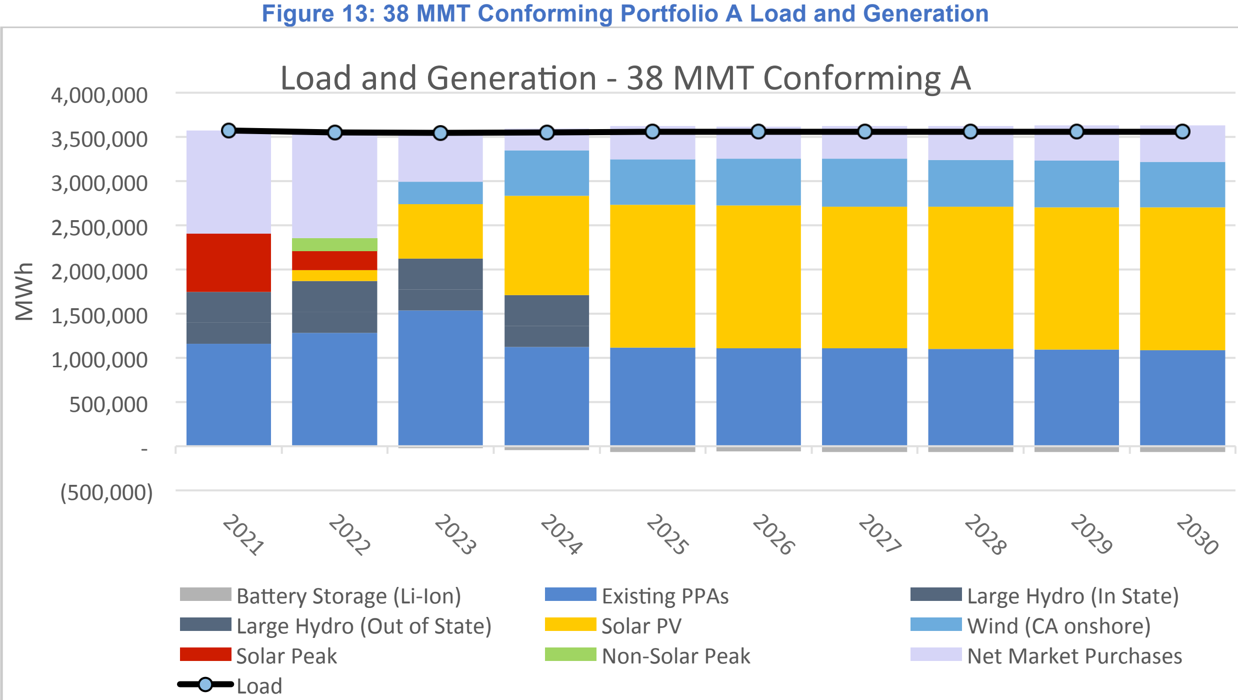


Figure 13: 38 MMT Conforming Portfolio A Load and Generation



iv. 38 MMT Conforming Portfolio B

For the 38 MMT Conforming Portfolio B, AURORA added a total of 350 MW of Battery Storage (Li-ion), 750 MW of Solar PV, and 300 MW of Wind by 2030. The units were selected by the LTCE model as the most competitive resources based on cost. Table 17 identifies the cumulative new resources added to the portfolio by 2030. Figure 14 shows the annual cumulative capacity expansion to the portfolio. Figure 15 show how Peninsula Clean Energy is meeting its load in each year from a combination of existing PPAs, new resources and market purchases.

Table 17: 38 MMT Conforming Portfolio B Total New Resources Added by 2030

Resource	Cumulative Added by 2030
Battery Storage (Li-Ion)	350 MW
Solar PV	750 MW
Wind CA Onshore	300 MW

Figure 14: 38 MMT Conforming Portfolio B Cumulative Capacity Expansion

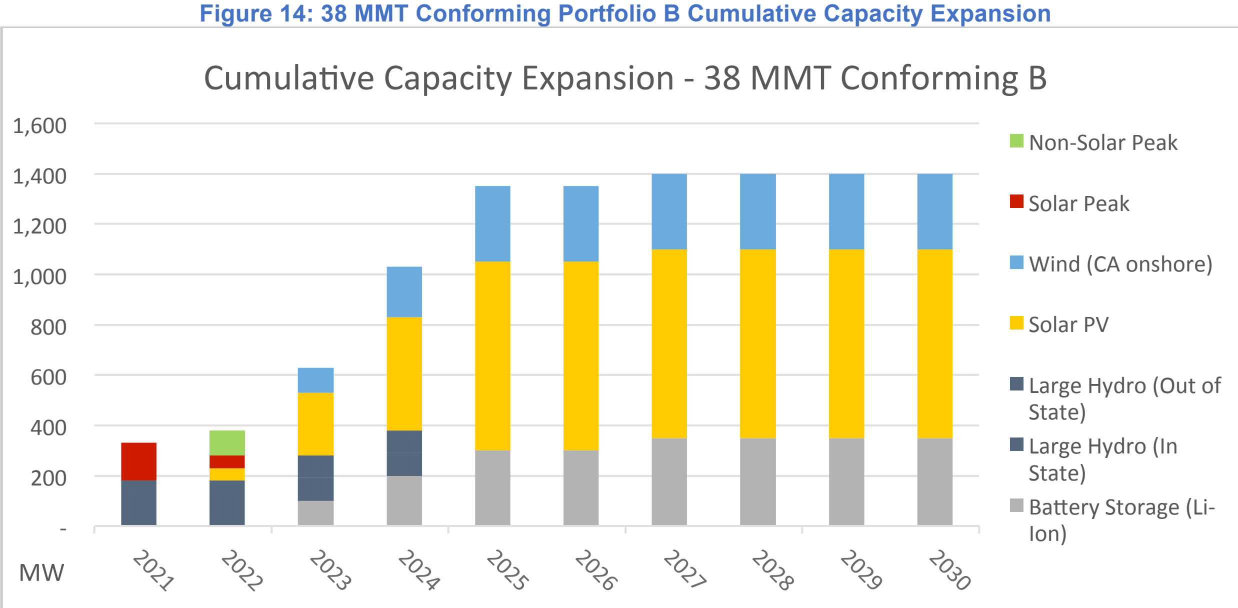
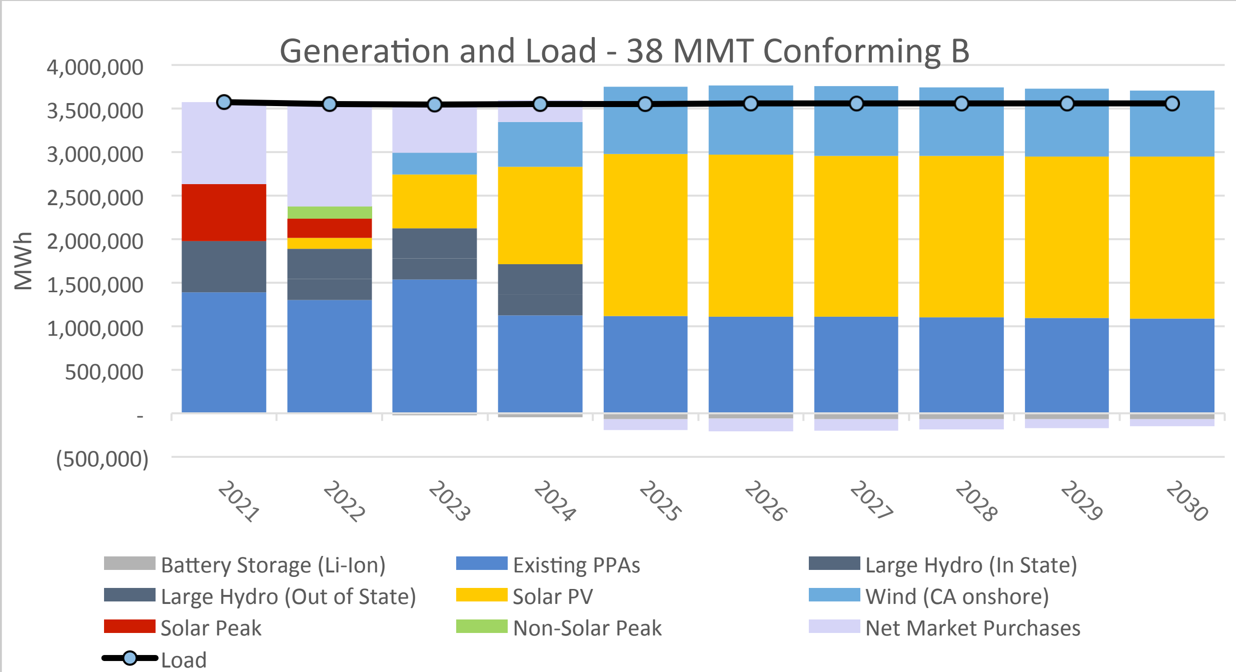


Figure 15: 38 MMT Conforming Portfolio B Load and Generation



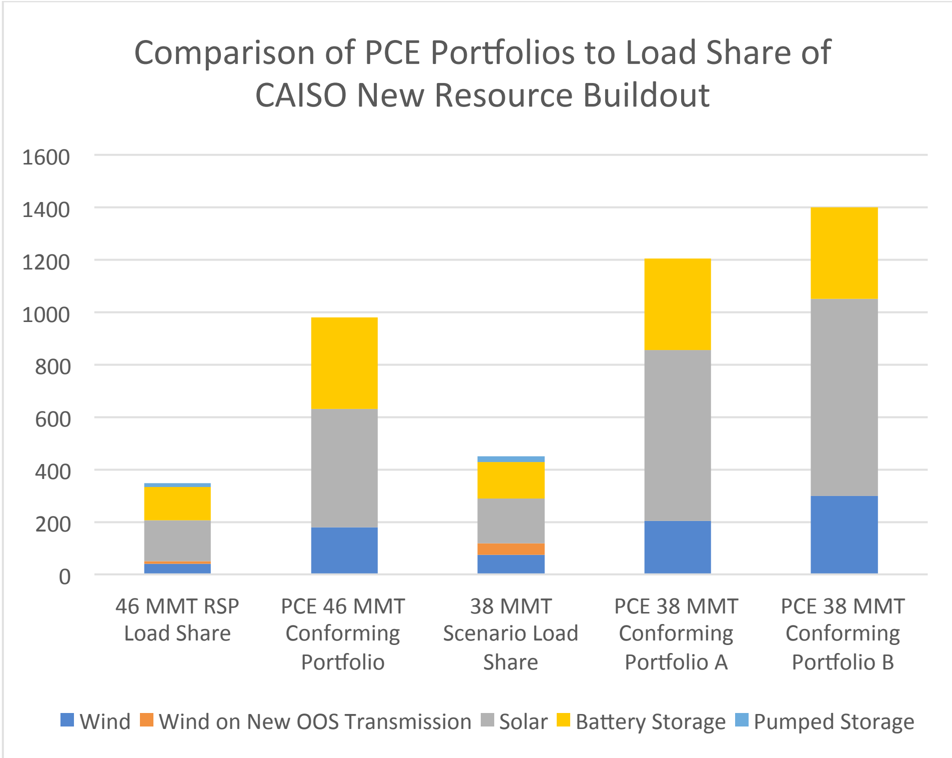
v. Comparison to Reference System Portfolio

Peninsula Clean Energy compared the new resources for the three Conforming Portfolios to the new resource buildout of the 2019-2020 RSP and 38 MMT Scenario, as applicable, based on Peninsula Clean Energy's year-ahead share of the total coincident peak load for the CAISO area IOUs, CCAs, and ESPs, as shown in the RDT Calculator. Peninsula Clean Energy's load represents 1.43% of CAISO load in 2030. Table 18 and Figure 16 below, provide a comparison of the load-weighted volume of resources identified in the RSP and the 38 MMT Scenario to the volumes identified through Peninsula Clean Energy analysis for each of its portfolios in 2030.

Table 18: Comparison of Peninsula Clean Energy Portfolios to Load Weighted Share of RSP and 38 MMT Scenario New Resource Buildout

Portfolio	Wind	Wind on New OOS Transmission	Solar	Battery Storage	Pumped Storage
46 MMT RSP Load Share	41	9	157	126	14
PCE 46 MMT Conforming Portfolio	180	0	450	350	0
38 MMT Scenario Load Share	75	43	171	139	23
PCE 38 MMT Conforming Portfolio A	205	0	650	350	0
PCE 38 MMT Conforming Portfolio B	300	0	750	350	0

Figure 16: Comparison of Peninsula Clean Energy Portfolios to Load Weighted Share of RSP and 38 MMT Scenario New Resource Buildout



In total, the AURORA model used by Peninsula Clean Energy chose larger volumes of new resources for each of the portfolios than the load weighted share of the RSP and 38 MMT Scenario. In particular, Peninsula Clean Energy's model shows larger volumes of wind, solar and 4-hr battery storage. There are also certain resources in the RSP and 38 MMT Scenario that are not reflected in Peninsula Clean Energy's Conforming Portfolios including 2-hr battery storage, pumped storage, and out-of-state wind. These resources were not selected in Peninsula Clean Energy's portfolios because other resources were determined by the model to be more cost effective to meet the goals identified. Specifically, Peninsula Clean Energy's internal renewable goals target of 100% renewable by 2025 is a significantly more ambitious target than California's RPS of 60% renewables by 2030 and 100% clean energy by 2045. This target resulted in most of Peninsula Clean Energy's new resources being added to the portfolio by 2026. The resources that were not chosen by the model, including pumped storage, geothermal and out-of-state or offshore wind were not available in the model until 2026.

Peninsula Clean Energy is interested in the benefits these resources can bring to a balanced and diverse portfolio and will continue to explore options for procurement despite the inputs and assumptions used in this modeling resulting in these resources not being selected as part of Peninsula Clean Energy's Conforming Portfolios. More detailed discussions of pumped storage and out-of-state wind can be found in Sections III.h and III.i below. In Section IV, we discuss our planned procurement activities in detail.

b. Preferred Conforming Portfolios

Peninsula Clean Energy is only submitting one 46 MMT Conforming Portfolio, thus this is Peninsula Clean Energy's Preferred Conforming Portfolio for the 46 MMT scenario. Peninsula Clean Energy is submitting two 38 MMT Conforming Portfolios. Peninsula Clean Energy's Preferred Conforming Portfolio for the 38

MMT Scenario is the 38 MMT Conforming Portfolio B, which results in emissions less than Peninsula Clean Energy's 38 MMT load share target. To support the description of how Peninsula Clean Energy's selections are consistent with each relevant statutory and administrative requirement, we have included the text of Public Utilities (PU) Code Section 454.52(a)(1) below and then describe how each Preferred Conforming Portfolio addresses each of the requirements herein. Additionally, in describing how the portfolios address the requirements of PU Code Section 454.52(a)(1)(E) below we explain whether and how the 38 MMT Conforming Portfolio B might operate differently, from a reliability perspective, depending on whether other LSEs procure in a manner consistent with a 46 MMT or 38 MMT target. Further in Section III.f, we describe in detail the different metrics we've used to evaluate reliability for each of the portfolios.

> *Beginning in 2017, and to be updated regularly thereafter, the commission shall adopt a process for each load-serving entity, as defined in Section 380, to file an integrated resource plan, and a schedule for periodic updates to the plan, and shall ensure that load-serving entities do the following:*
>
> *(A) Meet the greenhouse gas emissions reduction targets established by the State Air Resources Board, in coordination with the commission and the Energy Commission, for the electricity sector and each load-serving entity that reflect the electricity sector's percentage in achieving the economywide greenhouse gas emissions reductions of 40 percent from 1990 levels by 2030.*
>
> *(B) Procure at least 60 percent eligible renewable energy resources by December 31, 2030, consistent with Article 16 (commencing with Section 399.11) of Chapter 2.3.*
>
> *(C) Enable each electrical corporation to fulfill its obligation to serve its customers at just and reasonable rates.*
>
> *(D) Minimize impacts on ratepayers' bills.*
>
> *(E) Ensure system and local reliability on both a near-term and long-term basis, including meeting the near-term and forecast long-term resource adequacy requirements of Section 380.*
>
> *(F) Comply with subdivision (b) of Section 399.13 - A retail seller may enter into a combination of long- and short-term contracts for electricity and associated renewable energy credits. Beginning January 1, 2021, at least 65 percent of the procurement a retail seller counts toward the renewables portfolio standard requirement of each compliance period shall be from its contracts of 10 years or more in duration or in its ownership or ownership agreements for eligible renewable energy resources.*
>
> *(G) Strengthen the diversity, sustainability, and resilience of the bulk transmission and distribution systems, and local communities.*
>
> *(H) Enhance distribution systems and demand-side energy management.*

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

Peninsula Clean Energy's Conforming Portfolios are consistent with each relevant statutory and administrative requirement stated in PU Code Section 454.52(a)(1), as follows:

(A) Meet the greenhouse gas emissions reduction targets

Peninsula Clean Energy's 46 MMT Conforming Portfolio 2030 GHG emissions of 0.626 MMT are within the 1% of the assigned benchmark for Peninsula Clean Energy of 0.630 MMT when calculated using the CSP Calculator.

Peninsula Clean Energy's 38 MMT Conforming Portfolio A 2030 GHG emissions of 0.498 MMT are equal to or less than the assigned benchmark for Peninsula Clean Energy of 0.503 MMT when calculated using the CSP Calculator. Peninsula Clean Energy's 38 MMT Conforming Portfolio B 2030 GHG emissions of 0.347 MMT is 30% lower than the assigned benchmark.

(B) Procure at least 60% eligible renewable energy resources

Peninsula Clean Energy's 46 MMT Preferred Conforming Portfolio would result in 72% of load being served by eligible renewable resources. This is 12 percentage points above the RPS requirement of 60% by 2030.

Peninsula Clean Energy's 38 MMT Preferred Conforming Portfolio would result in over 100% of load being served by eligible renewable resources. This is at least 40 percentage points above the RPS requirement of 60% by 2030.

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

Peninsula Clean Energy's rates are currently set at 5% below PG&E's rates. As detailed in Section III.e below, Peninsula Clean Energy is committed to serving our customers at reasonable rates. In addition to setting rates that are competitive with PG&E, Peninsula Clean Energy works to minimize rate volatility by constructing a balanced and conservatively hedged power supply portfolio, building significant financial reserves[10] and minimizing rate changes to once per year when possible.

(D) Minimize impacts on ratepayers' bills

The AURORA model optimizes for portfolios that meet assigned objectives at least cost based on the inputs and assumptions. The Preferred Conforming Portfolios were the least-cost options for meeting the requirements of the IRP.

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[10] Peninsula Clean Energy Financial Reserves Policy: https://www.peninsulacleanenergy.com/wp-content/uploads/2018/06/Peninsula Clean Energy-Policy-18-Reserves-Policy_Adopted-0628818.pdf

(E) Ensure system and local reliability on both a near-term and long-term basis, including meeting the near-term and forecast long-term resource adequacy requirements

Peninsula Clean Energy evaluated the reliability of its portfolios using several metrics, including the following:

- The volume of system RA provided through the portfolio compared to peak load plus a PRMR as determined in the RDT;
- Net system power, as calculated by the CSP Calculator not served by the portfolio directly; and
- Net load duration curve to evaluate the ability of our portfolio, especially storage, to meet load not served directly by solar and wind resources.

The results of this analysis indicate that the 38 MMT Conforming Portfolio B is the most reliable of the three portfolios because of its improved ability to serve our load, while the 46 MMT Conforming Portfolio has a markedly greater reliance on system resources.

The operation of these portfolios will not differ markedly whether other LSEs procure to a 46 MMT or 38 MMT target. These low-carbon portfolios will meet load during the solar window with direct generation, while storing excess generation to meet evening and overnight load. As discussed in Section III.f below, some portion of load will be met with market energy (primarily natural gas), but this portion is lower than Peninsula Clean Energy's load share. Since the RSP and 38 MMT Scenario do not differ markedly with respect to the amount of retained natural gas, this basic dynamic would likely not change, although the greater build of solar resources would likely depress daytime prices making storing excess energy for evening and nighttime discharge more economical. As discussed below, the existing System RA construct creates the appearance of declining reliability as the ELCC decline with increased deployment of solar and storage, however, the actual basic operational dynamics suggest this may be illusory in light of greater capability to charge storage.

Please see Section III.f for a more thorough discussion of the System Reliability Analysis.

(F) Ensure that at least 65% of RPS procurement is from long-term contracts.

Peninsula Clean Energy's internal goal is for 50% of its retail sales to be procured through long-term contracts of 10 years or more. This equates to more than the required 65% long-term RPS contracting requirement because the long-term RPS contracting requirement refers to the portion of the RPS compliance period renewable requirement that must come from long-term contracts, whereas Peninsula Clean Energy's target applies to its entire retail load. Table 19 below compares Peninsula Clean Energy's internal goal against the requirements of subdivision (b) of PU Code Section 399.13.

Table 19: RPS Long-term Contract Requirements Compared to Peninsula Clean Energy Targets

RPS Compliance Period (RPS CP)	4	5	6
RPS CP Start Year	2021	2025	2028
RPS CP End Year	2024	2027	2030
RPS Target End Year	40%	52%	60%
RPS Long Term Req'd per SB 350	26%	34%	39%
Peninsula Clean Energy Long Term Additional Goal	24%	16%	11%
Peninsula Clean Energy Total Long Term (>10 years)	50%	50%	50%

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

Peninsula Clean Energy's Conforming Portfolios rely on procurement from a variety of resource types as well as significant storage resources. Peninsula Clean Energy carefully evaluates the long-term generation load-matching and congestion risks of new resources and weighs its options in the context of its existing supply and net demand on an hourly basis for the full duration of any contract period.

As described below, Peninsula Clean Energy does not include long-duration storage resources in its portfolio currently because the AURORA modeling indicated that such resources do not reflect a cost optimal approach to meeting our load. These modeling results notwithstanding, Peninsula Clean Energy is actively pursuing long-duration storage through a Request for Information (RFI) issued earlier in 2020, which indicated a wide variety of long-duration storage technologies are expected to be commercially viable within five years. Peninsula Clean Energy has also launched a Request for Offers (RFO) for long-duration storage resources.

Peninsula Clean Energy has developed several customer programs to support demand-side energy management to improve grid resilience. In particular, Peninsula Clean Energy has developed a resilience strategy around providing resilience to individual vulnerable customers, such as medical baseline customers, and providing resilience for critical community facilities, such as emergency services.

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

Demand-side resource planning is important to Peninsula Clean Energy. Peninsula Clean Energy actively supports electrification and distributed energy resource activities to meet its renewable energy goals. Peninsula Clean Energy recently launched a residential solar + storage program designed to reduce energy consumption during peak periods. Please refer to Section III.d.ii.2 for details on this program.

Peninsula Clean Energy is disappointed that it cannot include the impact of these activities in its load forecast for Conforming Portfolios for IRP compliance and has provided some recommendations in Section V Lessons Learned.

(I) Minimize localized air pollutants and other greenhouse gas emissions, with early priority on disadvantaged communities

Peninsula Clean Energy's 46 MMT Conforming Portfolio meets the assigned GHG benchmark. Peninsula Clean Energy's 38 MMT Preferred Conforming Portfolio B results in emissions lower than Peninsula Clean Energy's assigned benchmark. Peninsula Clean Energy does not procure electricity directly from any natural gas or other fossil resource power plants. Further, there are no polluting electricity generation resources located in the disadvantaged communities (DACs) in Peninsula Clean Energy's service territory. Two of Peninsula Clean Energy's existing PPAs are located in DACs. By entering long-term PPAs with Peninsula Clean Energy, these two projects will deliver renewable power to Peninsula Clean Energy's customers, while improving air quality, providing economic benefits, and creating hundreds of jobs in the projects' regions. Please refer to Section III.d below for further details.

c. GHG Emissions Results

Table 20 below presents the GHG emissions associated with each Conforming Portfolio. The CSP calculator was used to estimate the emissions. As indicated above, Peninsula Clean Energy used custom hourly load shapes and custom production profiles in our analysis. Load shapes were developed based on historical meter data for Peninsula Clean Energy customers. Custom production profiles were used for existing contracts based on historical production or project and location specific modeling. Detailed explanations for how these were developed is included in the Study Design section above.

Table 20: GHG Emissions Results from CSP Calculator

	2020	2022	2026	2030
Assigned Load Forecast (GWh)	3,610	3,552	3,558	3,560
46 MMT GHG Benchmark				0.630
46 MMT Conforming Portfolio Emissions	0.441	0.312	0.579	0.626
38 MMT GHG Benchmark				0.503
38 MMT Conforming Portfolio A Emissions	0.441	0.316	0.404	0.498
38 MMT Conforming Portfolio B Emissions	0.441	0.316	0.234	0.347

d. Local Air Pollutant Minimization and Disadvantaged Communities

i. Local Air Pollutants

Table 21 below identifies the estimated emissions in tonnes per year associated with the 46 MMT Conforming Portfolio based on the calculations in the CSP calculator.

Table 21: 46 MMT Preferred Conforming Portfolio Local Air Pollutants

	2020	2022	2026	2030
NOx	355	303	44	52
PM2.5	135	114	21	27
SO2	48	40	2	3

Table 22 below identifies the estimated emissions in tonnes per year associated with the 38 MMT Conforming Portfolio A based on the calculations in the CSP calculator.

Table 22: 38 MMT Conforming Portfolio A Local Air Pollutants

	2020	2022	2026	2030
NOx	356	302	33	37
PM2.5	135	114	14	21
SO2	48	40	1	2

Table 23 below identifies the estimated emissions in tonnes per year associated with the 38 MMT Conforming Portfolio B based on the calculations in the CSP calculator.

Table 23: 38 MMT Preferred Conforming Portfolio B Local Air Pollutants

	2020	2022	2026	2030
NOx	356	302	22	25
PM2.5	135	114	7	15
SO2	48	40	1	1

Peninsula Clean Energy does not currently procure and does not plan to procure electricity directly from any fossil-fueled power plants. Peninsula Clean Energy's only contribution to air pollutants is a result of reliance on system power. Based on the analysis in the CSP, Table 24 below identifies the portion of load that is being served by system power for each year of the study for the 46 MMT Conforming Portfolio.

Table 24: 46 MMT Preferred Conforming Portfolio Comparison of Demand and Net System Power

	2020	2022	2026	2030
Demand (at Generator Bus-Bar)	3,897	3,835	3,841	3,843
Net System Power	894	588	1,180	1,292
% of Load Served by System Power	23%	15%	31%	34%

Based on the analysis in the CSP, Table 25 below identifies the portion of load that is being served by system power for each year of the study for the 38 MMT Conforming Portfolio A.

Table 25: 38 MMT Conforming Portfolio A Comparison of Demand and Net System Power

	2020	2022	2026	2030
Demand (at Generator Bus-Bar)	3,897	3,835	3,841	3,844
Net System Power	892	597	770	982
% of Load Served by System Power	23%	16%	20%	26%

Based on the analysis in the CSP, Table 26 below identifies the portion of load that is being served by system power for each year of the study for the 38 MMT Conforming Portfolio B.

Table 26: 38 MMT Preferred Conforming Portfolio B Comparison of Demand and Net System Power

	2020	2022	2026	2030
Demand (at Generator Bus-Bar)	3,897	3,835	3,841	3,844
Net System Power	641	597	371	641
% of Load Served by System Power	16%	16%	10%	17%

Peninsula Clean Energy is very interested in reducing reliance on system power. Please see Section IV. Action Plan for details on Peninsula Clean Energy's plans to reduce reliance on system power.

ii. Focus on Disadvantaged Communities

For purposes of the IRP, the CPUC's guidelines define a DAC as any community scoring in the top 25% statewide or in one of the 22 census tracts within the top 5% of communities with the highest pollution burden that do not have an overall score, using the most recent version (CalEnviroScreen 3.0) of the California Environmental Protection Agency's CalEnviroScreen tool.

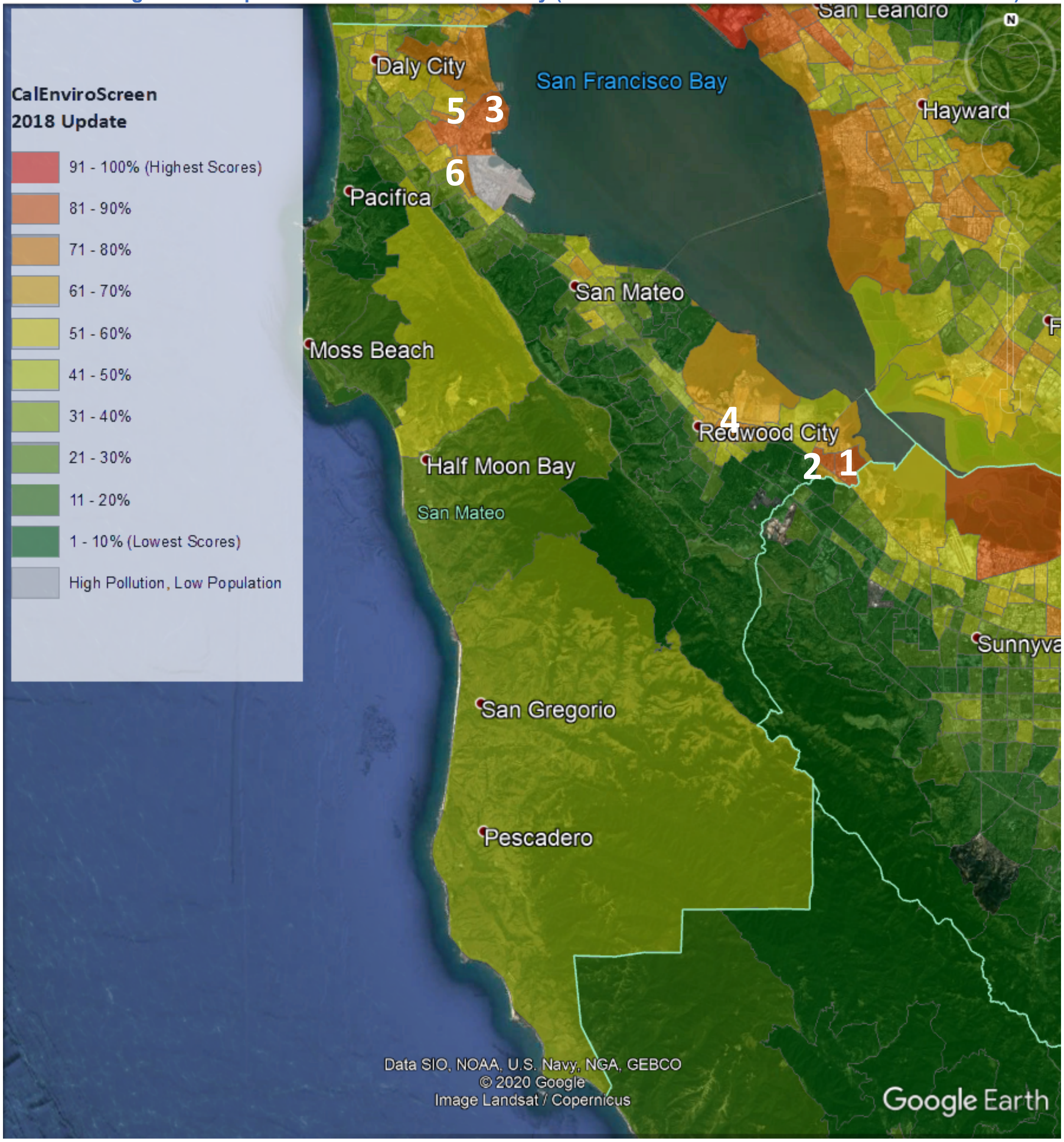
Peninsula Clean Energy identified six census tracts in San Mateo County in the top 25% of impacted census tracts, thereby meeting this definition of DACs. None of the 22 census tracts within the top 5% of communities with the highest pollution burden that do not have an overall score are located within San Mateo County. Please refer to Table 27 below for a list of the census tracts and locations of disadvantaged communities. Additionally, Figure 17 below provides a map to the location of each census tract in San Mateo County.

Table 27: San Mateo County's Disadvantaged Communities[11]

CalEnviroScreen 3.0 Results					Peninsula Clean Energy DACs[12]	
	Census Tract	**CES 3.0 %**	**CES 3.0 % Range**	**City**	**Population**	**Customer Accounts**
1	**6081611900**	86.83	86-90%	East Palo Alto	10,325	1,235
2	**6081612000**	81.69	81-85%	East Palo Alto	7,327	710
3	**6081602300**	80.89	81-85%	South San Francisco	3,753	1,160
4	**6081610201**	80.21	81-85%	Redwood City	5,764	2,125
5	**6081602100**	77.93	76-80%	South San Francisco	3,615	943
6	**6081604200**	75.43	76-80%	San Bruno	4,170	888
				Total	**34,954**	**7,061**

[11] Table 27 includes data from https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30, under CalEnviroScreen 3.0 Data and Additional Materials - ces3results.xlxs (updated June 2018)
[12] Not included in CalEnviroScreen 3.0 results; figures calculated by Peninsula Clean Energy.

Figure 17: Map of DACs in San Mateo County (Numbers correlate to census tracts in Table 27)



Peninsula Clean Energy estimates that it has approximately 7,000 residential accounts in DACs located within San Mateo County, as defined by the CPUC guidance. This represents roughly 2.4% of Peninsula Clean Energy's total customer accounts.

The CalEnviroScreen 3.0 identifies DACs by census tract, however, Peninsula Clean Energy doesn't currently capture customer data in this granularity. To determine an accurate estimate, Peninsula Clean Energy used the United States Postal Service (USPS) Zip Code Crosswalk files provided online by the

Department of Housing and Urban Development (HUD)[13]. HUD uses the USPS's database to reflect the locations of both residential and business addresses to help merge census tracts with zip codes. Peninsula Clean Energy used this method because it allocates data based on residential addresses rather than by area or population, a more accurate approach to determine the number of accounts in each census tract. Please reference Table 27 for the estimated number of Peninsula Clean Energy residential accounts in each of the identified census tracts.

1. Power Procurement in DACs

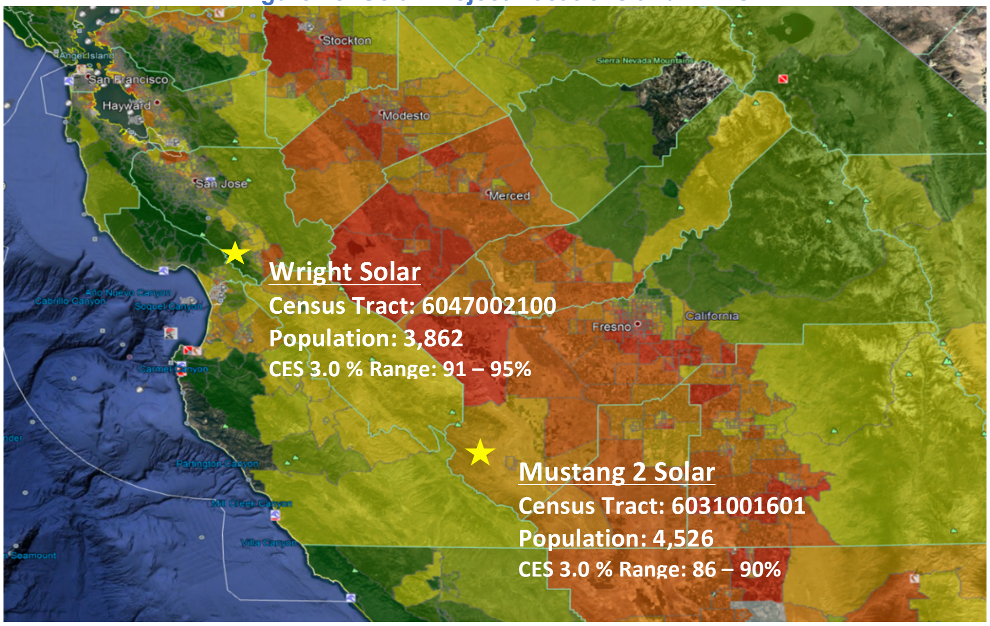
Peninsula Clean Energy does not procure electricity directly from any natural gas or other fossil resource power plants. Further, there are no polluting electricity generation resources located in the DACs in Peninsula Clean Energy's service territory identified above.

Peninsula Clean Energy fully recognizes the need to help mitigate the impacts of air pollution in regions of the state where communities have been disproportionately impacted by the existing generating fleet as well as the need to bring economic benefits to communities with high levels of poverty and unemployment. Consistent with this recognition, Peninsula Clean Energy has executed long-term PPAs with two solar projects located in DACs in Merced County and Kings County. By entering into long-term PPAs with Peninsula Clean Energy, these two projects will deliver renewable power to Peninsula Clean Energy's customers, while improving air quality, providing economic benefits and creating hundreds of jobs to the projects' region.

Each of these projects has signed a project labor agreement (PLA) with local unions. A PLA is a pre-hire collective bargaining agreement with one or more labor organizations that establishes the terms and conditions of employment for a specific construction project. Consistent with Peninsula Clean Energy's Sustainable Workforce policy[14], Peninsula Clean Energy believes support of local businesses, union labor and apprenticeship and pre-apprenticeship programs that create employment opportunities are important components of building and sustaining healthy and sustainable communities. As part of its procurement process, Peninsula Clean Energy collects information from project owners on expected labor impacts. This information is used to evaluate potential workforce impacts of proposed projects with the goal of promoting fair compensation, fair worker treatment, multi-trade collaboration, and support for the existing wage base in local communities where contracted projects will be located.

[13] https://www.huduser.gov/portal/datasets/usps_crosswalk.html
[14] https://www.peninsulacleanenergy.com/wp-content/uploads/2017/01/Peninsula Clean Energy-Policy-10-final-1.pdf

Figure 18: Solar Project Locations and DACs



Wright Solar is a 200 MW solar project currently operating in Merced County, less than 100 miles south of San Mateo County. Wright Solar is located in a DAC that ranks very highly on the CalEnviroScreen 3.0, falling within the 91-95% percentile of communities burdened by the highest pollution. Please refer to **Error! Reference source not found.** for the location of the project and CalEnviroScreen 3.0 details. The plant is producing power equivalent to that used by over 75,000 households.

Mustang Two Solar is a 100 MW solar project under construction in in Kings County, roughly 200 miles outside San Mateo County. The facility is located in a DAC that ranks on the CalEnviroScreen 3.0 in the 86-90% percentile of communities burdened by the highest pollution. Please refer to **Error! Reference source not found.** for the location of the project and CalEnviroScreen 3.0 details. Mustang Two Solar is currently under construction and expected to start operating by the end of 2020. The project owner estimates that approximately $3.1 million will be spent locally on materials and services, $3.6 million in tax revenue will go to Kings County and $8.1 million in tax revenue will go to the state.

2. LSE Activities & Programs Impacting DACs

Peninsula Clean Energy's ECOplus customers receive a 5% discount from PG&E's electrical service rate, which is an immediate benefit provided to all residents who want to reduce their monthly electrical bill. This saves residential customers $2.51 on average per month and in aggregate saves customers $18 million annually.[15]

As highlighted in Table 28, Peninsula Clean Energy has already launched or is planning to launch in the near future numerous programs and activities that contribute to economic development, energy resilience, home comfort, and sustainable transportation options within DACs while reducing GHG emissions by increasing local clean power production, encouraging adoption of clean transportation alternatives, and encouraging energy efficiency.

[15] Based on a typical usage of 427 kWh/month. For details on rates and savings calculation: https://www.peninsulacleanenergy.com/for-residents/

Table 28: Overview of Peninsula Clean Energy Programs Benefiting DACs

Program	Description	Status
Emergency Bill Credit for CARE Customers due to COVID 19	$3.6 million in $100 automatic credits placed directly on the bills of CARE and FERA customers to ease the economic burden of COVID-19 in April 2020. Credit is automatically added to the bills CARE customers that enrolled after April. Approximately 36,000 CARE customers have been served by this program.	Approved and implemented in April 2020, ongoing.
Power On Peninsula Medically Vulnerable (Portable Battery Program)	Donating portable batteries to medically vulnerable customers in high fire threat districts or in areas that are at risk for PSPS events. Program focuses on renters and residents of mobile home parks and condo who are not able to take advantage of SGIP Equity Resilience batteries rebates. Intensive outreach in Spanish.	Initial batteries received and distributed in August 2020.
Power On Peninsula Residential (Solar + Storage Program)	Connect residential customers to Sunrun for solar+storage options. Sunrun is committing to reducing Peninsula Clean Energy's load during specific hours. Includes robust community outreach and enrollment support for SGIP Equity Resilience-eligible homeowners.	Contract executed in June 2020 and program launching in August 2020.
Resilient Solar on Critical Facilities	Joint project with East Bay Community Energy (EBCE) to complete a scoping study to identify municipal critical facilities and complete a preliminary assessment for solar+storage resilience.	Preliminary assessment completed; RFI in May 2020.
CSGT DAC GT	Pursuant to D.18-06-027, CCAs may develop and implement their own DAC-GT and CS-GT programs to promote the installation of renewable generation among residential customers in disadvantaged communities.	Advice Letter will be submitted prior to the end of 2020.
E-Bikes	Rebate program for e-bikes, targeting customers with low to moderate incomes. Partnership with Commute.org for follow up incentives based on usage and Silicon Valley Bike Coalition for marketing. Program outreach focusing on affordable housing communities.	Program approved by Peninsula Clean Energy's Board in July 2020, currently under development with launch expected in Q4 2020.

Program	Description	Status
Low-Income Home Upgrade	$2 million over 4 years for turnkey service for no-cost home repairs and upgrades, energy efficiency, and electrification measures for low-income residents of San Mateo County.	Program approved by Peninsula Clean Energy's Board in May 2020, currently under development with launch expected in Q1 2021.
Drive Forward Electric (Low-Income Electric Vehicle (EV) Incentive)	This program offers up to $4,000 point of sale rebates to low-income residents for purchase of used plug-in hybrid cars. Peninsula Clean Energy is partnered with Peninsula Family Service's (PFS) DriveForward program, which provides affordable loans to help participants purchase reliable used vehicles and begin the process of repairing their credit through financial coaching. The program includes training on the benefits of plug-in vehicles, including understanding the fundamentals of such vehicles and how to benefit from them.	Program approved by Peninsula Clean Energy's board on April 26, 2018 and launched in March 2019.
Low-Power and Curbside Charging Pilots	$1 million for a 3-year pilot program to identify and pilot unique technology and business model innovations for expanded EV infrastructure within multi-unit dwellings and for curbside charging. The strategy is intended to help address the lack of excess power in a large segment of the County's multi-unit dwellings (80% are over 50 years old), and expand access to EV charging beyond single-family homeowners.	Program approved by Peninsula Clean Energy's Board on June 28, 2018. Multi-unit dwelling deployments targeted for Q3 and project development for curbside charging is in process with installation expected in 2021.
EV Ready Program	$28 million (includes $12 million provided by CEC through CALeVIP and $16 million provided by Peninsula Clean Energy) multifaceted program to accelerate electric vehicle charging infrastructure deployment. Program includes robust outreach and technical assistance with elevated assistance and incentives for affordable housing. Program also include workforce development. EV Ready aims to increase access to EV charging for both the low-income residents and nearly half of county residents who live in multi-unit dwellings. Targets installing at least 3,500 charge ports over 4 years.	Approved by Peninsula Clean Energy's Board in December 2018, currently under development with launch expected in September 2020.

Program	Description	Status
Reach Codes and Electrification Technical Assistance and Training	Provides technical assistance to local government for adoption of substantially enhanced local codes for EV readiness and to building designers and facilities managers for design and implementation. Includes training to contractors in electric appliance installation. Elevated technical assistance offered to affordable housing.	Program was approved in January 2019 and expanded in January 2020.
Community Outreach Grants	Annual grant cycle open to nonprofits and local government agencies to conduct community outreach and enroll customers in • Low-income discounts • Medical Baseline discounts • Peninsula Clean Energy programs in general, with an emphasis on reaching underserved populations The grants helped Peninsula Clean Energy distribute its message in English, Spanish, Chinese, Tongan and Samoan. The goal of distributing these small grants is to gain further participation from the public and local organizations to collaborate with Peninsula Clean Energy on efforts to create a sustainable, cleaner environment for San Mateo County.	After a successful 2018-19 grant cycle, six grants were awarded for 2019-20. The RFP for a 2020-21 grant cycle will be announced in Q3.

Since DACs based on the CalEnviroScreen definition make up a relatively small portion of Peninsula Clean Energy's customer base, we often expand the definition of eligible customers for the purposes of our programs to include eligibility based on income, customers on specific rates, and by using the San Mateo County Community Vulnerability Index.

For income-based eligibility, low income is often defined as household income below 80% of the area's median income. We estimate that more than 127,000 households[16] in San Mateo County fall within this definition. Low income could also be defined as households eligible for certain electric rates including California Alternate Rates for Energy (CARE) or Family Electric Rate Assistance (FERA) program. Peninsula Clean Energy has 35,047 accounts enrolled in the CARE rate and 1,606 accounts enrolled in the FERA program.

Several programs are also specifically targeted to customers that need power for medical devices. For these programs, we have used participation or eligibility for the Medical Baseline to identify customers. Peninsula Clean Energy has 5,567 customers on Medical Baseline tariff, but we believe enrollment is undersubscribed and are working with local agencies and non-profits to identify and enroll other eligible customers.

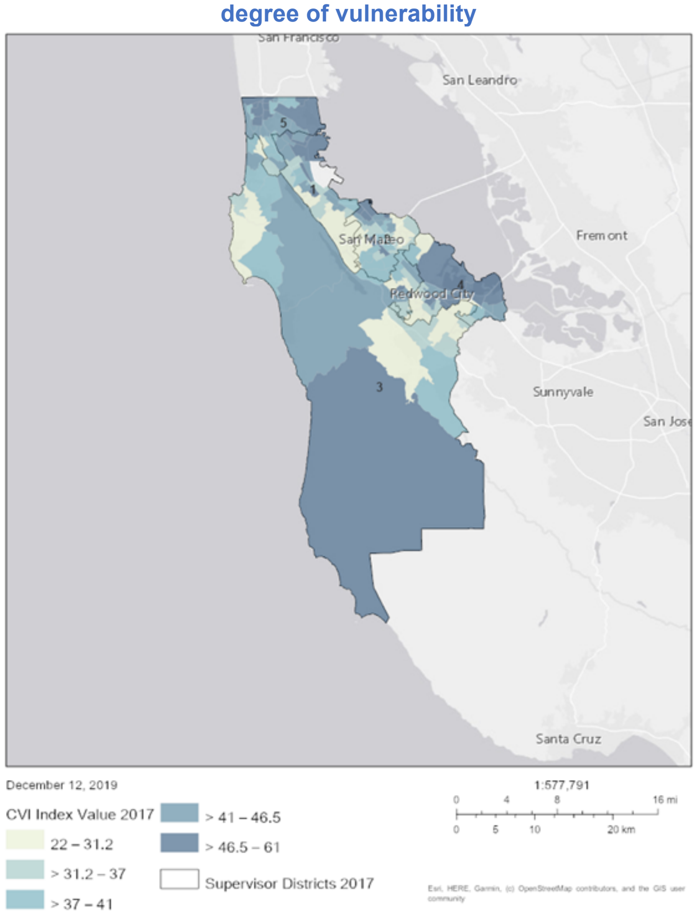
[16] Based on 2018 American Community Survey - https://data.census.gov/cedsci/table?q=San%20Mateo%20County,%20California&g=0500000US06081&tid=ACSDP1Y2018.DP03&hidePreview=true

Finally, we also consult the San Mateo County Community Vulnerability Index (CVI)[17],which is an initiative of the County Manager's Office and aims to demonstrate the geographical distribution of the overall vulnerability of the residents of the county. The CVI evaluates the following seven indicators of vulnerability:

- Health insurance coverage;
- Educational attainment;
- Supplemental security income;
- Gross rent as a percentage of income;
- Poverty;
- Unemployment; and
- Disability status.

The CVI identifies a large vulnerable population on the San Mateo County coast, which is not identified through the CalEnviroscreen definition. Please refer to Figure 19 below for a map of the Community Vulnerability Index for San Mateo County.

Figure 19: Map of San Mateo County Community Vulnerability Index. A dark shade of blue represents a high degree of vulnerability



[17] "Community Vulnerability Index": https://cmo.smcgov.org/cvi

e. Cost and Rate Analysis

Peninsula Clean Energy's rates are set by its Board of Directors. Since inception, Peninsula Clean Energy's goal has been to offer rates that are at parity or lower than PG&E rates. Peninsula Clean Energy's default product is ECOplus and rates for this product are currently set at 5% below PG&E's rates while providing customers with electricity that is 50% renewable and 95% carbon-free. It is imperative to Peninsula Clean Energy's success to manage cost and offer our customers competitive rates while maintaining our financial sustainability.

To meet this goal, Peninsula Clean Energy takes a number of actions to procure the lowest cost portfolio and protect our customers from unexpected price increases.

- Competitive procurement: Peninsula Clean Energy engages in competitive procurement processes to secure the lowest cost resources possible for our customers.
- Financial reserves: Peninsula Clean Energy maintains cash reserves at least equivalent to 180 days of total operating expenses, which can help Peninsula Clean Energy manage risk and remain financially solvent.[18]
- Credit rating: Peninsula Clean Energy is one of three CCAs to have received an investment grade credit rating. This helps us to secure the lowest cost power resources for our customers.
- Risk Management: Peninsula Clean Energy is subject to cost volatility and market price risk in meeting load requirements in the CAISO market. We manage this risk through forward procurement of fixed price contracts for energy. Peninsula Clean Energy uses a portfolio risk management approach in its power purchasing program, seeking low cost supply as well as diversity among technologies, production profiles, project sizes, project locations, counterparties, term lengths and timing of market purchases to cost average over time, including remaining cognizant of the value of open market positions.

Considering these goals, Peninsula Clean Energy analyzed the anticipated cost of the Conforming Portfolios and its impact to customers using AURORA. Overall, Peninsula Clean Energy's expected costs increase through 2025 and then remain relatively flat through 2030. Peninsula Clean Energy notes that numerous market factors could affect these assumptions. These risk factors are identified in the Barrier Analysis section below.

Peninsula Clean Energy's expected portfolio costs for the 46 MMT Conforming Portfolio are depicted in Figure 20 below, for the 38 MMT Conforming Portfolio A are depicted in Figure 21 below, and for the 38 MMT Conforming Portfolio B are depicted in Figure 22 below. A full description of the cost components is provided below.

[18] Financial Reserves Policy: https://www.peninsulacleanenergy.com/wp-content/uploads/2020/03/Peninsula Clean Energy-Policy-18-Reserves-Policy-Revised-2-27-20-1.pdf

Figure 20: Peninsula Clean Energy 46 MMT Conforming Portfolio Costs

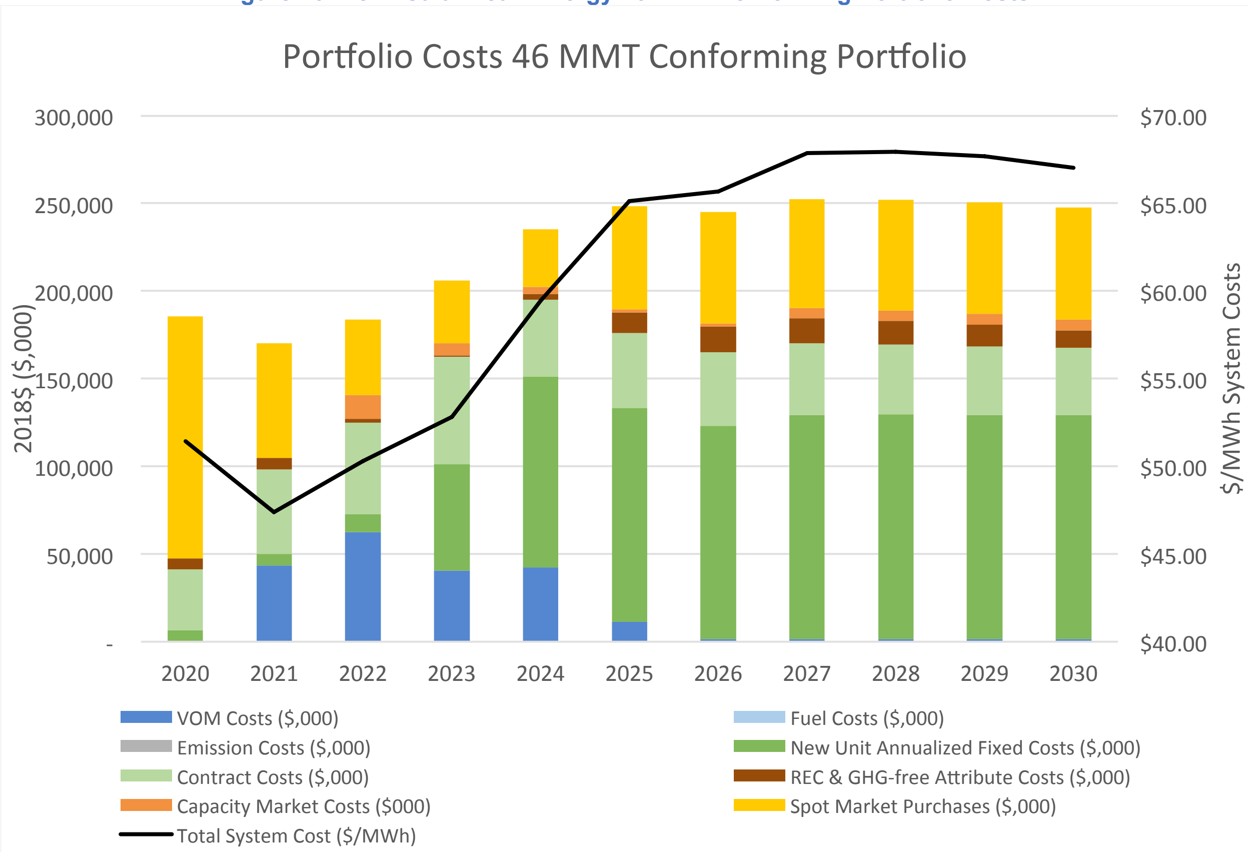


Figure 21: Peninsula Clean Energy 38 MMT Conforming Portfolio A Costs

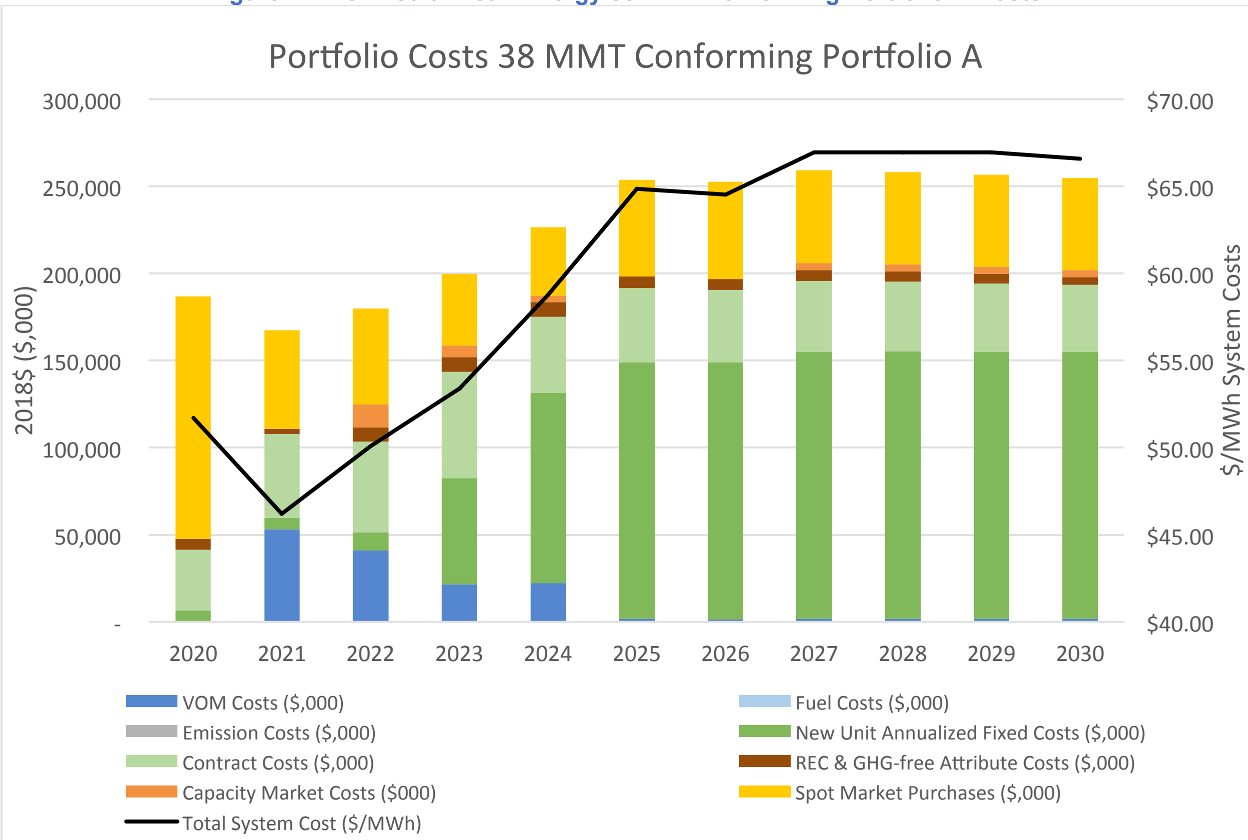
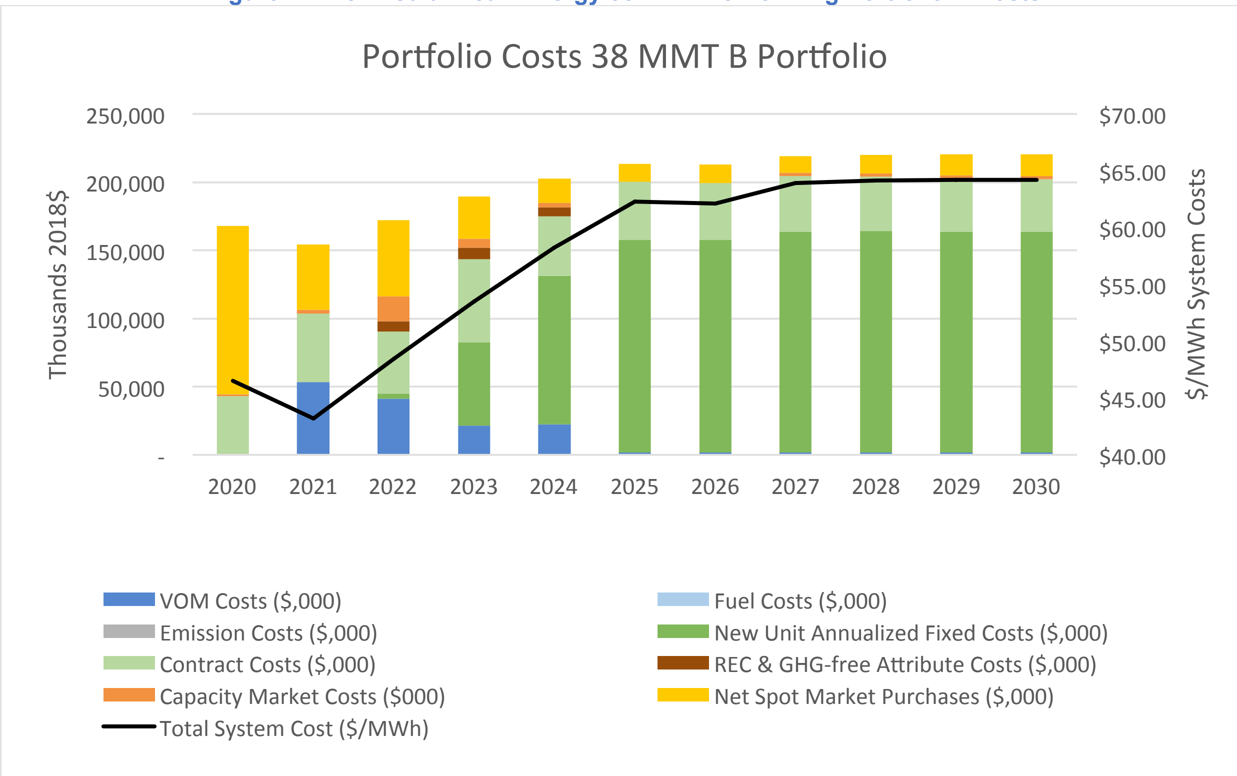


Figure 22: Peninsula Clean Energy 38 MMT Conforming Portfolio B Costs



i. Cost Components

For each portfolio, costs are comprised of the following components which are each described in more detail below:

- Market Purchases;
- New Unit Annualized Fixed Costs;
- Capacity Market Costs;
- REC and GHG-free Attribute Costs;
- Capacity Market Costs; and
- Contract Costs.

Market Purchases: Each of the portfolios start with higher levels of market purchases in the early years of the study period. Market purchase costs, and by extension market exposure, decrease over the study horizon as the portfolio is built to meet aggressive early year RPS targets. After 2025 market purchases stabilize in terms of their impact to the portfolio.

New Unit Annualized Fixed Costs: Includes capital and fixed O&M costs for long-term capacity selected by the optimization analysis. As Peninsula Clean Energy begins to build new resources within the portfolio, the cost mix of the portfolio shifts to become largely driven by the capital and fixed O&M costs for long-term capacity selected. This cost assumption is for modeling purposes only. Peninsula Clean Energy may choose to own resources or may choose to continue to contract with resources through PPAs.

VOM Costs: Variable O&M costs for long-term capacity selected by the optimization, contract costs for short-term contracts and long-term hydro contracts (in-state and out-of-state). It does not include existing PPA contract costs. This cost assumption is for modeling purposes only. Peninsula Clean Energy may choose to own resources or may choose to continue to contract with resources through PPAs.

Contract Costs: Reflects total cost for existing PPAs. This cost decreases slightly from 2023 to 2024 when two existing PPAs reach the end of their respective contract terms and then is relatively constant throughout the remainder of the study period.

Capacity Market Costs: Capacity market costs serve as a representation for the cost of RA products to meet reliability requirements beyond those met by each of the portfolios. Capacity market contracts were assumed to cost $5/kW-month over the duration of the study period.

REC and GHG-free Attribute Costs: REC and GHG-free purchases serve as a representation for the cost of attribute-only products. The price of the products was derived from the S&P Platts North American Emissions Special Report and fluctuate depending on the renewable and GHG-free generation contributed from the two portfolios. Peninsula Clean Energy requires minimal incremental attribute purchases to meet our internal targets based on the capacity expansion plan.

Total System Cost: Overall, the transition from relying on market purchases to serving energy needs through owned and contracted resources to meet internal RPS requirements will be a marginal impact on cost to serve load on a $/MWh basis. The range of costs to serve load on a $/MWh basis is within $45-$70/MWh over the entire study horizon and fluctuates in the early years and begins to rise steady through the forecast horizon as Peninsula Clean Energy expands its portfolio.

f. System Reliability Analysis

Peninsula Clean Energy's two preferred portfolios are the 46 MMT Conforming Portfolio and the 38 MMT Conforming Portfolio B. The System Reliability Progress Tracking Table from the Resource Data Template for the 46 MMT Conforming Portfolio is presented below as Table 29 and the System Reliability Progress Tracking Table from the Resource Data Template for the 38 MMT Conforming Portfolio B is presented below as Table 30. In the sections below the tables, Peninsula Clean Energy describes several methods for evaluating system reliability and how these two preferred portfolios contribute to system reliability.

Table 29: Preferred 46 MMT Conforming System Reliability Progress Tracking Table

System Reliability Progress Tracking Table (NQC MW) for month of September by contract status, 46 MMT portfolio	ELCC type	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
online	wind_low_cf	9	24	23	23	-	-	-	-	-	-	-
online	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
online	biomass	-	-	-	-	-	-	-	-	-	-	-
online	cogen	-	-	-	-	-	-	-	-	-	-	-
online	geothermal	-	-	-	-	-	-	-	-	-	-	-
online	hydro	8	8	8	8	8	8	8	8	8	8	8
online	thermal	94	22	22	-	-	-	-	-	-	-	-
online	battery	-	-	-	-	-	-	-	-	-	-	-
online	nuclear	-	-	-	-	-	-	-	-	-	-	-
online	solar	28	28	28	103	100	97	94	91	88	85	82
online	psh	-	-	-	-	-	-	-	-	-	-	-
online	unknown	539	481	162	66	-	-	-	-	-	-	-
development	wind_low_cf	-	-	-	-	-	-	-	-	-	-	-
development	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
development	biomass	-	-	-	-	-	-	-	-	-	-	-
development	cogen	-	-	-	-	-	-	-	-	-	-	-
development	geothermal	-	-	-	-	-	-	-	-	-	-	-
development	hydro	-	-	-	-	-	-	-	-	-	-	-
development	thermal	-	-	-	-	-	-	-	-	-	-	-
development	battery	-	-	-	-	-	-	-	-	-	-	-
development	nuclear	-	-	-	-	-	-	-	-	-	-	-
development	solar	-	14	14	14	12	11	9	9	9	9	9
development	psh	-	-	-	-	-	-	-	-	-	-	-
development	unknown	-	-	-	-	-	-	-	-	-	-	-
review	wind_low_cf	-	-	-	-	-	-	-	-	-	-	-
review	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
review	biomass	-	-	-	-	-	-	-	-	-	-	-
review	cogen	-	-	-	-	-	-	-	-	-	-	-
review	geothermal	-	-	-	-	-	-	-	-	-	-	-
review	hydro	-	-	-	-	-	-	-	-	-	-	-
review	thermal	-	-	-	-	-	-	-	-	-	-	-
review	battery	-	-	-	-	-	-	-	-	-	-	-
review	nuclear	-	-	-	-	-	-	-	-	-	-	-
review	solar	-	-	-	-	-	-	-	-	-	-	-
review	psh	-	-	-	-	-	-	-	-	-	-	-
review	unknown	-	1	13	92	76	75	73	73	73	73	73
planned_existing	wind_low_cf	-	-	-	-	-	-	-	-	-	-	-
planned_existing	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
planned_existing	biomass	-	-	-	-	-	-	-	-	-	-	-
planned_existing	cogen	-	-	-	-	-	-	-	-	-	-	-
planned_existing	geothermal	-	-	-	-	-	-	-	-	-	-	-
planned_existing	hydro	-	64	64	64	64	-	-	-	-	-	-
planned_existing	thermal	-	-	-	-	-	-	-	-	-	-	-
planned_existing	battery	-	-	-	-	-	-	-	-	-	-	-
planned_existing	nuclear	-	-	-	-	-	-	-	-	-	-	-
planned_existing	solar	-	-	-	-	-	-	-	-	-	-	-
planned_existing	psh	-	-	-	-	-	-	-	-	-	-	-
planned_existing	unknown	-	67	341	164	139	121	139	96	103	108	116
planned_new	wind_low_cf	-	-	-	15	31	35	40	40	40	40	40
planned_new	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
planned_new	biomass	-	-	-	-	-	-	-	-	-	-	-
planned_new	cogen	-	-	-	-	-	-	-	-	-	-	-
planned_new	geothermal	-	-	-	-	-	-	-	-	-	-	-
planned_new	hydro	-	-	-	-	-	-	-	-	-	-	-
planned_new	thermal	-	-	-	-	-	-	-	-	-	-	-
planned_new	battery	-	-	-	100	200	295	290	338	338	338	338
planned_new	nuclear	-	-	-	-	-	-	-	-	-	-	-
planned_new	solar	-	-	7	35	55	47	40	40	40	40	40
planned_new	psh	-	-	-	-	-	-	-	-	-	-	-
planned_new	unknown	-	-	-	-	-	-	-	-	-	-	-

Table 30: Preferred 38MMT Conforming Portfolio B System Reliability Progress Tracking Table

System Reliability Progress Tracking Table (NQC MW) for month of September by contract status, 38 MMT portfolio	ELCC type	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
online	wind_low_cf	9	24	23	23	-	-	-	-	-	-	-
online	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
online	biomass	-	-	-	-	-	-	-	-	-	-	-
online	cogen	-	-	-	-	-	-	-	-	-	-	-
online	geothermal	-	-	-	-	-	-	-	-	-	-	-
online	hydro	8	8	8	8	8	8	8	8	8	8	8
online	thermal	94	22	22	-	-	-	-	-	-	-	-
online	battery	-	-	-	-	-	-	-	-	-	-	-
online	nuclear	-	-	-	-	-	-	-	-	-	-	-
online	solar	28	28	28	103	100	97	94	91	88	85	82
online	psh	-	-	-	-	-	-	-	-	-	-	-
online	unknown	539	481	162	66	-	-	-	-	-	-	-
development	wind_low_cf	-	-	-	-	-	-	-	-	-	-	-
development	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
development	biomass	-	-	-	-	-	-	-	-	-	-	-
development	cogen	-	-	-	-	-	-	-	-	-	-	-
development	geothermal	-	-	-	-	-	-	-	-	-	-	-
development	hydro	-	-	-	-	-	-	-	-	-	-	-
development	thermal	-	-	-	-	-	-	-	-	-	-	-
development	battery	-	-	-	-	-	-	-	-	-	-	-
development	nuclear	-	-	-	-	-	-	-	-	-	-	-
development	solar	-	14	14	14	12	10	8	8	7	6	5
development	psh	-	-	-	-	-	-	-	-	-	-	-
development	unknown	-	-	-	-	-	-	-	-	-	-	-
review	wind_low_cf	-	-	-	-	-	-	-	-	-	-	-
review	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
review	biomass	-	-	-	-	-	-	-	-	-	-	-
review	cogen	-	-	-	-	-	-	-	-	-	-	-
review	geothermal	-	-	-	-	-	-	-	-	-	-	-
review	hydro	-	-	-	-	-	-	-	-	-	-	-
review	thermal	-	-	-	-	-	-	-	-	-	-	-
review	battery	-	-	-	-	-	-	-	-	-	-	-
review	nuclear	-	-	-	-	-	-	-	-	-	-	-
review	solar	-	-	-	-	-	-	-	-	-	-	-
review	psh	-	-	-	-	-	-	-	-	-	-	-
review	unknown	-	1	13	92	76	75	73	73	73	73	73
planned_existing	wind_low_cf	-	-	-	-	-	-	-	-	-	-	-
planned_existing	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
planned_existing	biomass	-	-	-	-	-	-	-	-	-	-	-
planned_existing	cogen	-	-	-	-	-	-	-	-	-	-	-
planned_existing	geothermal	-	-	-	-	-	-	-	-	-	-	-
planned_existing	hydro	-	64	64	64	64	-	-	-	-	-	-
planned_existing	thermal	-	-	-	-	-	-	-	-	-	-	-
planned_existing	battery	-	-	-	-	-	-	-	-	-	-	-
planned_existing	nuclear	-	-	-	-	-	-	-	-	-	-	-
planned_existing	solar	-	-	-	-	-	-	-	-	-	-	-
planned_existing	psh	-	-	-	-	-	-	-	-	-	-	-
planned_existing	unknown	-	67	341	166	131	67	79	67	70	90	112
planned_new	wind_low_cf	-	-	-	13	35	59	65	65	65	65	65
planned_new	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
planned_new	biomass	-	-	-	-	-	-	-	-	-	-	-
planned_new	cogen	-	-	-	-	-	-	-	-	-	-	-
planned_new	geothermal	-	-	-	-	-	-	-	-	-	-	-
planned_new	hydro	-	-	-	-	-	-	-	-	-	-	-
planned_new	thermal	-	-	-	-	-	-	-	-	-	-	-
planned_new	battery	-	-	-	100	200	300	300	344	338	332	326
planned_new	nuclear	-	-	-	-	-	-	-	-	-	-	-
planned_new	solar	-	-	7	35	61	77	64	56	49	42	35
planned_new	psh	-	-	-	-	-	-	-	-	-	-	-
planned_new	unknown	-	-	-	-	-	-	-	-	-	-	-

Peninsula Clean Energy takes its responsibility to procure a portfolio of resources that contribute to system reliability very seriously. Peninsula Clean Energy's Board has set aggressive renewable energy goals that go beyond the RPS requirements in timeline, volume and by instructing Peninsula Clean Energy staff to hit these targets by matching hourly load with renewable energy. These efforts are focused on eliminating reliance on system fossil fuel resources and ensuring system reliability in all hours. As part of its IRP analysis, Peninsula Clean Energy developed alternative scenarios to meet these internal goals, but staff ultimately decided these analyses were not ready for submittal. Over the next 6-12 months, Peninsula Clean Energy will continue to analyze the details associated with this priority and these alternative portfolios to understand costs, reliability and strategies to reduce reliance on system power. In the sections below, we present a reliability analysis for the two preferred conforming portfolios.

Numerous studies have demonstrated that high renewable portfolios can deliver solid reliability at a reasonable cost. NREL's Renewable Electricity Futures Study has demonstrated that "renewable electricity generation from technologies that are commercially available today, in combination with a more flexible electric system, is more than adequate to supply 80% of total U.S. electricity generation in 2050 while meeting electricity demand on an hourly basis in every region of the United States."[19] Similarly, other studies have found that serving California with 80% renewable energy would be cheaper than business as usual while serving load in all hours reliably.[20,21] Based on these studies, the low-carbon portfolios under consideration here should not implicate inherent reliability concerns for the grid, provided adequate grid planning and grid management.

Since low-carbon portfolios require different reliability measures than dispatchable portfolios, Peninsula Clean Energy has worked to develop methodologies to better evaluate the impacts of low-carbon portfolios on grid reliability. First, Peninsula Clean Energy reports the currently adopted system RA contracting needs for the Preferred 46 MMT Conforming Portfolio and the Preferred 38 MMT Conforming Portfolio B.

The transition to variable energy resources, especially wind and solar, means that a focus exclusively on peak load is misplaced. Reliability assessment of low-carbon resources will also need to evaluate serving load across all hours, since resources to meet load during the solar window will not be the same as resources used to meet evening ramping or overnight load. Unfortunately, for this purpose, existing reliability methodologies in the System RA construct are inadequate to assess how well low-carbon portfolios meet load in all hours. Therefore, Peninsula Clean Energy supplements the System RA analysis with two additional reliability measures. The first additional measure is the annual MWh of energy that Peninsula Clean Energy expects to purchase from the market, which represents the degree of reliance on dispatchable generation overall. The second alternative measure is a variant on the net load duration

[19] Renewable Electricity Futures Study, National Renewable Energy Laboratory. (2012). Hand, M.M.; Baldwin, S.; DeMeo, E.; Reilly, J.M.; Mai, T.; Arent, D.; Porro, G.; Meshek, M.; Sandor, D. eds. 4 vols. NREL/TP-6A20-52409. Golden, CO: Nation, Vol 1, at 4. http://www.nrel.gov/analysis/re_futures/.

[20] Cost-effective decarbonization of California's power sector by 2030 with the aid of battery storage (2019) Amol Phadke, Nikit Abhyankar, Ranjit Deshmukh, Julia Szinai, and Anand Gopal (2019), available at https://eta-publications.lbl.gov/sites/default/files/californiapowerdecarbonizationdraft_v6.pdf.

[21] The 2035 Study: Plummeting Solar, Wind, And Battery Costs Can Accelerate Our Clean Electricity Future (2020) Amol Phadke, Umed Paliwal, Nikit Abhyankar, Taylor McNair, Ben Paulos, David Wooley, Ric O'Connell, available at http://www.2035report.com/wp-content/uploads/2020/06/2035-Report.pdf?hsCtaTracking=8a85e9ea-4ed3-4ec0-b4c6-906934306ddb%7Cc68c2ac2-1db0-4d1c-82a1-65ef4daaf6c1

curve methodology proposed by Southern California Edison and CalCCA in Track 3b of the current RA proceeding (R.19-11-009).[22] This methodology expressly focuses on the ability of the dispatchable resources and storage discharge to serve the net load not served by time-dependent renewables.

Both of these supplemental measures represent provisional approaches and should be viewed as qualitative measures of the reliance of market or system energy, rather than any precise quantitative representation of the exact amount of energy or capacity that would be needed to meet all load in all hours. The net load duration curve methodology uses a prototype tool, since the details of the methodology have neither been discussed by stakeholders nor adopted by the Commission. Thus, these results are presented solely for the qualitative patterns.

All three measures show that the Preferred 38 MMT Conforming Portfolio B, with the highest level of new resource build and lowest GHG emissions, is the most reliable portfolio with the smallest reliance on resources outside the portfolio. All three of Peninsula Clean Energy's portfolios contain substantial storage capacity. Consequently, for this set of portfolios with robust storage, the lower the GHG target, the more reliable the portfolio appears to be. Across all three measures, the Preferred 38 MMT Conforming Portfolio B has a lower need for energy or system RA contracted capacity than either of the other Conforming Portfolios with higher GHG targets. Overall, the Preferred 46 MMT Conforming Portfolio appear to require 35% more system energy, and as much as 75% more supplemental capacity than the 38 MMT Conforming Portfolio B, depending on the methodology. Taken together, these measures provide a qualitative indication that Peninsula Clean Energy's higher renewable generation goals and focus on serving load in more hours support grid reliability.

i. System RA

The Preferred 38 MMT Conforming Portfolio B has lower open system RA requirements than the Preferred 46 MMT Conforming Portfolio in most years. Peninsula Clean Energy evaluated both portfolios' September open position through 2030 based on peak load, planning reserve margin and the portfolios' ELCC based on the RDT. For both portfolios, the key measure is the volume of system RA contracts we anticipate securing from the market to satisfy our System RA position. The results of this analysis is presented in Table 31 below for the 46 MMT Conforming Portfolio, and in Table 32 below for the 38 MMT Conforming Portfolio B. Additionally, Figure 23 below compares the open positions across the two portfolios.

[22] See Southern California Edison Company (U 338-E) And California Community Choice Association's Track 3 Proposal (August 7, 2020), https://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=344809752.

Table 31: 46 MMT Conforming Portfolio System RA Open Position Analysis

	Peak Demand	Peak demand + Planning Reserve Margin (15%)	Portfolio ELCC	RDT System RA Contracting Position
2021	[redacted]			
2022				
2023				
2024				
2025				
2026				
2027				
2028				
2029				
2030				

Table 32: 38 MMT Conforming Portfolio B System RA Open Position Analysis

	Peak Demand	Peak demand + Planning Reserve Margin (15%)	Portfolio ELCC	RDT System RA Contracting Position
2021	[redacted]			
2022				
2023				
2024				
2025				
2026				
2027				
2028				
2029				
2030				

Figure 23: Comparison of System RA Open Position For Each Portfolio Over Study Period

[redacted]

As demonstrated in the tables and figures above, for both portfolios analyzed, Peninsula Clean Energy expects that starting in 2025, when most of the new resource build for each portfolio is complete, the Preferred 46 MMT Conforming Portfolio will meet between approximately 90% to 96% of Peninsula Clean Energy's System RA needs, while the Preferred 38 MMT Conforming Portfolio B would cover between 94% to 102% of Peninsula Clean Energy's System RA need. For these two portfolios, Peninsula Clean Energy plans to contract for the remaining open position with resources in the market.

To evaluate Peninsula Clean Energy's ability to cover this open position with market resources, Peninsula Clean Energy compared the open position levels in each portfolio and year to its load share of total system gas resources.[23] Table 33 below shows the results of this analysis.

Table 33: Comparison of System RA Contract Position to Load Share of Natural Gas Resources

<table>
<tr><th>Year</th><th>46 MMT RSP Load Share of Gas Resources (MW)</th><th>46 MMT System RA Contract Position (MW)</th><th>38 MMT B RSP Load Share of Gas Resources (MW)</th><th>38 MMT B System RA contract Position (MW)</th></tr>
<tr><td>2021</td><td rowspan="10">358</td><td rowspan="10">[redacted]</td><td rowspan="10">330</td><td rowspan="10">[redacted]</td></tr>
<tr><td>2022</td></tr>
<tr><td>2023</td></tr>
<tr><td>2024</td></tr>
<tr><td>2025</td></tr>
<tr><td>2026</td></tr>
<tr><td>2027</td></tr>
<tr><td>2028</td></tr>
<tr><td>2029</td></tr>
<tr><td>2030</td></tr>
</table>

As demonstrated above, neither of Peninsula Clean Energy's portfolios imply a need to contract with more System RA than Peninsula Clean Energy's load share of total system gas resources. After 2022, both portfolios include volumes of System RA contracting well below our load share. The 38 MMT Conforming Portfolio B generally requires lower volumes of System RA contracting than the 46 MMT portfolio.

ii. Open Energy Position

The second measure of system reliability that Peninsula Clean Energy applied to its portfolios is a measure of each portfolio's reliance on resources outside of the portfolio by looking at the simple net system power across all hours, as calculated by the CSP Calculator. If the reliance on net system power is less than Peninsula Clean Energy's share of the energy available in the market[24], the portfolio may not have an undue reliance on the market to serve load overall. The total volume of net system power

[23] Peninsula Clean Energy's load share (1.43%) of the 2030 RSP natural gas fleet would be no more than 358 MW, while the share of the 2030 fleet in the 38 MMT portfolio would be no more than 330 MW. Peninsula Clean Energy uses the 2030 fleet because in both cases these are the smallest and thus are the most conservative benchmarks.

[24] Peninsula Clean Energy measured its share of energy available in the market as a share of the expected generation from the natural gas fleet in the RSP and the 38 MMT Scenario. The RSP natural gas fleet would generate approximately 2,665 GWh, assuming an 85% capacity factor, and the 38 MMT Scenario natural gas fleet would generate approximately 2,457 GWh, assuming an 85% capacity factor.

represents Peninsula Clean Energy's reliance on the market, notwithstanding the fact that Peninsula Clean Energy generates and sells excess energy in other hours. Although a useful indication of how much each portfolio relies on the market, Peninsula Clean Energy emphasizes that this is not an adopted methodology of the Commission and thus represents an informal and exploratory indication of potential impacts on system reliability. Table 34 below presents this comparison.

Table 34: Comparison of Market Electricity Purchases and Available Load Share

Year	46 MMT Load Share of Market Energy	46 MMT Conforming Portfolio (MWH)	38 MMT Load Share of Market Energy (MWH)	38 MMT Conforming Portfolio B (MWH)
2020	2,665,668	894,322	2,457,180	641,000
2022		588,129		596,862
2026		1,179,777		371,227
2030		1,291,664		640,695

Both Preferred Conforming Portfolios result in less energy purchased on the market than the energy generated from Peninsula Clean Energy's share of gas resources.[25] As noted above, the portfolios that deliver deeper reductions in GHG emissions also perform better on these reliability metrics because of the higher generation by resources within Peninsula Clean Energy's portfolio to serve load or charge storage, requiring less reliance on the market and system resources.

iii. Net Load Duration Curve position

The third measure of system reliability that Peninsula Clean Energy applied to its portfolios is the net load duration curve of its open energy position by month. This metric is based on a proposal by CalCCA and Southern California Edison in the RA rulemaking (R.19-11-009).[26] Peninsula Clean Energy used a modified net load duration curve to evaluate the ability of its renewable generation to charge storage and the ability of that storage to meet load not otherwise served by its variable renewable energy generation.[27]

In principle, this analysis is superior to either of the other metrics described above for evaluating the reliability of Peninsula Clean Energy's Conforming Portfolios because it explicitly captures the full contribution of renewables in all hours and then focuses on the ability to provide dispatchable generation or dischargeable energy storage to meet any net load remaining after the time-dependent generation. This analysis directly examines how much energy and capacity would be needed to serve this net load and whether our portfolio of dispatchable and dischargeable resources can meet it. As with the prior two measures, this analysis demonstrates that Peninsula Clean Energy's Preferred 38 MMT Conforming Portfolio B is the most reliable of the three Conforming Portfolios, while the 46 MMT Conforming Portfolio performs the worst.

[25] Generally, Peninsula Clean Energy's share of the 46 MMT RSP natural gas fleet would generate approximately 2,665 GWh, assuming an 85% capacity factor, and 2,457 GWh from the 38 MMT scenario fleet. Much of this fleet is dedicated to serving LSE load and so would not be available in the market, but since the LSE load would be served by that generation, the LSE would also not be purchasing in the market for that load.

[26] See Southern California Edison Company (U 338-E) And California Community Choice Association's Track 3 Proposal (August 7, 2020), https://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=344809752.

[27] The methodology also can accommodate baseload renewables and natural gas as well as long duration storage, although neither of the presented portfolios include these resources.

This measure is highly provisional, since the many details of the methodology have not been discussed or vetted by stakeholders or the Commission in R.19-11-009, nor has the methodology been adopted. Furthermore, Peninsula Clean Energy's net load duration tool is a prototype of an implementation of the methodology, so the results should also be taken as qualitatively indicative and provisional, rather than quantitatively precise. However, since the methodology takes a different conceptual approach from the System RA construct, these imprecise and provisional results nevertheless generate interesting insights into the performance of these portfolios.

This methodology evaluates both the capacity needed to serve net peak energy and the total amount of dispatchable energy needed to serve any load not served by wind and solar. Energy storage is charged from the portfolio exclusively with excess energy from wind and solar (and any baseload resources for portfolios that contain such resources) during hours in which these resources provide more energy than load.

The methodology involves the following steps:

1) Peninsula Clean Energy's hourly load duration curve is derived from Peninsula Clean Energy's load shape applied to the total annual load forecast in the 2019 IEPR forecast as reported in the CSP Calculator. As described in the load assumptions section above, Peninsula Clean Energy used a custom load profile because our coastal service territory has a markedly different load shape than the statewide average. Hours are arranged from highest to lowest load within each month. This analysis uses Peninsula Clean Energy's 2030 load as it coincides with the IRP planning horizon, but note that Peninsula Clean Energy's 2030 load is actually forecast to be lower than Peninsula Clean Energy's 2021 load.

2) Generation from Peninsula Clean Energy's variable energy resource (wind and solar) portfolio is subtracted from load duration curve. The generation in all 8,760 hours is calculated based on the nameplate capacity and the generic generation profiles from the CSP Calculator for wind and solar. The resulting difference is the Net Load Duration Curve.

3) Peninsula Clean Energy estimated the available charging energy from its portfolio as the total of energy generated in excess of load (*i.e.*, negative net load).[28] This excess energy can be used to charge energy storage to the portfolio's storage capacity on a daily basis, discounted for an 85% round trip efficiency.

4) Peninsula Clean Energy evaluated the following two measures to assess each portfolio's ability to serve the remaining net load:
    a. Ability to serve the highest peak net load by comparing that highest load to the total dispatchable capacity. For these portfolios, the only dispatchable capacity is the charged energy storage, which is credited as the duration-weighted average daily charge-weighted storage capacity.[29] This represents the expected dispatchable energy typically available during positive net load hours.

[28] For portfolios with baseload resources, baseload resources generation (gas, biomass/biogas, geothermal), hydro imports, and in-state hydro generation would also be subtracted from the Net Load Duration Curve.

[29] The average capacity of storage discounted by any amount the solar, wind, or baseload resources typically fail to charge. So, if storage is only charged to 80% of capacity on average during a given month, only 80% of the nameplate discharge capacity is counted toward peak net load. Hydro generation is counted as the average generation during hours where Peninsula Clean

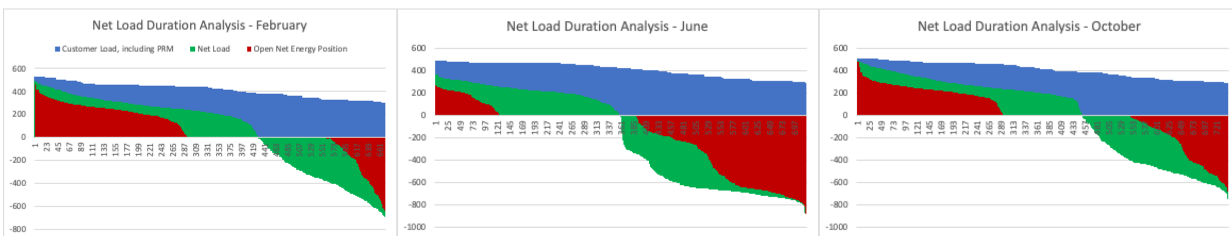
b. Ability to meet all positive net load by comparing its total net positive load across all hours to the total dispatchable energy from all dischargeable resources in its portfolio.[30] Energy generated during hours of negative net load can only count toward meeting positive net load if there is storage in the portfolio to move that energy to the proper hours.

5) Any remaining open energy position or open capacity position after accounting for all dispatchable and dischargeable energy reflects the amount of energy or capacity Peninsula Clean Energy would need to serve load from other resources in the market or need to obtain commitments to offer energy to the market.[31]

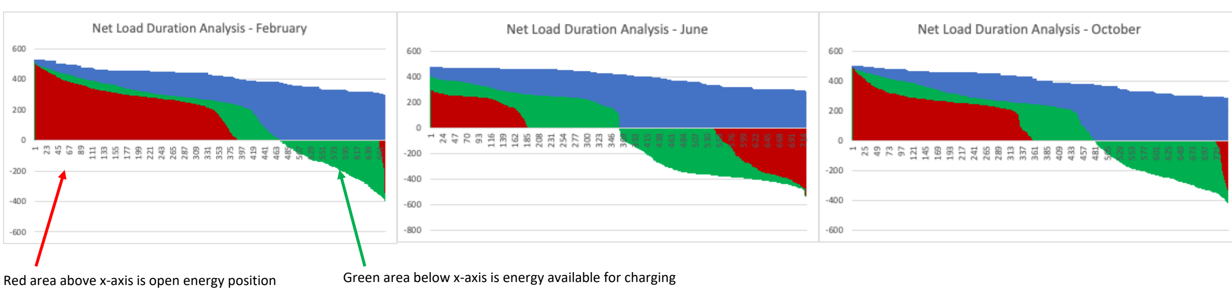
As with the other reliability metrics, this analysis suggests that the Preferred 38 MMT Conforming Portfolio B, which reflects Peninsula Clean Energy's RPS and GHG requirements, is a more reliable portfolio than the 46 MMT Conforming Portfolio. A graphical representation of the theoretical maximal performance of each portfolios is shown in Figure 24 below.

Figure 24: Monthly Net Load Duration Curves for Preferred Portfolios for February, June and October

38 MMT Conforming Portfolio B



46 MMT Conforming Portfolio



Energy actually has net load to serve (*i.e.*, evening and overnight hours, typically). For portfolios with baseload resources, these would also contribute to capacity to meet net peak load.

[30] In a departure from the SCE/CalCCA proposal, Peninsula Clean Energy's tool only counts energy from dispatchable resources generated during hours of positive net load toward meeting the positive energy position. The SCE/CalCCA proposal counts all energy from dispatchable generation, such as hydro, gas, biomass, and geothermal as able to meet any positive net load regardless of the hour in which it is generated, but Peninsula Clean Energy believes this results in an overestimate of the amount of dispatchable energy a portfolio is capable of delivering.

[31] This capacity and energy would theoretically be secured through something akin to a system RA contract, albeit with different assessment hours (e.g., most typically from HE 21 to sunrise). However, since this compliance product has not yet been adopted by the Commission, such energy would most likely be evaluated against the available fleet and market energy as portfolios are evaluated now under the standard System RA construct, to the extent they are evaluated for the ability to serve load outside of RA assessment hours at all.

Figure 24 provides a comparison of the net load duration curve analysis of the Preferred 38 MMT Conforming Portfolio B and the 46 MMT Conforming Portfolio. In each monthly graph, the blue curve represents the load duration curve (net of BTM resources). The green curve represents the net load duration curve after solar and wind generation is accounted for. The green area above the x-axis represents the load remaining to serve from storage, while the green area below the x-axis represents the excess energy available to charge storage. Finally, after accounting for storage charge and discharge, the red area above the x-axis represents the open energy position not served by the portfolio, while the red area below the x-axis represents available generation above what the storage can store and which would need to be curtailed or sold to the market in real time.

Consistent with the System RA measure above, both portfolios would require contracting with additional resources to meet the peak net load. Although the methodology is different from the System RA calculations above, the overall trend is similar. The 38 MMT Conforming Portfolio B could theoretically meet the peak net load in eight months of the year and would require contracting with additional resources in the other four. The 46 MMT Conforming Portfolio can meet capacity needs in five months of the year. The 38 MMT Conforming Portfolio B has a maximum monthly shortfall of 118 MW (in December), while the 46 MMT Conforming Portfolio shows a maximum open capacity position of 400 MW (also in December). Again, the analysis is directionally indicative that having fewer generating resources leaves the 46 MMT portfolio with a larger unserved position than the 38 MMT Conforming Portfolio B but does not identify the precise magnitude of any actual shortfall.

To place these shortfalls in context, Peninsula Clean Energy's CAM allocation would meet some of the open positions of each portfolio. With the CAM allocation included, the 38 MMT Conforming Portfolio B would have enough capacity in 11 months of the year and a maximum remaining position of 20 MW of System RA contracts to secure from the market. The 46 MMT Conforming Portfolio would cover seven months with a maximum open position of 301 MW. Again, these represent a relative performance and not a precise prediction of the actual open capacity position that would result were this methodology to be adopted.

The open energy position qualitatively parallels the overall annual open energy position as well. One critical difference is that this analysis evaluates the theoretical performance of the portfolio if all resources were used to their maximum capability to meet all load, which is different from the analysis of the open energy position evaluated in the RDT above, so again these results should be evaluated qualitatively. The 38 MMT Conforming Portfolio B could provide between 75% (June) to 33% (December) of the net dispatchable energy needed. Finally, the 46 MMT Conforming Portfolio meets between 57% and 8% of net dispatchable/dischargeable energy need. Although this methodology is substantively different than the RDT methodology above, both show the 46 MMT Conforming portfolio with an open energy position in 2030 approximately 50% larger than that of the 38 MMT Conforming Portfolio B. These results are summarized in Table 35 below.

Table 35: Summary statistics from Net Load Duration Curve Analysis

	46 MMT Conforming Portfolio	38 MMT Conforming Portfolio B
Net Peak Capacity (months met)	5 months	8 months
Maximum capacity shortfall	400 MW	118 MW
Maximum Percent of net energy requirement met	57%	75%
Minimum percent of net energy requirement met	8%	33%

iv. Conclusion

Overall, all three reliability analyses demonstrate the same pattern: more generating resources lead to more reliable portfolios, although this is true for Peninsula Clean Energy's portfolios because all three portfolios include nearly 500 MW of 4-hour Lithium-ion battery storage (equivalent to approximately 2,000 MWh) that could be charged and discharged daily. This significant storage fleet is key to using excess energy to meet load during hours in which generation alone does not serve load. These analyses demonstrate that with the appropriate portfolio including energy storage, a lower GHG emissions portfolio can be more reliable than a portfolio that builds fewer new resources in an attempt to keep its GHG emissions within 1% of the target for this IRP.

In both cases, Peninsula Clean Energy's portfolios would need additional energy during evening and overnight hours. However, having an open energy position is neither unusual, nor a departure from existing practice. Generally, open energy positions allow LSEs to take advantage of lower energy prices should they occur. However, should the Commission adopt a RA construct that accounts for all hours, Peninsula Clean Energy would contract for the obligation to provide capacity to CAISO during those hours much as System RA resources do today. Such contracts would be akin to a system RA contract, but with different assessment hours (e.g., most typically late evening hours to sunrise, rather than the current availability assessment hours window). Since the Commission has not yet adopted such a construct, such products do not generally exist yet. Thus, until such time the RA construct changes, Peninsula Clean Energy would anticipate being able to purchase energy in the market, since the needed energy does not exceed its share of what should be available under Commission projections.

g. Hydro Generation Risk Management

In-state drought and reliance on hydro generation poses a manageable risk in the near term and no direct risk in the long term since Peninsula Clean Energy does not plan to rely on hydro resources after 2025.

Electrical generation from hydroelectric facilities depends on the volume of water available to flow through turbine generators. A lack of precipitation in drought years creates low water availability and hence lower hydro generation output. Hydro systems without large reservoirs that can store water for multiple years and that can average out generation over time are at particular risk. California's hydro generation system is vulnerable to drought and has experienced lower than average hydro generation during droughts in 2007-2009 and 2012-2016.

Drought risk can impact generation system reliability. Hydro generation systems with at least some water storage and dispatch flexibility can generate up to their maximum capacity for short periods of time but cannot do so for long periods because of a lack of water due to the drought. Hydro systems with no effective water storage will be energy and capacity limited in a drought.

The risks that in-state drought pose to Peninsula Clean Energy's portfolios are consistent with the amount of hydro generation and level of risk borne by the RSP prior to 2025 and less than the RSP after 2025. This is due to Peninsula Clean Energy's internal goals to phase out hydro power by 2025 through procurement of additional renewable resources, therefore hydroelectric generation was not considered as an option in the portfolio after 2025. During the years hydro was considered, the analysis relied on the CPUC's 2019-2020 IRP assumptions on availability and contracting price of hydro resources. The analysis followed the RSP to determine out-of-state and in-state hydro availability for Peninsula Clean Energy in absence of available public information on contracted hydro or hydro expected to be contracted in the future. The RSP shows 2,852 MW of available imported hydro in 2020-2030, and 7,070 MW of in-state large hydro during the same time period, as shown in Table 36.

Table 36: Available Large Hydro per RSP Plan

Annual Availability	2020-2030
In State Hydro - MW	7,070
Hydro (Scheduled Imports) - MW	2,852

For imported hydro, the analysis assumed that Peninsula Clean Energy would have an amount of hydro to procure equivalent to its relative share of load with direct interties to the Pacific Northwest. There are two main transmission lines connecting the Pacific Northwest to CA: one connecting to Northern CA, and the other to LADWP. Thus, it was assumed that Peninsula Clean Energy would have access to its relative share of the combined load of Northern CA plus LADWP territory. That share is 3.2% of total load in 2020 and declines to 3.0% by 2030. Peninsula Clean Energy's corresponding share is approximately 90 MW and is reflected in Table 37. As noted above, based on Peninsula Clean Energy's internal goals, the model was not able to choose hydro as a resource after 2024.

Table 37: Potentially Available Hydro Imports (MW)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Peninsula Clean Energy	91	91	90	89	89	88	88	88	87	87	86

For large in-state hydro, the potential procured capacity is assumed to be equivalent to Peninsula Clean Energy's share of the total California load, assuming that Peninsula Clean Energy can procure hydro from anywhere in California. Peninsula Clean Energy's corresponding share is approximately 100 MW and is reflected in Table 38. As noted above, Peninsula Clean Energy does not plan to rely on hydro after 2024.

Table 38: Potentially Available In-State Large Hydro (MW)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Peninsula Clean Energy	101	99	99	98	97	97	96	96	95	95	94

In-state and out of state hydro resources follow the generation profiles provided in the CSP calculators with annual capacity factors for imported hydro at approximately 44% and for in-state hydro at 31%. Peninsula Clean Energy also used assumptions on contracted hydro prices for each type based on information obtained from Energy Division on forecasted operational costs (see Table 39).

Table 39: Assumed Contract Prices for Hydro (2016$/MWh)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
In-State Hydro	$37.17	$37.77	$37.29	$34.32	$35.18	$36.04	$36.90	$44.39	$51.88	$59.37	$66.86
Import Hydro	$30.71	$31.56	$31.85	$31.76	$32.64	$33.09	$33.54	$42.05	$50.56	$59.07	$67.58

Peninsula Clean Energy manages its risk to hydro generation fluctuation and prices by signing contracts from resources in both California and the Pacific Northwest, signing primarily firm delivery contracts and minimizing the volume procured through unit contingent contracts. Peninsula Clean Energy also contracts for hydro resources through a mix of counterparties and for varying terms to manage risk associated with counterparty default on hydro resources. Finally, Peninsula Clean Energy conducts statistical modeling on the volume of hydro it expects to be delivered for any unit contingent contracts taking into account snowpack levels and historical generation in similar years.

h. Long-Duration Storage Development

Energy storage is critical to California meeting its reliability and environmental objectives. With respect to reliability objectives, energy storage can help the State meet its capacity needs, which will be amplified by the retirement of natural gas-fired power plants and the upcoming retirement of California's last nuclear power plant, Diablo Canyon. Energy storage can also provide energy to the grid as scheduled energy as well as regulation energy required by the CAISO to manage grid frequency. This energy service is particularly important during the specific times of the day when solar and/or wind are not available to serve load. Energy storage can help California meet its renewables and GHG goals by charging when there is excess renewable generation, thereby avoiding the need to curtail renewable energy generation, and discharging when the emissions intensity of the grid is highest.

As part of the 2019-20 IRP LTCE modeling, 12-hour duration pumped storage was included as a resource option. For Peninsula Clean Energy, 0 MW of pumped storage resources was selected in all of the portfolios. Part of the reason pumped storage is not selected for Peninsula Clean Energy is due to the near-term internal RPS targets of 100% renewable by 2025 (and pumped storage was not available in the model until 2026) and the availability of battery storage (Li-ion) as a new resource. Table 40 below demonstrates the volume of long-duration storage chosen by the RSP and 38 MMT Scenario and indicates Peninsula Clean Energy's share based on its proportion of load served.

Table 40: Peninsula Clean Energy Load Share of Long Duration Storage

	2020	2022	2026	2030
46 MMT RSP	1,599	1,599	2,573	2,573
46 MMT Peninsula Clean Energy Load Share	23	23	37	37
38 MMT Scenario	1,599	1,599	3,204	3,204
38 MMT Peninsula Clean Energy Load Share	23	23	46	46

Despite the LTCE model not choosing long-duration storage for Peninsula Clean Energy's Conforming Portfolios, Peninsula Clean Energy understands and is committed to the value of this resource. Peninsula Clean Energy has undertaken several activities to support the development of long-duration storage.

Along with 12 other CCAs, Peninsula Clean Energy issued a joint RFI[32] on long-duration storage on June 3, 2020. The goal of the RFI was two-fold. First, the RFI is an important opportunity for Peninsula Clean Energy to collect information to inform upcoming efforts to issue a RFO for long-duration storage resources. Second, the RFI can be used to assess the viability of long-duration storage and inform developing its IRPs specifically as it relates to meeting long-duration storage capacity needs identified in the CPUC's RSP and 38 MMT Scenario.

The RFI is an attempt to reflect the results from the RSP in that it sought information for resources to be grid-charged, have a minimum discharge duration of 8 hours and commercial operation by 2026. The RFI was open to multiple technologies including battery storage, mechanical storage, thermal storage, and chemical storage. The RFI requested the following types of information: (1) storage technology and commercial history; (2) project specifics, including location, permitting, financing and development risks; and (3) contracting terms and preferences, including indicative pricing.

RFI responses were due July 1, 2020 and over 30 submissions were received for 16 distinct projects. While Peninsula Clean Energy and the group of CCAs are still reviewing results, the general observation is that the amount of capacity identified in the RSP and 38 MMT Scenario can be technically developed before 2026. The following is a summary of key information gathered:

- A total of 5,500 MW of project capacity was submitted;
- Offers varied in term length, battery discharge duration (8-, 12-, or 16-hour) and available attributes (e.g., RA only, tolling, A/S);
- 14 types of technologies were submitted including Li-ion, chemical flow, compressed air, pumped storage hydro, thermal storage, and second life EV batteries;
- Prices ranged from $10 - $51.26 per kW-month; and
- Projects developers indicated an ability to meet an on-line date of 2026 or earlier.

Additionally, no developer expressed specific concerns with respect to contracting with a single CCA or with multiple CCAs through a joint buying arrangement.

Peninsula Clean Energy, along with a subset of the CCAs that participated in the RFI, intends to issue a joint RFO later this year for long-duration storage solutions. These same CCAs are exploring the formation of a new joint-powers authority to enable the procurement of long-duration storage resulting from the RFO. Joint procurement for long-duration storage will allow for better economies of scale, while reducing project development, technology, and regulatory risk. While the results from the RFI appear promising from a technical potential basis, Peninsula Clean Energy and the other CCAs remain concerned about the costs, benefits and regulatory risk and will look to the results of its future RFO and discussions with developers and the CPUC to inform future procurement decisions for long-duration storage.

Additionally, Peninsula Clean Energy has engaged with two specific companies to better understand their specific technologies and the value these technologies might provide to Peninsula Clean Energy's portfolio and the overall electric system in California. These companies are Form Energy and Malta Energy. Both of these companies participated in and Peninsula Clean Energy provided letters of support for the California Energy Commission's grant funding opportunity, GFO-19-305 for Developing non-

[32] The RFI is available here: https://www.peninsulacleanenergy.com/previousrfo/rfi-long-duration-storage/

Lithium-ion Energy Storage Technologies to Support California's Clean Energy Goals under the Electric Program Investment Charge Program (EPIC).

Form Energy's proposal was chosen by the CEC for funding. Form Energy is developing an aqueous, air-breathing energy storage technology, which is a new class of long-duration energy storage that can provide days to weeks of energy storage and be sited anywhere in the grid, including in BTM configurations.

As part of the CEC project, Form Energy will deploy a 10-kilowatt (kW), 1,000 kilowatt-hour (kWh) (100-hour) prototype weatherized system for testing at the University of California, Irvine (UCI) Grid Evolution Laboratory (GEL). Form Energy is working with multiple partners including UCI's Advanced Power and Energy Program (APEP), the Electric Power Research Institute (EPRI), Southern California Edison (SCE) and Peninsula Clean Energy. SCE and Peninsula Clean Energy will provide technical advice and representative customer and distributed generation load profiles to ensure that tests reflect real-world grid conditions and customer needs. These tests will support multiple California policy goals by demonstrating the system's ability to: 1) reliably integrate 100% renewable energy microgrids and electric systems; and 2) maintain customer electric reliability during multi-day grid outages caused by wildfire public safety power shutoff (PSPS) events or other grid failures.

As a project partner, Peninsula Clean Energy will support Form Energy in four ways: 1) Peninsula Clean Energy will provide $95,000 of match funding in the form of cash in-hand; 2) Peninsula Clean Energy will provide representative load and generation data to inform the development of use cases of value to Peninsula Clean Energy customers to guide system prototype tests; 3) Peninsula Clean Energy will provide technical advice on methods to evaluate project benefits; and 4) Peninsula Clean Energy will support the project's technology and knowledge transfer efforts. Peninsula Clean Energy also commits to serve on the project's Technical Advisory Committee.

Malta Energy is developing an electro-thermal molten salt energy storage. While Malta Energy's proposal was not chosen by the CEC, Peninsula Clean Energy and Malta are working together on a technical assistance project. The goal of this project is to assess the technical and economic requirements for long-duration energy storage solutions integrated into Peninsula Clean Energy's energy supply portfolio, and develop initial project specifications, designs, and finance plans. The project will evaluate several use cases for the technology including renewables firming, capacity value, green industrial heat and serving load with renewable energy around the clock.

Peninsula Clean Energy is committed to procuring its share of the CPUC's 1,605 MW target for long-duration energy storage. Due to the scale and complexity of these projects, however, successful development will depend on efficient collaboration among numerous entities including LSEs, developers, manufacturers, market operators, regulators and environmental stakeholders.

i. Out-of-State Wind Development

As part of the 2019-20 IRP, out-of-state wind was included as a resource option for the LTCE plan. Out-of-state wind was not selected by the AURORA model for Peninsula Clean Energy due to its availability starting in 2026. Due to internal goals, the AURORA model primarily chose adding resources prior to 2026 for Peninsula Clean Energy's portfolios.

Out-of-state wind can offer several advantages over in-state wind. Specifically, it generally offers higher capacity factors and production profiles that differ from resources available in California. These attributes can make out-of-state wind an attractive resource. However, the higher cost and risk associated with interconnection is a concern. Additionally, Peninsula Clean Energy's Board has expressed concern around whether union labor would be used to construct of out-of-state wind projects, whether these projects would be subject to the same level of environmental siting analysis and permitting as in-state projects and the possibility for out-of-state projects to increase emissions by causing states to build polluting resources.

In 2018, Peninsula Clean Energy shortlisted an out-of-state wind project through its renewable resource RFO. Ultimately, Peninsula Clean Energy did not sign a PPA with the project as it was unable to overcome transmission challenges and the timeline and cost no longer met Peninsula Clean Energy's needs. Out-of-state wind will continue to be eligible under Peninsula Clean Energy's RFOs as long as it can deliver to CAISO.

j. Transmission Development

The set of existing resources Peninsula Clean Energy had in contract or in negotiation to contract as of June 30, 2020, are included in the Conforming Portfolios. Table 41 summarizes the location information for the new resources under long-term contract. Details are included in the Resource Data Template.

Table 41: Location Information for New Resources Under Contract or Under Negotiation

Project Name	Technology	Location	Queue Position	Interconnection Point	RESOLVE Area
Wright	Solar + Storage	Merced County, CA	779 (project online)	Los Banos - Panoche #1 230kV line	Central Valley and Los Banos
Mustang	Solar	Kings County, CA	1036	PG&E Mustang Switching Station 230kV	Westlands
New Solar + Storage (under negotiation)	Solar + Storage	Fresno County, CA	[redacted]		Westlands

Each of the Conforming Portfolios also includes new solar, wind, and storage resources that are modeled as new resources not yet under contract. Peninsula Clean Energy's only locational requirement for these resources is that they must qualify as PCC1 resources for RPS compliance purposes, meaning they either have a first point of interconnection with a California balancing authority or are dynamically scheduled into a California balancing authority.

For resources commencing operation on or before December 31, 2026, the CPUC requires LSEs to indicate which transmission zone the resources will be located in. Because Peninsula Clean Energy does not have a strong preference for resource location, it followed the RSP and 38 MMT Scenario distribution of wind and solar resources as described in Section II.b.ii.6 above. Ultimately, Peninsula Clean Energy will select resources with the best overall characteristics for cost and reliability, including the cost of any new transmission for interconnection. Risk of interconnection delays due to the need for new transmission construction are considered in reviewing all offers in Peninsula Clean Energy's procurement process.

IV. Action Plan

a. Proposed Activities

Peninsula Clean Energy's mission is to reduce GHG emissions by expanding access to sustainable and affordable energy solutions with a priority to design a power portfolio that is sourced by 100% carbon-free energy by 2025 that aligns supply and consumer demand on a 24 x 7 basis. At the same time, Peninsula Clean Energy is committed to serving customers with affordable power. As part of its IRP analysis, Peninsula Clean Energy developed a number of alternative scenarios to evaluate portfolios to meet this goal, but ultimately decided these were not ready for submittal. Over the next 6-12 months, Peninsula Clean Energy will continue to analyze the details associated with this priority and these alternative portfolios to understand costs, reliability and strategies to reduce reliance on system power.

The Preferred Conforming Portfolios identify a significant volume of new resources including wind, solar and Lithium-ion storage. To start the procurement process for Peninsula Clean Energy's Preferred Conforming Portfolios, on July 15, 2020 Peninsula Clean Energy launched a RFO for new long-term contracts with solar, wind and Lithium-ion batteries paired with renewable resources. Details on this procurement process are detailed further in the following section. All renewable resources that meet the California RPS PCC1 are eligible under this RFO, but we expect wind, solar and storage to be the most competitive based on the analysis in Peninsula Clean Energy's IRP. These three technologies are all commercially available and have been deployed in a high enough volume that the technologies are considered viable and financeable. Additionally. as part of the RFO requirements, new projects must meet specific development milestones to ensure resource viability. Specifically, we require that projects have site control and have a completed Phase 2 interconnection study from CAISO or equivalent. We identify potential barriers to procurement in Section IV.c below. In designing procurement activities, we try to take these risks into account and manage procurement to mitigate these risks.

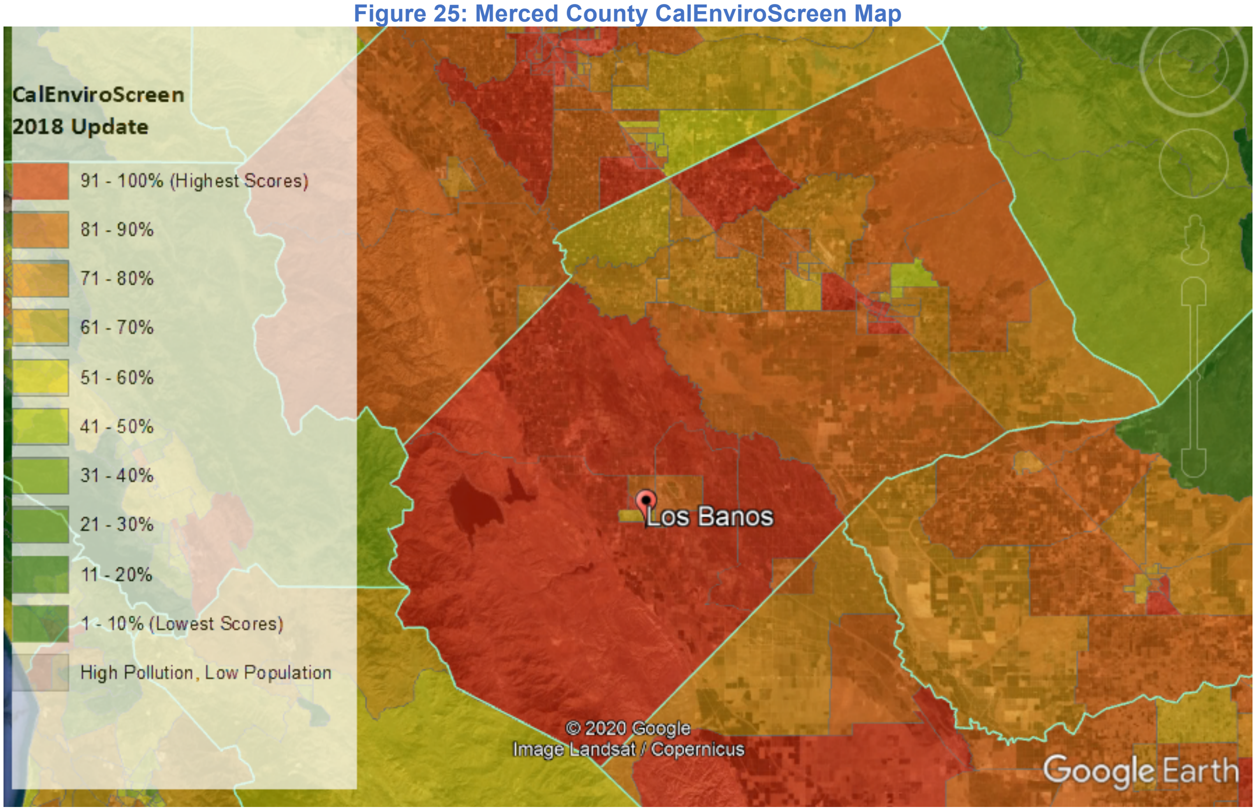
Peninsula Clean Energy plans to continue similar procurement activities on an approximately annual basis to fulfill the procurement of new resources identified in the Preferred Conforming Portfolios. This corresponds to Peninsula Clean Energy's Conforming Portfolios that show Peninsula Clean Energy adding significant quantities of new renewable energy and energy storage resources by 2026.

As detailed above, while long-duration storage was not identified in Peninsula Clean Energy's Preferred Conforming Portfolios, Peninsula Clean Energy is working with a group of CCAs to form a JPA to procure long-duration storage on the CCAs' behalf. The joint CCAs expect to release an RFO for long-duration storage by the end of 2020.

Peninsula Clean Energy is sensitive to the impact of procurement activities on DAC communities and takes this into account in energy procurement. In its recent solicitation for renewable energy and hybrid resources, Peninsula Clean Energy requested information from respondents on whether projects are located in DACs, any benefits their project will provide to DACs and information on how they have conducted outreach to DACs. Responses to these questions will be part of the project evaluation. Additionally, Peninsula Clean Energy has a number of programs in progress that benefit DACs. These were outlined above in Section III.d.ii. Any contracts with a term longer than five years must be approved by Peninsula Clean Energy's Board. These approvals take place during public Board meetings which provide opportunity for members of the public to comment on the proposed contract.

Additionally, Peninsula Clean Energy has a strategic goal to support CCA development in the Central Valley, particularly in areas where Peninsula Clean Energy has generation resources. Over the past year, Peninsula Clean Energy staff and Board members have been in conversation with the City of Los Banos, where the Wright Solar Project is located, and other Merced County jurisdictions about CCAs and a potential relationship with Peninsula Clean Energy. Figure 25 identifies CalEnviroScreen scores for Los Banos and Merced County. As can be seen in this figure, most of Los Banos and Merced County is considered a DAC. On June 3, 2020 the Los Banos City Council voted unanimously to move forward with a CCA technical study including an analysis of potential load integration/membership with Peninsula Clean Energy. The study is underway and is being conducted by MRW Associates, an energy consulting firm that has completed numerous CCA studies since 2010. We expect the results of that study to be available in early September.

Figure 25: Merced County CalEnviroScreen Map



Finally, while not specifically identified in the portfolios, Peninsula Clean Energy has launched or intends to launch in the near term a variety of programs targeting clean energy deployment, EVs, resilience, etc. that contribute to meeting Peninsula Clean Energy's portfolio, grid reliability, and consideration of DACs. Peninsula Clean Energy is also developing strategies and procurement from projects located in its San Mateo County service territory. Peninsula Clean Energy will develop the strategy for distributed energy resource procurement and implementation of these plans over the next year to support its goal to better match renewable energy supply to its customer load and reduce reliance on system power.

b. Procurement Activities

Peninsula Clean Energy takes a multi-pronged approach to meet its annual and long-term clean energy goals for RPS and carbon-free non-RPS eligible resources. This includes issuing Requests for Proposals (RFPs) or RFOs, participating in other entities' RFPs / RFOs, bilateral negotiations and exploring partnerships to develop clean energy resources. Peninsula Clean Energy varies the timing of its clean energy procurement to ensure a diversification of counterparties, prices and term and to meet short-term needs based on actual load.

Peninsula Clean Energy is currently soliciting proposals for new, long-term contracts with renewable and hybrid resources. Peninsula Clean Energy launched a joint RFO with San José Clean Energy on July 15, 2020 and responses are due September 4, 2020. Peninsula Clean Energy expects to notify shortlisted bidders by the end of October and negotiate and execute contracts by the end of Q1 2021. Details on the solicitation are available on the RFO website: https://www.peninsulacleanenergy.com/rfo-long-term-renewable/. Under this RFO, Peninsula Clean Energy is soliciting competitive proposals for the purchase of long-term (≥10 year) renewable energy or renewable energy plus storage contracts with a commercial on-line date of December 31, 2024 or sooner. In aggregate, Peninsula Clean Energy and San José Clean Energy are targeting to contract for 1,000,000 MWh total through this solicitation and intend to collect all relevant energy, environmental attributes, RA, and ancillary services benefits from the projects, as applicable. Peninsula Clean Energy has specifically requested innovative proposals including sundown clean energy, which is renewable energy delivered during non-solar generating hours. Additionally, Peninsula Clean Energy is requesting information on project impacts on DACs, workforce development, environmental impacts and decommissioning or end-of-life plans. All the collected information will be used in the evaluation of proposed projects. Peninsula Clean Energy expects to repeat this process approximately annually. For each new solicitation, Peninsula Clean Energy attempts to incorporate any best practices or lessons learned from previous solicitations as well as incorporate feedback from its peers on their successes and challenges.

Peninsula Clean Energy has met its renewable energy requirements for 2020 and has already procured 84% of its renewable requirements for 2021. Peninsula Clean Energy is procuring some additional GHG-free energy for 2020 and has an active solicitation for 2021. Peninsula Clean Energy also regularly participates in other entities' RFPs. Additionally, Peninsula Clean Energy has several mid-term duration contracts in negotiation with deliveries starting as soon as 2021.

Peninsula Clean Energy works with a group of four other CCAs, including East Bay Community Energy, San José Clean Energy and Silicon Valley Clean Energy to pool and procure RA. In 2019, this joint-RA group enlisted the support of ACES to administer request for RA offers and manage intra-pool transactions. For the upcoming RA compliance period 2021-23, Peninsula Clean Energy has procured a significant portion of its 2021 and 2022 system and flex RA needs and much of its local RA needs through 2022. Peninsula Clean Energy anticipates procuring additional RA for the upcoming compliance period through the joint-CCA effort, its own RFPs and bilateral negotiations and through participation in other LSEs' solicitations, including solicitations by PG&E. Consistent with the CPUC's central procurement entity decision, Peninsula Clean Energy does not plan to procure local RA products beyond 2023 unless it is a preferred resource such as DER or local renewables.

Peninsula Clean Energy has elected to self-procure all of the capacity required by Ordering Paragraph 3 of D.19-11-016. The capacity assigned to Peninsula Clean Energy in this decision is identified in Table 42 below.

Table 42: Peninsula Clean Energy D.19-11-016 Procurement Requirements

Compliance Date	Percent of Total	Capacity
August 1, 2021	50%	27.50 MW
August 1, 2022	75%	41.25 MW
August 1, 2023	100%	55.00 MW

Peninsula Clean Energy has executed a contract with [redacted] to procure 41.25 MW of RA from [redacted] for a term of 2021 - 2023. Peninsula Clean Energy is also in bilateral negotiations with a developer for a new solar + storage in front of the meter installation in Fresno County. The expected capacity for this storage is greater than 50 MW with a 4-hour duration and 100 MW of solar capacity– the expected QC is at least 50 MW with an expected commercial operation date in December 2022. The discussions include buying the full capacity value and dispatch rights of the resource. This is a new resource, so there is no resource ID assigned yet. Contract negotiation is in progress with a targeted execution date by the end of 2020. Peninsula Clean Energy is also in bilateral negotiations to add an energy storage component to the existing Wright Solar project [redacted] The existing project is a 200 MW solar installation that started operating in January 2020. We are in negotiations to add 80 MW / 4-hour battery storage installation. The expected commercial operation date of the storage resource is December 2022. The discussions include buying the full capacity value and dispatch rights of the resource. Contract negotiation is in progress with a targeted execution date by the end of 2020.

c. Potential Barriers

Peninsula Clean Energy identifies the following factors as potential barriers or risks to the procurement and eventual commercial operation of the resources identified in Peninsula Clean Energy's Preferred Conforming Portfolios.

Development and Construction Delays: In the development and construction of any new project there is the potential for delays related to unforeseen circumstances, including permitting timelines, interconnection construction timelines, product delivery, delays related to weather during construction. As discussed below, some of this is exacerbated by the novel coronavirus, trade tariffs, the Bulk System Power Executive Order and climate change leading to more extreme weather events.

Availability of Certain Resources: Peninsula Clean Energy has experienced strong competition for limited wind resources in California and interconnection challenges for out-of-state wind resources. Peninsula Clean Energy remains committed to procuring wind energy contracts in the future and is in negotiations for wind resource PPAs. There is also risk that assumptions around the timelines for the availability of newer resources such as off-shore wind or long-duration storage are not accurate.

Market Risks: Fluctuation and increasing volatility in market prices (*e.g.*, locational marginal prices, RA prices, RPS prices, project-specific PPA prices) impact Peninsula Clean Energy's ability to plan accurately and may impact valuation for projects.

Counterparty Credit: Damage to counterparty credit particularly in the context of the pandemic and economic uncertainty which may hurt Peninsula Clean Energy's confidence in a counterparty and may also make it more difficult or expensive to access financing for construction.

Curtailment: The CAISO balancing authority area has experienced an increasing frequency and magnitude of curtailment and negative pricing events. In the first half of 2020, CAISO curtailed over 1.2

MM MWh of power, almost twice as much as was curtailed in the same period of 2019 and 30% more than was curtailed in all of 2019. While the impacts of COVID-19 played some role in this, the primary driver behind the increase in curtailment, overgeneration and negative market price hours is the rapid expansion of renewable capacity and in particular solar generation in California and across the west.

Accurate Load Forecasting: Ability to accurately forecast load will influence the volume of resources Peninsula Clean Energy commits to as it does not want to over-contract for resources. This is impacted by expectations around customer participation and the number of customers opting to return to the incumbent utility and potential competition for customers from direct access, both of which could leave Peninsula Clean Energy with stranded assets in the form of long-term contracts. Load forecasting uncertainty has been exacerbated during the pandemic, increasing numbers of people working from home, the closure of businesses and general uncertainty.

Regulation: Regulatory uncertainty has created challenges to contracting for long-term renewable resources. Peninsula Clean Energy must do significant procurement through long-term contracts during a time of considerable regulatory uncertainty. On both the developer side and CCA side, the lack of clarity around RA rules makes it difficult to accurately value the attributes of a particular project. This is related both to the potential for central procurement as well as the rules around hybrid or co-located renewable and storage systems. Although the CPUC recently approved a methodology for calculating the RA contributions by hybrid resources, this methodology may change in the future, and the contributions made by batteries could decline over time. In addition, uncertainty around the assignment of unplanned resources impacts Peninsula Clean Energy's ability to plan accurately including in the form of CAM, RMR, capacity procurement mechanism (CPM), RA central procurement entity (CPE) and Power Charge Indifference (PCIA) allocations. The ongoing dispute over the role of a CPE has created uncertainty over how much of Peninsula Clean Energy's own RA needs it will be responsible to procure and how local resources it has already contracted will be valued. Additionally, there is uncertainty in how the PCIA allocations will be resolved. To date, the PCIA Working Group 3 has proposed[33] that LSEs may be eligible for a load share of PG&E's portfolio, but to date the Commission has taken no action on this proposal. Finally, uncertainty around PCIA levels impacts Peninsula Clean Energy's ability to plan budgets to ensure Peninsula Clean Energy is financially sustainable over the long term. It is not known how this regulatory uncertainty may be resolved and what impacts that will have on Peninsula Clean Energy's long-term procurement strategy.

Climate Change: Climate change itself is also exacerbating these risks. Among the effects is more severe and volatile weather which creates uncertainty in resource generation and load forecasting. Further, the severe weather has resulted in more intense fire conditions which can impact construction timelines both if the fire is located close to a project under construction, but also if an interconnecting utility has to focus resources on fire prevention and management, this may slow the processing timeline for interconnection studies and agreements.

COVID-19: The novel coronavirus pandemic has exacerbated some of these challenges by introducing additional uncertainty. There have been project construction delays related to supply chain issues when China shut down manufacturing in early 2020. Social distancing and other new safety requirements could extend typical construction timelines. An economic downturn could result in lower supplies of

[33] *Final Report of Working Group 3 Co-Chairs: Southern California Edison Company (U-338E) California Community Choice Association, and Commercial Energy* ("Final Report"). Filed February 21, 2020 in Rulemaking 17-06-026.

capital and financing to build new projects. Additionally, the impacts of the economic downturn on municipal budgets could cause reductions in staff and increase timelines for permitting. The pandemic is also making it very difficult to accurately plan for load forecasting. Peninsula Clean Energy is currently experiencing a significant reduction in customer load due to the effects of the coronavirus pandemic and the shelter-in-place order effective in Peninsula Clean Energy's service area. Peninsula Clean Energy is forecasting a reduction in load of about 5% to 10% relative to pre-pandemic load forecasts, but there is a lot of uncertainty around the recovery timeline and when load might return to pre-pandemic levels.

Trade Tariffs or Other Supply Restrictions: In 2018, new trade tariffs were placed on imported solar cells and modules. In 2020, the White House issued the Bulk Power System Executive Order, which impacts the ability to import bulk power system electric equipment from foreign adversaries. This has created uncertainty and impacted developers' expected timelines and costs around access to equipment.

Production Tax Credit (PTC) and the Investment Tax Credit (ITC) Expirations and Phasedowns: The federal PTC for wind expires at the end of 2020 and the ITC for commercial solar steps down to 10% at the end of 2022. This may impact future PPA rates for these projects and the availability of these types of projects.

CA "Split-Roll" Ballot Initiative: The California "split-roll" ballot initiative would change the way commercial property is taxed in California and lead potentially to significantly higher property taxes on solar projects. This could cause existing projects to default on financing, impact the ability for contracted but not constructed projects to access financing and increase the PPA rate for new un-contracted projects.

Plant Retirements: We do not expect plant retirements to be a significant risk. Peninsula Clean Energy's portfolios do not rely on specific existing resources beyond those currently under contract. There is some reliance on system power to meet load and natural gas for RA, but Peninsula Clean Energy's plan is to decrease this reliance over time.

d. Commission Direction or Actions

Peninsula Clean Energy's Board of Director's oversees and governs Peninsula Clean Energy's planning and procurement activities. This IRP was approved by Peninsula Clean Energy's Board of Directors on July 23, 2020, and the resolution documenting this approval is attached as Appendix A.

Peninsula Clean Energy requests that the Commission certify the completeness of Peninsula Clean Energy's IRP detailing Peninsula Clean Energy's Conforming Portfolios, as summarized above and detailed in the completed RDTs.

e. Diablo Canyon Power Plant Replacement

From a system reliability perspective, what matters is that the system is reliable after the retirement of Diablo Canyon Power Plant (DCPP), and not whether specific resources can be identified to replace DCPP on a one for one basis. This is especially true since the generation profile of DCPP is not easily accommodated in a high solar grid, unless there is a large amount of storage available to capture excess energy during the solar window.

Since the RSP represents a reliable portfolio without Diablo Canyon after 2025, the first assessment of adequate replacement for Diablo Canyon is whether the resources in the RSP are procured. As noted above, all of Peninsula Clean Energy's portfolios include more than our load share of the RSP new build resources. Therefore, by meeting our share of the RSP, we have also met our share of the resources to ensure a reliable grid after the retirement of DCPP (and any other resources expected to retire before 2026).

A second analysis would be to evaluate whether our portfolio is capable of dispatching the same energy profile as DCPP, should CAISO deem that profile is needed on a particular day. Peninsula Clean Energy's load share of DCPP's generation would be approximately 38 MW of capacity in all hours, or 912 MWh per day. Each of Peninsula Clean Energy's portfolios provides a minimum of approximately 2,600 MWh per day, with daily generation in excess of 4,500 MWh per day more typical throughout the winter.[34] Each of Peninsula Clean Energy's portfolios includes a fleet of 497 MW of 4-hour Lithium-ion battery storage (equivalent to 1,988 MWh) of storage, which is capable of delivering 124 MW for 16 hours on the longest night of the year, or more than double Peninsula Clean Energy's share of the generation of DCPP. Thus, our renewable portfolio is fully capable of serving 38 MW in each hour while also fully charging our storage. Nearly all days across the year, the renewable fleet generates well in excess of twice the amount required. Thus, should CAISO need the portfolio to replace the maximum output of DCPP in any hour, the combination of renewables and storage is more than capable of delivering the energy for CAISO.

V. Lessons Learned

Peninsula Clean Energy appreciates the CPUC's time and efforts in preparing for this round of integrated resource planning. We appreciate staff's responsiveness to questions and efforts to address stakeholder concerns ahead of the filing deadline. Peninsula Clean Energy appreciates the amount of effort and time that must go into this type of initiative and recognizes the developments and improvements over the first IRP cycle. Clearly, developing a robust and accurate planning process is no small feat and we appreciate the ability to move forward constructively together on this challenge.

In an effort to make future processes simpler, more accurate and more transparent, Peninsula Clean Energy offers the following additional suggestions.

Allow for a firm timeline for portfolio development. This cycle was marked by repeated delays and changes in portfolio requirements. These delays in the approval of the Reference System Plan and changes in filing requirements and resulting delays in the IRP deadline impact the ability for LSEs to conduct accurate modeling and planning in this process. Peninsula Clean Energy was strongly interested in providing the Commission with robust and extremely well-analyzed portfolios to support the Commission in its efforts. To that end, Peninsula Clean Energy along with several other CCAs engaged a consultant in October 2019 to support modeling efforts in expectation of a May 1, 2020 IRP due date. Some of the initial modeling efforts and analysis were delayed or not useful to the final submissions due to the RSP not being approved until April 2020 and based on guidelines provided in the IRP Filing Requirements in May 2020 and revised in June 2020 and again in August 2020. While Peninsula Clean

[34] In total, using our renewable fleet to both provide 38 MW in each hour during the solar window, while also fully charging our storage would require 2,680 MWH, 2,338 MWH to charge the storage, plus 342 MWH to supply 38 MW in each hour during the 9 hour December solar window. Applying the generic wind and generic solar generation profiles from the CSP calculator to our solar and wind resources provides a minimum of 2600MWH per day, with 4,000 to 6,500MWH per day for the 46MMT Conforming Portfolio and a minimum of approximately 4,700MWH and more typical range of 6,500MWH to 8,000MWH per day.

Energy certainly understands the challenges in foreseeing every possible issue complexity that arises while several dozen LSEs engage in the IRP process, Peninsula Clean Energy recommends increasing staffing or other resources or reconsidering the timelines and structures for this planning process. In general, the critical requirements and major parameters, such as load forecasts, required data inputs, required targets, and required portfolios must be finalized at least 8 to 10 months in advance in allow for fulsome and robust portfolio development. Peninsula Clean Energy believes this will be in the best interest of the overall process so that LSE IRPs can be of the highest quality and usefulness to the Commission.

Allow for Demand Side Resources. Demand-side resource planning is important to Peninsula Clean Energy. Peninsula Clean Energy actively supports electrification and distributed energy resource activities to meet its renewable energy goals. Peninsula Clean Energy is disappointed that it cannot include the impact of these activities in its load forecast for Conforming Portfolios for IRP compliance. The IEPR forecasting of load modifiers at the TAC level make it difficult to filter down to individual LSEs. Peninsula Clean Energy recommends the CPUC revise its process in future IRP cycles to allow LSEs to reflect load modification resources beyond Demand Response (DR) in their conforming portfolios, as long as such resources do not duplicate what is already accounted for in the IEPR forecast. Peninsula Clean Energy recommends providing more granularity in the IEPR forecast at the LSE level to avoid this double-counting. This would put such resources on an equal footing with supply-side resources for meeting state decarbonization goals. This is also in accordance with PU Code 454.52(a)(1)(G), which lists "enhance distribution systems and demand-side energy management" as a goal of the IRP process.

Provide Metrics for Demonstrating Reliability. Peninsula Clean Energy is keenly interested in supporting the Commission's efforts to ensure the IRP process delivers a reliable system. However, Peninsula Clean Energy is also concerned by the CPUC directive requiring LSEs to include portfolios with a minimum amount of GHG Emissions in 2030, and Peninsula Clean Energy believes this is not in accordance with the primary objectives of the IRP to conduct accurate planning to reduce GHG emissions. In its decision setting the requirements for this IRP, the CPUC states that:

> … we note the comments of the Joint CCAs that request the ability to file portfolios containing 100% GHG-free resources. While we applaud these LSEs for their forward thinking, they will still need to address how such portfolios will be reliable without further technological or fuel development. It is not sufficient for LSEs to assume that the reliability, renewable integration, and ramping needs associated with their portfolios will be met by resources in the portfolios of other LSEs.[35]

Peninsula Clean Energy is mindful of the technical difficulties of aggregating portfolios with different implicit targets as well as the challenge of evaluating the reliability impacts of individual portfolios. Nevertheless, as the Commission is aware, LSEs have had to develop their own measures of portfolio impacts on system reliability by the failure to provide standards by which LSEs could show such 100% carbon free portfolios adequately supply reliability, renewable integration, and ramping needs. In the spirit of playing a constructive role, Peninsula Clean Energy has attempted to contribute to this ongoing effort with consideration of alternative approaches. In the next IRP cycle, Peninsula Clean Energy looks forward to working with CPUC to define these standards and methods to allow 100% carbon-free portfolios can be conforming for all scenarios

[35] D.20-03-028

Peninsula Clean Energy urges the Commission to reevaluate its apparent understanding of the relationship between high renewable generation and impacts on reliability. It appears that the Commission's decision to require a fixed level of emissions for the 46 MMT Conforming Portfolios and justify any deviation in 38 MMT Conforming Portfolios arose out of a perception that portfolios with greater renewable generation would undermine reliability. However, this perception appears to conflate emissions with reliability, renewable integration, and ramping, which is inappropriate. Certainly, for the three portfolios analyzed here, having greater levels of renewable generation supports reliability, in part because of the inclusion of significant amounts of storage. Thus, the filing requirements somewhat perversely would require heightened showings and analysis for portfolios with lower emissions than for those hitting the benchmarks, even though in many instances the lower GHG emission benchmarks likely have lower impacts on system reliability. This dynamic strongly suggests that the Commission look beyond the System RA and ELCC constructs when evaluating renewable integration needs and reliability. Peninsula Clean Energy looks forward to a constructive conversation around these and many other methods to solve the many issues facing California.

Provide transparency in decision making. In future iterations of the planning process and as the process becomes more routinized, Peninsula Clean Energy recommends an increased level of transparency about how the plans will be used and what metrics will be assessed to evaluate conformance. Clear, up front standards for evaluation and clear processes for any conclusions to be reached from IRPs will help LSEs craft a better product and ensure a higher quality overall outcome. Peninsula Clean Energy looks forward to working with the Commission in future to develop such standards to ensure the Commission's needs are met.

Glossary of Terms

Alternative Portfolio: *LSEs are permitted to submit "Alternative Portfolios" developed from scenarios using different assumptions from those used in the Reference System Plan. Any deviations from the "Conforming Portfolio" must be explained and justified.*

Approve (Plan)*: the CPUC's obligation to approve an LSE's integrated resource plan derives from Public Utilities Code Section 454.52(b)(2) and the procurement planning process described in Public Utilities Code Section 454.5, in addition to the CPUC obligation to ensure safe and reliable service at just and reasonable rates under Public Utilities Code Section 451.*

Balancing Authority Area (CAISO): *the collection of generation, transmission, and loads within the metered boundaries of the Balancing Authority. The Balancing Authority maintains load-resource balance within this area.*

Baseline resources: *Those resources assumed to be fixed as a capacity expansion model input, as opposed to Candidate resources, which are selected by the model and are incremental to the Baseline. Baseline resources are existing (already online) or owned or contracted to come online within the planning horizon. Existing resources with announced retirements are excluded from the Baseline for the applicable years. Being "contracted" refers to a resource holding signed contract/s with an LSE/s for much of its energy and capacity, as applicable, for a significant portion of its useful life. The contracts refer to those approved by the CPUC and/or the LSE's governing board, as applicable. These criteria indicate the resource is relatively certain to come online. Baseline resources that are not online at the time of modeling may have a failure rate applied to their nameplate capacity to allow for the risk of them failing to come online.*

Candidate resource: *those resources, such as renewables, energy storage, natural gas generation, and demand response, available for selection in IRP capacity expansion modeling, incremental to the Baseline resources.*

Capacity Expansion Model: *a capacity expansion model is a computer model that simulates generation and transmission investment to meet forecast electric load over many years, usually with the objective of minimizing the total cost of owning and operating the electrical system. Capacity expansion models can also be configured to only allow solutions that meet specific requirements, such as providing a minimum amount of capacity to ensure the reliability of the system or maintaining greenhouse gas emissions below an established level.*

Certify (a Community Choice Aggregator Plan)*: Public Utilities Code 454.52(b)(3) requires the CPUC to certify the integrated resource plans of CCAs. "Certify" requires a formal act of the Commission to determine that the CCA's Plan complies with the requirements of the statute and the process established via Public Utilities Code 454.51(a). In addition, the Commission must review the CCA Plans to determine any potential impacts on public utility bundled customers under Public Utilities Code Sections 451 and 454, among others.*

Clean System Power (CSP, formerly "Clean Net Short") methodology*: the methodology used to estimate GHG emissions associated with an LSE's Portfolio based on how the LSE will expect to rely on system power on an hourly basis.*

Community Choice Aggregator*: a governmental entity formed by a city or county to procure electricity for its residents, businesses, and municipal facilities.*

Conforming Portfolio*: the LSE portfolio that conforms to IRP Planning Standards, the 2030 LSE-specific GHG Emissions Benchmark, use of the LSE's assigned load forecast, use of inputs and assumptions matching those used in developing the Reference System Portfolio, as well as other IRP requirements including the filing of a complete Narrative Template, a Resource Data Template and Clean System Power Calculator*.

Effective Load Carrying Capacity*: a percentage that expresses how well a resource is able avoid loss-of-load events (considering availability and use limitations). The percentage is relative to a reference resource, for example a resource that is always available with no use limitations. It is calculated via probabilistic reliability modeling, and yields a single percentage value for a given resource or grouping of resources.*

Electric Service Provider*: an entity that offers electric service to a retail or end-use customer, but which does not fall within the definition of an electrical corporation under Public Utilities Code Section 218.*

Filing Entity*: an entity required by statute to file an integrated resource plan with CPUC.*

Future*: a set of assumptions about future conditions, such as load or gas prices.*

GHG Benchmark (or LSE-specific 2030 GHG Benchmark)*: the mass-based GHG emission planning targets calculated by staff for each LSE based on the methodology established by the California Air Resources Board and required for use in LSE Portfolio development in IRP.*

GHG Planning Price: *the systemwide marginal GHG abatement cost associated with achieving a specific electric sector 2030 GHG planning target.*

Integrated Resources Planning Standards (Planning Standards)*: the set of CPUC IRP rules, guidelines, formulas and metrics that LSEs must include in their LSE Plans.*

Integrated Resource Planning (IRP) process*: integrated resource planning process; the repeating cycle through which integrated resource plans are prepared, submitted, and reviewed by the CPUC*

Long term*: more than 5 years unless otherwise specified.*

Load Serving Entity*: an electrical corporation, electric service provider, community choice aggregator, or electric cooperative.*

Load Serving Entity (LSE) Plan*: an LSE's integrated resource plan; the full set of documents and information submitted by an LSE to the CPUC as part of the IRP process.*

Load Serving Entity (LSE) Portfolio*: a set of supply- and/or demand-side resources with certain attributes that together serve the LSE's assigned load over the IRP planning horizon.*

Loss of Load Expectation (LOLE): *a metric that quantifies the expected frequency of loss-of-load events per year. Loss-of-load is any instance where available generating capacity is insufficient to serve electric demand. If one or more instances of loss-of-load occurring within the same day regardless of duration are counted as one loss-of-load event, then the LOLE metric can be compared to a reference point such as the industry probabilistic reliability standard of "one expected day in 10 years," i.e. an LOLE of 0.1.*

Net Qualifying Capacity: *Qualifying Capacity reduced, as applicable, based on: (1) testing and verification; (2) application of performance criteria; and (3) deliverability restrictions. The Net Qualifying Capacity determination shall be made by the California ISO pursuant to the provisions of this California ISO Tariff and the applicable Business Practice Manual.*

Non-modeled costs*: embedded fixed costs in today's energy system (e.g., existing distribution revenue requirement, existing transmission revenue requirement, and energy efficiency program cost).*

Nonstandard LSE Plan*: type of integrated resource plan that an LSE may be eligible to file if it serves load outside the CAISO balancing authority area.*

Optimization*: an exercise undertaken in the CPUC's Integrated Resource Planning (IRP) process using a capacity expansion model to identify a least-cost portfolio of electricity resources for meeting specific policy constraints, such as GHG reduction or RPS targets, while maintaining reliability given a set of assumptions about the future. Optimization in IRP considers resources assumed to be online over the planning horizon (baseline resources), some of which the model may choose not to retain, and additional resources (candidate resources) that the model is able to select to meet future grid needs.*

Planned resource: *any resource included in an LSE portfolio, whether already online or not, that is yet to be procured. Relating this to capacity expansion modeling terms, planned resources can be baseline resources (needing contract renewal, or currently owned/contracted by another LSE), candidate resources, or possibly resources that were not considered by the modeling, e.g., due to the passage of time between the modeling taking place and LSEs developing their plans. Planned resources can be specific (e.g., with a CAISO ID) or generic, with only the type, size and some geographic information identified.*

Qualifying capacity*: the maximum amount of Resource Adequacy Benefits a generating facility could provide before an assessment of its net qualifying capacity.*

Preferred Conforming Portfolio*: the conforming portfolio preferred by an LSE as the most suitable to its own needs; submitted to CPUC for review as one element of the LSE's overall IRP plan.*

Preferred System Plan: *the Commission's integrated resource plan composed of both the aggregation of LSE portfolios (i.e., Preferred System Portfolio) and the set of actions necessary to implement that portfolio (i.e., Preferred System Action Plan).*

Preferred System Portfolio: *the combined portfolios of individual LSEs within the CAISO, aggregated, reviewed and possibly modified by Commission staff as a proposal to the Commission, and adopted by the Commission as most responsive to statutory requirements per Pub. Util. Code 454.51; part of the Preferred System Plan.*

Reference System Plan: *the Commission's integrated resource plan that includes an optimal portfolio (Reference System Portfolio) of resources for serving load in the CAISO balancing authority area and meeting multiple state goals, including meeting GHG reduction and reliability targets at least cost.*

Reference System Portfolio*: the multi-LSE portfolio identified by staff for Commission review and adopted/modified by the Commission as most responsive to statutory requirements per Pub. Util. Code 454.51; part of the Reference System Plan.*

Short term*: 1 to 3 years (unless otherwise specified).*

Staff: *CPUC Energy Division staff (unless otherwise specified).*

Standard LSE Plan: *type of integrated resource plan that an LSE is required to file if it serves load within the CAISO balancing authority area (unless the LSE demonstrates exemption from the IRP process).*

Table of Acronyms

ALJ	Administrative Law Judge
APEP	Advanced Power and Energy Program
CAISO	California Independent System Operator
CAM	Cost Allocation Mechanism
CARE	California Alternate Rates for Energy
CCA	Community Choice Aggregator
CEC	California Energy Commission
CPE	Central Procurement Entity
CPM	Capacity Procurement Mechanism
CPUC	California Public Utilities Commission
CSP	Clean System Power
CVI	San Mateo County Community Vulnerability Index
D	Decision
DCPP	Diablo Canyon Power Plant
ELCC	Effective Load Carrying Capacity
EPRI	Electric Power Research Institute
EV	Electric Vehicle
FERA	Family Electric Rate Assistance
GEL	Grid Evolution Laboratory
GHG	Greenhouse Gas
IEPR	Integrated Energy Policy Report
IOU	Investor-Owned Utility
IRP	Integrated Resource Plan
kW	Kilowatt
KWh	Kilowatt-hour
LSE	Load Serving Entity
LTCE	Long-Term Capacity Expansion
MIP	Mixed Integer Linear Programming
MMT	Million Metric Ton
MW	Megawatt
MWh	Megawatt-hour
PCC1	Portfolio Content Category 1
PCIA	Power Charge Indifference Adjustment
PG&E	Pacific Gas and Electric
PPA	Power Purchase Agreement
PRMR	Planning Reserve Margin Requirement
PSPS	Public Safety Power Shutoff
R	Rulemaking
RA	Resource Adequacy

RDT	Resource Data Template
RFO	Request for Offers
RFP	Request for Proposals
RMR	Reliability Must Run
RPS	Renewable Portfolio Standard
RSP	Reference System Plan
SCE	Southern California Edison
UCI	University of California, Irvine