VALLEY CLEAN ENERGY ALLIANCE

Staff Report – Item 8

TO: Valley Clean Energy (VCE) Community Advisory Committee (CAC)

FROM: Mitch Sears, Interim General Manager
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Director of Power Services
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SUBJECT: CPUC Integrated Resource Plan and Required Action Plan (IRP)

DATE: July 23, 2020

RECOMMENDATION

Review draft of VCE Integrated Resource Plan (IRP) and provide recommendations to the Board regarding the adoption of the IRP including the selection of VCE's Preferred Conforming Portfolio in the final resource plan report to be submitted to the California Public Utilities Commission (CPUC) by September 1, 2020.

BACKGROUND

VCE is required by the CPUC to prepare an IRP for the supply of energy in the period from 2020 to 2030. The objective of the IRP is to provide guidance for VCEA's Board, executive management, and the public regarding the expected power supply cost and the resources needed for meeting electric demand in the 2020-2030 period. The IRP is due to the CPUC on September 1, 2020 and must be adopted by the Board prior to submission. Following this meeting's review of the IRP, a final report will be prepared for approval at Board's meeting in August.

Staff conducted two public IRP workshops to inform of the IRP process and to gather input and feedback regarding the long term resource portfolios considered in the IRP. The workshops were held on December 9, 2019 and May 28, 2020. The second meeting was also conducted as a special meeting of the CAC and the Committee provided input and feedback to the IRP scenarios that were presented. Based on the input from the public, the CAC and discussions with VCE staff, the attached draft IRP report was prepared by SMUD for review.

The key components of the IRP are two long term resource portfolios and an action plan to demonstrate that VCE has sufficient resources and planning processes in place to implement the resource plan. The format of the report, the electric demand forecast, and a minimum number of scenarios to consider are all dictated by CPUC decisions and rulings under the IRP rule making proceeding R.16-02-007.

The draft resource plans reflected in the attached draft IRP provide the mandatory resource portfolios. These resource portfolios were developed such that the projected GHG emissions match the CPUC requirements of respectively 156,000 metric tons per year and 129,000 metric tons per year by 2030. In reality, VCE may choose to adopt more ambitious resource portfolios that result in lower GHG emissions. However, staff does not recommend submitting additional portfolios to the CPUC at this time since it will necessitate significant additional work in both the IRP regulatory process and the Renewable Portfolio Standard (RPS) regulatory process. Instead, VCE can reflect changes in its subsequent IRP filings, if desired.

The recommended resource portfolios that are presented in the attached report offer a balanced resource plan that expands on the solar PV contracts VCE has entered into in 2020 by adding local solar PV resources, new wind resources and battery-based energy storage. Similar to what VCE is doing today, each portfolio also includes a limited amount of carbon-free large scale hydro resources that will help reduce VCE's GHG emission levels to the required amounts by 2030.

The draft IRP also includes a proposed action plan for implementing the IRP. The proposed actions are focused mainly on monitoring progress of the projects with which VCE completed long term PPAs in 2020 and on planning procurement of additional resources in the 2025-2030 period. The action plan clarifies that it is VCE's intention to continue seeking new resources to its portfolio by pursuing only RPS-eligible renewable resources and storage and that VCE intends to identify candidate resources through an open, public RFO process.

Based on the final feedback from the CAC staff will prepare a final draft IRP for adoption by the Board at VCE's August Board meeting.

REQUESTED BOARD ACTION

Staff will be making the following recommendations to the Board for their action on August 13, 2020:

That the Board adopt a resolution establishing the following:

- Approving the Integrated Resource Plan in substantially the form attached, and adopting the Conforming 46MMT Portfolio as its Preferred Portfolio
- Adopting the IRP action plan, which is a required element of the IRP.

Attachment

1. Draft 2020 IRP

Attachment 1
Proposed Integrated Resource Plan

Standard LSE Plan

Valley Clean Energy Authority

2020 INTEGRATED RESOURCE PLAN

DRAFT

July 15, 2020

Table of Contents

I. Executive Summary

Valley Clean Energy Alliance, or Valley Clean Energy (VCE) is a joint powers authority working to implement a state-authorized Community Choice Energy (CCE) program. Participating VCE governments include the City of Davis, the City of Woodland and the unincorporated parts of Yolo County. Beginning January 2021, the City of Winters will also join VCE. The vision of VCE is to enable the participating jurisdictions to determine the sources, modes of production, and costs of the electricity they procure for the residential, commercial, agricultural, and industrial users in their areas. PG&E continues to deliver the electricity procured by VCE and to perform billing, metering, and other electric distribution utility functions and services. Customers within the participating jurisdictions have the choice not to participate in the VCE program. VCE's vision as an organization and as adopted by its Board in 2017 is shown in Figure 1. This report was prepared in accordance with decision D.20-03-028 by the California Public Utilities Commission (Commission) under proceeding R.16-02-007. The report follows the format provided by the Commission.

Figure 1. VCE Vision - Check and Refresh

The near-term vision for VCE is to provide electricity users with greater choice over the sources and prices of the electricity they use, by:

- Offering basic electricity service with higher renewable electricity content, at a rate competitive with PG&E;
- Developing and offering additional low-carbon or local generation options at modest price premiums;
- Establishing an energy planning framework for developing local energy efficiency programs and local energy resources and infrastructure; and
- Accomplishing the goals enumerated above while accumulating reserve funds for future VCE energy programs and mitigation of future energy costs and risks.

The long -term vision for VCE is to continuously improve the electricity choices available to VCE customers, while expanding local energy-related economic opportunities, by:

- Causing the deployment of new renewable and low carbon energy sources;
- Evaluating and adopting best practices of the electricity service industry for planning and operational management;
- Substantially increasing the renewable electricity content of basic electricity service, with the ultimate goal of achieving zero carbon emissions electricity;
- Developing and managing customized programs for energy efficiency, on-site electricity production and storage;
- Accelerating deployment of local energy resources to increase localized investment, employment, innovation and resilience;
- Working to achieve the climate action goals of participating jurisdictions to shape a sustainable energy future; and
- Saving money for ratepayers on their energy bills.
- Remaining open to the participation of additional jurisdictions.

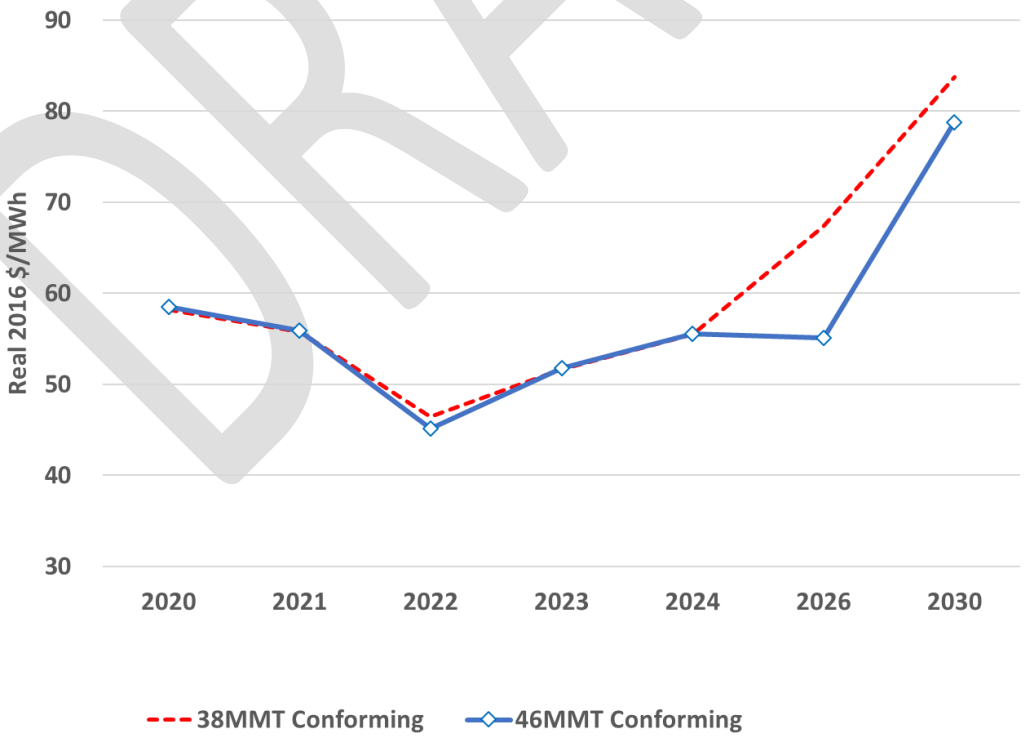
Since VCE started serving load in June 2018 and in accordance with the action plan of its 2018 IRP, VCE has started adding resources under long term contracts and is gradually building up a portfolio of short and long term assets in line with its vision and the demand of its customers. To date, VCE has relied mainly on market purchases of energy, Resource Adequacy (RA), and Renewable Energy Credits (RECs) in order to serve its electric demand and meet regulatory requirements with respect to resource adequacy and renewable energy. Starting in 2021 it will increasingly meet electric demand with resources under long term contracts. VCE has contracted for 122 MW of new solar resources to come online before the end of 2021 and 7 MW of battery capacity to come online by August 1, 2021. For the purposes of this filing, VCE considered several IRP portfolio alternatives that were reviewed and discussed by VCE's Board, its Community Advisory Committee and the general public over the course of several meetings and workshops that were open for attendance and public inputs. From this process followed two resource portfolios that are presented in this report: The first

portfolio, entitled 46MMT Portfolio or Conforming Portfolio, is based on expanding VCE's solar PV contract portfolio with storage, local solar and wind to create a balanced portfolio that meets state requirements. This portfolio is expected to result in estimated emissions of 56,000 metric tons per year by 2030. Over the course of the 2020-2030 period, the renewable energy content of the portfolio is adjusted to meet statutory and regulatory RPS requirements as well as the Greenhouse gas benchmark values stipulated by the Commission.
The second portfolio, entitled 38MMT was prepared demonstrate an alternative portfolio that meets the greenhouse gas requirements of the 38MMT, which for VCE amounts to 129,000 metric tons per year by the year 2030.

Ultimately, the choice of resource path is uncertain and will to a large extent depend on future market and technology-cost developments as well as on the evolving preferences of VCE customers. VCE's resource plan may therefore be adjusted according to market developments over the next several years.

Figure 2 shows a comparison of the estimated generation costs for each of the resource portfolios submitted for the 2020-2030 period.

Figure 2. Annual Generation Costs by Resource Portfolio and Year



VCE's portfolio costs are significantly lower than those reported in the RESOLVE tool for the generation portion of the retail rate. This result is likely driven largely by a discrepancy in assumptions regarding costs for RA and for existing resources. VCE relied on Its own forecasts for RA capacity, RECs, and carbon free energy (large scale hydro) while largely using the RESOLVE model's estimate of marginal energy costs and for the levelized cost of new resources in VCE's portfolio.

There are several important assumptions of VCE's IRP analysis that should be considered:

- The resource portfolios are based on contracting only for new resources over the 2020-2030 period. The selected resources are all either RPS-eligible renewable energy sources or battery storage. For additional energy and capacity needs beyond those shown in the resource plan, VCE expects to rely on the CAISO market and on bilateral energy and capacity markets.
- The modeling and analysis are based on assumptions and prices available in the Reference System Portfolio (RSP) results for the RESOLVE model that were developed for the Commission and that were made public on March 26 2020[1]
- Resources in the portfolios were selected so as not to exceed VCE's proportional maximum share of each resource category (e.g. wind, solar, storage, etc). While VCE prefers local wind resources (e.g. Solano Wind), these resources can be exchanged for other generic new resources after 2025 since there is significant uncertainty on the exact sources from where VCE may source its future wind resources.
- VCE considers the analyses and conclusions of this IRP report to be tentative for the period 2025-2030 and subject to adjustments as market conditions change and technology and customer preferences evolve.
- VCE's analysis considers only the generation portion of electric services delivered to VCE's customers since this is the only part for which VCE is responsible. It is anticipated that the IRP filing by PG&E will cover the other aspects, such as transmission, distribution, and Demand Side Management programs.
- VCE's Action Plan includes several activities that are expected to enable VCE to implement, fine-tune and adjust its resource plan, including issuing a solicitation for long term and local renewable capacity and setting long term procurement policies and goals for the organization.
- The load forecast and load shape used in this IRP are based on CEC's 2019 IEPR data which uses load characteristics and shape from PG&E's service territory. Thus, neither the demand level or the shape represent the best available view of VCE's load.
- The load forecast also does not include any impacts of the Covid-19 pandemic which is expected to reduce demand significantly in 2020. VCE also expects that demand will remain depressed as a result of the expected 2020 recession and subsequent economic recovery in the 2020-2023 period.

The estimated GHG emissions for VCE in 2030 using Commission's Clean System Power Calculator Tool is shown in Table 1 below for each of the resource portfolios considered, as well as the Commission GHG benchmark value of 129,000 tons per year for the year 2030.

[1] https://www.cpuc.ca.gov/General.aspx?id=6442459770

Table 1. Estimated GHG Emissions in 2030 by Resource Portfolio using the Commission GHG Calculator (metric tons 000)

	46MMT	38 MMT
Commission Mandated Benchmark	156	129
VCE 46MMT Portfolio	134	N/A
VCE 38 MMT Portfolio	N/A	108

VCE's IRP analysis is based on a simplified hourly production cost model of VCE's portfolio, where it is assumed that California as a whole follows the resource plan outlined in the 46MMT Reference System Portfolio (RSP) and that VCE can freely buy and sell energy into the CAISO electricity and ancillary service markets at the market prices expected in the Reference System Portfolio provided by the Commission[2]. VCE's analysis also uses the same assumptions that the Reference System Portfolio was based on, including levelized costs for new generating resources and the same renewable energy resource classifications, renewable energy profiles, and geographical naming conventions (e.g. "Solano Wind" or "Sacramento River Solar"). The resulting resource portfolios also utilize resources wherein the use of each renewable energy resource or storage does not exceed VCE's proportional share of the resource potential.
VCE's Action Plan outlines key activities over the next several years for VCE. An important near-term activity in the Action Plan is to complete the negotiation and procurement of long term renewable energy contracts for local capacity in response to VCE's RFO that was issued in April 2020. Completion of vendor selection and PPA negotiations is expected by the end of 2020.
VCE considers local resources to be important for meeting its long term vision of managing customized programs, local investments, and employment as well as helping participating jurisdictions achieve their long term climate and sustainability goals.
The Action Plan also outlines other key activities over the next 1-3 years, including monitoring progress towards completion of new resources and initiating procurement of resources for the 2025-2030 period. Section 4 of this report describes VCE's Action Plan in more detail.
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II. Study Design

The study was designed to provide VCE, its Board, management, and community with a resource plan and portfolio that meets VCE's needs of renewable energy content, resource diversity and cost-effectiveness while meeting all regulatory and statutory requirements. After discussions with the Board, its Community Advisory Committee and with input from the public, VCE prepared two conforming portfolios for submission: One conforming portfolio called

[2] For the 46MMT portfolio, the power prices and other market Inputs for CAISO were derived from the RESOLVE case entitled "46MMT_20200207_2045_2GWPRM_NOOTCEXT_RSP_PD", and for the 38MMT portfolio, VCE used " 38MMT_20200117_2045_2GWPRM_NOOTCEXT" that are available at https://www.cpuc.ca.gov/General.aspx?id=6442459770

"46MMT" which conforms with the 46MMT Commission portfolio resource portfolio and one portfolio called "38MMT" which conforms with the alternative GHG benchmark for which LSE's are required to also submit a resource portfolio.
VCE's modeling approach is based on utilizing current market data for the front years of the IRP study period (2020-2022), and using available data and assumptions from the Commission as a basis for resource portfolio choices in the 2023-2030 period. In the modeling, VCE is considered as a "price taker" in the CAISO market wherein it is assumed that VCE, due to its small peak load and energy demand relative to the rest of the CAISO market, cannot influence prices and therefore can buy and sell power at CAISO spot market prices, as represented by the RESOLVE model results for the respective portfolios (46 MMT RSP and 38MMT), wherein CO2 allowance prices are implicitly reflected in the CAISO price.
The GHG planning price is not used in the VCE model runs, because VCE does not propose to own or otherwise sign long term contracts for fossil-fueled generation. VCE's only exposure to GHG avoidance costs is from the cost of GHG mitigation implicit in power market pricing for net purchases of load from the CAISO and for net sales of renewables into the CAISO market.

Load Forecast

VCE's load forecast is based on the "mid Baseline mid AAEE" version of Form 1.1c of the California Energy Commission's (CEC) 2019 IEPR demand forecast for the PGE service area[3]. VCE also uses the PGE service area hourly load shape, wherein VCE's hourly load is assumed to be proportional to its share of the annual electricity demand for the PG&E service territory for all hours[4]. VCE requested an update to its load forecast to reflect the fact that the City of Winters will join VCE starting in 2021. This request was granted in an April 15 ruling that finalized load forecasts and greenhouse gas benchmarks for LSEs[5]. Table 2 below shows VCE's retail load forecast for the 2020-2030 period as well as the expected wholesale peak load for September (using VCE's 2021 RA allocation and the Resource Data Template spreadsheet provided by the Commission)

Year	Energy Demand (GWh) **(Based on 2019 IEPR)**	September Peak Demand (MW) **(Using CPUC's Resource Data Template)**
2020	706	206
2021	765	204
2022	761	204

[3] https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-IEPR-03

[4] https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-IEPR-03

[5] https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M333/K160/333160852.PDF

2023	759	205
2024	760	206
2025	761	207
2026	761	208
2027	761	209
2028	761	210
2029	761	211
2030	761	212

Table 2. VCE electric demand and peak load 2020-2030

Objectives

The objective of the IRP is to provide guidance for VCE's Board, executive management, and the public regarding the expected cost and environmental footprint of supplying VCE customers with reliable, affordable and clean energy in the 2020-2030 period. The resource portfolios presented in this IRP are the result of discussions among VCE's Board, advisory committee and the public regarding resource preferences, resource diversity cost effectiveness in meeting statutory and regulatory requirements as well as VCE's own goals for its power supply. The detailed resource portfolio choices are discussed in the assumptions section below.

a. Methodology

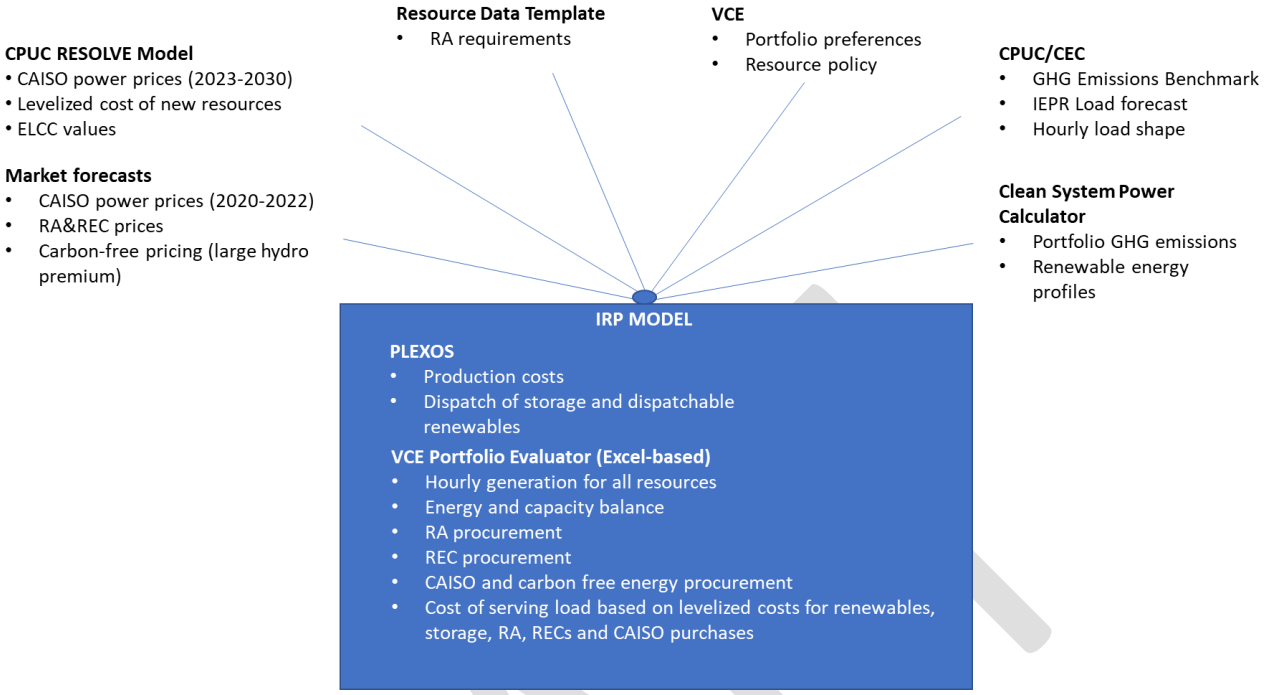
Based on the updated IEPR load forecast for VCE, shown in Table 2 above, VCE's annual electric consumption in the 2020-2030 period represents less than half a percent of the statewide electric consumption (~0.3%). It is therefore expected that VCE will have little or no opportunity to influence market prices of any of the components of the electric supply for this IRP. In other words, VCE is a price taker. Under this expectation, VCE can transact energy, capacity, and resource adequacy and enter into short or long term contracts without impacting the overall market prices in these markets. This philosophy is reflected in our methodology. In a further effort to make the IRP consistent with the Commission's requirements and assumptions for California, VCE's methodology for quantifying the costs and greenhouse gas impacts of portfolio alternatives relies mainly on publicly available data provided by the Commission to support this IRP process as well as on the updated 2019 IEPR forecast that includes a forecast of VCE's electricity demand, including the City of Winters from 2021. Two resource portfolios are presented in this report. The details of each portfolio are presented in Section III.a, below.

i. Modeling Tool(s)

VCE's resource plan is based on a simplified production cost modeling approach that utilizes publicly available data from the various tools provided by the Commission as well as the IEPR load forecast from the CEC. With this data, VCE developed an hourly spreadsheet model that captures the expected costs of providing electricity to VCE's customers in the 2020-2030 period under different resource portfolio alternatives, including the costs of RA, RECs and carbon-free resources. In order to ensure that battery storage and dispatchable renewables such as biomass can be adequately co-optimized with the fixed-profile renewable resources, PLEXOS was used to minimize the overall costs of meeting load. This approach is consistent with the data and assumptions of the RESOLVE model, the Clean System Power calculator, Resource Data Template and the RPS calculator. The model relies on input assumptions and modeling results from the Reference System Portfolio that was adopted in D.20-03-028.

The RESOLVE model provides a simplified representation of the entire WECC system and performs a cost-based simulation and forecast for the 2018-2030 period that selects resources and provides estimates of total and marginal costs as well as emissions and reliability parameters. With this model, only 37 representative days per year are modeled and subsequently aggregated to provide an estimate of full-year impacts. Based on the 37 days modeled in RESOLVE, VCE developed a power price forecast for all 8760 hours in a year. VCE's spreadsheet model assumes that prices and the cost and availability of resources are given. VCE is treated as a price taker in the CAISO market, wherein VCE's objective is to minimize costs for meeting its resource needs at given prices for capacity, energy, and new resources. The input assumptions used for this model are drawn from the RESOLVE model as well as from the Commission's Clean System Power calculator, the Resource Data Template and CEC's IEPR load forecast. Figure 3 highlights the modeling methodology, tools and inputs used to prepare VCE's IRP portfolios

Figure 3. VCE's modeling methodology and data sources



ii. Modeling Approach

VCE worked with its Board, Community Advisory Board, and the public to shape two resource portfolios.

The 46MMT portfolio was created as a resource path for ensuring that VCE meets all statutory and regulatory requirements, including reaching GHG emissions of 156,000 per year by 2030. The 46MMT portfolio represents a balanced approach using resources that VCE expects to be available in Northern California, including solar, wind and storage opportunities for long term contracting. This results in a resource portfolio where only renewable energy sources and battery capacity are pursued. In additional to renewable resources, VCE also expects to rely somewhat on carbon-free hydro resources to ensure that VCE meets its 2030 GHG goal of 156,000 tons per year in the 46MMT portfolio and 129,000 tons per year in the 38MMT portfolio. Finally, to balance its total need for energy and capacity, VCE expects to rely on market purchases from the CAISO and bilateral markets. While VCE would welcome additional contracting for biofuels or other dispatchable baseload renewables, these are considerably more expensive than wind and solar resources and also have a significantly longer lead time to develop. Therefore, such resources were not included in the resource plan.

The 38MMT portfolio was developed to comply with requirements described D.20-03-028 as an alternative portfolio that meets the lower GHG planning target of 129,000 tons per year by 2030, as requested by the CPUC. This 38MMT portfolio is nearly identical to the 46MMT portfolio but includes the use of additional wind, battery storage and large-scale hydro resources in the years leading up to 2030 in order to reduce GHG emissions to the required levels.

The resource composition of each portfolio is discussed in further detail below. Methodology and calculations used to generate metrics for the portfolios were generally developed in Excel, based on CPUC data and is discussed in detail under subsection 2(b)(i) Modeling Tools, above.

III. Study Results

This section shows study results for the two IRP portfolios that were considered by VCE. Detailed portfolio selection results are shown in Excel spreadsheets that were filed together with this IRP. Considering that the planned resource procurement beyond what VCE will contract for in 2020 is not expected until 2025-27, there is necessarily significant uncertainty in the plan and in the indicated preferred resource choices.

a. Conforming and Alternative Portfolios

Two portfolios are submitted for consideration in this IRP: One portfolio conforming with the Reference System Portfolio, entitled Conforming 46MMT portfolio, and one portfolio that conforms with the Commission's 38MMT scenario, entitled Conforming 38MMT portfolio. The underlying data and scenarios are defined in D.20-03-028. The two portfolios were finalized after consulting VCE's Community Advisory Board and the public through public meetings. VCE is not submitting any alternative portfolios.

Since completing its first IRP, VCE has forged ahead with contracting for new renewable energy under long term contracts that will span beyond the 2020-2030 contract period shown in this report. Before the end of 2020, VCE expects to have completed long term contracts for 122 MW of new solar PV resources and 7MW of battery storage, all of which is planned to come online before January 2022. Significant uncertainty remains regarding the long-term load growth and resource needs for VCE. Therefore, the results shown in this section as well as in the attached spreadsheets that provide details on the long-term portfolio selection, are necessarily

approximations that should be viewed as options and guidance on general direction rather than providing specific detailed procurement targets for the 2025-2030 period.

Table 3 below shows a summary of resource portfolio results for the two portfolios. Both portfolios meet the Commission's IRP requirements. VCE's Board selected the portfolio entitled 46MMT as its preferred portfolio. The detailed resource choices for each portfolio are shown in the Resource Data Template that were submitted together with this IRP:

Table 3. Portfolio results summary (MW Nameplate Capacity)

	46MMT (Conforming and Preferred)							38MMT						
	2020	**2021**	**2022**	**2023**	**2024**	**2026**	**2030**	**2020**	**2021**	**2022**	**2023**	**2024**	**2026**	**2030**
BTM Solar	47	60	68	74	80	89	109	47	60	68	74	80	89	109
Contracted Resources (As of July 2020)														
New Solar PV		122	122	122	122	122	122	122	122	122	122	122	122	122
Small Hydro	0.7	0.7	0.7	0.7	0.7			0.7	0.7	0.7	0.7	0.7		
Planned Resources														
New Wind						20	41						20	50
New Local Solar				20	20	20	53				20	20	20	53
New 4-hour Li-Ion Battery		7	7	7	7	15	50		7	7	7	7	15	80
Small-Scale Hydro						0.7	0.7						0.7	0.7
Large Scale Hydro						20	20						20	34

b. Preferred Conforming Portfolios

iii. 46 MMT Target Portfolio

The Conforming 46MMT portfolio is VCE's preferred portfolio. This portfolio represents a continuation of VCE's renewable energy focused portfolio that will allow VCE to reach more than a 60% RPS level by 2030. A summary of the resource choices in this portfolio is shown in Table 3, above. The resulting generation from the 46MMT portfolio as well as the estimated annual electric demand is summarized in Table 4, below. Portfolio details for the Preferred Portfolio are also shown in the Excel files for new and existing resources that were part of this submission.

Table 4. Summary of annual electric demand and generation by resource type for Preferred Conforming 46MMT Portfolio (GWh)

	2020	2021	2022	2023	2024	2026	2030
Retail Electric Demand	706	765	761	759	760	761	761
Wholesale Energy Demand (accounting for losses)	770	834	829	827	828	829	829
Market purchases	530	771	503	450	451	344	209
Carbon Free Energy incl. Hydro	233	29	0	0	0	54	54
Wind	0	0	0	0	0	55	112
Solar	0	28	320	373	373	373	459
Small Hydro	6.7	6.5	6.5	6.5	6.5	6.5	6.5
Storage	-	(0.2)	(0.3)	(2.3)	(2.1)	(3.6)	(11.8)
RECs	308	95	-	-	-	-	-
RPS Delivered (% of Retail load)	44%	17%	43%	50%	50%	57%	77%

The portfolio generation summarized in Table 4, above, shows the expected performance of the 46MMT portfolio that is consistent with VCE's long term preferences and conforms with Commission and statutory requirements. The resource choices are based on estimated short term and long term costs for energy, capacity, renewables and carbon-free energy.

VCE's long term operational goals include maintaining electricity prices that are competitive with PG&E retail prices while at the same time delivering a supply portfolio that is both cleaner and more locally sourced than PG&E's portfolio. Considering these priorities, the long-term portfolio mix is likely to be adjusted compared to the above in line with changes in market prices. There are several reasons why VCE's Preferred Portfolio relies on a mix of renewable resources, including solar PV, wind, small scale hydro and battery storage: First, a high level of renewable energy is preferred by VCE and its customers. Second, relying on a mix of wind, solar and storage help to match renewable generation to VCE's load profile compared to a more-solar heavy portfolio which could otherwise be preferred from a cost perspective. Even though other resources are attractive from the perspective of resource diversification and ability to match VCE's load, such as geothermal resources, biomass and pumped storage hydro, VCE believes these resources also to be significantly more challenging to develop and their near time feasibility is therefore questionable. VCE is also a very small LSE, which would necessitate teaming up with other LSE's to develop and/or contract for non-solar resources. This adds risk to the development and contracting cycle. Finally, levelized costs for 4-hour battery storage are expected to be competitive with conventional gas-fired capacity (as available In

the CAISO RA market) from about 2025, making battery storage a cost-preferred resource for RA.

VCE used the levelized cost estimates that were included in the RESOLVE model as a basis for estimating generation costs of different technologies. Based on this, VCE expects solar PV to be the lowest cost supply alternative for existing and new sources in the 2020-2030 period. VCE recently signed long term contracts for new solar PV capacity, adding 122 MW of capacity, expected to come online before 2022. These two new resources are not part of Baseline resources, as defined by D.20-03-028. In addition, VCE completed an RFO for new local resources in Q2 of 2020, expected to result in about 20 MW of new solar capacity, possibly combined with storage, to come online by 2023. Also in the first half of 2020, VCE partnered with Redwood Coast Energy Authority and issued an RFO for up to 20 MW of RA capacity to come online on or before August 1, 2021. 50% of this capacity will be for VCE and will ensure that VCE meets the procurement mandates for 2021 set out in D.19-11-016.

As part of VCE's action plan that is described in Section 4 of this report, VCE plans to conduct additional solicitations for new resources as needed to ensure sufficient resources are available also in the 2025-2030 period. The exact timing of such solicitations will depend on how fast VCE's electric demand grows in the next 3-5 years. For example, VCE expects that the Covid19 pandemic of 2020 along with the ensuing economic recession will dampen electric demand to levels significantly below those shown in this IRP during the 2020-2025 period.

In line with many other industry analysts, the RESOLVE model's levelized costs for battery storage also suggests a long-term declining trend. Declining costs for battery storage suggest that in the next ten years, batteries are likely to become the most cost-effective means of meeting VCE's resource adequacy needs, surpassing traditional gas-fired generation in terms of resource costs. Therefore, the Preferred Portfolio includes up to 50MW of battery capacity by 2030. If battery storage costs decline faster than anticipated, VCE may consider increasing its reliance on batteries, and conversely, if battery costs remain at close to 2018-2020 levels, then VCE is likely to rely more on market purchases for its RA needs.

VCE's preferred resource portfolio is consistent with the RSP in that the resource choices - solar PV and battery storage are also part of the Reference System Portfolio and the total capacity envisioned by VCE is less than its proportional share of the maximum resource build as documented in the RESOLVE model for the 46MMT

scenario[6]. When comparing directly to the RSP for the year 2030, VCE has higher amounts of new solar resources and slightly lower than the RSP in other renewable energy categories compared to its load-share of the RSP. The compliance of this portfolio with statutory and regulatory mandates is discussed further in subsection (v) below.

iv. 38 MMT Target Portfolio

VCE's 38MMT portfolio provides VCE's conforming portfolio for complying with the additional GHG target of 129,000 metric tons per year for VCE that was set out in a ruling dated April 15, 2020[7]. To achieve the GHG emissions associated with the 38MMT portfolio, VCE expanded the resource portfolio slightly under all categories – solar PV, Wind, Battery Storage and large-scale hydro. As with the 46MMT portfolio, VCE values a balanced portfolio approach and would be open to adjusting the resource choices in the future, depending on the cost and availability of other renewable resources. In creating the 38MMT portfolio, VCE also aims to ensure that VCE does not exceed its proportional share of limited resources such as large-scale hydro or wind. We note, however, that if, due to resource limitations of a particular wind resource (e.g. Solano Wind), VCE's share of such a resource exceeds its proportional share based on load, VCE would be open to sourcing the same generation technology from another geographical area. As discussed in section 2(b)(ii), above, the 46MMT and the 38MMT portfolio are identical until after 2026. The compliance of this portfolio with statutory and regulatory mandates is discussed further in subsection (v) below.

Table 5. Summary of annual electric demand and generation by resource type for the 38MMT portfolio (GWh).

	2020	2021	2022	2023	2024	2026	2030
Retail Electric Demand	**706**	**765**	**761**	**759**	**760**	**761**	**761**
Wholesale Energy Demand (accounting for losses)	770	834	829	827	828	829	829
Market purchases	530	771	503	450	451	344	155
Carbon Free Energy incl. Hydro	233	29				54	91
Wind						55	136

[6] See results for scenario "46MMT_20200207_2045_2GWPRM_NOOTCEXT_RSP_PD" available at https://www.cpuc.ca.gov/General.aspx?id=6442459770

[7] https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M333/K160/333160852.PDF

Solar		28	320	373	373	373	459
Small Hydro	6.7	6.5	6.5	6.5	6.5	6.5	6.5
Storage		-0.2	-0.3	-2.3	-2.1	-3.6	-18.9
RECs	308	96					
RPS Delivered (% of Retail load)	45%	17%	43%	50%	50%	57%	79%

v. Compliance with Statutory and Administrative Requirements

Section 454.52 (a) (1) of the Public Utility Code sets out several requirements which LSEs must comply with in their IRPs:

- **Meet GHG emissions reduction targets established by the State Air Resources Board.** VCE's Preferred Resource Portfolio shows estimated GHG emissions of 135,000 metric tons per year by 2030, which is consistent with the target established for VCE in ruling April 15, 2020. VCE's 38MMT Scenario is also consistent with the lower GHG target required in that same ruling, showing estimated emissions of 108,000 metric tons per year by 2030.[8]
- **Procure at least 60 percent eligible renewable energy resources by December 31, 2030.** All portfolios considered in this IRP will meet the statutory RPS requirements. The actual level of RPS achieved in each compliance period will depend on how market conditions and prices for renewable energy evolve and on whether VCE's renewable energy procurement policies change. While VCE has a strong commitment to a clean local supply of energy, maintaining competitive retail electric prices are also a key consideration in the balancing of priorities for VCE.
- **Just and reasonable rates.** VCE's rates are approved by its Board in accordance with VCE policies. VCE's goal is to meet or beat PG&E's retail electric rates. As of mid-2020, VCE's retail rates match those of PG&E.
- **Minimize impacts on ratepayers' bills.** See section III (e) below.
- **Ensure system and local reliability.** Since VCE is not a distribution utility, most of the obligations in this area do not apply. However, VCE, in its resource plan incorporates the need for providing system and local RA at 115% of the expected monthly peak load for VCE. The estimated costs for such capacity are incorporated in the resource costs for all portfolios. Additionally, VCE will incorporate into its long-term power purchase agreements with intermittent renewable resources the ability to curtail output in the face of negative market prices.
- **Enhance distribution systems and demand-side energy management.** Since the distribution system and demand side management is managed by PG&E, the responsibility for meeting these requirements lie with PG&E. VCE has not taken any action to assume the responsibility for demand-side programs from PG&E. As

[8] The GHG Benchmarks established by CPUC ruling In April for VCE were 156,000 tons and 129,000 by 2030 respectively for the 46MMT portfolio and the 38MMT portfolio. CPUC-developed filing templates subsequently reduced the benchmarks for respectively 135,000 and 108,000 tons per year by 2030 (for details, see ftp://ftp.cpuc.ca.gov/energy/modeling/CSP_46MMT_june_2020.xlsx and ftp://ftp.cpuc.ca.gov/energy/modeling/CSP_38MMT_june_2020.xlsx)

highlighted in the Action Plan in section 4 below, VCE plans to conduct studies regarding commencing programs that could include energy efficiency, demand response and other incentives for VCE customers, once VCE accrues sufficient financial reserves to start such activities.

- **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.** See section III(d) i below.

Additional requirements

- **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. (PUC 399.13 (b)).** As shown in Table 3 and in the spreadsheets submitted with this IRP, VCE has contracted for 122 MW of solar PV capacity that will start coming online in Q4 of 2021, which will ensure that the long term requirement is met for the 2021-2024 compliance period and beyond.
- **Replace Diablo Canyon Capacity (D.20-03-028).** See section IV(e) of this report.
- **Procurement mandate (D.19-11-016).** VCE was ordered to procure a total of 12.6MW of new capacity to come online in the 2021-2023 time period, including 6.3MW to come online no later than August 1, 2021. As highlighted in Section IV and other parts of this report, VCE conducted jointly with Redwood Coast Energy Authority in Q2 2020 an RFP for RA capacity for up to 20MW with at least 11.7MW being available by August 1, 2021 (the capacity is the sum of VCE's and RCEA's 2021 procurement mandates). At the time of this filing the procurement of capacity resulting from this RFP has not yet been finalized and it is represented in the IRP portfolio as 7MW of new battery storage. VCE's Action Plan includes activities to finalize the procurement and closely monitor progress to ensure the capacity comes online in a timely manner. The remainder of VCE's procurement mandate will be met by solar PV resource that were contracted in 2020, as discussed in several sections of this report.

c. GHG Emissions Results

The estimated Greenhouse gas emissions from the Preferred Portfolio and the 38MMT Portfolio match the requirements set out by the Commission in its ruling dated April 15, 2020 under R.16-02-007 and as later modified through the Clean System Calculators for each scenario that were issued on June 15, 2020. Based on guidance provided from the Commission and its staff, VCE understands that the Conforming 46MMT Portfolio are requested to match the 2030 GHG targets, i.e. neither be higher or lower than the targets of 156,000 tons (134,000 tons through CSP Calculator)for VCE, while in the 38MMT scenario LSE may use portfolios that achieve emissions that are lower than the benchmark of 129,000 tons (108,000 tons through CSP Calculator) for VCE. VCE has chosen to have both of its portfolios closely match the Commission benchmark emissions but also notes that lower costs and lower GHG emissions could materialize if capital costs for new renewable energy continue to decline in line with the historical trends for solar PV and storage, making it advantageous to invest more heavily in renewable energy. In the Preferred Portfolio, VCE also expects that about 20 MW of large-scale hydro resources will be needed to achieve its modified GHG benchmark of 134,000 tons of CO2 per year by 2030. In the 38MMT portfolio VCE expects that about 34MW of carbon free large-scale hydro generation would be

necessary to meet the goal, sourced from either California or out of state hydro. Table 6 shows the estimated emissions from VCE's portfolios for the 2020-2030 period based on using the Clean System Calculator provided by the Commission. In using this tool, VCE used the default settings and only updated VCE's load and entered the respective resource portfolios. Table 6 also shows the estimated emissions of NOx, PM2.5 and SO2 during the forecast period.

Table 6. Estimate CO_2 and pollutant emissions by year and resource portfolio

	46MMT Portfolio (Preferred) (0.156 Target)				38MMT Portfolio (0.129 Target)			
	2020	2022	2026	2030	2020	2022	2026	2030
CO_2 (000 metric tons)	307	221	185	134	307	222	188	107
PM $_{2.5}$ (tons)	11.2	8.3	7.0	5.8	11.3	8.4	7.2	4.8
SO_2 (tons)	1.1	0.8	0.7	0.6	1.1	0.8	0.7	0.5
NO_x (tons)	17.4	13.7	13.1	11.1	17.4	13.7	13.5	9.2

d. Local Air Pollutant Minimization and Disadvantaged Communities

i. Local Air Pollutants

VCE's emissions are entirely a result of using system power for parts of its short term and long-term power supply. VCE also does not have any fossil-fueled power plants within its service territory. It is therefore expected that changes to air emissions from power plants will have little or no impact on the air quality within its service territory. Table 6, above, demonstrates that based on the CSP calculator for the 46MMT portfolio, emissions of particulate matter and SO_2 will fall by nearly 50% and NO_x by more than 35% in the 2020-2030 period as a result of the power grid becoming cleaner and VCE's increased use of renewable energy and storage in its power supply.

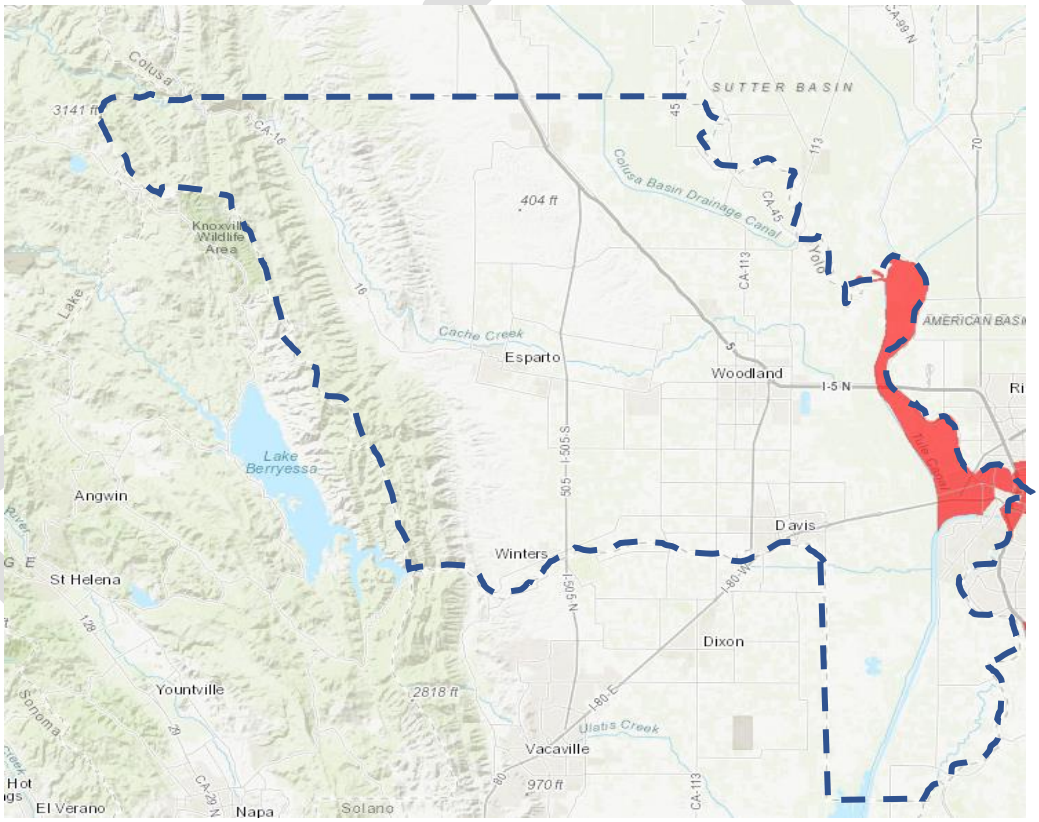
VCE's IRP portfolios expand their use of renewable energy in the forecast period and also increase the amount of battery storage from zero in 2020 to 50 MW by 2030 in the 46MMT portfolio and up to 80MW in the 38MMT portfolio. The combination of higher amounts of renewable energy and expanded use of battery storage will contribute to reducing VCE's reliance on system power over the forecast period. The Action Plan provides additional detail about how and when VCE plans to conduct resource solicitations for new energy and capacity resources.

ii. Focus on Disadvantaged Communities

Disadvantaged communities are defined as the top 25% impacted areas within the service territory, where the impact is determined using the CalEnviroScreen 3.0 tool. VCE notes that the CalEnviroScreen tool has not been updated since VCE's last IRP submission in 2018 and therefore the assessment is also virtually unchanged. Based on CalEnviroScreen 3.0 tool, there are only four census tracts in Yolo county that meet the Commission's criteria for disadvantaged communities. Of these, only area 101.02, which is a largely rural census

tract, is partially located in VCE's service territory. The total number of households in this census tract was 2,408 in 2016[9]. Based on a cross-comparison with VCE customer addresses in this area, it is estimated that fewer than 100 VCE customer accounts are located within this impacted area. Thus, less than 0.15% of VCE's customers are estimated to be in disadvantaged communities. According to the CalEnviroscreen 3.0 tool[10], the key reasons for this census tract falling within the top 25% appears to be risks associated with a combination of low income and environmental factors such as groundwater risks, cleanup sites, hazardous waste and air pollution. There are no power plants in this disadvantaged community. The fact that the impacted areas are situated close to major transportation hubs likely contributes to the CalEnviroscreen 3.0 rating.

Figure 4. CalEnviroScreen 3.0 Results for Yolo County



VCE's rate is designed to provide economic benefits for all rate payers, including disadvantaged communities. As part of the Action Plan described in chapter 4, VCE also plans to conduct studies to determine suitable programs and incentives that can be launched once VCE accumulates sufficient financial reserves and cash flow to be able to run

[9] 2016 US Census Bureau statistics for census tract 101.02 (https://www.census.gov/data/data-tools.html)

[10] https://oehha.ca.gov/media/downloads/calenviroscreen/document/ces3results.xlsx

programs. The action plan laid out in Section 4 of this report includes planned activities and considerations regarding energy procurement. However, it should be noted that the affected disadvantaged community, when correlated to land suitable for renewable resource development, does not have any significant land suitable for large scale renewable energy development due to the predominant land use types, such as prime farmlands, Williamson Act Lands, conservation easements, and Sacramento River bypass (flood) channels.

Until further notice, PG&E will continue to make its existing programs in VCE's service territory with respect to energy efficiency and demand response available to VCE customers.

e. Cost and Rate Analysis

VCE's cost and rate analysis includes only an assessment of generation costs[11]. VCE recognizes that while areas such as transmission, distribution, and programs are very important for the overall energy cost for VCE customers, PG&E is responsible for the energy delivery infrastructure and any costs associated with this will likely be covered in PG&E's IRP filing.

VCE's generation rates are the same as PG&E's. They were raised to this level from a previous discount to PG&E rates in order to ensure the near term financial stability of VCE during its startup phase – over time, VCE hopes to be able to again introduce rate discounts relative to PG&E rate, but VCE also notes that this depends critically on the level of the PCIA and other costs over which VCE has only limited influence.

Figure 5, shows a comparison of the estimated generation costs for VCE in each of the years, 2020-2024, 2026, and 2030 for the Preferred Portfolio and the 38MMT portfolio. The Figure also contrasts the estimated costs for VCE's generation supply with the expected generation costs reported in the RESOLVE model's Reference System Plan. The results for VCE's portfolios were derived by using the Commission provided tools, including RESOLVE modeling results and assumptions, as described in Section 2, above.

[11] The generation costs include wholesale energy costs, RA costs, costs for RECs and contracted renewables but does not include any T&D costs

Figure 5. Estimated annual generation costs by resource portfolio (2016 $/MWh)

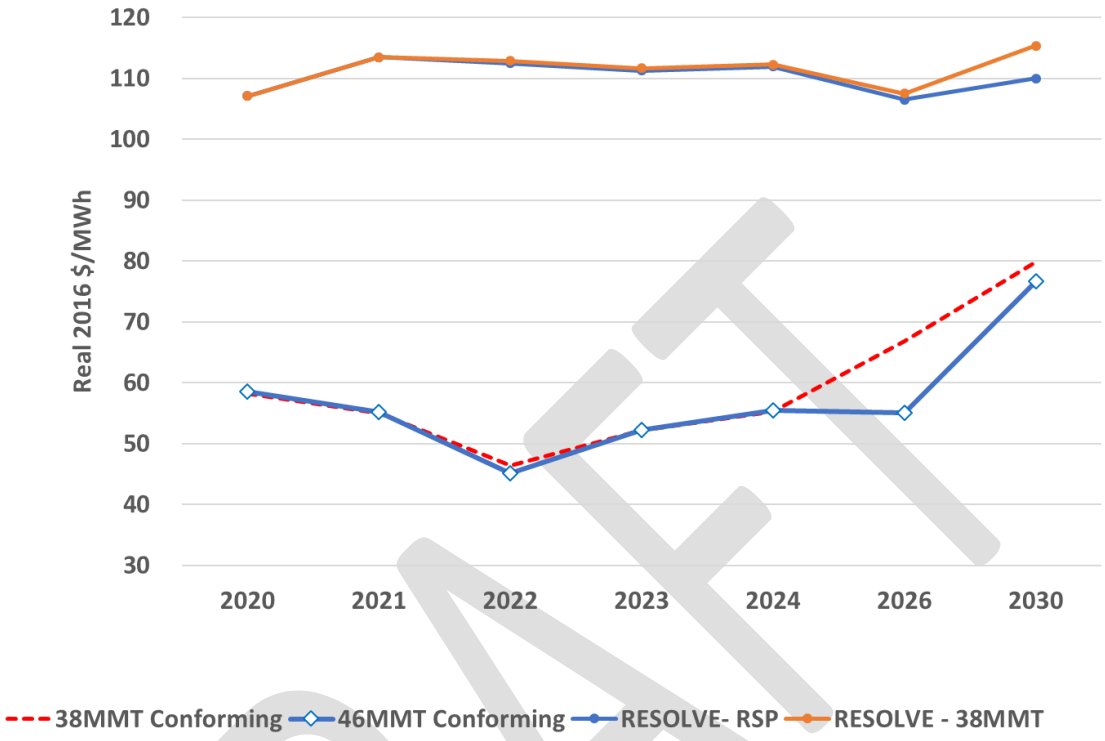


Figure 5 shows that the Preferred Conforming 46MMT Portfolio will remain significantly below the RESOLVE model's estimated generation costs for the Reference System Plan for the entire forecast period. One reason for this difference may be a difference in modeling methodology for capacity between VCE and that of the RESOLVE model. VCE uses a forecast of capacity (or RA) prices in California covering the 2020-2030 period. This forecast is based on current and expected market conditions for capacity. In the long term VCE's forecasted capacity costs are also capped by the least cost technology for bringing more capacity to the CAISO market. Prior to 2025 this is estimated to be gas-fired combustion turbine capacity and after 2025 it is expected to be 4-hour Lithium Ion based battery storage. In contrast, the RESOLVE model appears to model estimated generator fixed costs directly (including financing of new capacity) and set revenue requirements (and thus generation rates) to include all such fixed and financing costs, possibly resulting in higher estimated costs for generation. As discussed in Section II above, VCE uses the hourly marginal cost of electricity from the RESOLVE model along with the RESOLVE model's levelized costs for new capacity. The methodology is thus consistent with VCE being a price-taker in the CAISO energy and capacity markets wherein other LSE's are following the RSP.

For market purchases, it is assumed that in the 2020-2022 period, energy and RA will be available at prices indicated through current RA prices in bilateral (or OTC) markets. Energy is expected to be available at prices corresponding to ICE's power futures prices for NP15. In the 2023-2030 period, it is assumed that energy can be procured at the estimated hourly

CAISO price reported for RESOLVE's Reference System Plan. It is also assumed that RA can be secured at a capacity corresponding to the lowest capacity cost between the traditional provider of capacity, a Gas-fired combustion turbine generator, and the emerging capacity resource – 4-hour lithium ion batteries. Cost estimates displayed in the RESOLVE model suggests that from 2024 onwards, 4-hour battery storage capacity will be a lower cost alternative than conventional gas fired generation. This expectation is based on the assumption that the RA resource will operate for energy only infrequently and that sufficient resources will be available in the system to meet night time and winter energy demand.

The difference in the estimated costs of VCE's portfolio and the RESOLVE model results implies that other LSEs could also find a lower cost solution than the RESOLVE Reference System Plan, mainly due to new renewable resources having lower costs than the marginal cost of CAISO power. This, in turn, makes the RESOLVE model outcome increasingly unlikely as a market outcome and could potentially leave existing assets unable to recover their full costs. VCE recommends that the Commission looks into this potential outcome to better understand overall results when aggregating individual LSE IRPs.

For 2020, VCE has been allocated between 19 and 22 MW of CAM capacity during the summer months and between 12.2-18 MW in non-summer months. The allocated capacity corresponds to about 10 percent of VCE's monthly capacity requirements. The financial costs or benefits of using CAM resources rather than generally available resources to meet VCE's RA need in the forecast has not been accounted for in this IRP – if they were, it would slightly reduce the estimated cost of electricity compared to what is shown in Figure 5.

f. System Reliability Analysis

VCE's conforming portfolios both meet or exceed all CPUC requirements regarding RA, procurement of new capacity, replacement of Diablo Canyon resources, storage mandates and RPS requirements.

VCE's portfolios are planned to a 15% reserve margin, using renewable resources, hydro, and storage, based on the ELCC and NQC numbers provided by the Commission as part of the RSP. As discussed above in other sections of this report, VCE expects costs for battery storage to decline further over the 2020-2030 period and VCE therefore expects to add 50MW of new 4-hour battery storage in its 46MMT Conforming portfolio and up to 80MW of new 4-hour battery storage in the 38MMT Conforming portfolio. This total capacity exceeds regulatory requirements and will ensure that VCE contributes its fair share to reliability within the CAISO market. It is also noted that even though VCE does not have plans to pursue long term storage and the moment, it has issued a request for information from market participants together with other CCAs. We also note that since VCE is planning to add significant amounts of 4-hour storage in the anticipation that this will be the least cost option for RA, this capacity can also be utilized to offer longer duration storage.

Table 6 below shows VCE's System Reliability Progress Tracking Table for VCE's preferred and Conforming 46MMT portfolio and Table 7 shows the corresponding table for the Conforming 38MMT portfolio.

Table 7. 46MMT Preferred Conforming portfolio System Reliability Progress Tracking Table

INSERT TABLE FOR 46 MMT PORTFOLIO (TO BE COMPLETED)

Table 8. 38MMT Conforming portfolio System Reliability Progress Tracking Table

INSERT TABLE FOR 38 MMT PORTFOLIO (TO BE COMPLETED)

As of 2020, VCE has procured all of its capacity needs in accordance with CAISO's and the Commission's requirements for resource adequacy. VCE will continue with these RA requirements going forward and will thus procure a substantial amount of its capacity needs in bilateral markets at least three years in advance of the load serving period covered by the capacity.

Through its long term contracting for renewable wind and solar resources as well as by contracting for storage capacity, VCE expects to cover about 40% of its capacity needs over the 2020-2030 period for summer peak period. VCE also expects another 10% of peak capacity to be provided by CAM resources (based on maintaining 2020 allocations). The balance, about 50% of VCE's capacity needs and about 45% of its energy needs will be sourced in CAISO and/or bilateral markets for energy and capacity. Since VCE is contributing its fair share and more to new resource and capacity development in the CAISO, it is anticipated that VCE will be able to meets its resource needs in this manner in the 2020-2030 period. Furthermore, the volume of expected market purchases of energy and RA in the CAISO markets is estimated to be less than VCE's load share of the existing installed capacity in the CAISO area. Finally, it is not yet clear how the recently adopted procurement mechanism for local RA as provided in D.20-06-002 will impact VCE's capacity procurement or costs, but VCE will naturally comply with this and future RA regulations and will continue to seek to minimize costs for its ratepayers of providing reliable energy and capacity.

g. Hydro Generation Risk Management

VCE's portfolios include only one small-scale hydro resource, the Indian Valley which provides 6.4GWh of energy per year and is an RPS eligible renewable resource. This corresponds to about 0.8% of VCE's load. While having a small overall impact on VCE's portfolio, there are four distinct risks and potential impacts associated with this resource related to drought:

- **Energy.** VCE expects to know ahead of the impacted year what the impact of a drought will be on production. Any energy shortfall will be compensated through CAISO spot market purchases
- **Capacity**. VCE contracts only for energy so capacity risk is not applicable for VCE's existing hydro contracts
- **RPS**. VCE expects to maintain a balance of RECs that exceeds the statutory requirements in the 2024-2030 period which means any shortfall will likely not affect the RPS compliance for VCE. If a shortfall is observed in the 2021-2024 period, VCE may compensate with market purchases of RECs, depending on the significant of the shortfall relative to statutory requirements
- **GHG**. A shortfall of energy in 2030 will reduce the amount of carbon free energy in VCE's portfolio and could put its 2030 GHG target at risk. Indian Valley hydro's impact on VCE's GHG emissions is however small, and VCE expects to be able to make up for any shortfall in bilateral short term markets.

In the longer term, both portfolios include large scale hydro as a means to achieve VCE's 2030 GHG emissions targets of 156,000 tons in the 46MMT portfolio and 129,000 in the 38MMT portfolio. The 46MMT portfolio includes a total of 20MW of large scale hydro that may be sourced from in-state and/or out-of-state resources. Similarly, the 38MMT portfolio includes 34MW of large scale hydro resources. VCE chose to limit its dependence on large scale hydro to no more than 34MW across both scenarios so as not to exceed VCE's proportional share of the total currently available large scale hydro capacity from in-state and out-of-state resources as reported in the RSP. A drought could reduce the delivery of carbon free energy from hydro resources and therefore put the achievement of VCE's target at risk. To mitigate this risk, VCE may increase the amount of solar PV in its portfolio and thereby reduce expected emission to less than the target GHG amounts. Higher levels of solar PV in VCE's portfolios may also help reduce the overall costs of electricity for VCE's customers. However, it is VCE's understanding that the Commission requires the conforming portfolios to meet (rather than beat) the carbon goals set out in its April 15, 2020 ruling under R.16-20-007 and therefore such additional resources were not included in the resource portfolios. If there is a risk of drought causing a shortfall of carbon-free energy, VCE may also seek to find other out-of-state hydro resources to compensate for shortfalls in California hydro resources caused by a drought, including seeking to tie such resources up under longer term contracts to increase the likelihood that they will be available to VCE when needed.

VCE's hedging of supply risk is focused on the next 12-24 months and includes securing a variety of resources to ensure delivery at stable costs of all the attributes needed in VCE's portfolio, including energy, RA, carbon, and RPS. Due to its shorter term nature, hedging decisions are not directly part of the IRP or able to address hydro delivery risk towards the end of the forecast period. However, if at the time leading up to 2030, VCE's carbon goals are deemed to be at risk, the hedging policy will seek to minimize that risk by procuring additional capacity from carbon free resources up to 24 months in advance.

h. Long-Duration Storage Development

While VCE's resource plan does not include any long duration storage development, VCE together with 10 other CCAs conducted a request for information from California market participants and developers with the objective of learning more about available technologies, costs and market readiness [12][13]. Responses to the RFI were due in July 2020 and the CCA group is currently in the process of analyzing the responses. The results will be used to inform future procurements that may lead to revisions of VCE's resource plan in the future. Depending on the response and the associated costs and lead-times estimated by respondents, VCE may pursue longer duration storage resources than it currently has in its portfolio.

It should be noted however, that in the 46MMT portfolio, VCE is planning to install up to 40 MW of new battery storage with a duration of at least 4 hours during the forecasting period. This far exceeds VCE's storage procurement obligations and the procurement will be pursued on the expectation that battery storage will be cost-competitive with other capacity resources from about 2025. These batteries are also an option to use for longer duration of 8 hours or more since VCE does not expect to have any constraints with respect to using the batteries at full capacity and a duration of 4hours or at 50% of capacity with a duration of 8 hours. Batteries can therefore also provide the longer duration storage in addition to short term storage.

Traditional long term storage options such as pumped storage hydro is likely to be very challenging for VCE to undertake since traditionally such projects are very capital intensive, large scale and have long lead times, all of which would be barriers for VCE in developing this type of storage. These potential barriers to long term storage are also discussed under Barriers in Section 4.c.

i. Out-of-State Wind Development

VCE is not planning or developing out-of-state wind resources as part of its IRP or other planning, but would be open to pursuing contracts with out-of-state wind resources if such were to be offered at competitive prices and reasonable lead times during VCE's future resource solicitations.

VCE believes out of state wind resources could be an important complement to other renewable resources since it could potentially provide more stable generation at non-daylight hours. Considering the long distance and numerous jurisdictions that out-of-state wind may have to traverse before reaching California, the cost and regulatory hurdles for out-of-state wind are likely higher and more costly that in state wind. Expanding the CAISO

[12] Clean Power Alliance of Southern California, CleanPowerSF, East Bay Community Energy, Marin Clean Energy, Monterey Bay Community Power, Peninsula Clean Energy, Redwood Coast Energy Authority, San Jose Clean Energy, Silicon Valley Clean Energy, Sonoma Clean Power and Valley Clean Energy.

[13] https://www.mcecleanenergy.org/wp-content/uploads/2020/06/MCE-2020-Joint-CCAs-Long-Duration-Storage-RFI_060320.pdf

footprint as currently considered with the EDAM market could help make out-of-state wind resources more attractive.

j. Transmission Development

Since the finalization of the baseline list of plants for the IRP, VCE has completed contracts for two new solar projects. The first is Aquamarine, located in Kings county, of which VCE has a 50MW share. The second is Rugged Solar, a 72 MW facility in San Diego county. Both of these plants have completed interconnection agreements and no additional transmission is expected to be needed. In the first half of 2020, VCE also conducted an RFO for local capacity and an RFP for battery storage. VCE is currently working through the selection of vendors and negotiations of the possible purchase agreements resulting from these solicitations. VCE does not expect that any of these projects will require new transmission. Likewise, in the longer term, VCE's portfolio includes additional solar, wind and storage capacity in the 2026-2030 period. Specific units have not yet been identified for these resource additions but VCE expects to pursue a combination of local and CAISO-wide capacity and would expect these to include new transmission only insofar the cost of such projects would remain competitive with offers that does not include transmission. VCE's resource choices as reflected in Table 3 reflects the expectation of contracting mainly for Northern California resources. However, depending on availability and price, these could also be substituted for other resources in CAISO or capacity and energy that is deliverable into CAISO.

IV. Action Plan

VCE's action plan is focused on managing risks around resource availability, contracting and procurement in the 2020-2030 time period. Actions therefore focus on securing resources under long term contracts and monitoring their progress during development and construction. Actions also include conducting resource solicitations for new supply to come online in the 2025-2030 period. Finally, the action plan also includes activities to manage the resource portfolio and to adjust the portfolio to ensure costs and risks are matched, that VCE maintain attractive rates and provide a reliable supply of clean energy in compliance with all state law and regulations.

a. Proposed Activities

VCE has executed two Power Purchase Agreements ("PPA") to procure 122 MW from two solar PV facilities. Aquamarine Solar is expected to commence construction in July 2020 and Rugged Solar is expected to commence construction in Q3 2020. The expected Commercial Operation Dates of these two projects are both in 2021. VCE is also together with Redwood Coast Energy Authority pursuing battery storage resources to come online by August 2021. Finally, VCE is completing additional long term renewable procurement activities in 2020, including an RFO for local capacity, expected to result in new resources to come online on or before January 2024.

As with all new build resources, there is the potential for delay from numerous development related risks. VCE is managing these risks by first having contracted with relatively mature projects that have interconnection agreements in place and by closely monitoring progress of the projects with developers.

VCE's ability to meet RPS requirements relies more on the certainty and timely development of its long-term renewable resources under development than it does to the variation of actual generation deliveries. Because of this, VCE chooses to focus more of its efforts around the potential impact of project development delays. VCE incorporates guaranteed Commercial Operation Date (COD) clauses in its long term PPAs. Guaranteed CODs have financial penalties which make them more conservatively estimated commitments. For planning purposes, VCE uses guaranteed CODs as its assumptions when assessing its risk for RPS Procurement purposes.

With a focus on project development risk, VCE approaches its risk assessment by calculating its ability to meet RPS requirements under the worst-case scenario to understand when it must make decisions on alternative options to maintain compliance. For example, the projects VCE has contracted with have COD dates in 2021. VCE uses models incorporating RNS methodologies to calculate the longest delay in COD it could tolerate before violating the 65% long term requirement (Pub. Util. Code Section 399.13(b)). VCE's analysis suggests that the COD for all long-term projects could be delayed until close to the end of the 2nd Quarter in 2022 before VCE is at risk of not meeting its long-term requirement for compliance period 4 (2021-2024). To manage this risk, VCE is closely monitoring the development status of its long-term projects under development. Depending on the type of delay that might be introduced, VCE plans on supplementing with additional short-term purchases from existing renewable resources and if necessary, long-term commitments as well.

Continuously managing performance and risk

While the resource plan is mainly focused on identifying supply to a given load, there are also significant risks and uncertainties associated with load, including impacts of Covd 19, load migration, net metering impacts and the growth of behind-the-meter devices such as solar PV, EVs and battery storage. To control supply risks, VCE's suppliers are obligated to provide regular reports on development progress and potential issues with their projects. Although VCE has not received official notice of anticipated disruption on any of its projects under development, supply chain disruption from the pandemic remains a significant concern. VCE is closely monitoring the status and working with its developers to stay on top of any potential issues in order to react accordingly. VCE's objective is to contribute to California's renewables goals by building incremental resources onto the grid. Should there be force majeure level impacts to projects under development, VCE may consider using the purchase of renewable energy from existing resources to supplement its power supply.

VCE is also continuously monitoring and tuning its power supply portfolio to ensure an optimal balance between short term power purchases and longer-term contracts. With the Preferred 46MMT portfolio, VCE expects to rely on short term power purchases for about 50 percent of its load. VCE believes this portfolio reflects a balanced approach of ensuring that all statutory requirements are met while at the same time balancing short and long term contracts to remain flexible to react to changes in market conditions and to changes in load.

As part of its actions, VCE plans to closely monitor performance of its portfolio under contract, including risks of drought for its small scale hydro projects and curtailment risks for solar resources. Over the course of the RPS compliance periods, the risk of underperformance is expected to be very small and VCE also has performance guarantees as part of its long term contracts. Any RPS shortfalls over the compliance periods will be addressed with procurement of PCC1 renewable energy credits. Additional procurement activities and barriers are discussed further in the sections below.

Outreach and inputs from disadvantaged communities

VCE will continue outreach activities to all customers, including the limited areas within its service territory identified as disadvantaged communities. Members of DACs, like all VCE customers are able to participate in VCE Board and stakeholder meetings. It should also be noted that VCE does not administer any customer programs for energy efficiency, demand response, etc since these are all under the responsibility of PG&E.

Activities to minimize air pollutants with a priority on disadvantaged communities

Per the CalEnviroScreen tool and as discussed in Section 3.d.ii, VCE estimates that less than 0.15 percent of its customers reside in disadvantaged communities. VCE's balanced and renewables-focused portfolio will help reduce VCE's reliance on fossil fuels and could thus contribute to lower emissions also in the DAC areas in Yolo County. Over the 2020-2030 period, VCE will also reduce its overall reliance on CAISO market purchases which will contribute to a cleaner power mix in general, although the impact of VCE's activities will likely have a negligible impact on the disadvantaged communities in VCE's service territory.

b. Procurement Activities

VCE plans to continue its efforts to contract for new resources through an open and transparent process, following the procurement policy that VCE has developed since the 2018 IRP filing. In the past two years, VCE has undertaken two requests for offers from renewable energy providers, in Q3 of 2018 and in Q2 of 2020. VCE plans to continue soliciting resources through RFOs going forward.

VCE's 2018 RFO resulted in the 122 MW of new solar capacity that will come online before 2022 through two long term PPAs that were signed in the first half of 2020.

The following procurement activities are underway or planned to support the implementation of VCE's Preferred Conforming 46MMT portfolio. Procurement activities, including the timing of activities are expected to be the same between the Conforming 46MMT portfolio and the Conforming 38MMT portfolio. However, if the 38MMT portfolio were to become the main portfolio to be implemented, it would require more resource to be procured at each procurement event compared to the Preferred 46 MMT portfolio.

2020 RFO for local renewable energy. In April 2020 VCE issued an RFO for local renewable resources wherein VCE is seeking projects of up to 25 MW to come online by the end of

2023 at the latest. VCE is currently in the process of evaluating offers and expects to complete one or more PPAs for new local capacity by the end of 2020. These resources are reflected in both of VCE's conforming IRP portfolios as new solar capacity becoming available from 2024.

Storage RFP. In April of 2020, VCE and Redwood Coast Energy Authority issued a joint RFP for up to 20MW of incremental resource adequacy capacity targeted to come online by August 1, 2021. This is a very tight timeline in order to ensure that VCE can meet its resource procurement mandates for 2021 and beyond. Together with the 50MW Aquamarine solar PPA that VCE completed in 2020, and the procurement of local capacity described above, VCE expects that these projects together will meet and exceed VCE's 12.6MW procurement mandate. VCE expects to complete contracting for the new RA capacity by the end of 2020.

Long term storage RFI. Together with 10 other CCAs, VCE issued a request for information on long duration storage in June of 2020. Long duration storage could be considered after 2025 if proven feasible and cost-effective. See section 3.h. above for detailed

Procurement of renewable energy and storage in 2025 and beyond. Following the expected addition of new renewable local capacity in 2024 in response to VCE's 2020 RFO, new resources are not expected to be needed until 2026 or 2027. Both of VCE's conforming portfolios call for additional storage to be added in the year 2025, in the anticipation that 4-hour battery storage will be the lowest cost capacity for resource adequacy by that year. VCE also sees new battery storage as the most likely alternative for replacing its share of capacity following the Diablo Canyon retirement. VCE expects this storage to result from either or both of VCE's 2020 resource solicitations for RA and for local capacity.

Both of the conforming portfolios also call for new wind resources to be added in 2026, as well as new solar and storage capacity before 2030 to help ensure VCE meets both its RPS and its GHG targets. In addition, over the 2025-2030 period, VCE expects to ramp up its use of storage – to 40MW by 2030 for the 46MMT portfolio and to 70MW for 38MMT portfolio. To facilitate this growth of the resource portfolios, VCE plans to conduct an open resource solicitation or RFO in 2022 or 2023 to seek capacity for the years 2026-2027 and likely another RFO in 2025 or 2026 to secure resources for the period 2028 onwards. If during these planned solicitations, VCE were to receive offers from existing renewable generators and/or different technologies than envisioned in this IRP, those would be considered as well alongside other offers and would need to go through the same validation and qualification process before being finalized in a PPA. It should be noted, however, that the exact timing of future resource solicitations is uncertain, especially considering the unprecedented situation facing VCE as well as California as a whole from the Covid19 pandemic. It is possible that electric demand will decline significantly in the recession that is widely expected to follow the pandemic which in turn could cause VCE to delay its procurement of new resources to match the pace of electric demand growth over the 2020-2030 period

Programs

VCE does not administer any customer programs at present. However, load management programs such as demand response and managed charging of electric vehicles could potentially become cost-competitive ways of ensuring that VCEs capacity needs are met.

VCE will continue to explore programs that can be offered in parallel with PG&E's customer programs

Potential Barriers

VCE does not see specific barriers associated with its preferred Portfolio. In fact, one of the reasons for the resource choices and timing in the Preferred Conforming Portfolio (PCP) is the feasibility of the selection and how it fits with VCE's overall resource portfolio preferences. While the PCP has no specific barriers, there could be significant barriers associated with two considerations that the Commission has requested LSEs to address – long term storage and replacement of Diablo Canyon, both of which call for long term resource adequacy. VCE may face barriers in procuring long term storage and Diablo Canyon replacement due to it small size which will likely necessitate procuring long term storage capacity jointly with other California LSEs.

c. Commission Direction or Actions

VCE does not seek any direction or action from the Commission at the moment

d. Diablo Canyon Power Plant Replacement

Based on the Commission's Resource Data Template spreadsheet, VCEs share of Diablo Canyon is 11.3MW (0.49% of 2,300MW). Over the course of the 2020-2030 period, VCE's preferred conforming 46MMT portfolio as well as the conforming 38MMT portfolio includes new capacity that cover the procurement mandate, the Diablo replacement, the RPS requirements and the 2030 GHG goals. In terms of new generation capacity, Table 3 as well as tables 6 and 7 show that VCE plans to add 25MW of solar capacity in 2024 and 20 MW of wind capacity in 2026 or 2027, and additional battery storage in the 2025-2030 time period. Taken together this more than covers VCE's share of Diablo Canyon's capacity. It should be noted that the 40 MW of incremental 4-hour storage planned for the Preferred Conforming 46MMT portfolio and the 70MW planned for the 38MMT portfolio could also be considered as respectively 20 and 35 MW of long-term 8 hour storage thus meeting all requirements for both Diablo Canyon consideration and long duration storage. If the RA market gets tight, RA prices should increase significantly in the 2020-2025 period which could trigger VCE to accelerate its procurement ensure sufficient capacity comes online even prior to Diablo Canyon's retirement. We also note that there is no shortage of potential storage projects that could at least partially replace the RA from Diablo Canyon. According to the Commission' s Resource Data Template spreadsheet, there is about 2,300 MW of battery storage in CAISO's interconnection pipeline with executed interconnection agreements and another 1,200 MW of battery capacity under development with interconnection agreements in progress. This suggests that there is no shortage of candidate resources that could be procured and finalized on relatively short notice to replace Diablo Canyon in case load grows quickly and capacity market prices increase. However, considering the Covid19 pandemic in 2020 and its longer term effects on California load growth, VCE expects that load is more likely to be slower than expected and that new capacity may not be needed until the after the timelines shown in VCE's Preferred Conforming 46MMT portfolio.

V. Lessons Learned

There is a significant opportunity to consolidate reporting, data and databases between the IRP and RPS Procurement Plan processes. Both of these require detailed reporting and plans to cover efforts to 2030. While the scope is slightly different, the RPS procurement plan can be nearly completely covered by the plans detailed in the IRP, especially for LSEs like VCE that expect to rely only on contracted renewables, storage, and market purchases for its future resource supply. VCE therefore encourages the Commission to continue looking for opportunities top streamline data and reporting between these processes. VCE also expects that there could be significant opportunities to coordinate data and databases between the IRP and the RA processes. By having more complete and cross-cutting resource databases, the efforts for both LSEs and the Commission could be reduced in terms of preparing and reviewing compliance filings and would help reduce inadvertent errors and inconsistencies between the various reports on resource plans, energy supply, capacity and renewables.

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 Portfolio. 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 Portfolio: *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 Portfolio.*

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).*