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BEFORE THE PUBLIC UTILITIES COMMISSION OF THE

STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue Electric Integrated Resource Planning and Related Procurement Processes.	Rulemaking 20-05-003

INTEGRATED RESOURCE PLAN OF SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E)

PUBLIC VERSION

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Table of Contents

Section	Page

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

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Pursuant to Ordering Paragraph ("OP") 11 of Decision ("D.") 20-03-028, Southern California Edison Company ("SCE") respectfully submits its Integrated Resource Plan ("IRP") to the California Public Utilities Commission ("Commission" or "CPUC").

I.

EXECUTIVE SUMMARY

A. The IRP Process Continues to Play a Critical Role in Decarbonizing California While Maintaining Electric System Reliability

In this second IRP cycle, the Commission has made progress in planning for California's decarbonized future through its Reference System Portfolio ("RSP") modeling process, including Commission staff's 2045 Framing Study considering the implications on the electric system of deep decarbonization and serving as a clean fuel to decarbonize other sectors. That 2045 Framing Study[1] and SCE's *Pathway 2045* analysis[2] demonstrate that California must adopt an electric sector greenhouse gas ("GHG") target between 30 million metric tons ("MMT") and 38

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[1] *See Administrative Law Judge's Ruling Seeking Comment on Proposed Reference System Portfolio and Related Policy Actions*, Rulemaking ("R.") 16-02-007, November 6, 2019, Attachment A at 148-166.

[2] SCE's *2045 Pathway* analysis white paper and appendices are available at: https://www.edison.com/home/our-perspective/pathway-2045.html, and included as Appendix A.

MMT by 2030 to most economically and feasibly reach the state's overall GHG reduction and clean energy goals. Despite the Commission establishing a 46 MMT electric sector target – a target that will make it difficult to meet California's 2030 GHG emissions limit and the state's longer-term Senate Bill ("SB") 100 and carbon neutrality goals – SCE is encouraged by the Commission's statements that a 38 MMT target "is also potentially a reasonable goal" and that it is not precluding adopting a lower target in the 2019-2020 Preferred System Portfolio ("PSP").[3] Likewise, the Commission's requirement that load-serving entities ("LSEs") file both 38 MMT- and 46 MMT-compliant conforming portfolios in their IRPs for review and analysis by the Commission provides a valuable procedural path to keep open the potential for applying the 38 MMT target in this IRP cycle.[4]

SCE strongly urges the Commission to adopt a 38 MMT target for the PSP and the 38 MMT conforming portfolios in LSEs' IRPs to help put California on a viable trajectory towards meeting its decarbonization goals, rather than maintaining a 46 MMT target during this IRP cycle. Accordingly, SCE submits its 38 MMT- and 46 MMT-compliant bundled conforming portfolios (the "38 MMT Preferred Conforming Portfolio" and "46 MMT Preferred Conforming Portfolio"), but requests the Commission approve SCE's 38 MMT Preferred Conforming Portfolio. SCE further recommends the Commission update and modify its 38 MMT portfolio to make it reliable and economic and provide that portfolio to the California Independent System Operator ("CAISO") for the next Transmission Planning Process ("TPP").

With the recent capacity shortfalls throughout the CAISO system on August 14 and 15, 2020, which required the utilities to shed load for the first time in nearly 20 years, the need for the IRP proceeding to have a strong focus on maintaining system reliability as the grid decarbonizes is clear. California must continue to make progress towards a decarbonized and clean air future to combat climate change and its associated extreme weather events, as well as the health impacts of air pollution. In doing so, the Commission must also vigilantly plan for

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[3] *See* D.20-03-028 at 31, Finding of Fact 11, Conclusion of Law ("COL") 7, 14, OP 1-2.
[4] *See id.* at 31, COL 8, OP 2-3, 11.

ensuring system reliability during this transition and not delay issuing the necessary procurement authorizations and mandates needed for all LSEs to equitably contribute to maintaining system reliability.

SCE appreciates the Commission's greater focus on system reliability in this IRP cycle. However, additional Commission action is necessary to ensure system reliability on both a near- and longer-term basis. Notwithstanding SCE's critical comments on the shortcomings of the RESOLVE model and the most recent RSP's exceedance in meeting a 1-in-10 loss-of-load expectation ("LOLE") reliability standard,[5] the Commission's system modeling appropriately identifies near- and mid-term capacity shortfalls faced by the CAISO system. SCE includes in this IRP filing a 38 MMT-compliant CAISO system-wide resource plan (the "38 MMT CAISO System-Wide Portfolio") and reliability analysis that confirms the capacity need identified in the Commission's 46 MMT RSP, but concludes the 2024 through 2026 system capacity need to maintain reliability is greater than indicated in the RSP. To avoid rushed and costly procurement that might impede LSEs' ability to bring the requisite system capacity online by 2024, SCE strongly recommends that the Commission expeditiously require all LSEs to procure new system capacity to meet this 2024 system reliability need by no later than the first quarter of 2021. After a more complete analysis of LSEs' aggregated IRPs and development of the PSP, the Commission should then act by the end of 2021 to order LSEs to procure the larger residual system capacity need for 2025 and 2026.

Further, SCE's system reliability analysis concludes that the growing renewables penetration in California requires a higher planning reserve margin ("PRM") than the current 15 percent PRM used in the IRP and Resource Adequacy ("RA") proceedings. The Commission should develop a PRM in the IRP proceeding, in coordination with the RA proceeding, that better reflects the state's evolving electricity market and better helps to ensure system reliability.

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[5] *See id.* at 44 (Table 7).

SCE is also concerned with the continued use of the current effective load carrying capability ("ELCC") methodology, which provides a generic derating of capacity in all hours to estimate the contribution of solar and wind resources to system reliability. Given the large amount of behind-the-meter ("BTM") and in-front-of-the-meter ("IFOM") solar on the system, it is more prudent to plan to the net peak load (i.e., peak load minus solar and wind) to make sure sufficient dispatchable generation is available to meet system reliability needs when there are expected hours of low solar and wind generation.

SCE therefore recommends the Commission reexamine the use of the current ELCC methodology to determine the capacity contributions of solar and wind resources in IRP modeling and in the RA proceeding. Relatedly, the Commission should prioritize the development of robust reliability planning standards used to guide the development of LSEs' IRP filings to ensure LSEs plan for their share of electric system needs, and that when the Commission aggregates all LSEs' plans into the PSP, it will produce a portfolio of resources that meets reliability needs. In this IRP filing, SCE includes a proposed reliability methodology centered on ensuring LSEs provide sufficient capacity to meet their net peak load and provide sufficient energy to meet their net load duration curve and charge any energy storage used to meet their needs. SCE's proposed reliability methodology should be used in aggregating LSEs' plans in this IRP cycle and adopted as a reliability planning standard for the next IRP cycle.

Finally, SCE's 38 MMT Preferred Conforming Portfolio indicates a need for additional clean energy resources to serve SCE's bundled service customers in 2026 and beyond. Depending on the outcome of the Power Charge Indifference Adjustment ("PCIA") proceeding's Working Group 3 process, which is considering proposals to allocate Renewables Portfolio Standard ("RPS")-eligible and GHG-free energy procurement from the investor-owned utilities' ("IOUs") portfolios to other LSEs, SCE may have a need for additional clean energy resources before 2026 and a greater need than what is currently shown in its portfolio. The Commission should authorize SCE to begin flexibly procuring clean energy resources to meet the identified clean energy need in SCE's Commission-approved Preferred Conforming Portfolio and any additional clean energy need arising from the PCIA Working Group 3 process.

In summary, SCE requests the following in this IRP filing, as discussed further below:

- To maintain system reliability, the Commission should take expedited action by the first quarter of 2021 to mandate that all LSEs procure their share of the 2024 system capacity need.
- Based on the Commission's full analysis of LSEs' aggregated IRPs and development of the PSP, the Commission should act by the end of 2021 to require LSEs to procure the larger residual system capacity need for 2025 and 2026.
- The Commission should adopt an electric sector 2030 GHG target of 38 MMT for all LSEs and the PSP.
- The Commission should update and modify its 38 MMT portfolio to make it reliable and economic, and provide that portfolio to the CAISO for the next TPP.
- The Commission should approve SCE's 38 MMT Preferred Conforming Portfolio.
- The Commission should authorize SCE to begin procuring clean energy resources to meet the identified clean energy need in SCE's Commission-approved Preferred Conforming Portfolio and any additional clean energy need arising from the PCIA Working Group 3 process under a flexible procurement framework.
- The Commission should reexamine the current PRM requirement in the IRP proceeding, in coordination with the RA proceeding, to develop a PRM that better reflects California's evolving electricity market and helps to better ensure system reliability.
- The Commission should reassess the use of the current ELCC methodology in the IRP and RA proceedings to estimate the contributions of solar and wind resources to system reliability.
- The Commission should adopt strong reliability planning standards to guide the development of LSEs' IRP filings and ensure LSEs plan for their share of electric

system needs. SCE's proposes a net peak load and energy sufficiency reliability methodology, which establishes a refined ELCC that accounts for the expected contribution of solar and wind resources to reliably serve load in each hour. SCE's proposed reliability methodology should be used in the Commission's review and aggregation of LSEs' plans in this IRP cycle and as a reliability planning standard in future IRP cycles.

B. SCE's CAISO System-Wide Analysis Demonstrates There is a Significant System Capacity Shortfall in 2024 Through 2026, and the Commission Should Expeditiously Order System Reliability Procurement to Meet That Need

SCE developed a least-cost, operable, and reliable resource plan for the CAISO system to meet the 38 MMT electric sector GHG target in 2030 – the 38 MMT CAISO System-Wide Portfolio. SCE's objective was to develop an economic CAISO system-wide resource plan that was updated with the California Energy Commission's ("CEC") 2019 Integrated Energy Policy Report ("IEPR") demand forecast; validated for operability and compliance with the 38 MMT GHG target, RPS requirements, and the PRM; and deemed reliable through rigorous LOLE analysis. SCE employed a three-step iterative process to develop its CAISO system portfolio including capacity expansion modeling to build the least-cost resource portfolio satisfying the required constraints, production cost modeling to evaluate the portfolio's operational feasibility and validate the GHG emissions, and LOLE analysis to assess the reliability performance of the CAISO system-wide portfolio. The resulting 38 MMT CAISO System-Wide Portfolio builds the least-cost resource portfolio to achieve the 38 MMT GHG target and other constraints, is operable (i.e., satisfies energy demand, ancillary services, and ramping requirements in an expected load and energy delivery case), and meets a 1-in-10 LOLE reliability standard.

SCE's 38 MMT CAISO System-Wide Portfolio confirms a near-term system capacity need of approximately 4,200 megawatts ("MW") by 2023, which is sufficiently met by the incremental system RA capacity procurement required by D.19-11-016 and the once-through cooling ("OTC") unit compliance deadline extensions recommended by that decision. However, after the recommended OTC compliance deadlines expire at the end of 2023, SCE's system-wide modeling demonstrates there is an additional system capacity need of about 1,700 MW in 2024. With the planned shutdown of the Diablo Canyon units in 2024 and 2025, this system capacity need increases by approximately 3,000 MW to about 4,700 MW in 2025, and again by approximately 675 MW to about 5,380 MW in 2026. This system capacity shortfall is in addition to the 3,300 MW of system reliability procurement ordered in D.19-11-016. Moreover, this system capacity is needed to maintain reliability independent of whether a 38 MMT or 46 MMT electric sector GHG target is established.

Maintaining system reliability is a foundational requirement of the IRP process.[6] SCE's 38 MMT CAISO System-Wide Portfolio shows a clear system capacity need to maintain reliability in 2024, which substantially increases in 2025 and 2026. The Commission's 46 MMT RSP and 38 MMT portfolio also show a need for new system capacity in the 2024 through 2026 timeframe, albeit at lower amounts.[7] As noted above, although SCE did not perform a 46 MMT system-wide analysis, the 2024 through 2026 system capacity need identified in SCE's 38 MMT CAISO System-Wide Portfolio is largely independent of the 2030 GHG target across these scenarios and would also be present in a 46 MMT scenario. As such, SCE strongly urges the Commission to act on the identified 2024 need by the first quarter of 2021 by requiring that all LSEs procure their share of the needed system capacity for 2024.

Expedited Commission action on the 2024 system reliability need is necessary to provide sufficient time to bring new resources online by the summer of 2024 while avoiding potentially costly emergency procurement. Beginning this procurement by early 2021 is a prudent approach

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[6] *See* Cal. Pub. Util. Code §§ 454.51(a) (The Commission shall "[i]dentify a diverse and balanced portfolio of resources needed to ensure a *reliable* electricity supply that provides optimal integration of renewable energy in a cost-effective manner.") (emphasis added), 454.52(a)(1)(E) (The Commission shall ensure that LSEs "*[e]nsure 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.") (emphasis added).

[7] *See* D.20-03-028 at 41, 46.

that would allow LSEs and resource developers to start the often lengthy process to solicit and execute contracts for new resources, obtain Commission approval in the case of the IOUs, complete interconnection and permitting, complete construction, and initiate commercial operation. Waiting until late 2021 or early 2022 after the PSP is complete to initiate procurement for resources needed in 2024 may make it difficult for new capacity to come online by summer of 2024, and would exclude some of the options for optimal prices and resource types as occurred with the required procurement through D.19-11-016.[8] Taking action to address the 2024 system capacity need is also a "least regrets" strategy because any procurement to meet the 2024 need will also help meet the substantially greater 2025 and 2026 system capacity shortfall.

SCE recommends the Commission use the proposed analysis of LSEs' aggregated plans in the first quarter of 2021, in advance of the development of the PSP,[9] to determine the 2024 system reliability procurement need, and also issue a decision requiring LSEs to conduct the 2024 system reliability procurement by no later than the first quarter of 2021. The Commission's first quarter 2021 decision requiring LSEs to procure to meet the 2024 system capacity need should, at a minimum, identify and equitably allocate the 2024 system capacity need and establish upfront the opt-out and backstop procurement framework and cost allocation mechanism for such procurement. However, if necessary, the 2024 system reliability procurement may be allocated based on peak load share given the shortened timeframe required to address the system capacity shortfall.

A system reliability procurement order to satisfy the residual 2025 to 2026 system capacity shortfall resulting from the retirement of Diablo Canyon should be addressed in a subsequent procurement mandate issued by year-end 2021 that incorporates the results and needs

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8 For the D.19-11-016 procurement, LSEs had less than two years from the decision to bring the first tranche of the procurement online by August 1, 2021. This limited the pool of projects that could meet such an expedited commercial operation date to those that were already far along in the development process. Generally, this limits competition and increases costs.

9 *See Administrative Law Judge's Ruling Scheduling Prehearing Conference and Seeking Comments on Proposed Proceeding Schedule*, R.20-05-003, June 15, 2020, Attachment A at 2.

identified in the PSP upon its completion in the third quarter of 2021. Once the PSP is complete and the mid-decade need has been confirmed based on a full and robust analysis of the aggregated procurement proposed by individual LSEs' IRPs and development of the PSP, LSE-specific need determinations can be made. The PSP-derived 2025 to 2026 system reliability procurement need can be proportionally allocated to LSEs based on the gap between the LSE's proposed procurement and the PSP-derived procurement need using a need-based allocation mechanism.

In addition, the Commission's decision ordering system reliability procurement for 2025 and 2026 should adopt a comprehensive procurement framework that establishes upfront the opt-out and backstop procurement process and cost allocation mechanism for the procurement. The decision should also define LSE requirements to demonstrate progress towards resource development identified in their IRPs, the procurement allocated to them through the IRP process, and the consequences if LSEs do not comply with their plans. Without a clearer link between planning and procurement it is not clear whether the IRP proceeding's planning activities will translate into the procurement and new resource development needed to maintain grid reliability and reach California's decarbonization goals.

C. A 38 MMT GHG Target is Necessary to Enable the Electric Sector to Reasonably Plan to Achieve California's Decarbonization Goals

California has set ambitious clean energy and climate goals to reduce GHG emissions to 40 percent below 1990 levels by 2030 and achieve 100 percent of electricity retail sales from zero-carbon resources and carbon neutrality by 2045.[10] Helping California to meet its 2030

[10] *See* SB 32 (2016); SB 100 (2018), Executive Order B-55-18 (2018).

GHG reduction target is one of the principal objectives of the IRP process.[11] Furthermore, the Commission has stated the IRP proceeding "will be the ongoing venue for handling any planning and/or procurement necessary to meet SB 100 goals."[12]

Planning for the level of clean resources and grid investments needed through 2030 and beyond is necessary now and should span the next decade rather than accumulate at the end of the decade. It is critical to get the target right at the onset – the longer insufficient targets are being used to meet California's GHG objectives, the greater the challenge becomes to feasibly and affordably reach the state's decarbonization goals. With a possible three-year IRP cycle under consideration, the Commission may not have the opportunity to set a lower GHG target for the next IRP cycle until 2023, which would leave little time for needed clean resource development and associated investments by 2030. For California to achieve its decarbonization objectives, the Commission must use the IRP proceeding to position the electric sector on a trajectory to deeply decarbonize and facilitate the decarbonization of the state's heavy emitting sectors through electrification.

SCE's *Pathway 2045* analysis concludes that reaching California's decarbonization goals is possible, but will require a near-complete transformation of how the state sources and uses energy across all sectors of the economy.[13] Achieving 2045 goals also requires meeting or exceeding the intervening 2030 GHG reduction target. To feasibly and cost-effectively meet California's long-term decarbonization targets, the elector sector must reduce GHG emissions to 30 MMT by 2030, or about 36 MMT if BTM combined heat and power ("CHP") GHG emissions are included in the electric sector target as they are in the Commission's GHG targets.

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[11] *See* Cal. Pub. Util. Code §§ 454.51(a) (the portfolio of resources identified by the Commission "shall rely upon zero carbon-emitting resources to the maximum extent reasonable and be designed to achieve any statewide greenhouse gas emissions limit"), 454.52(a)(1)(A) (the Commission shall ensure that LSEs "[m]eet greenhouse gas emissions reduction targets established by the State Air Resources Board, in coordination with the commission and Energy Commission, for the electricity sector and each load-serving entity that reflect the electricity sector's percentage in achieving economywide greenhouse gas emissions reductions of 40 percent from 1990 levels by 2030.").

[12] R.20-05-003 at 8.

[13] *See* Appendix A.

This is supported by Commission staff's 2045 Framing Study, which shows a 2030 GHG target between 30 and 38 MMT is needed to meet the longer-term 2045 decarbonization goal.[14]

A 46 MMT electric sector GHG target puts California at risk of not meeting its GHG reduction goals and misses a much-needed chance to ensure all LSEs, and the state as a whole, are planning to make the investments needed to build a cleaner California. Setting a GHG target approximately 20 percent (10 MMT) too high in the electric sector means that other sectors (e.g., transportation, buildings) will need to make up the difference with more expensive abatement alternatives, and the sectors that are decarbonizing through electrification will have less carbon reduction impact for each option. Indeed, Commission staff stated that "the electricity sector reduces GHG emissions more than other sectors, and exceeds the minimum regulatory requirements under SB100, due to lower GHG abatement costs in the electricity sector relative to other sectors, and due to the implementation challenges of achieving a 40% reduction in GHG emissions from some of the other sectors by 2030."[15] This statement highlights the need for the electric sector to drive to necessary GHG reductions by 2030 to more affordably enable decarbonization of other sectors through electrification.

For all these reasons, the Commission should adopt a 38 MMT 2030 electric sector GHG target for all LSEs and the PSP. The Commission should also approve SCE's 38 MMT Preferred Conforming Portfolio and the 38 MMT conforming portfolios of other LSEs. Additionally, the Commission should update and modify its 38 MMT portfolio to make it reliable and economic and provide it to the CAISO for use in the next TPP.

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[14] *See Administrative Law Judge's Ruling Seeking Comment on Proposed Reference System Portfolio and Related Policy Actions*, R.16-02-007, November 6, 2019, Attachment A at 165.

[15] *Id.*

D. Summary of SCE's 38 MMT CAISO System-Wide Portfolio, Preferred Conforming Portfolios, and Action Plans

1. SCE's 38 MMT CAISO System-Wide Portfolio

SCE generally discussed the development of its 38 MMT CAISO System-Wide Portfolio and that portfolio's finding of a need for additional system capacity to maintain reliability in the 2024 to 2026 time period in Section I.B above. This section summarizes some of the other key findings from SCE's CAISO system-wide modeling including:

- SCE's CAISO system-wide sensitivity analysis for the 38 MMT GHG target scenario shows that increasing out-of-state wind to provide more portfolio diversity does not improve system reliability when compared to a heavy solar and 4-hour energy storage portfolio. In fact, increasing the amount of out-of-state wind increases the LOLE which in turn increases the need for additional capacity to meet the 1-in-10 reliability standard, and thus increases costs.
- SCE examined the pattern of unserved load in its LOLE analysis and found that loss-of-load events occurred only in summer months (July to September), during late afternoon and early evening hours, and their durations were shorter than four hours in all studied cases. Therefore, longer duration storage (> 4 hours) was not selected as an economic option to enhance system reliability. SCE found that the optimal portfolio relies primarily on solar and 4-hour energy storage, which supports resource dispatchability and increases reliability. Some 7-hour energy storage supports economic GHG reduction in the latter part of the decade.
- SCE's results show the PRM requirement is resource mix dependent. To maintain a 1-in-10 LOLE reliability standard for the 38 MMT GHG target scenario, the PRM, which has traditionally been 15 percent, needs to increase to 16.5 percent in 2024 and increase further to 17.5 percent in 2026 and thereafter due to increased renewables on the system. Given these results also align with the 46 MMT RSP LOLE analysis

completed by Commission staff, SCE recommends the Commission reexamine the PRM requirement in the IRP proceeding, in coordination with the RA proceeding.

2. SCE's 38 MMT Preferred Conforming Portfolio and Action Plan

Based on its Commission-assigned bundled load forecast, SCE developed a least-cost resource portfolio for its bundled service customers to meet its share of the 38 MMT GHG target using capacity expansion modeling and validating the resulting GHG emissions using the Commission's Clean System Power ("CSP") Calculator.[16] The result was SCE's 38 MMT Preferred Conforming Portfolio.[17] SCE's 38 MMT Preferred Conforming Portfolio achieves its share of the electric sector 38 MMT target by reaching 6.484 MMT of GHG emissions in 2030, a 68 percent RPS, and 84 percent clean energy. As explained in Section I.C, a 38 MMT GHG target is needed to feasibly and cost-effectively achieve the state's 2030 GHG reduction goal and long-term 2045 decarbonization goals. Thus, the 38 MMT Preferred Conforming Portfolio is SCE's preferred portfolio and it should be approved by the Commission.

Similar to SCE's 38 MMT CAISO System-Wide Portfolio, SCE's 38 MMT Preferred Conforming Portfolio shows that system capacity additions are needed in the near- and mid-term to meet system reliability needs. SCE's bundled share of the incremental system RA capacity procurement ordered in D.19-11-016 adequately meets SCE's share of system capacity needs through 2023. However, additional system capacity is needed to maintain system reliability starting in 2024. For SCE's bundled load, 434 MW of 4-hour energy storage is added in 2024, an additional 860 MW of 4-hour energy storage is added in 2025, and an additional 111 MW of 4-hour energy storage is added in 2026. Because there is an overall system capacity shortfall that should be met by all LSEs, the Commission should direct all LSEs to conduct system

[16] As discussed in Sections III.A.2, III.A.3, and III.C, the CSP Calculator overstates the GHG emissions of SCE's bundled portfolios compared to SCE's own modeling. This resulted in a need for SCE to include additional clean resources in the portfolios that SCE believes are unnecessary to economically meet its GHG targets. The Commission should improve the CSP Calculator for the next IRP cycle to make certain the calculator accurately calculates portfolio GHG emissions and avoids unnecessary resource additions and costs to customers.

[17] SCE did not develop any alternative portfolios for either the 38 MMT or 46 MMT GHG target.

reliability procurement to satisfy this need as discussed in Section I.B. SCE proposes to meet its share of the need through this procurement process.

SCE's 38 MMT Preferred Conforming Portfolio shows no significant need for additional clean energy resources in the near-term, but such resources are needed beginning in 2026. The solar additions begin in 2026 with approximately 250 MW and increase each year to almost 4,000 MW in 2030. The portfolio also includes approximately 450 MW of in-state wind additions in 2030. If the PCIA structure changes through the Working Group 3 process and some of SCE's RPS-eligible and GHG-free energy procurement is allocated to other LSEs, then SCE will need to backfill these resources. This may result in an earlier and greater need for clean energy resources in SCE's portfolio.

Due to the quantity of clean energy resources that need to be added to SCE's portfolio over the next 10+ years, the circumstances created when all LSEs are soliciting for the same resources at the same time, and the potential to take advantage of near-term opportunities for cost competitive clean energy procurement such as the federal investment tax credit ("ITC"), SCE requests Commission authority to begin procuring clean energy resources to meet the needs identified in its Commission-approved Preferred Conforming Portfolio. SCE urges the Commission to approve SCE's 38 MMT Preferred Conforming Portfolio and authorize SCE to procure to meet its identified needs for clean energy resources in 2026 and beyond. SCE also requests authority to begin procuring additional clean energy resources that may be needed in SCE's Commission-approved Preferred Conforming Portfolio as a result of the outcome of the PCIA Working Group 3 process.

The Commission should adopt a flexible procurement framework for clean energy resource procurement that would provide SCE the option to hold annual solicitations, or run concurrently with a reliability solicitation, to begin meeting the clean energy resource needs in its Commission-approved Preferred Conforming Portfolio. SCE would then make a final determination on whether to hold a solicitation and how much of its clean energy need to procure in each solicitation based on the market response. Flexibly distributing procurement over a longer period affords SCE increased optionality to procure higher quantities when solicitations return competitive prices (or less when prices are higher than expected), which will allow SCE to pursue the most cost competitive clean energy resources for its bundled service customers.

3. SCE's 46 MMT Preferred Conforming Portfolio and Action Plan

SCE's 46 MMT Preferred Conforming Portfolio was developed using the same process as SCE's 38 MMT Preferred Conforming Portfolio, but to meet SCE's share of a 46 MMT GHG target. SCE's 46 MMT Preferred Conforming Portfolio achieves its share of the electric sector 46 MMT target by reaching 8.131 MMT of GHG emissions in 2030, a 62 percent RPS, and 78 percent clean energy.

SCE's 46 MMT Preferred Conforming Portfolio shows the same system capacity needs in the 2024 through 2026 time period as in SCE's 38 MMT Preferred Conforming Portfolio, and also meets those needs through 4-hour energy storage. As with SCE's 38 MMT Preferred Conforming Portfolio, SCE proposes to satisfy those system capacity needs through the procurement process discussed in Section I.B.

SCE's 46 MMT Preferred Conforming Portfolio shows no significant need for additional clean energy resources in the near-term, but such resources are needed beginning in 2028. The solar additions begin in 2028 with approximately 360 MW and increase each year to almost 1,900 MW in 2030. As noted with respect to SCE's 38 MMT Preferred Conforming Portfolio, the outcome of the PCIA Working Group 3 process could result in a need to backfill legacy clean energy contracts, which would increase SCE's procurement need.

SCE advocates that the Commission approve SCE's 38 MMT Preferred Conforming Portfolio. Nevertheless, if the Commission were to approve SCE's 46 MMT Preferred Conforming Portfolio, SCE requests Commission authority to begin procuring to meet the identified need for clean energy resources in its Commission-approved Preferred Conforming Portfolio (including any additional clean energy resources that may be needed as a result of the outcome of the PCIA Working Group 3 process) under the same flexible procurement framework discussed with respect to SCE's 38 MMT Preferred Conforming Portfolio.

E. The Commission Should Establish Strong Reliability Planning Standards

A fundamental purpose of the IRP process is to make certain that LSEs are planning for adequate resources to meet electric system needs and the state's decarbonization goals.
A reliable RSP and/or PSP are crucial to determining potential system capacity needs; however, without LSE requirements to meet needs identified in those plans, they lose significance and the IRP process will fall short of this important objective. Accordingly, the Commission should adopt strong reliability planning standards that clearly define how reliability needs are identified and allocated to LSEs and ensure alignment with the broader structural changes to the RA program being considered in Track 3.B of the RA proceeding, R.19-11-009.

In particular, SCE is concerned that the current System Reliability Progress Tracking Table relies solely on ELCC values based on the current ELCC methodology to determine solar and wind capacity contributions during the peak.[18] As the electric system changes over time and the peak hour shifts to later in the day, these ELCC values will not capture such changes and thus potentially over-value solar and wind capacity contributions. Moreover, a peak-load focused reliability construct is not sufficient in a system that is increasingly dominated by resources with physical use limitations and fails to capture reliability issues arising outside of the peak hours. With the grid relying more on energy storage and other use-limited resources (e.g., renewables, demand response, etc.), LSEs will need to have sufficient capacity to meet net peak load and sufficient energy to support their load in hours beyond the peak hours.

In this IRP, SCE includes a proposed reliability methodology centered on an LSE's net peak load and the energy sufficiency of its generation and energy storage portfolio.[19] SCE's

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[18] As addressed in Section III.F.1, the System Reliability Progress Tracking Table also inaccurately forecasts LSEs' system RA requirements because it keeps LSEs' forecasted peak load static throughout the planning period and does not account for departing load.

[19] *See* Section III.F.2 and Appendix D.

proposed reliability methodology consists of three parts: (1) a capacity check performed on the net peak load; (2) an energy sufficiency analysis to ensure adequate energy can be provided by non-solar and non-wind resources; and (3) an energy storage charging check to make sure any energy storage can be charged by the LSE's resources. Rather than evaluating ELCC as a generic derating of the capacity (i.e., net qualifying capacity ("NQC")) of a solar or wind resource, SCE's more precise methodology would account for the expected contribution to capacity in each hour. The three parts of SCE's reliability methodology more accurately assess solar and wind capacity contributions to the net peak load, ensure an LSE's resource portfolio provides sufficient energy to meet its net load, and make certain an LSE's resource portfolio can provide sufficient energy to charge its energy storage if necessary. The Commission should use this proposed reliability methodology in its review and aggregation of LSEs' IRPs in this IRP cycle and as a reliability planning standard for the future IRP cycles.

F. Organization of SCE's IRP

SCE's IRP follows the Narrative Template adopted by the Commission in D.20-03-028 and provided by Commission staff. Section II – Study Design describes how SCE approached the process of developing its IRP and discusses the objectives and methodology for SCE's IRP analytical work, including modeling tools, modeling approach, and assumptions. Section III – Study Results presents the results of SCE's IRP analytical work as described in Section II, including portfolio results and detailed information on SCE's 38 MMT CAISO System-Wide Portfolio, SCE's 38 MMT Preferred Conforming Portfolio, and SCE's 46 MMT Preferred Conforming Portfolio. Section IV – Action Plan describes the action plans, barrier analysis, and requests for Commission action associated with SCE's Preferred Conforming Portfolios, as well as the status of SCE's D.19-11-016 system reliability procurement and Diablo Canyon power plant replacement. Section V – Lessons Learned discusses SCE's suggested changes to the IRP process for consideration by the Commission.

Finally, SCE includes the required Resource Data Templates ("RDTs") as Appendix E.1 (for the 38 MMT Preferred Conforming Portfolio) and Appendix E.2 (for the 46 MMT Preferred Conforming Portfolio). SCE also includes the required CSP Calculators as Appendix F.1 (for the 38 MMT Preferred Conforming Portfolio) and Appendix F.2 (for the 46 MMT Preferred Conforming Portfolio). In addition, the required attestation regarding SCE's D.19-11-016 system reliability procurement is included as Appendix G.

II.

STUDY DESIGN

SCE's approach for this IRP focused on maintaining system reliability in the near and longer terms in a rapidly evolving electric system and affordably meeting California's goal to reduce GHG emissions 40 percent below 1990 levels by 2030 and positioning the state to be able to achieve 100 percent of electricity retail sales from zero-carbon resources and carbon neutrality by 2045.[20] SCE's electric system modeling is grounded in SCE's economy-wide *Pathway 2045* analysis and confirmed by Commission staff's 2045 Framing Study, which show that reaching the state's 2045 SB 100 goals requires the electric sector to achieve GHG emissions between 30 and 38 MMT by 2030.[21] Using the 38 MMT upper bound of this range, SCE developed a comprehensive CAISO system-wide resource plan – the 38 MMT CAISO System-Wide Portfolio – that meets a 38 MMT GHG target in 2030 and a 1-in-10 LOLE reliability standard. For its bundled load, SCE also developed a 38 MMT Preferred Conforming Portfolio and a 46 MMT Preferred Conforming Portfolio as required by D.20-03-028.[22]

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[20] *See* SB 32 (2016); SB 100 (2018); Executive Order B-55-18 (2018).

[21] *See* Appendix A; *Administrative Law Judge's Ruling Seeking Comment on Proposed Reference System Portfolio and Related Policy Actions*, R.16-02-007, November 6, 2019, Attachment A at 165.

[22] As discussed above, SCE urges the Commission to approve its 38 MMT Preferred Conforming Portfolio.

A. Objectives

SCE's overall objectives for its IRP analytical work are consistent with the goals for the IRP process set forth in SB 350. Namely, SCE's intent was to develop optimized portfolios that meet California's goal of reducing economy-wide GHG emissions levels in a reliable and cost-effective manner, while also meeting other state goals[23] and operational requirements of the CAISO system.

In particular, SCE's primary analytical objectives in developing the 38 MMT CAISO System-Wide Portfolio were to:

1. Achieve a California electric sector 2030 GHG target of 38 MMT (approximately 25.28 MMT for the CAISO system excluding BTM CHP GHG emissions)[24] that enables the state to feasibly and cost-effectively meet its 2030 GHG emissions limit and puts California on the right path to reach its 2045 goal of powering 100 percent of electricity retail sales with carbon-free electricity.
2. Identify annual near-term, mid-term, and long-term system capacity needs through 2030 and any need for procurement requirements for system capacity.
3. Create a least-cost resource portfolio considering all baseline and candidate resources to serve load operably and reliably.
4. Address whether out-of-state wind resources will provide a diversified portfolio to enhance reliability in the CAISO system and whether California needs 12-hour duration energy storage as the Commission's 46 MMT and 38 MMT scenario modeling concludes.

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23 *See* Cal. Pub. Util. Code §§ 454.51(a), 454.52(a)(1).

24 Because the CAISO system represents approximately 81 percent of the load share of all retail electric providers in the state, the 2030 CAISO system GHG target in SCE's 38 MMT CAISO System-Wide Portfolio is 25.28 MMT, which is 81 percent of the total electric sector 38 MMT target minus 5.5 MMT of BTM CHP GHG emissions in the CAISO system.

5. Determine whether the CAISO system should have a higher adequate PRM requirement to ensure system reliability due to the significant increase in renewables and the retirement of baseload units in the resource portfolio.
6. Develop lessons learned, suggestions for improvement, or additional requirements for IRP CAISO system-wide modeling to improve its effectiveness.

SCE's objectives in developing its bundled 38 MMT Preferred Conforming Portfolio and 46 MMT Preferred Conforming Portfolio were to:

1. Achieve SCE's 2030 GHG emissions benchmarks of 6.496 MMT (for the 38 MMT Preferred Conforming Portfolio) and 8.180 MMT (for the 46 MMT Preferred Conforming Portfolio), which are consistent with SCE's share of the relevant electric sector 2030 GHG targets.[25]
2. Ensure that SCE's bundled portfolios meet SCE's bundled energy and capacity needs and properly contribute to CAISO system needs annually through 2030.
3. Limit the selection of shared system resources, such as existing transmission and import and export capability, to SCE's bundled service customers' share of overall system load. This was done to allow SCE's bundled portfolios to use system resources without over-relying on the system.
4. Generally, limit SCE's candidate generation resources, as identified in the RESOLVE model, to its bundled load share to prevent over-subscribing the technical potential of economic resources, which helps avoid potential difficulties in combining all LSEs' portfolios into the Commission's PSP.
5. Develop lessons learned, suggestions for improvement, or additional requirements for IRP modeling to improve its effectiveness.

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[25] SCE's 2030 GHG emissions benchmarks of 8.003 MMT and 9.687 MMT for the 38 MMT and 46 MMT targets, respectively, include BTM CHP GHG emissions of about 1.507 MMT for SCE. Pursuant to Commission guidance, SCE excluded the BTM CHP GHG emissions in its modeling, CSP calculations, and GHG emissions benchmarks.

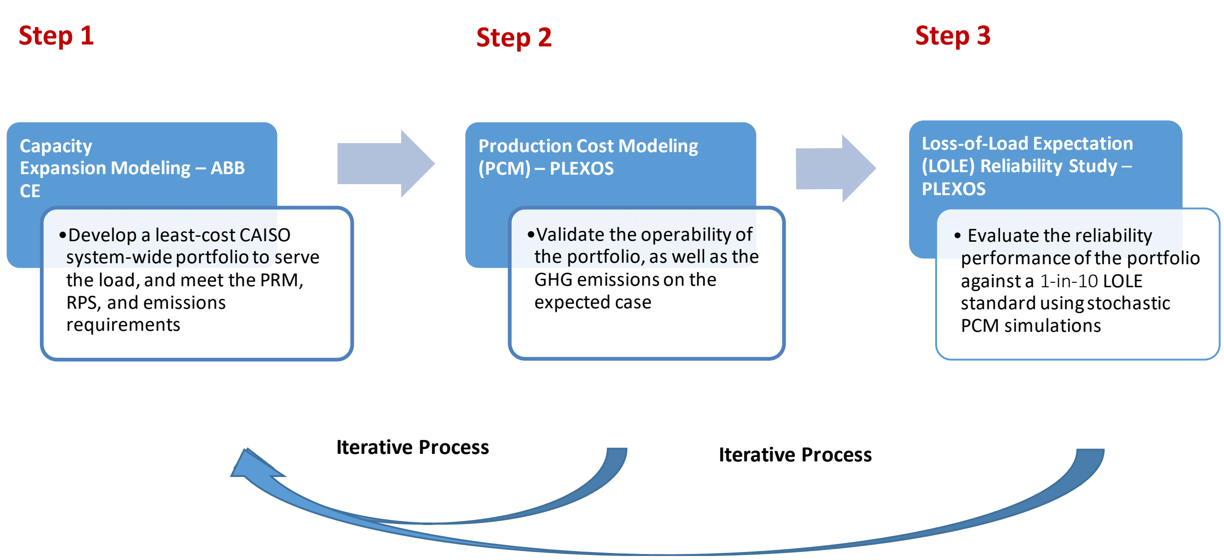
B. Methodology

This section discusses how SCE developed its 38 MMT CAISO System-Wide Portfolio and its bundled portfolios. First, SCE discusses the modeling tools it used for its IRP modeling. Second, SCE addresses its modeling approach for this IRP. Third, SCE added a section that explains the assumptions used in its IRP modeling.

1. Modeling Tool(s)

For its IRP modeling, SCE utilized ABB CE capacity expansion modeling and PLEXOS production cost modeling ("PCM") simulation software, based on the specific requirements of each process step, in creating, analyzing, and validating resource portfolios. The following Figure II-1 provides an overview of the process and modeling tools that SCE used in developing its 38 MMT CAISO System-Wide Portfolio. SCE's 38 MMT CAISO System-Wide Portfolio has been proven operable in terms of sufficient ancillary services and adequate ramping capability to serve the CAISO hourly load, meets the CAISO system share of the 38 MMT GHG target and RPS requirements, and is reliable while meeting the 1-in-10 LOLE reliability standard.

Figure II-1
Modeling Tools Used in Development of SCE's 38 MMT CAISO-System Wide Portfolio



Specifically, SCE used the following three-step iterative process:

1. Step 1: Build the optimized CAISO system-wide resource portfolio using the ABB CE model to meet the CAISO system share of a 38 MMT GHG target, PRM and RPS requirements, and to serve the load of the CAISO system, based on all assumptions for baseline and candidate resources, transmission system limitations, etc.
   To effectively obtain the optimal solution, the 8760-hourly load on an annual basis is simplified.
2. Step 2: Perform the detailed PLEXOS PCM simulation to validate if the CAISO system-wide resource portfolio produced by the ABB CE model can operate on an expected and deterministic basis, while meeting the 2019 IEPR load and associated ancillary services and ramping requirements in each hour, satisfying transmission limitations and individual generation constraints, and incorporating more detailed emissions calculations to reflect the variation of load and generation and meet the annual GHG target. If there are any unserved load and violations of the above limitations, constraints, and targets, the updated requirements will be implemented to rerun the ABB CE model to create a new system-wide resource portfolio.
3. Step 3: Assess system reliability by the LOLE study using PLEXOS Monte Carlo simulations considering the uncertainties on load, wind and solar generation, and gas generation outages. If the CAISO system-wide generation portfolio does not meet the 1-in-10 LOLE reliability standard, the PRM requirement will be increased to rerun the ABB CE model and create a new system-wide resource portfolio.

SCE's bundled portfolios were developed using the ABB CE model and the CSP Calculator as shown in Figure II-2 below.

Figure II-2
Modeling Tools Used in Development of SCE's Bundled Portfolios

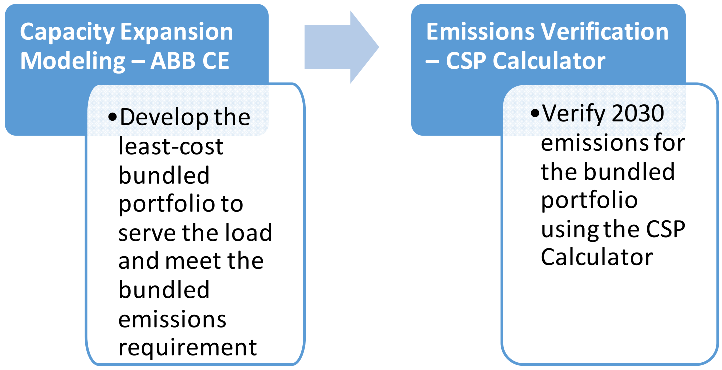


Table II-1 below provides information on specific modeling software used by SCE to develop its IRP.

Table II-1
Modeling Software Specifications

Model Type	Model	Vendor	Version number
Capacity Expansion	ABB CE	ABB	19.4
Production Cost	PLEXOS	Energy Exemplar	7.500 R02

SCE provides more details on its capacity expansion modeling, PCM, and LOLE analysis in the sections below.

a) <u>Capacity Expansion Modeling</u>

Among the modeling tools mentioned above, the capacity expansion model is critical in the IRP process because it is utilized to develop the resource portfolios at least cost. SCE continues to use the ABB CE model to develop its resource portfolios to meet GHG emissions and other constraints. ABB CE is a commercially available, long-term resource planning tool developed by ABB Enterprise Software Company. ABB CE is capable of optimizing a well-defined power system to meet GHG requirements, transmission and import/export limits, the PRM, and energy balance requirements at least cost.

SCE selected ABB CE for the additional functionalities it provides, to support SCE in developing multiple optimal resource portfolios. For example, ABB CE can consider all studied years instead of relying on the seven sample years in RESOLVE. It also models each thermal generating unit individually and is capable of simultaneously co-optimizing the investment, dispatch, and retirement/refurbishment. Additionally, ABB CE directly uses 8,760 hourly load, renewables, and hydropower data, to calculate the "typical week" of each month for optimization. SCE has observed more economical resource build-outs from ABB CE compared to RESOLVE in both IRP cycles.[26]

Further, for its 38 MMT CAISO System-Wide Portfolio, SCE went through the iterative process to run the ABB CE modeling and PLEXOS PCM simulations and ensure that the least-cost resource portfolio built by ABB CE is not only operable to meet the hourly demand, ancillary service requirements, and GHG target in the deterministic PCM simulations, but also reliable while meeting the 1-in-10 LOLE reliability standard in the 500 Monte Carlo PCM simulations.

Table II-2 provides a summary of differences between the ABB CE model and RESOLVE and an explanation of how those differences should be considered during evaluation of SCE's portfolios.

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[26] SCE's 38 MMT CAISO System-Wide Portfolio from the ABB CE model achieves a 15 percent savings of new resource costs in 2030 compared to the Commission's 38 MMT portfolio. The annual total savings are $600 million per year. The annual cost of new resources was calculated as the levelized cost of capacity in RESOLVE ($/kilowatt ("kW")-year) multiplied by the selected new resource capacity in the portfolio (kW). Battery costs incorporated both capacity and energy cost components depending on the duration. *See also Integrated Resources Plan of Southern California Edison Company (U 338-E)*, R.16-02-007, August 1, 2018, at 35-36.

Table II-2
Differences Between RESOLVE and ABB CE Models

RESOLVE	ABB CE	How differences should be considered during evaluation of portfolios
Aggregated super thermal generators	Detailed individual generator modeling	ABB CE enables a more detailed thermal supply stack representation by modeling each thermal generator individually. The result is a more realistic estimate of fuel use and GHG emissions.
Includes ancillary service requirements	Does not include ancillary service requirements	Ancillary service requirements, as operational reliability requirements, are better evaluated in PCM simulations where detailed generator characteristics and 8,760 hourly demand is evaluated. SCE evaluates these requirements in PLEXOS PCM simulations.
Investment decisions on: • New generation (gas and renewables) • New storage • Generation retirement • New demand response	Investment decisions on: • New generation (gas and renewables) • New storage • Generation retirement • Generation refurbishments • Purchase and sale power contracts • Demand-side management programs • New transmission • Cap-and-trade emission allowance transactions • Fuel purchases	ABB CE has additional functionality when considering investment decisions. Although SCE did not use all functionalities in this IRP, the additional functionality makes ABB CE a more integrated model that would help the Commission achieve its goals for the IRP process if it were adopted as the IRP's primary modeling tool for future cycles.
For each year in the analysis horizon, RESOLVE models operations for 37 typical days	For each year in the analysis horizon, ABB CE model applies the "typical week" method to scale down the number of hours	ABB CE provides a better representation of electrical load and renewable generation because there is greater variability from its "typical week" sampling method compared to RESOLVE's 37 days. "Typical week" sampling results in 84 types of days (one week for each month) – more than twice as many as RESOLVE. Some months in RESOLVE have only one type of day associated, leaving no room for even a weekday-weekend differentiation.

Correlated 37 shapes for load, renewables, and hydropower	37 days mapped to 8,760 shapes for load, renewables, and hydropower	Loads between the two models are comparable because SCE translated the RESOLVE 37 load, renewables, and hydropower shapes into 8,760 hourly shapes before populating ABB CE.
Aggregated hydropower with daily energy limit corresponding to 37 days	Allows individual hydropower modeling as either baseload, peak shaving, or limited energy. Both or either or daily or monthly energy limits are available.	SCE converted the RESOLVE daily energy limit into a monthly energy limit in ABB CE. The annual hydropower generation between RESOLVE and ABB CE are consistent.
Financial model minimizes Net Present Value ("NPV") of all-in resource cost	Financial model minimizes resources' Real Economic Carrying Charge	ABB CE has a comparable financial valuation method to RESOLVE. ABB CE values costs based on the difference of NPVs from purchasing resources in perpetuity when resource life is longer than 2030. Similarly, RESOLVE calculates an additional weight on the NPVs incurred in 2030.
Simulates selected sample years. In this IRP cycle, RESOLVE simulated years 2020-2024, 2026, and 2030.	Simulates every single year in the planning horizon	ABB CE optimizes the resource build-out and closely examines the PRM requirement for each single year. Additional capacity shortage issues were found for 2025 due to Diablo Canyon's retirement, whereas RESOLVE is not able to identify this issue due to its limitation on selected simulation years.

b) PCM Simulation

In the IRP process, it is important to conduct PCM simulations to validate the operational feasibility and performance of the portfolios built by the capacity expansion model for the CAISO system. A PCM simulation approach is used to dispatch generation resources to meet the demand and ancillary service requirements of the system on an hourly basis, while satisfying all the generator operational constraints, transmission constraints, and other system reliability requirements. Ancillary services, such as operating reserves and frequency response, are necessary requirements managed by the CAISO to ensure operational reliability and stability of the power system. Compared to the capacity expansion model, the PCM, which considers the detailed generator characteristics, ramping capabilities, and balancing load on an hourly basis, is an effective tool to assess the operational feasibility of resource portfolios in a power system.

SCE used PLEXOS, a commercial software program with a mixed integer programming optimization engine, to perform the PCM simulation for the CAISO system and mimic CAISO day-ahead market operations. PLEXOS co-optimizes energy and ancillary services and generates the commitment and dispatch of available generation resources to meet demand and reserve requirements at least cost, subject to transmission and individual generation resource constraints. SCE's PLEXOS model is set to a CAISO-only, zonal/nodal model based on the full network model CAISO publishes on a regular basis.

c) LOLE Analysis

To assess the reliability of SCE's 38 MMT CAISO System-Wide Portfolio, SCE conducted an LOLE analysis using PLEXOS Monte Carlo simulations of 500 trials considering the uncertainties of load, wind and solar generation, and gas generation outages. SCE leveraged the Commission's LOLE methodology and load, solar, and wind profiles to conduct the stochastic analysis. Additionally, SCE adopted the Commission's interpretation of a 1-in-10 LOLE reliability standard, where a loss-of-load event is defined as a day in which at least one hour has insufficient capacity to meet load and/or reserve requirements.[27] SCE used a CAISO zonal modeling approach in the PLEXOS PCM platform to conduct the study. Appendix B provides a more detailed description of SCE's LOLE analysis methodology and process.

2. Modeling Approach

Figure II-1 and Figure II-2 above provide a general overview of how SCE developed its 38 MMT CAISO System-Wide Portfolio and its bundled 38 MMT and 46 MMT Preferred Conforming Portfolios. This section describes SCE's modeling approach in more detail.

a) 38 MMT CAISO System-Wide Portfolio Development

SCE employed a three-step iterative process to develop its 38 MMT CAISO System-Wide Portfolio as shown in Figure II-1. SCE utilized the ABB CE capacity expansion model to build the least-cost resource portfolio satisfying the chosen constraints. Specifically, SCE used a

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[27] *See* Energy Resource Modeling Section, Energy Division, *Unified Resource Adequacy and Integrated Resource Plan Inputs and Assumptions – Guidance for Production Cost Modeling and Network Reliability Studies*, March 29, 2019, at 12.

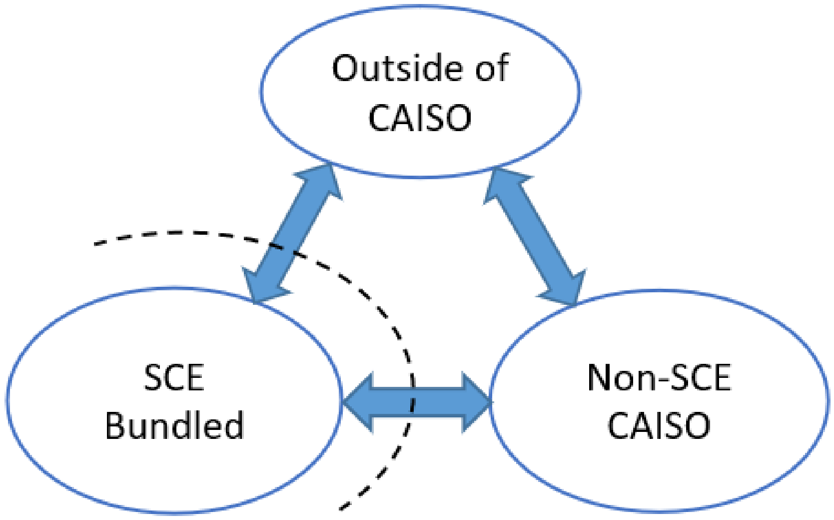
straight-line approach to apply declining GHG targets as annual constraints for its CAISO system-wide portfolio development. Once the resource portfolio was determined by ABB CE, SCE used PLEXOS PCM to evaluate the power system's operational feasibility and validate the total GHG emissions. This step of the analysis used detailed generator characteristics, operating constraints, and ancillary service requirements. Finally, once the portfolio was validated to meet operational and GHG emissions constraints, an LOLE analysis was performed to assess reliability performance of the CAISO system-wide portfolio.

b) Bundled Portfolio Development

SCE used the ABB CE model to develop the least-cost resource portfolios that meet its GHG emissions benchmarks for bundled service customers, where a straight-line approach was used to represent these declining GHG targets as annual constraints. The modeling approach represented the system as three linked transmission areas: SCE bundled, the remainder of CAISO, and the rest of the Western Electricity Coordinating Council ("WECC"). This was done for two reasons: (1) to ensure that shared resources (e.g., CAISO system resources, major transmission lines, and import/export lines) are not excessively used by any one LSE; and (2) to more precisely account for GHG emissions attributable to SCE bundled service customers.[28] Figure II-3 below depicts the regional structure of the SCE bundled system.

[28] SCE enforced the 15 percent PRM in development of its bundled portfolios consistent with the assumption applied in the CAISO system-wide modeling. PCM simulation is not needed for bundled portfolios because each LSE relies on system resources and resources from other LSEs, and it is not economic to require resource self-sufficiency for each LSE.

Figure II-3
SCE Bundled System Topology



To constrain resource sharing between the three regions, transmission limits were estimated based on both the load share and the physical, simultaneous transmission limits. The following Table II-3 and Table II-4 summarize the interregional transmission limits enforced in the SCE bundled system. There is no Commission-established methodology or requirements for determining how much imports individual LSEs should rely on throughout the analysis timeframe in their resource portfolios. Based on SCE's near-term expectations of import RA given recent solicitations and the near-term market outlook, SCE determined the import limit from the rest of WECC to the SCE bundled system for near-term years (i.e., through 2024). For 2025 and thereafter, SCE applied the SCE bundled peak load share of a 5,000 MW maximum import limit. Finally, SCE used an imported power CO2 emissions rate of 0.428 metric tons per megawatt-hour ("MWh") between its bundled system and the rest of WECC. Applying this emissions rate accounts for CAISO system emissions generated on behalf of SCE's bundled service customers and is consistent with the Commission's assumed emissions rate for unspecified imports.[29]

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[29] *See Inputs & Assumptions: 2019-2020 Integrated Resource Planning*, February 2020, at 84, available at: https://www.cpuc.ca.gov/General.aspx?id=6442459770.

Table II-3
Rest of WECC to SCE Bundled Transmission Limits[30]

Year	Assumed SCE Bundled Import RA Capacity (MW)	Methodology
2021	2,121	SCE expected import RA MW based on recent procurement and near-term market outlook
2022	1,993	
2023	1,982	
2024	1,960	
2025	1,356	SCE bundled peak load share of a 5,000 MW maximum import limit
2026	1,351	
2027	1,348	
2028	1,346	
2029	1,350	
2030	1,355	

Table II-4
Rest of CAISO to SCE Bundled Transmission Limits

Transmission Lines	Import Limit on the Path (MW)	Methodology
SCE Bundled to Rest of CAISO	3,000	Path 26 South to North transmission limit
Rest of CAISO to SCE Bundled	4,000	Path 26 North to South transmission limit

For the SCE resources subject to the cost allocation mechanism ("CAM"), the resource share that contributes to SCE's bundled portfolios is the proportional share determined by SCE bundled energy load to the total non-bundled and bundled peak energy load from the 2019 IEPR. SCE did not receive its 2021 initial year-ahead allocations in the RA process until July 21, 2020, which was too late to incorporate into SCE's IRP modeling.[31]

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30 SCE's share of Hoover and Palo Verde were accounted for separately.

31 In its RDTs, SCE used its proportional share of CAM resources based on its 2021 initial year-ahead share of total coincident peak load as assigned in the RA process and kept that share static throughout the IRP planning horizon.

When considering candidate resources for its bundled portfolios, SCE partitioned the candidate resources on a pro rata basis, according to the SCE bundled load share to the CAISO system load in 2030. If this candidate resource partitioning approach is used by all LSEs, it will ensure that the total selected resources by each category will not exceed the maximum available potential when the Commission combines LSEs' IRPs to form the PSP. SCE also assumed its share of existing system-wide thermal resources according to the SCE bundled load share to the CAISO system load for each year. Additionally, in developing the bundled portfolios, SCE assumed that all RPS resources with expiring contracts were automatically re-contracted and the amount of capacity from these resources were held constant throughout the planning period.

Lastly, SCE made a few permissible adjustments to the CSP Calculator and used it to validate total GHG emissions from the proposed bundled portfolios.[32] If the bundled portfolio was found to not meet the GHG target using the CSP Calculator, SCE's GHG target was reduced and the capacity expansion model was rerun to create a new portfolio.

3. <u>Assumptions</u>

The planning assumptions associated with all of SCE's IRP scenarios align with the 2019 IEPR mid Baseline mid Additional Achievable Energy Efficiency ("AAEE") demand forecast and SCE's Commission-assigned bundled load forecast.[33] Supply-side resource costs, performance characteristics, and resource potential were extracted from the assumptions embedded in the RESOLVE model used to develop the Commission's RSP except as otherwise noted.

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[32] SCE made permissible adjustments to the CSP Calculator for a more accurate result. SCE believes additional modifications to the CSP Calculator are needed. Although these additional recommendations were not incorporated in order to comply with the filing requirements, they are detailed in Section III.C.2.

[33] *See Administrative Law Judge's Ruling Correcting April 15, 2020 Ruling Finalizing Load Forecasts and Greenhouse Gas Benchmarks for Individual 2020 Integrated Resource Plan Filings*, R.16-02-007, May 20, 2020, at Attachment A.

In developing the 38 MMT CAISO System-Wide Portfolio, SCE generally used the same inputs and assumptions as those used by Commission staff to develop the RSP except as explained below:

- SCE used the 2019 IEPR demand forecast as directed by the Commission.
- Rather than using the ELCC surface approach used to specify solar and wind resources' contribution to the PRM requirement in the RSP by RESOLVE, SCE used the expected energy delivery in the net peak load hour (hour ending ("HE")19) for each month based on average solar and wind generation to determine solar and wind resources' contribution to the PRM requirement. SCE believes this better represents the actual resource contribution in the net peak load hour and is consistent with use of ELCC in assessing how solar and wind resources contribute to the system PRM.

To develop SCE's bundled portfolios, SCE also used inputs and assumptions consistent with those used by Commission staff to develop the RSP with a few adjustments described below:

- As addressed above, SCE used the expected energy delivery in the net peak load hour (HE19) for each month based on average solar and wind generation to determine solar and wind resources' contribution to the PRM requirement.[34]
- RESOLVE shows that no transmission cost is included for wind resources in Mexico. That is not an accurate assumption and there is significant uncertainty in determining what transmission costs would be appropriate for such resources. Accordingly, SCE did not include Baja California wind resources in Mexico in the candidate resources when developing its bundled portfolios due to the inaccurate representation of

34 In its RDTs, SCE used the ELCC values provided in the RDT. Additionally, while SCE's RDTs use contract information as of June 30, 2020, SCE's modeling uses contract information as of April 30, 2020 due to the time needed to complete the modeling.

resource costs in RESOLVE and the uncertainty in determining transmission costs for these resources.[35]

III.

STUDY RESULTS

A. Conforming and Alternative Portfolios

As explained above, SCE developed a least-cost, operable, and reliable 38 MMT CAISO System-Wide Portfolio for the CAISO system to meet the 38 MMT GHG target in 2030. For its bundled load, SCE developed one bundled 38 MMT Preferred Conforming Portfolio and one bundled 46 MMT Preferred Conforming Portfolio, without any alternative portfolios.
SCE strongly recommends the Commission adopt a 38 MMT GHG target for all LSEs and the PSP and approve SCE's 38 MMT Preferred Conforming Portfolio.

The sections below describe the results for: (1) SCE's 38 MMT CAISO System-Wide Portfolio and related sensitivities; (2) SCE's 38 MMT Preferred Conforming Portfolio; and (3) SCE's 46 MMT Preferred Conforming Portfolio.

1. SCE's 38 MMT CAISO System-Wide Portfolio Results

SCE's 38 MMT CAISO System-Wide Portfolio was developed to confirm the Commission's 38 MMT portfolio for operability, reliability, and achievement of the 38 MMT GHG target. Moreover, SCE wanted to develop an economic CAISO system-wide resource plan that was updated with the 2019 IEPR demand forecast and deemed reliable through rigorous LOLE analysis. SCE's *Pathway 2045* analysis requires the elector sector to reduce GHG emissions to 30 MMT by 2030 (or about 36 MMT if BTM CHP GHG emissions are included in the electric sector target as they are under the Commission's GHG targets) to feasibly and affordably meet California's long-term decarbonization targets.[36] This is supported by

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[35] As further discussed in Section III.C.2, SCE also modified the load shape in the CSP Calculator to match the 2019 IEPR hourly load shape for the SCE Transmission Access Charge ("TAC") area.
[36] *See* Appendix A.

Commission staff's 2045 Framing Study, which shows a 2030 GHG target between 30 and 38 MMT for the California electric sector to meet the state's SB 100 goals.[37] Accordingly, SCE used a 38 MMT GHG target for its CAISO system-wide analysis because that target is comparable to the 2030 GHG emissions level that SCE's *Pathway 2045* analysis determined is necessary to effectively position the state to reach its 2045 decarbonization goals.

SCE's 38 MMT CAISO System-Wide Portfolio is a comprehensive, operable, and reliable portfolio that meets the CAISO system share of the 38 MMT GHG target in 2030. The portfolio is shown in Figure III-1 and discussed in more detail below. The following are key findings from the results of SCE's analysis:

- To align with the most recent RSP,[38] SCE did not include D.19-11-016's required procurement of 3,300 MW of incremental system RA capacity or recommended OTC unit compliance deadline extensions. Without these resources in the baseline, SCE's results confirm a near-term system capacity need of up to about 4,200 MW by 2023. This need is met by the 3,300 MW of incremental system RA capacity procurement and the recommended OTC unit compliance deadline extensions through 2023.
- SCE's results show a substantial system capacity need in the 2024 to 2026 timeframe due to the retirement of the OTC units with recommended compliance deadline extensions by the end of 2023 and the retirement of Diablo Canyon units in 2024 and 2025. Even with the 3,300 MW of system reliability procurement required by D.19-11-016, SCE's results show a need for an additional 5,381 MW of system capacity by 2026 to maintain reliability – specifically, 1,697 MW in 2024, an additional 3,010 MW in 2025, and an additional 674 MW in 2026. SCE's PCM and LOLE analysis show that these system capacity needs can reliably and most economically be met with 4-hour energy storage.

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[37] *See Administrative Law Judge's Ruling Seeking Comment on Proposed Reference System Portfolio and Related Policy Actions*, R.16-02-007, November 6, 2019, Attachment A at 165.

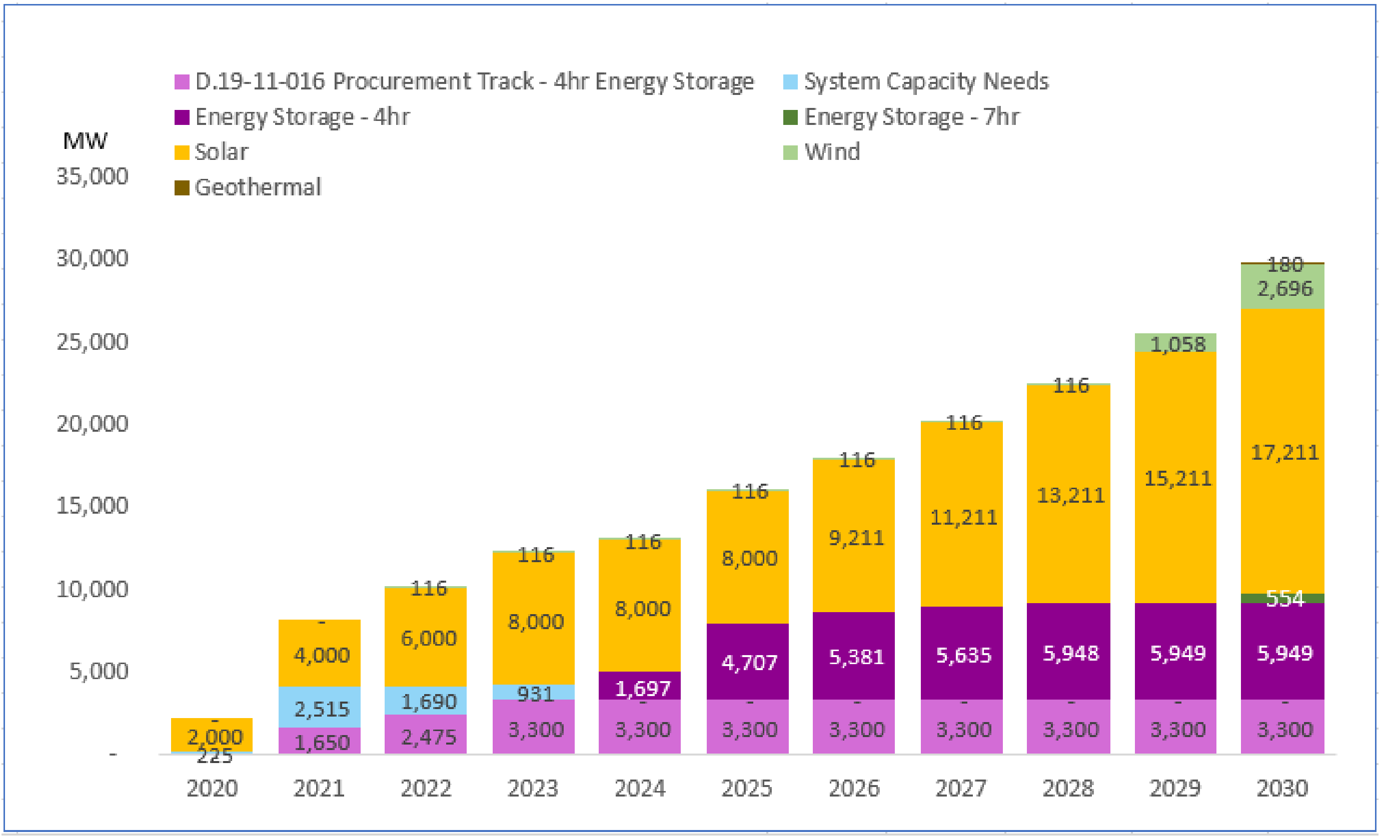
[38] *See* D.20-03-028 at 35-36.

- SCE's PLEXOS PCM simulation reported about 1.5 MMT higher GHG emissions for the initial prospective resource portfolio than the ABB CE capacity expansion model in 2030, mainly due to the modeling simplifications in the capacity expansion model. ABB CE models thermal resources in a simplified manner compared to PLEXOS PCM. Detailed generator limitations, such as minimum up/down time and no-load fuel, are not considered. In addition, ABB CE dispatches generation resources to meet the load by typical week, whereas PLEXOS PCM optimizes the resource dispatch every hour in a given year in chronological order which leads to the inclusion of more extreme days. SCE therefore reran the ABB CE model iteratively with a 1.5 MMT lower GHG target by 2030 to ensure the resource portfolio would meet the GHG target in the PLEXOS PCM simulations.
- SCE also ran a CAISO system-wide sensitivity analysis for the 38 MMT GHG target scenario using an out-of-state wind portfolio to increase portfolio diversity and compared it to a solar and 4-hour energy storage-heavy optimal build-out. Increasing the amount of out-of-state wind resources increased the LOLE value and required additional capacity to meet reliability standards which increases costs.
- Additionally, SCE examined the pattern of unserved load in its LOLE analysis and found that loss-of-load events occurred only in summer months (July to September) and during late afternoon and early evening hours (HE18 to HE20). The duration of the loss-of-load events was always shorter than four hours in all studied cases. Therefore, longer duration storage (> 4 hours) was not selected in the modeling as an economic option that enhances system reliability compared to more 4-hour energy storage resources. SCE found that the optimal portfolio relies primarily on substantial solar and 4-hour energy storage, which supports resource dispatchability and increases reliability.
- SCE's results show the PRM requirement is resource mix dependent. To maintain a 1-in-10 LOLE reliability standard for the 38 MMT GHG target scenario, the PRM,

which has traditionally been 15 percent, needs to increase to 16.5 percent in 2024 and increase further to 17.5 percent in 2026 and thereafter due to the substantial amount of renewables in the resource portfolio that do not contribute to system needs during select peak hours later in the day and the retirement of baseload units in the resource portfolio. SCE made these increases to the PRM requirements in the ABB CE model to iteratively develop the resource portfolio for the 38 MMT GHG scenario which resulted in a 38 MMT CAISO System-Wide Portfolio that satisfies a 1-in-10 LOLE reliability standard.

As shown in Figure III-1 below, SCE's 38 MMT CAISO System-Wide Portfolio includes substantial solar and 4-hour energy storage capacity additions by 2030. This resource portfolio includes the most economic combination of resources to meet the GHG target and maintain reliability. By 2030, SCE's 38 MMT CASIO System-Wide Portfolio includes cumulative capacity additions of 5,949 MW of 4-hour and 554 MW of 7-hour energy storage in addition to 17,211 MW of solar, 180 MW of geothermal, and 2,696 MW of in-state wind.

Figure III-1
SCE's 38 MMT CAISO System-Wide Portfolio – Cumulative Capacity Additions



Notes: 1. 554 MW of 7-hour energy storage and 180 MW of geothermal additions are identified in 2030 to meet the GHG target
2. 2021-2023 system capacity needs will be satisfied by recommended OTC compliance deadline extensions
3. 2,000 MW of annual solar build-out limit is enforced according to RSP assumption

Consistent with the assumptions used in the RSP, SCE limited solar additions to 2,000 MW per year.[39] Even with this limitation, the portfolio adds solar capacity up to the 2,000 MW limit through 2023. Upon expiration of the ITC in 2023, the portfolio does not add additional solar until 2026.

As noted above, starting in 2024, the portfolio shows a need for 1,697 MW of system capacity to maintain reliability in addition to the 3,300 MW of incremental system RA capacity procurement for 2021 to 2023 already required by D.19-11-016. The additional 1,697 MW system capacity need primarily results from the OTC unit compliance deadline extensions

39 *See* D.20-03-028 at 35.

recommended in D.19-11-016 expiring by the end of 2023. SCE's modeling selected only 4-hour energy storage to meet this need. There is also an additional system capacity need to maintain reliability of 3,010 MW in 2025 and an additional 674 MW in 2026 due to the planned retirement of Diablo Canyon. As with the 2024 need, SCE's modeling selected 4-hour energy storage to meet these 2025 and 2026 needs. By 2026, the system capacity built to meet system reliability needs (including the D.19-11-016 procurement) totals a cumulative 8,681 MW. This system capacity is needed to maintain reliability independent of whether a 38 MMT or 46 MMT electric sector GHG target is established.

This system capacity need is generally consistent with the Commission's identification of new generation capacity needs in the 2024 to 2026 timeframe in the RSP and the Commission's 38 MMT portfolio.[40] However, SCE's 38 MMT CAISO System-Wide Portfolio builds more dispatchable system capacity than the RSP, which uses more solar and wind capacity to contribute to the system PRM. In particular, the 46 MMT RSP includes 6,127 MW of new battery storage, 222 MW of shed demand response, and 973 MW of pumped storage by 2026 (with 3,299 MW of battery storage and 222 MW of shed demand response by 2024), all totaling 7,322 MW of new dispatchable capacity by 2026.[41] By 2026, the 46 MMT RSP also includes about 1,307 NQC MW of new solar and wind.[42] SCE considers this use of the assumed ELCC of added solar and wind to contribute to the system PRM at peak hours to be problematic from a portfolio design perspective as further discussed in Section III.F.2.

Furthermore, SCE's system-wide analysis and reliability study indicate a tightness in system capacity through 2030, and consequently the 38 MMT CAISO System-Wide Portfolio does not retire any natural gas generation due to the need for economic system capacity. This contrasts with the Commission's 38 MMT portfolio, which retires over 2,000 MW of

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[40] *See id.* at 41, 46.
[41] *See id.* at 41.
[42] *See id.* Solar and wind NQC values calculated by multiplying nameplate MW with marginal ELCC values of solar and wind from the RDT found in the file: "ELCC_assumptions_used_within_Resource_Data_Template.xlsx," downloaded from https://www.cpuc.ca.gov/General.aspx?id=6442459770.

natural gas generation capacity in 2030.[43] SCE supports the Commission developing scenarios of economic natural gas generation retirements; however, SCE cautions that preparing for natural gas generation retirements should be a deliberate process that includes analytical findings from the CAISO TPP. Given the tightness in system capacity through 2030 and beyond, additional system and potentially local capacity above the incremental resources identified in SCE's 38 MMT CAISO System-Wide Portfolio would be needed to backfill any natural gas generation capacity that exits the CAISO system.

As mentioned previously, SCE's 38 MMT CAISO System-Wide portfolio is least cost, operable, and reliable. Table III-1 below shows several key metrics associated with this portfolio, including GHG emissions, the PRM, LOLE value, and total resource cost. As shown in the table, SCE's 38 MMT CAISO System-Wide Portfolio meets the GHG targets in the PLEXOS PCM simulation and satisfies the 1-in-10 LOLE reliability standard for all three years 2024, 2026, and 2030.

Table III-1
Key Metrics for SCE's 38 MMT CAISO System-Wide Portfolio

Metric	2024	2026	2030
CAISO GHG Target (MMT)	37.5	33.5	25.3
ABB CE - RPS Target	48%	50%	60%
ABB CE - PRM	16.5%	17.5%	17.5%
PLEXOS - CAISO GHG Emissions (MMT)	29.7	32.9	25.3
PLEXOS - LOLE (events per year)	0.098	0.068	0.050
Total Resource Cost per year (in billion 2016 dollars)	$1.5	$2.1	$3.4

SCE's CAISO system-wide analysis found that a heavy solar and 4-hour energy storage build-out in 2030 is more cost-effective and more reliable than the portfolio with out-of-state wind selected by the RESOLVE model in 2030. SCE ran a system-wide sensitivity analysis to

[43] *See* D.20-03-028 at 46.

understand the impact on cost and reliability of a high out-of-state wind build-out at the CAISO system level. The high out-of-state wind sensitivity case forced additional out-of-state wind additions (1,500 MW of Wyoming wind and 1,500 MW of New Mexico wind by 2030), consistent with the 3,000 MW of out-of-state wind added in 2030 in the Commission's 38 MMT portfolio.[44]

Compared to a heavy solar and 4-hour energy storage build-out, this sensitivity resulted in a change in the portfolio of about 3,100 MW more wind, 7,000 MW less solar, and about 1,900 MW less equivalent 4-hour energy storage by 2030. As shown in Figure III-2 below, this out-of-state wind sensitivity portfolio has a higher resource cost even though total new nameplate capacity is lower (+$400 million, +12 percent). The higher portfolio cost derives from the greater cost of out-of-state wind – partly due to the higher technology cost of wind generation compared to solar and partly due to the transmission expansion costs for 1,500 MW to New Mexico and 1,500 MW to Wyoming. In turn, the new resource cost of the solar heavy-build-out is lower than the Commission's 38 MMT portfolio (-$700 million, -17.5 percent) as shown in Figure III-3 below.

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[44] *See id.*

Figure III-2
SCE's 38 MMT 15 Percent PRM LOLE Portfolios

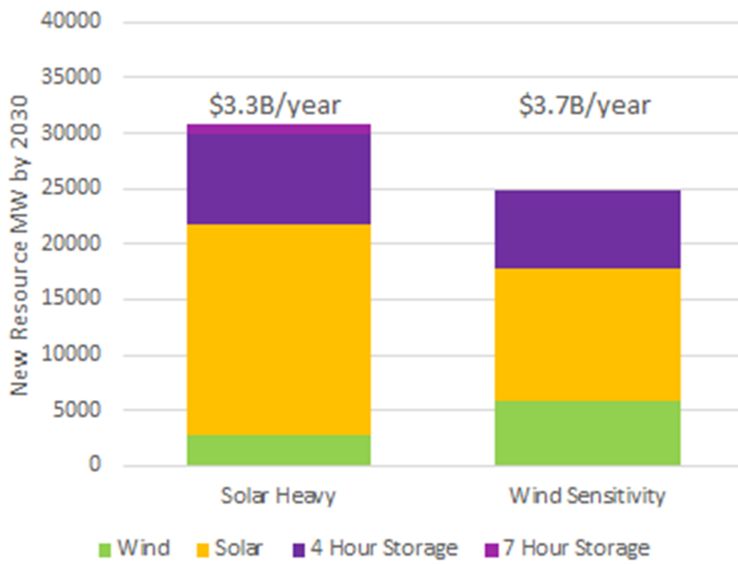
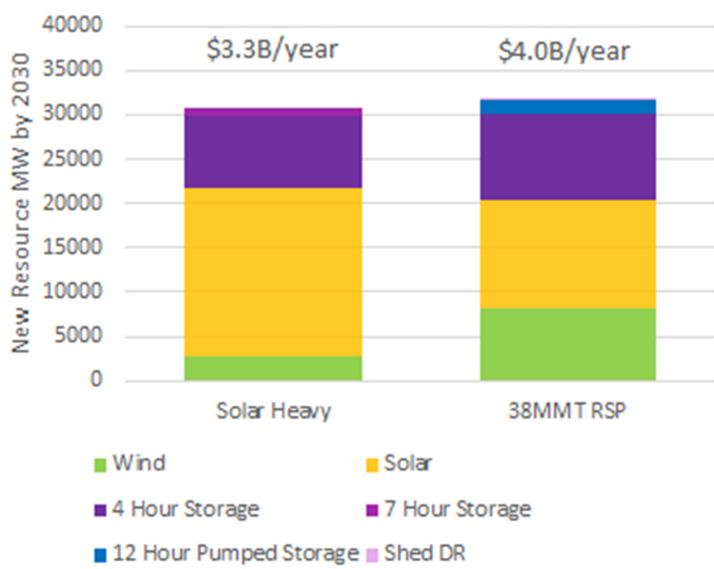


Figure III-3
SCE's 38 MMT 15 Percent PRM Solar Heavy Portfolio and Commission's 38 MMT Portfolio



The results of SCE's out-of-state wind sensitivity portfolio show not only a higher cost, but also a higher LOLE and a higher need for additional capacity compared to a solar and 4-hour energy storage-heavy portfolio to meet a 1-in-10 LOLE reliability standard. The detailed results show that there is low wind generation available during the unserved load hours. Due to these findings and the transmission needs associated with building more out-of-state wind resources, SCE did not include out-of-state wind additions in its bundled portfolios.

Table III-2 below shows the comparative LOLE reliability study results for 2030 using the Commission's methodology for calculating LOLE.[45] These results for both out-of-state wind and solar-heavy portfolios were created by the capacity expansion model with the 15 percent PRM requirement enforced for all study years.

Table III-2
LOLE for Year 2030

Scenario	LOLE (day/year)	Capacity Needed (MW)
Solar Heavy	0.208	500
Out-of-State Wind	1.282	2,317

The results of the reliability assessment found that a higher share of out-of-state wind additions does not improve system reliability relative to a heavy solar and dispatchable storage fleet. This is primarily due to the ability of 4-hour energy storage to flexibly convert non-dispatchable resources such as solar into dispatchable resources, which ultimately enhances system reliability.

In 2030, SCE's 38 MMT CAISO System-Wide Portfolio includes 554 MW of 7-hour energy storage for economical GHG reduction. Long-duration pumped storage was not selected because it is currently uneconomic and does not provide additional reliability benefits through 2030 when compared to the use of shorter duration energy storage. This contrasts with both the Commission's 46 MMT RSP and 38 MMT portfolio which added 973 MW and 1,605 MW of pumped storage, respectively.[46] As SCE stated in its comments on the proposed decision on the RSP, it is unclear from the RESOLVE modeling why these resources were selected, when there

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[45] For the Commission, a loss-of-load event is a day with at least one hour with insufficient capacity to meet load and reserve requirements. *See* Energy Resource Modeling Section, Energy Division, *Unified Resource Adequacy and Integrated Resource Plan Inputs and Assumptions – Guidance for Production Cost Modeling and Network Reliability Studies*, March 29, 2019, at 12.

[46] *See* D.20-03-028 at 41, 46.

are no long (12-hour) duration needs identified.[47] If a greater than 4-hour need was identified, the RESOLVE model should have made a more economic selection than jumping to a higher cost 12-hour pumped storage resource. SCE's LOLE reliability study[48] identified patterns that indicate unserved load typically occurs in HE18 to HE20 during summer peaks with a duration of three hours or less. SCE concludes that 4-hour energy storage resources are sufficient and more economic to meet this reliability need. Therefore, 12-hour duration pumped storage resources are not needed and uneconomic for this portfolio. Although SCE found the CAISO system would benefit from 7-hour energy storage in 2030, that was primarily for GHG reduction. SCE recognizes, however, that after 2030 and if greater amounts of natural gas generation exit the system prior to 2030, greater needs for longer duration storage may emerge.

SCE's 38 MMT CAISO System-Wide Portfolio shows a heavy 4-hour energy storage build-out driven by the need to maintain a 15 percent PRM early in the decade, followed by an increase in the PRM above 15 percent in the later part of the decade. SCE used the iterative approach to address reliability discussed in Section II. Iterating the ABB CE capacity expansion model and PLEXOS PCM runs until an acceptable LOLE was achieved enabled SCE to identify that a 15 percent PRM was no longer adequate to ensure reliability. SCE's CAISO system-wide modeling results found that to maintain a 1-in-10 LOLE reliability standard, the PRM needs to increase from 15 to 16.5 percent during 2024 and 2025 and to 17.5 percent after 2025 given the significant increase in renewables and the retirement of baseload units in the resource portfolio.

The higher PRM requirements resulted in approximately 700 MW of additional 4-hour energy storage for 2024 and 2025, and 1,200 MW of additional 4-hour energy storage for 2026 and beyond. The results show that with the increasing level of renewables in the portfolio, the PRM requirement needs to increase to maintain the 1-in-10 LOLE reliability standard. As such, the PRM requirement is resource mix dependent. SCE suggests the Commission initiate a

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[47] *See Opening Comments of Southern California Edison Company (U 338-E) on Proposed Decision Regarding 2019-2020 Electric Resource Portfolios to Inform Integrated Resource Plans and Transmission Planning*, R.16-02-007, March 12, 2020, at 8.

[48] *See* Appendix B.

process for updating the PRM requirement in the IRP proceeding in coordination with the RA proceeding.

The heavy 4-hour energy storage portfolio provides the necessary operating characteristics to ensure system reliability is maintained. Overall economic achievement of system-wide decarbonization targets relies on a solar and 4-hour energy storage-heavy portfolio with some reliance on in-state wind by 2030. A pumped storage solution or higher share of out-of-state wind additions do not economically improve system reliability relative to a heavy solar and dispatchable storage fleet.

SCE's 38 MMT CAISO System-Wide Portfolio is more economic, operable, and reliable compared to the RSP. The Commission's RSP selected more expensive out-of-state wind and pumped (long-duration) storage, did not meet the minimum reliability requirements, and did not meet the GHG target.[49] The Commission's 38 MMT portfolio also selected more expensive out-of-state wind and pumped (long-duration) storage.[50] In addition, the Commission did not model the year 2025, and therefore did not identify a resource need for that year. Conversely, SCE's annual analysis saw the largest system capacity need occur in 2025. SCE's 38 MMT CAISO System-Wide Portfolio did not select out-of-state wind due to its high costs and chose lower-priced, shorter duration, more flexible 4-hour energy storage to meet system capacity needs while reducing GHG emissions. SCE's 38 MMT CAISO System-Wide Portfolio saves in new resource costs by 15 percent in 2030 compared to the Commission's 38 MMT portfolio, with an annual cost difference of approximately $600 million.[51] Accordingly, SCE's 38 MMT CAISO System-Wide Portfolio is an optimal system portfolio.

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49 *See* D.20-03-028 at 41, 44.

50 *See id.* at 46.

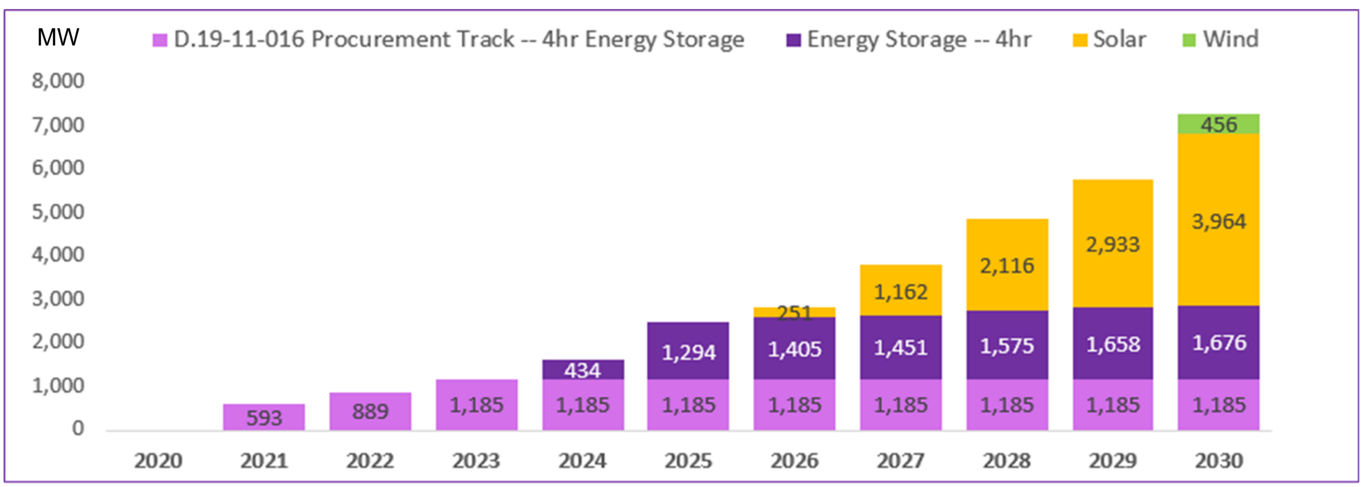
51 Both portfolios' new resource costs were calculated as the sum-product of selected capacity and the levelized cost of capacity assumed in RESOLVE. In 2030, new resources for SCE's 38 MMT CAISO System-Wide Portfolio cost $3.4 billion per year while the Commission's 38 MMT portfolio new resources cost $4.0 billion per year.

2. SCE's 38 MMT Preferred Conforming Portfolio

SCE's 38 MMT Preferred Conforming Portfolio was developed to meet SCE's bundled load share of a 2030 electric sector GHG target of 38 MMT (8.003 MMT or 6.496 MMT when BTM CHP GHG emissions are excluded). As explained above, the Commission should adopt a 38 MMT GHG target for all LSEs and the PSP and approve SCE's 38 MMT Preferred Conforming Portfolio because a 38 MMT target is needed for the California electric sector to feasibly and affordably achieve the state's 2030 GHG reduction goal and long-term 2045 decarbonization goals. A 46 MMT target is not sufficient.

As shown in Figure III-4 below, SCE's 38 MMT Preferred Conforming Portfolio adds a similar resource mix when compared with SCE's 38 MMT CAISO System-Wide Portfolio and meets GHG reduction goals cost-effectively. In the near- and mid-term, solar and 4-hour energy storage are added to the portfolio with in-state wind added only in 2030. In 2030, SCE's 38 MMT Preferred Conforming Portfolio achieves its share of the electric sector 38 MMT target by reaching 6.484 MMT of GHG emissions, a 68 percent RPS, and 84 percent clean energy.

Figure III-4
SCE's 38 MMT Preferred Conforming Portfolio – Cumulative Capacity Additions



As with SCE's 38 MMT CAISO System-Wide Portfolio, SCE's 38 MMT Preferred Conforming Portfolio shows that system capacity additions are needed in the near- and mid-term to meet system reliability needs. SCE's bundled share of the incremental system RA capacity procurement ordered in D.19-11-016 adequately meets SCE's share of system capacity needs through 2023;[52] however, additional system capacity is needed to maintain system reliability starting in 2024. Specifically, for SCE's bundled load, 434 MW of 4-hour energy storage is added in 2024, an additional 860 MW of 4-hour energy storage is added in 2025, and an additional 111 MW of 4-hour energy storage is added in 2026.

These results are commensurate with the system reliability need shown in the 38 MMT CAISO System-Wide Portfolio. Filling the SCE bundled need with 4-hour energy storage is the most cost-effective approach. As further addressed in Section IV.B.1, SCE urges the Commission to expeditiously require procurement by all LSEs to address the 2024 system capacity need. Addressing the 2024 need by the first quarter of 2021 would help prevent the need for a rushed and potentially costly procurement process similar to the one that culminated with D.19-11-016. Moreover, initiating a procurement process to meet the 2024 need is a "least regrets" approach because if there is uncertainty in the need,[53] the new resources would be available to offset the need in 2025 and 2026 due to the imminent Diablo Canyon shutdown. The Commission should also require LSEs to procure to meet the residual 2025 and 2026 system capacity need by the end of 2021.

SCE's 38 MMT Preferred Conforming Portfolio shows that there is no significant need for clean energy in the near-term, but physical clean energy is needed beginning in 2026.

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[52] As shown in Figure III-4, the D.19-11-016 procurement was not included in the baseline but is shown separately. SCE assumed its D.19-11-016 procurement would be 4-hour energy storage and included SCE's total 1184.7 MW procurement requirement for 2021 through 2023 (not including any procurement done by SCE for opt-out LSEs). SCE did not subtract any procurement that may ultimately be allocated to loads that had not yet departed from SCE bundled service at the time D.19-11-016 was decided, but such departing load may also reduce SCE bundled load in the Commission-assigned bundled load forecast that was used to develop this portfolio, and thus SCE's share of any system capacity needs. SCE adjusted its D.19-11-016 procurement in its RDTs to account for forecast departing load based on guidance from Energy Division staff.

[53] Currently, there is significant uncertainty associated with potential reductions to the load forecasts due to the COVID-19 pandemic that could impact the timing of the new resource build-out. Load reductions due to COVID-19 may result in less expected capacity need for SCE's bundled service customers in the near- to mid-term. However, it is reasonable to expect that the impacts of the COVID-19 pandemic on demand and resource needs would revert back to a pre-COVID trajectory in the mid- to latter part of the decade.

The solar additions begin in 2026 with 251 MW and increase each year to a cumulative 3,964 MW in 2030. If the PCIA structure changes through the Working Group 3 process and part of SCE's RPS-eligible and/or GHG-free energy procurement is allocated to other LSEs, then new clean energy resources will also be needed to backfill those that are allocated, increasing SCE's procurement need. A decision on the PCIA Working Group 3 issues is expected by the end of 2020. Therefore, consistent with Commission's guidance, SCE incorporated current PCIA rules in its modeling for its bundled portfolios. SCE's strategy to address this uncertainty is discussed in Section IV.B.2.

To meet SCE's 2030 GHG emissions benchmark using the CSP Calculator, SCE's original 38 MMT bundled portfolio (which already met the 2030 GHG emissions benchmark in SCE's modeling) was re-modeled by lowering the GHG target in the ABB CE capacity expansion model, resulting in additional clean resources in 2030. Approximately 100 MW of wind and 550 MW of solar were added to the portfolio to meet SCE's 2030 GHG emissions benchmark in the CSP Calculator. As discussed in Section III.C.2, the CSP Calculator does not accurately portray the GHG emissions of SCE's bundled portfolios. Independent calculations using the ABB CE model show the GHG emissions calculated by the CSP Calculator are 4.3 percent higher. These problems with the CSP Calculator resulted in additional clean energy resources being added to SCE's 38 MMT Preferred Conforming Portfolio that SCE believes are unnecessary to economically achieve its GHG target. The resources added in 2030 also impact the cost of SCE's 38 MMT Preferred Conforming Portfolio, which is shown in Section III.E. The CSP Calculator should be improved for the next IRP cycle to allow for a resource build-out by in 2030 that avoids unnecessary resource additions and costs to customers.

For the new resources in SCE's 38 MMT Preferred Conforming Portfolio, as required by the Narrative Template, Table III-3 compares the mix of new resources in SCE's portfolio to the mix of new resources in the Commission's 38 MMT portfolio.[54]

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[54] Because it is load modifying, SCE did not include shed demand response in this comparison.

Table III-3
Comparison of Commission’s 38 MMT Portfolio and SCE’s 38 MMT Preferred Conforming Portfolio – Cumulative New Resource Addition Mix

Resource Type	2020		2021		2022		2023		2024		2026		2030	
	CPUC's 38 MMT	SCE	CPUC's 38 MMT	SCE	CPUC's 38 MMT	SCE	CPUC's 38 MMT	SCE	CPUC's 38 MMT	SCE	CPUC's 38 MMT	SCE	CPUC's 38 MMT	SCE
Wind	-	-	1%	-	26%	-	22%	-	26%	-	20%	-	17%	7%
OOS Wind on New Transmission	-	-	-	-	-	-	-	-	-	-	-	-	9%	-
Utility-Scale Solar	93%	-	62%	-	53%	-	60%	-	54%	-	45%	15%	38%	65%
Battery Storage	7%	-	38%	-	22%	-	18%	-	21%	100%	26%	85%	31%	28%
Pumped (long-duration) Storage	-	-	-	-	-	-	-	-	-	-	8%	-	5%	-

Unlike the Commission’s 38 MMT portfolio, SCE’s 38 MMT Preferred Conforming Portfolio does not include any long-duration storage (including pumped storage) because the need can be met more economically and reliably with the use of 4-hour energy storage. Additionally, the new resource additions in SCE’s 38 MMT Preferred Conforming Portfolio include 7 percent in-state wind in 2030 whereas the new resource additions in the Commission’s 38 MMT portfolio include 17 percent in-state wind. Similar to SCE’s 38 MMT CAISO System-Wide Portfolio, the new resource additions in SCE’s 38 MMT bundled portfolio include a significant amount of solar (65 percent) and 4-hour energy storage (28 percent) in 2030 due to their cost-effectiveness and in the case of 4-hour energy storage, system reliability benefits. For the reasons discussed in Section III.A.1, the addition of out-of-state wind does not cost-effectively improve system reliability relative to a heavy solar and dispatchable storage portfolio. This is primarily due to the ability of 4-hour energy storage to flexibly convert non-dispatchable resources such as solar into dispatchable resources, which ultimately enhances system reliability. The transmission costs for out-of-state wind are also highly uncertain. Accordingly, SCE did not include out-of-state wind in its 38 MMT Preferred Conforming Portfolio.

The existing and new resources included in SCE’s 38 MMT Preferred Conforming Portfolio are identified in the RDT for that portfolio (Appendix E.1).[55] This includes the existing

[55] The resource information in SCE’s RDTs is current as of June 30, 2020; however, SCE used resource information current as of April 30, 2020 in its modeling due to the time needed to complete the modeling.

resources that SCE owns or has under contract and resources under development that may or may not have Commission-approved contracts, including SCE's share of CAM resources, as of June 30, 2020 (collectively, these are consistent with the definitions for "online," "development," and "review" in the RDT-defined "contract_status"). The "review" resources include SCE's executed contracts to meet its D.19-11-016's system reliability procurement requirement for August 1, 2021 deliveries and SCE's recently signed contracts with Ormond Beach, Moss Landing, and Alamitos, which were under Commission review on June 30, 2020.

With respect to existing resources SCE expects to contract during the planning period (consistent with the definition for "planned_existing" in the RDT-defined "contract_status"), as explained in Section II.B.2.b, SCE made assumptions about its future share of imports and assumed that all RPS resources with expiring contracts were automatically re-contracted with the amount of capacity from these resources held constant throughout the planning period. SCE also assumed its share of existing system-wide thermal resources according to the SCE bundled load share to the CAISO system load for each year.

SCE generally plans to meet the need for new resources additions in its SCE's 38 MMT Preferred Conforming Portfolio through future procurement activities, including those described in Section IV. SCE's planned new resources (consistent with the definition of "planned_new" in the RDT-defined "contract_status") also include SCE's yet to be executed D.19-11-016 system reliability procurement for August 1, 2022 and 2023 deliveries.[56]

3. SCE's 46 MMT Preferred Conforming Portfolio

SCE's 46 MMT Preferred Conforming Portfolio was developed to meet SCE's bundled load share of a 2030 electric sector GHG target of 46 MMT (9.687 MMT or 8.180 MMT when BTM CHP GHG emissions are excluded). A 46 MMT GHG target does not achieve the GHG reductions necessary to reach California's 2030 GHG emissions target and does not put the state

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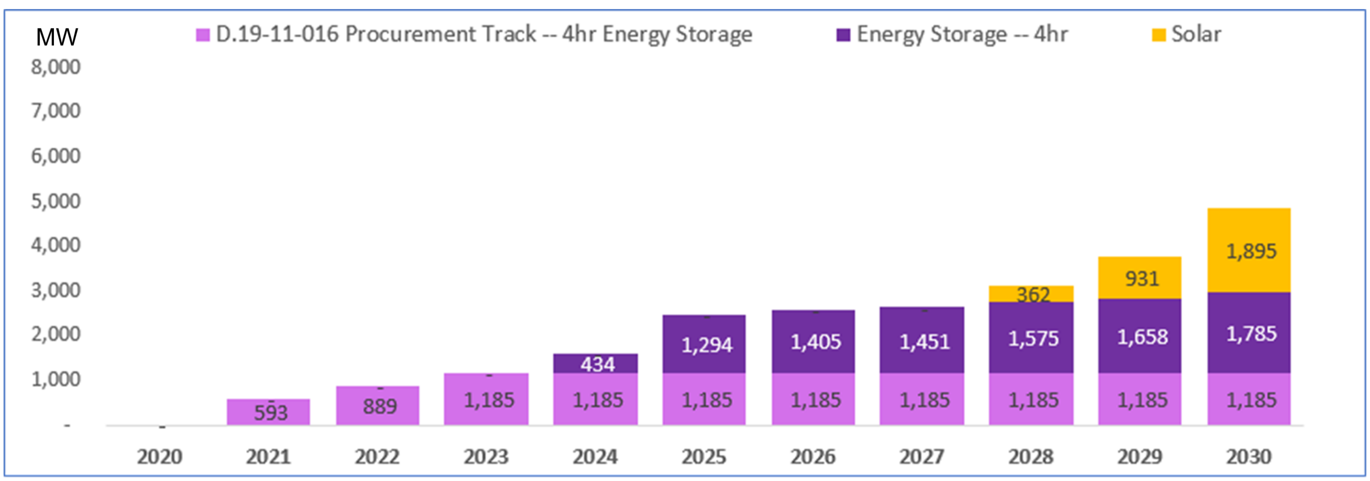
[56] As noted above, SCE's D.19-11-016 procurement as reflected in its RDTs does not include any procurement on behalf of opt-out LSEs and SCE has adjusted its D.19-11-016 procurement in its RDTs to account for forecast departing load based on guidance from Energy Division staff.

on the right track to reach its 2045 decarbonization goals. The Commission should adopt a 38 MMT GHG target for all LSEs and the PSP and approve SCE's 38 MMT Preferred Conforming Portfolio.

As shown in Figure III-5 below, SCE's 46 MMT Preferred Conforming Portfolio adds a similar resource mix when compared with SCE's 38 MMT CAISO System-Wide Portfolio and meets SCE's share of a 46 MMT GHG target cost-effectively. This portfolio includes the same 4-hour energy storage additions included in SCE's 38 MMT Preferred Conforming Portfolio for 2024 through 2026 to meet system reliability needs. These results are commensurate with the system reliability need shown in the 38 MMT CAISO System-Wide Portfolio. Filling the SCE bundled need with 4-hour energy storage is the most cost-effective approach. The portfolio also begins adding solar resources in 2028 continuing through 2030. In 2030, SCE's 46 MMT Preferred Conforming Portfolio achieves its share of the electric sector 46 MMT target by reaching 8.131 MMT of GHG emissions, a 62 percent RPS, and 78 percent clean energy.

Figure III-5
SCE 46 MMT Preferred Conforming Portfolio – Cumulative Capacity Additions



Because SCE's 46 MMT Preferred Conforming Portfolio includes the same system capacity need in 2024 through 2026 as the 38 MMT Preferred Conforming Portfolio and also meets that need through 4-hour energy storage, the discussion of that need and system capacity additions in Section III.A.2 is also applicable to this portfolio.

SCE's 46 MMT Preferred Conforming Portfolio shows that there is no significant need for clean energy in the near-term, but physical clean energy is needed beginning in 2028. The solar additions begin in 2028 with 362 MW and increase each year to a cumulative 1,895 MW in 2030. As noted with respect to SCE's 38 MMT Preferred Conforming Portfolio, the outcome of the PCIA Working Group 3 process could result in a need to backfill clean energy resources allocated to other LSEs, which would increase SCE's procurement need.

To meet SCE's 2030 GHG emissions benchmark using the CSP Calculator, SCE's original 46 MMT bundled portfolio (which already met the 2030 GHG emissions benchmark in SCE's modeling) was reoptimized by lowering the GHG target in the ABB CE capacity expansion model, which resulted in additional clean resources in 2030. Approximately 400 MW of solar was added to the portfolio to meet SCE's 2030 GHG emissions benchmark in the CSP Calculator. As discussed in Section III.C.2, the CSP Calculator does not accurately portray the GHG emissions of SCE's bundled portfolios. Independent calculations using the ABB CE model show the GHG emissions calculated by the CSP Calculator are 3.3 percent higher. These problems with the CSP Calculator resulted in additional clean energy resources being added to SCE's 46 MMT Preferred Conforming Portfolio that SCE believes are unnecessary to economically achieve its GHG target. The resources added in 2030 also impact the cost of SCE's 46 MMT Preferred Conforming Portfolio, which is shown in Section III.E. The CSP Calculator should be improved for the next IRP cycle to allow for a more realistic resource build-out in 2030 and avoid unnecessary resource additions and costs to customers.

For the new resources in SCE's 46 MMT Preferred Conforming Portfolio, as required by the Narrative Template, Table III-4 below compares the mix of new resources in SCE's portfolio compares to the mix of new resources identified in the Commission's 46 MMT RSP.[57]

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[57] Because it is load modifying, SCE has not included shed demand response in this comparison.

Table III-4
Comparison of Commission's 46 MMT RSP and SCE's 46 MMT Preferred Conforming Portfolio – Cumulative New Resource Addition Mix

Resource Type	2020		2021		2022		2023		2024		2026		2030	
	RSP	SCE	RSP	SCE	RSP	SCE	RSP	SCE	RSP	SCE	RSP	SCE	RSP	SCE
Wind	-	-	1%	-	19%	-	16%	-	19%	-	15%	-	12%	-
OOS Wind on New Transmission	-	-	-	-	-	-	-	-	-	-	-	-	2%	-
Utility-Scale Solar	93%	-	62%	-	58%	-	65%	-	57%	-	45%	-	45%	51%
Battery Storage	7%	-	38%	-	24%	-	20%	-	24%	100%	34%	100%	37%	49%
Pumped (long-duration) Storage	-	-	-	-	-	-	-	-	-	-	5%	-	4%	-

Unlike the Commission's 46 MMT RSP, SCE's 46 MMT Preferred Conforming Portfolio does not include any long-duration storage (including pumped storage) because the need can be met more economically and reliably with the use of 4-hour energy storage. For economic reasons, SCE's 46 MMT Preferred Conforming Portfolio includes no in-state wind in 2030 whereas 12 percent of the new resource additions in the Commission's RSP are in-state wind. Similar to SCE's 38 MMT Preferred Conforming Portfolio, the new resource additions in SCE's 46 MMT Preferred Conforming Portfolio include a significant amount of solar (51 percent) and 4-hour energy storage (49 percent) resources in 2030 due to their cost-effectiveness and in the case of 4-hour energy storage, system reliability benefits. For the reasons discussed in Section III.A.1, the addition of out-of-state wind generation does not improve system reliability relative to a heavy solar and dispatchable storage portfolio. This is primarily due to the ability of 4-hour energy storage to flexibly convert non-dispatchable resources such as solar into dispatchable resources, which ultimately enhances system reliability. The transmission costs for out-of-state wind are also highly uncertain. Accordingly, SCE did not include out-of-state wind in its 46 MMT Preferred Conforming Portfolio.

The existing and new resources included in SCE's 46 MMT Preferred Conforming Portfolio are identified in the RDT for that portfolio (Appendix E.2).[58] This includes the existing resources that SCE owns or has under contract and resources under development that may or may not have Commission-approved contracts, including SCE's share of CAM resources, as of June 30, 2020 (collectively, these are consistent with the definitions for "online," "development," and "review" in the RDT-defined "contract_status"). The "review" resources include SCE's executed contracts to meet its D.19-11-016's system reliability procurement requirement for August 1, 2021 deliveries and SCE's recently signed contracts with Ormond Beach, Moss Landing, and Alamitos, which were under Commission review on June 30, 2020.

With respect to existing resources SCE expects to contract during the planning period (consistent with the definition for "planned_existing" in the RDT-defined "contract_status"), as explained in Section II.B.2.b, SCE made assumptions about its future share of imports and assumed that all RPS resources with expiring contracts were automatically re-contracted with the amount of capacity from these resources held constant throughout the planning period. SCE also assumed its share of existing system-wide thermal resources according to the SCE bundled load share to the CAISO system load for each year.

SCE generally plans to meet the need for new resources additions in its SCE's 46 MMT Preferred Conforming Portfolio through future procurement activities, including those described in Section IV. SCE's planned new resources (consistent with the definition of "planned_new" in the RDT-defined "contract_status") also include SCE's yet to be executed D.19-11-016 system reliability procurement for August 1, 2022 and 2023 deliveries.[59]

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58 The resource information in SCE's RDTs is current as of June 30, 2020; however, SCE used resource information current as of April 30, 2020 in its modeling due to the time needed to complete the modeling.

59 As noted above, SCE's D.19-11-016 procurement as reflected in its RDTs does not include any procurement on behalf of opt-out LSEs and SCE has adjusted its D.19-11-016 procurement in its RDTs to account for forecast departing load based on guidance from Energy Division staff.

B. Preferred Conforming Portfolios

Detailed descriptions of SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios are included in Sections III.A.2 and III.A.3 above. SCE only developed one 38 MMT bundled portfolio and one 46 MMT bundled portfolio; therefore, SCE's conforming portfolios for each GHG target are also its preferred portfolios for each GHG target.

As explained in detail in Section I.C, a 46 MMT GHG target is not sufficient to put California on the right track to achieve its 2030 GHG reduction target and longer-term 2045 zero-carbon resource and carbon neutrality goals. Both SCE's *Pathway 2045* analysis and Commission staff's 2045 Framing Study show that meeting California's 2045 decarbonization goals requires a 2030 electric sector GHG target in the range of 30 to 38 MMT.[60] Therefore, the Commission should approve SCE's 38 MMT Preferred Conforming Portfolio, which achieves SCE's share of the 38 MMT target, because it is the portfolio that contributes the GHG reductions necessary to reach the state's GHG reduction and clean energy goals.
The Commission should also adopt a 38 MMT target for all LSEs and the PSP.

As discussed in Section III.E, there is a modest 0.6 percent difference in the 2030 system average rate for SCE's 38 MMT Preferred Conforming Portfolio compared to the 46 MMT Preferred Conforming Portfolio. However, the rate impact of each portfolio must be viewed from the perspective of what it achieves in terms of GHG reduction, criteria pollutant reduction, and clean energy. While the 46 MMT Preferred Conforming Portfolio's 2030 system average rate may be slightly lower than the system average rate for the 38 MMT Preferred Conforming Portfolio, that portfolio also does not satisfy the GHG target that is necessary to reach California's decarbonization goals. Indeed, compared to the 46 MMT Preferred Conforming Portfolio, SCE's 38 MMT Preferred Conforming Portfolio has lower GHG emissions (6.484 MMT vs. 8.131 MMT), a higher RPS (68 percent vs. 62 percent), more clean energy (84 percent

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[60] *See* Appendix A; *Administrative Law Judge's Ruling Seeking Comment on Proposed Reference System Portfolio and Related Policy Actions*, R.16-02-007, November 6, 2019, Attachment A at 165.

vs. 78 percent), and lower criteria pollutant emissions (536 tons vs. 628 tons of PM2.5, 121 tons vs. 132 tons of SO2, and 1,245 tons vs. 1,441 tons of NOx) in 2030. SCE's 38 MMT Preferred Conforming Portfolio is the least-cost portfolio to achieve SCE's share of the 38 MMT GHG target. As such, SCE's 38 MMT Preferred Conforming Portfolio better meets the goals and requirements of the IRP process, and is the portfolio that should be approved by the Commission.

The needed system capacity procurement to maintain reliability is generally the same under both SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios. However, SCE's 38 MMT Preferred Conforming Portfolio is SCE's preferred blueprint for clean energy procurement for the reasons stated above.

The following sections discuss how each portfolio meets the statutory requirements in Public Utilities Code Section 454.52(a)(1).

Meeting the GHG emissions reduction targets established by California Air Resources Board ("CARB"), in coordination with the Commission and CEC (Section 454.52(a)(1)(A)). As shown in Section III.C.1, both Preferred Conforming Portfolios meet their respective 2030 GHG emissions benchmarks based on the CSP Calculator results. However, SCE's 38 MMT Preferred Conforming Portfolio better meets this goal because it achieves SCE's share of the 38 MMT GHG target needed to reach California's decarbonization goals.

Procuring at least 60 percent eligible renewable energy resources by 2030 (Section 454.52(a)(1)(B)). Both Preferred Conforming Portfolios include expected levels of eligible renewable energy resources exceeding California's 60 percent RPS goal by 2030, but SCE's 38 MMT Preferred Conforming Portfolio achieves a higher RPS than the 46 MMT Preferred Conforming Portfolio (68 percent vs. 62 percent).

Enabling each electrical corporation to fulfill its obligation to serve its customers at just and reasonable rates and minimizing impacts on ratepayers' bills (Sections 454.52(a)(1)(C) and (D)). SCE's Preferred Conforming Portfolios are each the least-cost portfolio to meet their respective GHG targets. As discussed previously, however, SCE's 38 MMT Preferred Conforming Portfolio represents the least-cost feasible path for meeting the state's 2030 GHG target and effectively positioning California to reach its 2045 decarbonization goals.

Ensuring system and local reliability on both a near-term and long-term basis (Section 454.52(a)(1)(E)). Both Preferred Conforming Portfolios meet the current 15 percent PRM requirement and both portfolios meet SCE's forecasted system RA requirements when using an adjusted peak load that accounts for load departure as discussed in Section III.F.1. As stated, however, in Section III.A.1, SCE's reliability study found that the PRM requirement should be revisited, which may have implications on SCE's Preferred Conforming Portfolios. In addition, SCE performed its proposed reliability methodology on its 38 MMT Preferred Conforming Portfolio for the month of September for 2026 and 2030. As discussed in Section III.F.2, those results demonstrate that SCE's 38 MMT Preferred Conforming Portfolio meets the capacity check performed on the net peak load, an energy sufficiency analysis to ensure adequate energy can be provided by non-solar and non-wind resources, and an energy storage charging check to ensure any energy storage can be charged by SCE's resources during those periods.

Complying with subdivision (b) of Section 399.13 (Section 454.52(a)(1)(F)). Public Utilities Code Section 399.13(b) requires that beginning January 1, 2021, at least 65 percent of the procurement a retail seller counts toward the RPS 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. Public Utilities Code Section 399.13(a)(5)(B)(iii) also allowed SCE to elect early compliance with the long-term contracting requirements in Section 339.13(b). On August 28, 2017, SCE informed the Commission of its election to start compliance with the long-term contracting requirement in 2017. Most of SCE's existing RPS-eligible resource portfolio is contracted through long-term contracts of 10 years or more and SCE expects that to continue. SCE will continue to comply with Section

399.13(b), beginning in 2017, as reported in its annual RPS compliance reports.

Strengthening the diversity, sustainability, and resilience of the bulk transmission and distribution systems, and local communities (Section 454.52(a)(1)(G)). Both Preferred Conforming Portfolios have been cost optimized and do not result in any known transmission system reliability challenges. As explained in Section III.J, for both Preferred Conforming Portfolios, resources within SCE transmission zones were strategically placed to avoid exceeding known transmission capability limits and minimize transmission upgrades. Both Preferred Conforming Portfolios also include significant additions of energy storage that can provide greater flexibility on the transmission and distribution systems. Moreover, SCE's Preferred Conforming Portfolios will strengthen local communities by reducing GHG emissions and criteria pollutants, especially the 38 MMT Preferred Conforming Portfolio which achieves more GHG and criteria pollutant reductions.

Enhancing distribution systems and demand-side energy management (Section 454.52(a)(1)(H)). SCE's Preferred Conforming Portfolios align with the RSP's demand-side assumptions. Both Preferred Conforming Portfolios also include significant energy storage, which could enhance the distribution system.

Minimizing localized air pollutants and other GHG emissions with early priority on disadvantaged communities (Section 454.52(a)(1)(I)). Both Preferred Conforming Portfolios reduce GHG emissions and criteria pollutants, although SCE's 38 MMT Preferred Conforming Portfolio better meets this goal by more significantly reducing GHG emissions and criteria pollutants. Additionally, SCE has taken other actions to minimize GHG emissions and local pollutants in disadvantaged communities as discussed in Section III.D.2, including through SCE's transportation electrification efforts.

C. GHG Emissions Results

1. SCE's Preferred Conforming Portfolios Meet GHG Emissions Benchmarks Using the CSP Calculator, But the Portfolios Needed Additional Resources to Reach the Benchmarks Relative to SCE's Internal Modeling Results

As shown in Table III-5 and Table III-6 below, SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios achieve 2030 GHG emissions that are less than SCE's 2030 GHG emissions benchmarks based on the CSP Calculator results. As provided in the CSP Calculator, SCE's portfolio GHG emissions do not include BTM CHP GHG emissions and SCE used its 38 MMT and 46 MMT GHG emissions benchmarks without BTM CHP GHG emissions.

Notably, SCE's internal modeling indicates that its portfolios have significantly lower GHG emissions than those shown by the CSP Calculator. For the 38 MMT Preferred Conforming Portfolio, the 2030 GHG emissions are 6.484 MMT using the CSP Calculator results and 6.214 MMT based on SCE's modeling, a 4.3 percent difference. For the 46 MMT Preferred Conforming Portfolio, the 2030 GHG emissions are 8.131 MMT using the CSP Calculator results and 7.870 MMT based on SCE's modeling, a 3.3 percent difference. SCE's internal modeling GHG emissions are direct outputs from SCE's ABB CE capacity expansion modeling.

Table III-5
38 MMT GHG Benchmark Comparison – CSP Results vs. SCE's Internal Modeling

38 MMT	2020	2022	2026	2030	SCE's Internal Modeling 2030 GHG	SCE's 38 MMT Benchmark
GHG Emissions (MMT)	10.360	8.403	8.435	6.484	6.214	6.496
% Change from 2020		-19%	-19%	-38%		

Table III-6
46 MMT GHG Benchmark Comparison – CSP Results vs. SCE's Internal Modeling

46 MMT	2020	2022	2026	2030	SCE's Internal Modeling 2030 GHG	SCE's 46 MMT Benchmark
GHG Emissions (MMT)	10.376	8.411	8.769	8.131	7.870	8.180
% Change from 2020		-19%	-15%	-22%		

In order to provide conforming portfolios that meet SCE's 2030 GHG emissions benchmarks using the CSP Calculator, SCE's original 38 MMT and 46 MMT bundled portfolios (which already met the 2030 GHG emissions benchmarks in SCE's modeling) were re-modeled in the ABB CE capacity expansion model to the lower the GHG targets, which resulted in additional clean resources in 2030. In the 38 MMT Preferred Conforming Portfolio, about 100 MW of wind and 550 MW of solar were added to meet the GHG emissions benchmark in the CSP Calculator. In the 46 MMT Preferred Conforming Portfolio, approximately 400 MW of solar was added in 2030. SCE believes these resources are unnecessary to achieve its GHG targets. Ultimately, SCE remains concerned that the assumptions and modeling tools in the IRP process, including the CSP Calculator, over-build resources relative to other modeling tools and could result in unnecessary over-procurement and customer expense. The Commission should explore the causes for why the models used by the Commission, RESOLVE and SERVM, and the CSP Calculator result in resource additions that are not needed when using other models. SCE discusses needed improvements to the CSP Calculator in the section below.

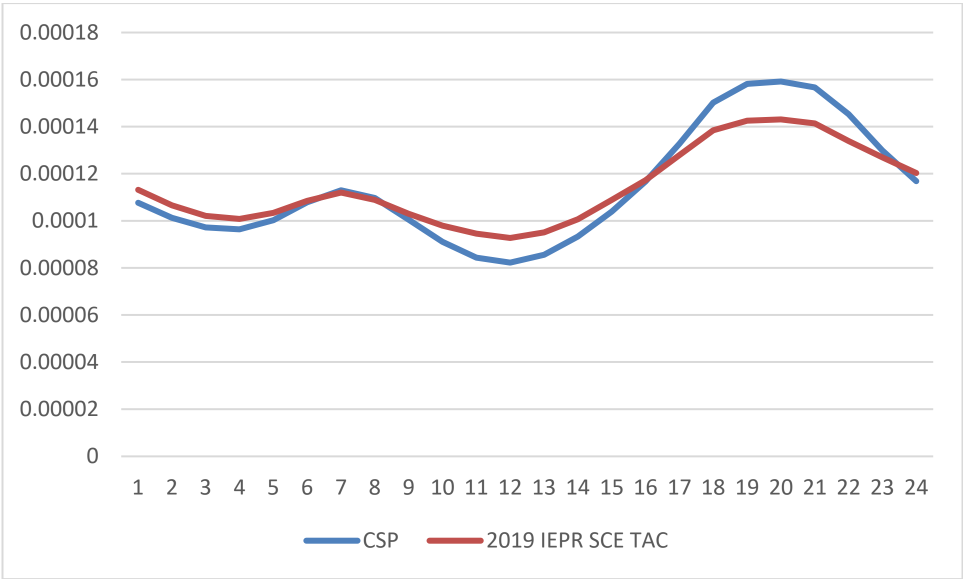
2. <u>The CSP Calculator Should Be Improved to Provide a More Accurate Estimation of a Portfolio's GHG Emissions</u>

In the process of identifying why the CSP Calculator GHG results were higher than those resulting from SCE's internal modeling, SCE identified improvements to the CSP Calculator that the Commission should adopt to provide more accurate estimations of a resource portfolio's GHG emissions. These improvements can be categorized into three different categories: consistency, standardization, and customization.

a) **Consistency**

One of the largest differences that SCE noticed in the CSP Calculator was the hourly managed load shape. SCE used the 2019 mid-AAEE IEPR hourly load shape for the SCE TAC area to shape its bundled annual energy. However, the CSP Calculator default managed load shape does not match what SCE used in its modeling. Figure III-6 below shows the average normalized load for a day for the default managed load shape in the CSP Calculator and the 2019 IEPR's hourly SCE TAC shape.

Figure III-6
Average Normalized Load



The figure shows that the default CSP Calculator managed load shape is very different from the 2019 IEPR hourly SCE TAC shape. More concerning is the large difference during HE18 to HE23. This difference caused significantly higher GHG emissions results in the CSP Calculator. Using the default CSP Calculator managed load shape, SCE's GHG emissions would have increased by about 0.48 MMT.[61] To reflect the 2019 IEPR SCE hourly TAC shape, SCE implemented a fix by using the custom load function in the CSP Calculator. SCE modified

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[61] All GHG differences noted in the Consistency, Standardization, and Customization sections represent an average GHG impact for the 38 MMT and 46 MMT portfolios.

the non-C&I load shape to provide a starting point that would result in the final managed load shape matching the 2019 IEPR SCE hourly TAC shape for 2030. However, only one custom load shape can be input that is used for all time periods. Thus, SCE's fix only truly works for 2030; the other years may only estimate the GHG emissions since it is likely that the IEPR SCE hourly TAC shape differs for the other years. SCE strongly recommends the Commission ensure that the modeling, the associated tools, and the assumptions utilize consistent hourly managed load shapes.

b) Standardization

Another driver of GHG emissions differences was differing hourly solar and wind shapes. To match the assumptions used in RESOLVE, SCE utilized the solar and wind shapes from RESOLVE in its own capacity expansion modeling. Because the ABB CE model uses the full 8,760 hour shape, SCE took the RESOLVE solar and wind shapes and reconstructed the shapes using the 37-day type weightings. The RESOLVE shapes are based on 2007 to 2009 weather years. In contrast, the CSP Calculator uses 2007 weather year data. The use of a larger dataset to create the solar and wind RESOLVE shapes and the 37-day types drives differences in GHG emissions. If SCE utilized the default solar and wind shapes in the CSP Calculator, the resulting GHG emissions would be about 0.20 MMT higher.

To replicate the same solar and wind shapes that SCE used in its own capacity expansion modeling, SCE utilized the custom GHG-free shape function of the CSP Calculator to aggregate all its solar and wind generation into one hourly generation profile. While SCE's fix addresses the differing solar and wind shapes, SCE remains concerned that the hourly shapes used in RESOLVE, the CSP Calculator, and in LSEs' planning are not standardized. SCE recommends that the Commission adopt a single set of hourly solar and wind shapes that can be used in all modeling.

Another notable difference is the utilization of different line loss percentages. In RESOLVE, the Scenario Tool defaults to a T&D line loss value of 7.24 percent.[62] However, in the CSP Calculator, the line loss value of 7.98 percent was calculated from a system-wide view using 2019 IEPR data. For SCE's modeling, SCE used a historical line loss value of 6.80 percent, which closely aligns with the implied SCE line losses using SCE specific data from the 2019 IEPR.[63] In the CSP Calculator, the line loss value affects the total managed load that an LSE needs to serve. The difference of 1.18 percentage points between the default CSP Calculator losses and SCE's internal modeling results in a GHG impact of about 0.24 MMT.

SCE was not able to correct for this difference in the CSP Calculator without modifying the calculator's underlying calculations. Thus, to comply with its GHG emissions benchmarks in the CSP Calculator, SCE's resource portfolios include additional resources beyond what SCE believes is necessary to meet its customers' load and satisfy GHG emissions requirements. For future IRP cycles, SCE recommends that the Commission adopt a standardized, unifying system-wide line loss factor and TAC level-specific line loss factors for LSEs. The system-wide loss factor would be used for CAISO system analyses and modeling. While the TAC level-specific loss factors would be used by LSEs for their own planning, modeling, and reporting, both the system-wide loss factor and TAC level-specific loss factors should be derived from the same IEPR forecast used for annual energy and hourly shapes.

c) Portfolio Customization

In the CSP Calculator, an LSE is allocated CHP based on load share. However, an LSE will know the total MW from CHP based on its own contract information. Based on SCE's

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[62] The RESOLVE T&D line loss value can be found in the workbook "RESOLVE_Scenario Tool 2020-05-27_inputs_for_pyomo_5-6-9.xlsb" on the tab 'Loads – Forecast' in cell D4.

[63] Using the 2019 IEPR forecast in "CED 2019 Managed Forecast - LSE and BA Tables Mid Demand - Mid AAEE Case CORRECTED Feb 2020," SCE calculated the line loss values using forms 1.1c and 1.5a. For SCE TAC, Pacific Gas and Electric Company TAC, San Diego Gas & Electric Company TAC, and CAISO, these line loss values are 6.90 percent, 9.08 percent, 8.20 percent, and 7.96 percent, respectively.

contract information, SCE has minimal CHP capacity in 2030. Accordingly, the 603 MW associated with a simple load allocation of the CHP is inaccurate. This difference potentially results in an approximately 0.11 MMT GHG emissions increase. Therefore, to ensure SCE's resource portfolios were conforming, SCE included additional resources to meet its GHG emissions benchmarks in the CSP Calculator. SCE recommends that future versions of the CSP Calculator allow LSEs to input the amounts of CHP in their portfolios to better reflect the expected portfolio GHG emissions.

d) Conclusion

SCE identified four areas – hourly load shape, renewable hourly shapes, line losses, and customizable CHP – where the CSP Calculator and assumptions could be improved to better estimate GHG emissions. The total GHG emissions impact of these improvements would be about 1.03 MMT of GHG emissions for SCE, which represents a significant portion of SCE's bundled 2030 GHG emissions benchmarks of 6.496 MMT (38 MMT) and 8.180 MMT (46 MMT) excluding BTM CHP GHG emissions. SCE was able to address about 0.68 MMT of the GHG emissions through permissible adjustments to the CSP Calculator. However, the remaining 0.35 MMT was essentially addressed by increasing resources to ensure SCE delivered IRP conforming portfolios.

D. Local Air Pollutant Minimization and Disadvantaged Communities

1. Local Air Pollutants

As shown in Table III-7 and Table III-8 below, SCE's bundled portfolios reduce criteria pollutants based on the CSP Calculator. In SCE's 46 MMT Preferred Conforming Portfolio, criteria pollutants decrease by an average of 9 percent in 2030. SCE's 38 MMT Preferred Conforming Portfolio provides more than double the reduction when compared to SCE's 46 MMT Preferred Conforming Portfolio with criteria pollutants reductions of about 21 percent on average in 2030. Ultimately, this can be directly linked to reduced reliance on natural gas generation.

Table III-7
38 MMT Preferred Conforming Portfolio Criteria Pollutants

38MMT	2020	2022	2026	2030
PM2.5 (T)	692	615	632	536
SO2 (T)	152	137	141	121
NOx (T)	1537	1391	1483	1245
PM2.5 - % Change from 2020		-11%	-9%	-23%
SO2 - % Change from 2020		-10%	-8%	-20%
NOx - % Change from 2020		-9%	-3%	-19%

Table III-8
46 MMT Preferred Conforming Portfolio Criteria Pollutants

46 MMT	2020	2022	2026	2030
PM2.5 (T)	690	615	647	628
SO2 (T)	152	138	143	132
NOx (T)	1532	1397	1510	1441
PM2.5 - % Change from 2020		-11%	-6%	-9%
SO2 - % Change from 2020		-9%	-6%	-13%
NOx - % Change from 2020		-9%	-1%	-6%

2. Focus on Disadvantaged Communities

Although the Commission's CSP Calculator methodology for estimating NOx, PM 2.5, and SO2 emissions does not provide sufficient granularity to specifically assess the amount of emissions reductions in disadvantaged communities ("DACs"), SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios reduce these emissions (along with GHG emissions), especially in SCE's 38 MMT Preferred Conforming Portfolio as shown in Sections III.C.1 and III.D.1. This will benefit both DACs and other communities throughout California. SCE also addresses its minimization of local air pollutants and GHG emissions, with early priority on DACs, in two ways: first, by examining the locations of proposed new resources and second, by highlighting how SCE's planned transportation electrification efforts will help to alleviate GHG emissions and air pollution in DACs. In addition, SCE provides information on DACs in its service area, including a description of the DACs it serves and the customers of in those DACs, existing and planned programs affecting DACs, and engagement with DACs.

a) SCE Preferred Conforming Portfolio Locational Information

The following maps shown in Figure III-7 and Figure III-8 provide a perspective on the quantity and location of the additional renewable resources needed to support SCE's Preferred Conforming Portfolios. SCE proposes no new natural gas generation as part of either of its Preferred Conforming Portfolios. All incremental resources are renewables and energy storage. Given SCE's service area contains over 900 census tracts designated as DACs,[64] spread across various counties, many of the new resources identified in SCE's Preferred Conforming Portfolios could be located in proximity to DACs.

SCE does not define specific locations for resources in its IRP, as project siting is managed by developers and it would not be prudent for SCE to define specific locations for projects based on system-wide or bundled portfolio modeling. As further discussed below, SCE currently gathers locational information and information regarding proximity to DACs for specific projects through the procurement process and evaluates these factors as part of the evaluation and selection process.

In the Fast Track of SCE's recent System Reliability Request for Offers ("RFO") to meet the D.19-11-016 procurement requirements for August 1, 2021 deliveries, two of the seven contracts for stand-alone energy storage projects or energy storage projects co-located with existing solar projects were for projects located in DACs.[65]

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[64] In the 2010 census, there were 8,057 census tracts in California. 2,007 of those census tracts are DACs.

[65] *See* SCE Advice 4218-E at 17-18.

Figure III-7
Location and Amount of the Additional Resources for SCE's 38 MMT Preferred Conforming Portfolio

Figure III-8
Location and Amount of the Additional Resources for SCE's 46 MMT Preferred Conforming Portfolio

b) **Transportation Electrification**

According to CARB, the transportation sector remains the "largest source of GHG emissions in the state."[66] CARB also found that when zero-emission vehicles are compared to diesel vehicles, "they are two to five times more energy efficient, reduce dependence on petroleum, and reduce GHG emissions substantially."[67] SCE's *Clean Power and Electrification Pathway* analysis determined that the optimal approach for feasibly and cost-effectively meeting California's 2030 GHG emissions goal includes at least 7 million electric vehicles by 2030 and

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[66] CARB, *California Greenhouse Gas Emissions for 2000 to 2017*, 2019 Edition, at 1, available at: https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ghg_inventory_trends_00-17.pdf.

[67] CARB, *Advanced Clean Trucks* factsheet, June 25, 2020, available at: https://ww2.arb.ca.gov/sites/default/files/2020-06/200625factsheet_ADA.pdf.

that transportation electrification can result in almost 60 MMT of GHG emissions reduction by 2030, which represents approximately one-third of the total GHG emissions reductions required (from 2015 levels) to achieve California's 2030 goal.[68] SCE's *Pathway 2045* analysis concludes economically meeting both California's 2030 and 2045 decarbonization goals will require three-quarters of light-duty vehicles, two-thirds of medium-duty vehicles, and one-third of heavy-duty vehicles to be electric by 2045.[69] This, in addition to deep electric sector decarbonization, will play a significant role in emissions reductions in DACs. Electrification of the transportation sector will also greatly improve local air quality – an urgent community need across California and particularly in Southern California. Many communities, particularly DACs, are situated near heavily traveled freight corridors, where the concentration of air pollutants often exceeds health-based standards.[70]

The California Legislature in Public Utilities Code Section 740.12(a)(1) rightly established that "[a]dvanced clean vehicles and fuels are needed to reduce petroleum use, to meet air quality standards, to improve public health, and to achieve greenhouse gas emission reduction goals," and that widespread transportation electrification "requires electrical corporations to increase access to the use of electricity as a transportation fuel."[71] Accordingly, the Commission authorized utility transportation electrification programs, including SCE's (1) Charge Ready light-duty electric vehicle charging infrastructure pilot and bridge programs, which are expected to result in the installation of over 2,700 light-duty electric vehicle charge ports at approximately 150 sites, and (2) Charge Ready Transport Program, which is authorized to achieve a minimum of 870 sites with 8,490 electric vehicles procured or converted.[72] On August 27, 2020, the

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[68] *See* SCE, *The Clean Power and Electrification Pathway* white paper, November 2017, at 6-8, available at: https://www.edison.com/home/our-perspective/pathway-2045.html.

[69] *See* Appendix A at 9-10.

[70] Electrification in areas such as the I-710 corridor between Long Beach and Los Angeles promotes environmental justice by ensuring that climate investments provide near-term air quality benefits to a broad set of communities.

[71] Cal. Pub. Util. Code § 740.12(a)(1)(A), (E).

[72] Data as of July 2020. SCE's Charge Ready Transport has 62 sites in process servicing 1,446 vehicles.

Commission unanimously approved SCE's Charge Ready 2 program, which will support the installation of approximately 40,000 light-duty electric vehicle chargers (through make-ready installations and new construction rebates).

In order to support the number of electric vehicles needed to achieve the state's 2030 and 2045 decarbonization goals, California will need to support significant away-from-home charging infrastructure and charging infrastructure at multi-unit dwellings. California will also need to support transportation electrification within the medium- and heavy-duty sectors, as CARB's Innovative Clean Transit[73] and Advanced Clean Trucks[74] regulations take steps to transition California's medium- and heavy-duty fleets to zero emission everywhere feasible. Reaching the level of electric vehicles needed to meet California's GHG goals translates to approximately 2.7 million light-duty electric vehicles, as well as additional medium- and heavy-duty electric vehicles, in SCE's service area.[75] This will require commensurate increases in charging infrastructure, including in DACs. As noted above, SCE is already working toward enabling this level of adoption within its service area. More information regarding SCE's transportation electrification-related programs benefitting DACs is included in Section III.D.2.c.1.a below.

By increasing electric vehicle adoption, SCE's transportation electrification programs help improve local air quality and reduce GHG emissions broadly. For example, the medium- and heavy-duty vehicle segments represent the majority of NOx and PM2.5 emissions in the on-road mobile category, and light-duty vehicles account for one-third of the NOx emissions and

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[73] *See* CARB Innovative Clean Transit Regulation, available at: https://ww2.arb.ca.gov/sites/default/files/2019-10/ictfro-Clean-Final_0.pdf.

[74] *See* CARB Advanced Clean Trucks Regulation, Resolution 20-19, June 25, 2020, at 10, available at: https://ww3.arb.ca.gov/regact/2019/act2019/finalres20-19.pdf.

[75] SCE's Preferred Conforming Portfolios, which are based on the CEC's IEPR 2019 mid-case, assume 1.1 million light-duty electric vehicles for SCE's service area. *See* CEC Transportation Energy Forecasting Unit, *Regional Light-Duty Electric Vehicle Forecast* presentation, November 14, 2019, at 12, available at: https://www.energy.ca.gov/sites/default/files/2019-12/02%20Palmere_CEC_11.14.19%20DAWG%20Presentation_ada.pdf.

over 40 percent of PM2.5.[76] Based on SCE's vehicle forecast, SCE estimates that over 20 MMT of GHG, over 17,000 cumulative tons of NOx, and over 51,000 cumulative tons of VOCs could be reduced through 2030 statewide from electric conversion in the transportation sector.[77]

For future IRP cycles, the IRP process needs an economy-wide perspective to put the electricity sector on an appropriate path to meet California's SB 32 goal for GHG reduction by 2030, SB 100 goal for zero-carbon resources by 2045, and Executive Order B-55-18 goal of carbon neutrality by 2045. Consideration of the relationship of the electricity sector to other GHG-emitting sectors, including transportation, is an important part of ensuring that California moves in a cohesive manner towards decarbonizing the state. Each economic sector cannot be viewed in isolation. One important step to achieve this goal is for the Commission to coordinate with the CEC to ensure the IEPR includes holistic scenarios with combined assumptions for transportation electrification (and building electrification) that are consistent with a feasible and affordable approach to achieving California's GHG reduction and decarbonization goals on an economy-wide basis.

c) **DACs in SCE's Service Area**

The Commission has rightly recognized that in order to put an early priority on emissions reductions in DACs, LSEs must identify the DACs they serve and evaluate the current and planned programs that work to support clean energy access and equity in these communities. SCE has identified the DACs in its service area based on the criteria established by the

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[76] Light-duty vehicle subcategories included in calculation: light-duty passenger vehicles, light-duty trucks 1, light-duty trucks 2, light-heavy-duty diesel trucks 1, light-heavy-duty diesel trucks 2, light-heavy-duty gas trucks 1 and light-heavy-duty gas trucks 2. *See* CARB, *Statewide 2012 Estimated Annual Average Emissions*, available at: https://www.arb.ca.gov/app/emsinv/2017/emssumcat_query.php?F_YR=2012&F_DIV=-4&F_SEASON=A&SP=SIP105ADJ&F_AREA=CA.

[77] *See Amended Prepared Testimony in Support of Southern California Edison Company's Application for Approval of its Charge Ready 2 Infrastructure and Market Education Programs*, Application ("A.") 18-06-015, November 15, 2018, at 71.

Commission.[78] The following provides a general description of the DACs served by SCE, and SCE customers served in DACs.[79] More detailed information, including the natural gas generation plants in these communities and information on community engagement, is included in Appendix C.

Of the state's population living in DACs, 47 percent reside in SCE's service area. In SCE's service area, approximately 39 percent of SCE's residential households are in DACs and/or have subsidized rates. The majority of the DACs in SCE's service area are clustered along major transportation routes, where the emissions from internal-combustion engines significantly affect the areas. This includes communities such as South Los Angeles, San Bernardino, and San Joaquin Valley.

There are 901 census tracts in SCE's service area that are designated as DACs. The key demographics for each census tract are available, but due to the dense urban nature of many of them, aggregating to the county subdivision makes sense for the majority of them. Where the DAC-designated census tracts are a significant minority of the census tracts in the subdivision, SCE recommends a more granular approach. To arrive at the number of DACs and county subdivisions used for the DAC demographic descriptions, SCE used ArcGIS to evaluate layered data from the CalEnviroScreen 3.0, SCE's system geolocation data, and the ArcGIS layer for county subdivision boundaries. The use of these data layers in ArcGIS resulted in identifying 51 county subdivisions with designated DACs in SCE's service area. Some of the in-area designations come from closely shared borders with other LSEs, even if the geographic region at these over-laid geographic regions may not actually include customers or facilities. However, SCE chose to include these DACs and county subdivisions in its description of the demographics of the county subdivisions in Appendix C.

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[78] The Commission defined a DAC as any census tract scoring in the top 25 percent of impacted census tracts on a statewide basis or within the top 5 percent of census tracts without an overall score but with the highest pollution burden, using the CalEnviroScreen tool. *See* D.18-02-018 at OP 6.

[79] Data provided within this section is from CalEnviroScreen 3.0. The data may be accessed at: https://oehha.ca.gov/media/downloads/calenviroscreen/document/ces3results.xlsx.

(1) Current and Planned Programs and Activities Impacting DACs

The following information provides a summary of current and planned SCE programs and activities that impact DACs or contribute to economic development within DACs.

(a) Customer Programs

SCE implements and manages a diverse portfolio of energy products, programs and services for its customers to help in energy efficiency, electric vehicles, and renewable energy adoption. While these programs are offered to customers throughout SCE's service area, there may be some programs in which greater marketing and outreach to DACs may occur.

These programs include the following residential tariffs.

Tariff Type	Tariff Offering
Standard	• Tiered • Time-of-Use • Green
Discounted (based on income qualifications or participation in select public assistance programs)	• California Alternate Rates for Energy ("CARE") • Family Electric Rate Assistance
Baseline Allowance	• Medical Baseline • All-Electric Baseline

SCE also offers the following energy management programs.

Program	Details
Energy Savings Assistance Program	• No cost energy-efficient appliance replacement for eligible customers, based on income qualifications or participation in select public assistance programs
Comprehensive Manufactured Home Program	• No cost energy upgrades for qualifying mobile homes and mobile-home communities
Home Energy Efficiency Rebates	• Rebates to offset purchase of energy-efficient products such as: home area network, smart thermostat, electric portable power stations, and HVAC heat pumps • Eligible products are researchable at the SCE Marketplace
Summer Discount Plan	• Bill credits for allowing SCE to temporarily cycle central A/C during energy events
Home Energy Advisor	• Free online survey, providing customized tips for reducing energy usage
San Joaquin Disadvantaged Communities Pilot Projects	• Currently underway, this pilot program will replace propane or wood burning appliances with electric appliances and limited weatherization treatments to reduce overall energy costs and improve the health, safety and air quality of participating residents in three DACs in the San Joaquin Valley: West Goshen, Ducor, and California City
Smart Energy Program	• Bill credits to residential customers with qualifying smart thermostats in return for participation in energy events • Includes one-time bill credit for program sign-up and offers a recycling rebate for old thermostats

SCE has proposed the following pilots targeting customers in DACs in the 2021-26 Energy Savings Assistance Program Application (A.19-11-004):

Pilot	Details
Building Electrification ("BE") Enhanced Retrofit Pilot	• Provides heat pumps for space conditioning and water heating for high usage customers
Single-family BE Retrofit Pilot	• Provides heat pumps for space conditioning and water heating, and electrical panel upgrades, if applicable, to low income customers
New Construction Clean Energy Homes Pilot	• Provides all-electric support and incentives for builders/developers of low income housing. Also provides technical design assistance, incentives based on GHG savings, and education and outreach for tenants

SCE offers the following programs facilitating transportation electrification for its residential customers.

Program	Details
Clean Fuel Reward Program	• Mail-in rebate for the purchase or lease of a new or used electric vehicle
Charge Ready Home Installation Rebate	• One-year pilot concluded on May 31, 2019. Program provided 2,670 rebate checks to offset cost of permit and electrician fees when installing a home charging station

In addition to rebates for residential customers driving electric vehicles, SCE is engaged in a number of transportation electrification infrastructure projects. This is of particular importance to DACs that fall along the goods movement corridors at the seaports, the I-710, and Inland Empire goods movement and storage areas. These projects include:

- **Charge Ready Light-Duty Pilot and Bridge Funding:** As of June 30, 2020, SCE's Charge Ready Pilot has installed 1,240 charging ports at 79 sites, out of the planned 1,301 charging ports at 81 sites. Of the 1,301 committed charge ports, 628 charge ports (48 percent) are in DACs. Additionally, SCE's Bridge Funding program (which extends the Charge Ready Pilot) has installed 598 charging ports at 28 customer sites out of the projected 1,454 ports at 67 sites. Of the 1,454 committed charge ports, 664 charge ports (46 percent) are in DACs.

  - On August 27, 2020, the Commission voted to approve SCE's Charge Ready 2, which will support approximately 40,000 new light-duty electric vehicle charging ports (includes make-ready installations and new construction rebates), of which 50 percent would be installed within DACs.[80]

- **Charge Ready Transit Bus:** In this completed pilot, SCE worked with government transit agencies to support three transit agencies electrifying their fleets. A total of 30 new ports were installed. The pilot focused on agencies with routes that traversed through DACs.
- **Port Electrification:** These projects are providing infrastructure to electrify yard tractors and rubber tire gantry cranes to reduce emissions in heavily impacted DAC areas near the Port of Long Beach.
- **DC Fast Charge ("DCFC") Pilot:** SCE deployed electric infrastructure to support five DCFC sites, with a total of 14 DCFC ports installed and accessible to all drivers. All sites are located within 1.5 miles of a DAC and are near multi-family housing.
- **Charge Ready Transport:** SCE will install infrastructure for at least 870 customer sites by 2024 to support a minimum of 8,490 medium- and heavy-duty electric vehicles.
  - A minimum of 40 percent of the infrastructure budget results in installations in disadvantaged communities in SCE's service territory.
  - At least 25 percent of the program's infrastructure budget will be dedicated to vehicles operating at seaports and warehouses in SCE's service area, which are in heavily impacted DAC areas.

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[80] *See Application of Southern California Edison Company (U 338-E) for Approval of its Charge Ready 2 Infrastructure and Market Education Programs*, A.18-06-015, June 26, 2018.

- In addition to the infrastructure, eligible participants in DACs will receive a rebate for as much as half of the cost of the electric vehicle charging stations.

In addition, SCE offers the following renewable energy programs.

Program	Details
Multi-family Affordable Solar Homes	• For multifamily building owners to offset the cost of installing a new solar energy system for common areas and/or to reduce energy costs for low-income tenants
Solar for Affordable Housing ("SASH")	• Administered by Grid Alternatives for the Commission, provides incentives to qualified low-income homeowners to help offset the costs of a solar electric system • Solar + Storage Pilot for Low-Income Housing and Subsidized Green Rate for CARE customers • Provides a flexible, transparent structure that supports the proliferation of solar in DACs
DAC-SASH[81]	• Modeled after existing SASH program • Available to low-income customers who are resident-owners of single-family homes in DACs • Provides up-front financial incentives towards the installation of solar generating systems on homes of low-income customers
DAC-Green Tariff[82]	• Modeled after the Green Tariff portion of the Green Tariff Shared Renewables program • Will be available to customers who live in a DAC and meet the income eligibility requirements for CARE or Family Electric Rate Assistance Program • Provides a 20 percent rate discount compared to the customer's otherwise applicable tariff

81 *See* D.18-06-027 at 2-3.

82 *See id.* at 3.

Community Solar Green Tariff[83]	• Modeled after the Shared Renewables, or Community Renewables, portion of the Green Tariff Shared Renewables program, structured similarly to the DAC-Green Tariff • Will be primarily available to low-income customers in DACs to enable them to benefit from the development of solar generation projects located in their own or nearby DACs
Self-Generation Incentive Program	• Rebates to customers who install qualifying types of distributed generation to meet all or a portion of their own energy needs • Beginning in April 2020, customers living in low-income or DACs or in high fire risk areas are now eligible for increased equity resiliency incentives to offset most of the cost to install an energy storage system

(b) Economic Development

SCE has long been committed to developing and maintaining working partnerships with diverse suppliers (Women, Minority, and Service Disabled Veteran) and LGBT (Lesbian, Gay, Bisexual and Transgender) business enterprises. In 2020, SCE is providing direct and in-kind support of over $1.3 million to 57 diverse organizations for membership and sponsorship. This funding includes organization memberships, conferences, custom programs, and workshops. The organizations represent a broad spectrum of community interests and serve DACs throughout SCE's service area.

(c) Ongoing Community Outreach

SCE works closely with community-based organizations ("CBOs"), as well as leaders from key customer segments, to increase awareness about safety, promote programs and services, hear feedback, and align on common goals. SCE's outreach efforts related to impacted communities and DACs are described below.

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[83] *See id.* at 3-4.

(i) **<u>Clean Energy Access Working Group</u>**

SCE has partnered with The Greenlining Institute ("Greenlining") to form the Clean Energy Access Working Group ("CEAWG"). The joint aim is to develop community-centric solutions for air quality and climate change issues. This partnership is a major step toward direct engagement on clean energy access, air quality, and climate change issues in Southern California. Greenlining facilitates a collaborative conversation between SCE and 49 members from nearly 30 organizations representing environmental advocacy organizations, community-based organizations, clean tech companies, solar developers, electric vehicle advocates, environmental justice organizations, faith-based organizations, and academia. Working together, the parties can craft and support state and local policies and programs to improve air quality for environmentally impacted communities and bring clean energy technology investment, clean energy jobs, and job training to communities.

In 2019, the CEAWG started working on an early-stage community solar project in Willowbrook, California to provide underserved community members access to locally produced solar energy that could provide free electric vehicle charging, fund workforce training and job creation programs, provide for clean energy and efficiency education, or lower customer bills. Greenlining worked with SCE to hold two separate tours of the site, one for CEAWG members and one for the Commission's Low Income Oversight Board ("LIOB") members. The tours provided an opportunity for CEAWG and LIOB members to discuss the benefits this project will offer Willowbrook.

In 2020, Edison International, SCE's parent organization, will be providing grant funding to CEAWG members or their recommended 501(c)(3) organizations to allow local groups to plan and execute a community-developed project with local clean energy benefits. The proposed projects may include clean energy, energy efficiency, air quality improvements, climate resiliency, climate adaptation efforts, wildfire prevention, or Public Service Power Shutoff preparation efforts.

(ii) Valley Clean Air Now

SCE has partnered with Valley Clean Air Now ("Valley CAN"), administrator of a scrap-and-trade program in the San Joaquin Valley, where several DACs are located. Valley CAN is a nonprofit organization committed to improving air quality in the San Joaquin Valley, home of many high-polluting, older, and unregistered cars that do not meet state emissions standards. SCE serves on the Valley CAN board where it supports Tune In & Tune Up, Valley CAN's smog repair program. Tune In & Tune Up events are held throughout the year to give residents a free emissions test to determine whether their vehicle qualify for free repairs at a local STAR-certified smog shop. As part of this program, Charge Across Town has partnered with Valley CAN to provide electric vehicle test drives as part of Tune In & Tune Up events in the event that residents would like to trade in their older polluting vehicles for a new or used plug-in electric vehicle in lieu of performing expensive smog repairs as part of the San Joaquin Air Pollution Control District's DriveClean! Vehicle replacement program. Edison International, SCE's parent organization, also supports ValleyCAN's Community Clean Car Clinics, where residents can bring in their paperwork to determine if they qualify for the DriveClean! Incentives and receive assistance with their application.

(iii) emPOWER Program

EmPOWER uses CBOs as one-stop-shop marketers for clean energy programs in underserved communities in Los Angeles County. Edison International, SCE's parent organization, was the original funder and remains the principal corporate partner in developing the program, along with Liberty Hill (the regional program administrator) and Valley CAN. EmPOWER currently supports nine CBOs working in more than 15 communities. In 2019, the program successfully reached 11,000 low income households with over 90 percent of households located in a state-identified DAC or low-income community census tract, and 62 percent of these households falling locations in the top 10 DAC percentile range. SCE programs presented to customers include bill savings, home efficiency upgrades, solar, and electric vehicle rebates.

The first full year of the program recently received a favorable review in the UCLA Luskin Center report, "*emPOWER - A Scalable Model for Improving Community Access to Environmental Benefit Programs in California*." On average, each household was eligible for nine offered programs from multiple providers.

(iv) **Advisory Panels**

SCE has also convened several advisory panels as part of an ongoing effort to facilitate dialogue and build relationships in order to understand key issues important to stakeholders. The forums provide a sounding board for prospective company initiatives and policies and bring greater awareness of SCE's positions on current issues. SCE works to ensure DAC interests are represented on advisory panels. For example, the Consumer Advisory Panel has board members representing all regions of SCE's service area, including those with a special interest in low-income and minority communities, rural communities, Native American communities, and faith-based organizations. SCE's advisory panels include:

- Consumer Advisory Panel
- Government Advisory Panel
- Business Advisory Panel
- Small Business Advisory Panel
- California Large Energy Consumer Association Advisory Panel
- California Manufacturers & Technology Association Advisory Panel
- Transportation Electrification Advisory Board (also known as the Program Advisory Council)

E. **Cost and Rate Analysis**

In this section, SCE discusses the forecasted revenue requirements and system average rates for SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios, as well as a baseline scenario for comparison. The modest rate increases for SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios are driven in part by the inclusion of cost-competitive clean energy and energy storage resources that support renewable integration and other grid needs. Specifically, SCE's 38 MMT Preferred Conforming Portfolio includes 84 percent carbon-free generation in 2030, and SCE's 46 MMT Preferred Conforming Portfolio includes 78 percent carbon-free generation in 2030.

SCE's Baseline scenario uses the same cost assumptions as the 38 MMT and 46 MMT Preferred Conforming Portfolios but excludes all generic resource additions. The Baseline scenario represents SCE's fuel and purchased power expenditures based on the current resources it has under contract or expects to contract with through 2030. The Baseline scenario does not include new build generic resources that SCE needs to meet reliability or GHG goals as required by the Narrative Template.[84] Additionally, the Baseline scenario assumes that load and RA needs are to be met through generic RA and market purchases in lieu of building or contracting for energy storage and renewable resources. The Baseline scenario is not a viable planning scenario because it does not build the new resources needed to meet system reliability and GHG reduction requirements.

SCE used RESOLVE's resource costs for the new resources needed to develop its 38 MMT and 46 MMT Preferred Conforming Portfolios. To calculate the total portfolio revenue requirements and system average bundled rates shown in Table III-9, Table III-10, and Table III-11 below, SCE's cost and rate forecast begins with the expected revenue and rates that will be implemented on October 1, 2020 based on approved filings. The 2020 revenue and rates are based on the 2018 General Rate Case ("GRC") (2020 attrition year) and the 2020 Energy Resource Recovery Account ("ERRA") Forecast application, which also approves the total retail and bundled sales forecast that SCE uses to implement rates. For 2021 through 2030, forecasted costs associated with all pending applications before the Commission are included in this revenue forecast, as are forecasted costs for all approved proceedings. More specifically, the

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84 *See Narrative Template,* June 15, 2020, at 8.

revenue forecast is based on SCE's 2021 GRC[85] through attrition year 2023 with an assumed 3 percent inflation increase in years 2024 through 2030.

The revenue and rate forecasts for 2021 through 2030 use load and fuel and purchased power expenditure forecasts developed in 2020, while the revenue and rates for 2020 were developed in 2019.[86] Therefore, there are differences in the 2020 and 2021 through 2030 revenue requirements and rates based on this difference in assumptions. Moreover, in 2021, SCE is planning to implement several under-collections of wildfire costs related to events in 2017 and 2018, which are one time only, as well as ERRA and base revenue balancing account under-collections that are also expected to be one-time collections. For these reasons, 2021 has higher rates and is considered an outlier in terms of future rates. Some of the revenue requirements assumed to be implemented in 2021 will likely be delayed until future years, but at the time of this IRP filing, these assumptions represent SCE's filed requests with the Commission.

Beginning in 2021, and most relevant to bundled generation rates, SCE's revenue and rate forecast assumes approval of its 2021 ERRA Forecast application, which includes departing load rates in the generation rate component. Allocation of the PCIA revenue contribution to bundled generation revenue from departing load customers is accounted for in the bundled generation rate. Although this assumption from the 2021 ERRA Forecast filing is utilized, all scenarios incorporate fuel and purchased power expenditures consistent with the scenarios presented in this filing. The fuel and purchased power expenditures associated with New System Generation rates are included in the cost category labeled "Other."

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[85] *See 2021 General Rate Case Amended Update Testimony (Exhibit SCE-52, A2)*, A.19-08-013, August 19, 2020. Functional balancing account revenue requirements are not included in the forecast revenues for 2022 and beyond.

[86] The 2021 to 2030 revenue and rate forecast uses SCE's bundled load forecast as provided in the *Administrative Law Judge's Ruling Correcting April 15, 2020 Ruling Finalizing Load Forecasts and Greenhouse Gas Benchmarks for Individual 2020 Integrated Resource Plan Filings*, dated May 20, 2020, while the 2020 revenue and rates are based on SCE's internal load forecast.

Finally, within the delivery rate, SCE assumes Federal Energy Regulatory Commission ("FERC") revenue is based on the approved 2020 FERC formula rate with an assumed long run inflation of 2 percent from 2021 through 2030. The forecast includes all revenue associated with SCE's transportation electrification programs, including Charge Ready 1 Pilot, Charge Ready Bridge extension, and Charge Ready 2 proposed decision,[87] as well as already approved Transportation Electrification Priority Review Pilots and Standard Review Programs. Additionally, the forecast assumes all requested wildfire related applications, which are driving the 2021 one time increases discussed above, including GRC Track 2, Wildfire Emergency Memorandum Account, Catastrophic Event Memorandum Account, Grid Safety and Reliability Program, Assembly Bill 1054 Securitization, and the Wildfire Fund Charge, which is an extension of the existing Department of Water Resources bond charge that funds SCE's wildfire costs above existing recovery levels.

Financial assumptions underlying the revenue forecast include: asset lives of 65 years for distribution substation equipment, 33 to 59 years for distribution poles and lines, 20 years for meters, 45 years for transmission station equipment, 61 to 65 years for transmission lines and towers, and 50 years for general building; capitalization of eligible operation and maintenance ("O&M") expenses at 50 percent for pension and benefits and 28 percent for administrative and general; cost escalation and inflation rates (~2 to 3 percent); labor loaders of 41 percent; a weighted average cost of capital of 7.68 percent; federal income taxes at 21 percent; state income taxes at 8.84 percent; and other tax related assumptions such as bonus depreciation and tax repair eligibility that were in place at the time of SCE's 2021 GRC Application.

The estimated 2030 system average rate is 18.27 cents[88] per kilowatt-hour ("kWh") for the 38 MMT Preferred Conforming Portfolio, a 0.6 percent increase over the 18.17 cents per

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[87] A.18-06-015, Proposed Decision of Administrative Law Judge Goldberg, issued on July 27, 2020. On August 27, 2020, Administrative Law Judge Goldberg issued Revision 1 with slightly lower costs, but this occurred after the analysis presented here was prepared. The change is immaterial to the rate analysis.

[88] System average rates are presented in 2019 dollars.

kWh for the 46 MMT Preferred Conforming Portfolio, and a 2.3 percent increase over the 17.85 cents per kWh for the Baseline scenario portfolio. These are relatively small increases between the 2030 system average rates of the portfolios and shows that the 38 MMT Preferred Conforming Portfolio is an affordable plan for SCE's customers. Further, because SCE and other LSEs will need to reach these lower GHG targets as they move towards achieving the required clean energy goals of SB 100, these costs and rates should be seen as the minimum of what is needed by 2030. The 38 MMT Preferred Conforming Portfolio puts SCE on a more stable path to reach the long-term decarbonization goals adopted by the state.

An additional observation regarding the revenue requirements analysis for both SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios is that there are decreasing generation revenue requirements, on a 2019 dollar basis, through 2030 in both scenarios. A key driver of this result is the uncertainty in RA costs for existing market resources in the future, including the highly uncertain costs to keep natural gas generation units in the system despite the significant decreases in net costs of new entry for new system capacity, which are typically energy storage resources as SCE's modeling and the Commission's RSP have found. SCE used its internal assumptions on future net costs of new entry capacity for 4-hour energy storage systems to estimate the costs for market RA in the future. If, however, the current relatively high market costs for RA are representative of future costs to maintain system resources, that would lead to increases in SCE's generation revenue requirements and system average rates through 2030. This upward pressure in revenue requirements and rates would be present in all portfolios – the Baseline scenario portfolio and the 38 MMT and 46 MMT Preferred Conforming Portfolios – but the relatively minor cost difference between the 38 MMT and 46 MMT Preferred Conforming Portfolios would remain consistent with the findings above. SCE recommends that in future IRP cycles, as part of the inputs and assumptions, the Commission provide LSEs an assumed RA capacity price forecast that can be applied consistently across LSEs' IRPs.

Table III-9
Revenue Requirements and System Average Bundled Rates for SCE's Baseline
(in million 2019 dollars, unless otherwise noted)

Line No.	Category	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	*Distribution*	4,501	7,884	6,336	6,650	6,703	6,757	6,806	6,862	6,919	6,966	7,026
2	*Transmission*	1,209	1,056	935	934	933	933	932	931	930	930	929
3	*Generation*	4,526	4,352	4,079	4,029	3,743	3,698	3,709	3,738	3,585	3,576	3,555
4	*Demand Side Programs*	366	396	226	219	155	151	145	137	133	126	116
5	*Other*	1,153	1,301	1,316	1,168	1,050	1,065	1,064	1,049	1,036	1,018	1,008
6 (sum lines 1-5)	*Baseline Revenue Requirement*	11,755	14,989	12,892	13,000	12,585	12,604	12,655	12,718	12,604	12,616	12,634
7	*System Sales (GWh)*	80,234	78,490	78,417	78,752	78,841	78,966	79,079	79,257	79,557	79,882	80,219
8	*Bundled Sales (GWh)*	[redacted]	54,701	52,831	53,125	53,331	53,308	53,404	53,559	53,956	54,100	54,393
9	*System Average Delivery Rate (¢/kWh)*	9.01	13.55	11.24	11.39	11.21	11.28	11.31	11.33	11.34	11.32	11.32
10	*Bundled Generation Rate (¢/kWh)*	8.30	7.96	7.72	7.58	7.02	6.94	6.94	6.98	6.64	6.61	6.54
11	*System Average Bundled Rate (¢/kWh)*	17.31	21.51	18.96	18.98	18.23	18.22	18.26	18.31	17.98	17.93	17.85

Table III-10
Revenue Requirements and System Average Bundled Rates for SCE's 38 MMT Preferred Conforming Portfolio (in million 2019 dollars, unless otherwise noted)

Line No.	Category	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	*Distribution*	4,501	7,884	6,336	6,650	6,703	6,757	6,806	6,862	6,919	6,966	7,026
2	*Transmission*	1,209	1,056	935	934	933	933	932	931	930	930	929
3	*Generation*	4,526	4,352	4,079	4,029	3,707	3,614	3,641	3,725	3,618	3,648	3,673
4	*Demand Side Programs*	366	396	226	219	155	151	145	137	133	126	116
5	*Other*	1,153	1,301	1,316	1,168	1,095	1,191	1,200	1,189	1,186	1,174	1,166
6 (sum lines 1-5)	*38 mmt Revenue Requirement*	11,755	14,989	12,892	13,000	12,593	12,646	12,723	12,845	12,786	12,845	12,910
7	*System Sales (GWh)*	80,234	78,490	78,417	78,752	78,841	78,966	79,079	79,257	79,557	79,882	80,219
8	*Bundled Sales (GWh)*	[redacted]	54,701	52,831	53,125	53,331	53,308	53,404	53,559	53,956	54,100	54,393
9	*System Average Delivery Rate (¢/kWh)*	9.01	13.55	11.24	11.39	11.27	11.44	11.49	11.51	11.52	11.51	11.51
10	*Bundled Generation Rate (¢/kWh)*	8.30	7.96	7.72	7.58	6.95	6.78	6.82	6.96	6.71	6.74	6.75
11	*System Average Bundled Rate (¢/kWh)*	17.31	21.51	18.96	18.98	18.22	18.22	18.30	18.46	18.23	18.26	18.27

Table III-11
Revenue Requirements and System Average Bundled Rates for SCE's 46 MMT Preferred Conforming Portfolio (million 2019 dollars, unless otherwise noted)

Line No.	Category	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	*Distribution*	4,501	7,884	6,336	6,650	6,703	6,757	6,806	6,862	6,919	6,966	7,026
2	*Transmission*	1,209	1,056	935	934	933	933	932	931	930	930	929
3	*Generation*	4,526	4,352	4,079	4,029	3,707	3,614	3,628	3,665	3,537	3,571	3,613
4	*Demand Side Programs*	366	396	226	219	155	151	145	137	133	126	116
5	*Other*	1,153	1,301	1,316	1,168	1,095	1,191	1,200	1,189	1,186	1,174	1,174
6 (sum lines 1-5)	*46 mmt Revenue Requirement*	11,755	14,989	12,892	13,000	12,593	12,646	12,710	12,785	12,705	12,768	12,858
7	*System Sales (GWh)*	80,234	78,490	78,417	78,752	78,841	78,966	79,079	79,257	79,557	79,882	80,219
8	*Bundled Sales (GWh)*	[redacted]	54,701	52,831	53,125	53,331	53,308	53,404	53,559	53,956	54,100	54,393
9	*System Average Delivery Rate (¢/kWh)*	9.01	13.55	11.24	11.39	11.27	11.44	11.49	11.51	11.52	11.51	11.52
10	*Bundled Generation Rate (¢/kWh)*	8.30	7.96	7.72	7.58	6.95	6.78	6.79	6.84	6.55	6.60	6.64
11	*System Average Bundled Rate (¢/kWh)*	17.31	21.51	18.96	18.98	18.22	18.22	18.28	18.35	18.08	18.11	18.17

F. System Reliability Analysis

As previously discussed, SCE developed a 38 MMT CAISO System-Wide Portfolio that is reliable and operable. SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios also contribute SCE's fair share to system reliability and renewables integration. Below, SCE provides the System Reliability Progress Tracking Table results for its 38 MMT and 46 MMT Preferred Conforming Portfolios.

Additionally, as discussed in Sections I.B, III.A.1-III.A.3, and IV.B.1, both SCE's 38 MMT CAISO-System Wide Portfolio and SCE's Preferred Conforming Portfolios show a need for additional system capacity to maintain system reliability in the 2024 to 2026 timeframe. SCE urges the Commission to act expeditiously to require procurement by all LSEs to meet such need, and to mandate procurement to address the 2024 need by no later than the first quarter of 2021.

The substantial energy storage resources added through SCE's 38 MMT CAISO System-Wide Portfolio and supported by SCE's Preferred Conforming Portfolios provide significant energy storage capacity to convert non-dispatchable and intermittent renewables into dispatchable resources to enhance CAISO system dispatchability and reliability. This is confirmed through SCE's reliability analysis on its CAISO system-wide portfolio discussed in Section III.A.1, which indicates that the loss-of-load hours occur during the summer and between HE18 and HE20. There were no discernable additional loss-of-load events that indicated a need for more ramping resources beyond those already in the baseline and added by the model, suggesting that the energy storage resources and natural gas generation in the system can effectively integrate the renewables needed to reach the 38 MMT GHG target.

Furthermore, the analysis required by the Commission in the System Reliability Progress Tracking Table is not sufficient to signal to LSEs whether their portfolios are adequately contributing to system reliability. Although system reliability will ultimately be tested when the Commission aggregates LSEs' IRPs into a PSP, LSEs need to know before they file their IRPs whether their portfolios are likely making a sufficient contribution to system reliability.
In addition, the Commission needs a clear and actionable standard to judge whether each LSE's portfolio is contributing a fair share of resources to meeting the system's reliability needs.
To address this issue, SCE has included a proposed reliability methodology to more accurately capture the system reliability contributions of LSEs' resource portfolios for use in the aggregation of LSEs' plans and future IRP cycles.

1. System Reliability Progress Tracking Table Results

The following Table III-12 and Table III-13 include the System Reliability Progress Tracking Table from the RDTs for SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios.

Table III-12
SCE's 38 MMT Preferred Conforming Portfolio System Reliability Progress Tracking Table

System Reliability Progress Tracking Table (NQC MW) for month of September by contract status, 38 MMT	ELCC type	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
online	wind_low_cf	348	348	337	334	334	334	334	334	334	327	327
online	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
online	biomass	69	55	50	34	25	25	25	18	-	-	-
online	cogen	414	254	56	40	40	23	17	5	1	1	1
online	geothermal	183	59	59	59	59	59	59	59	51	51	51
online	hydro	827	824	824	824	824	824	824	824	824	824	824
online	thermal	9,513	4,841	4,836	3,619	2,174	2,174	2,174	2,174	2,174	2,174	2,174
online	battery	44	44	44	44	44	44	44	3	3	3	3
online	nuclear	-	-	-	-	-	-	-	-	-	-	-
online	solar	662	652	652	652	652	652	648	648	648	648	648
online	psh	199	199	199	199	199	199	199	199	199	199	199
online	unknown	4,799	2,265	2,242	2,210	2,161	2,162	2,127	2,128	2,124	2,108	2,098
development	wind_low_cf	-	-	-	-	-	-	-	-	-	-	-
development	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
development	biomass	-	44	44	44	44	44	44	44	44	44	44
development	cogen	-	-	-	-	-	-	-	-	-	-	-
development	geothermal	-	-	-	-	-	-	-	-	-	-	-
development	hydro	-	-	-	-	-	-	-	-	-	-	-
development	thermal	-	-	-	-	-	-	-	-	-	-	-
development	battery	6	251	261	261	260	260	260	256	252	246	241
development	nuclear	-	-	-	-	-	-	-	-	-	-	-
development	solar	-	-	-	-	-	-	-	-	-	-	-
development	psh	-	-	-	-	-	-	-	-	-	-	-
development	unknown	4	19	19	19	19	4	4	4	4	4	4
review	wind_low_cf	-	(3)	-	-	-	-	-	-	-	-	-
review	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
review	biomass	-	(14)	-	-	-	-	-	-	-	-	-
review	cogen	-	27	10	10	10	10	10	10	10	10	10
review	geothermal	-	-	-	-	-	-	-	-	-	-	-
review	hydro	-	-	-	-	-	-	-	-	-	-	-
review	thermal	-	3,773	3,322	2,912	-	-	-	-	-	-	-
review	battery	-	137	137	137	137	137	137	134	132	130	127
review	nuclear	-	-	-	-	-	-	-	-	-	-	-
review	solar	-	-	-	-	-	-	-	-	-	-	-
review	psh	-	-	-	-	-	-	-	-	-	-	-
review	unknown	-	881	796	2,156	2,256	486	486	486	486	486	486
planned_existing	wind_low_cf	-	-	67	87	87	87	90	90	90	135	135
planned_existing	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
planned_existing	biomass	-	-	-	-	-	-	-	23	48	48	48
planned_existing	cogen	-	-	-	-	-	-	-	-	-	-	-
planned_existing	geothermal	-	-	-	37	37	37	73	319	369	369	369
planned_existing	hydro	-	-	-	-	-	-	-	-	-	-	-
planned_existing	thermal	-	-	-	-	2,697	4,154	4,244	4,247	4,219	4,253	4,287
planned_existing	battery	-	-	-	-	-	-	-	-	-	-	-
planned_existing	nuclear	-	-	-	-	-	-	-	-	-	-	-
planned_existing	solar	-	80	80	80	80	80	80	80	80	80	101
planned_existing	psh	-	-	-	-	-	-	-	-	-	-	-
planned_existing	unknown	5	2,126	1,993	1,982	1,960	1,356	1,351	1,348	1,346	1,350	1,355
planned_new	wind_low_cf	-	-	-	-	-	-	-	-	-	-	99
planned_new	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
planned_new	biomass	-	-	-	-	-	-	-	-	-	-	-
planned_new	cogen	-	-	-	-	-	-	-	-	-	-	-
planned_new	geothermal	-	-	-	-	-	-	-	-	-	-	-
planned_new	hydro	-	-	-	-	-	-	-	-	-	-	-
planned_new	thermal	-	-	-	-	-	-	-	-	-	-	-
planned_new	battery	-	-	226	522	1,160	2,019	2,131	2,139	2,222	2,262	2,238
planned_new	nuclear	-	-	-	-	-	-	-	-	-	-	-
planned_new	solar	-	-	-	-	-	-	21	87	139	164	184
planned_new	psh	-	-	-	-	-	-	-	-	-	-	-
planned_new	unknown	-	90	90	-	-	-	-	-	-	-	-
TOTAL supply, NQC MW		17,074	16,953	16,343	16,263	15,259	15,171	15,381	15,661	15,799	15,917	16,054

[redacted]

Table III-13
SCE's 46 MMT Preferred Conforming Portfolio 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	348	348	337	334	334	334	334	334	334	327	327
online	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
online	biomass	69	55	50	34	25	25	25	18	-	-	-
online	cogen	414	254	56	40	40	23	17	5	1	1	1
online	geothermal	183	59	59	59	59	59	59	59	51	51	51
online	hydro	827	824	824	824	824	824	824	824	824	824	824
online	thermal	9,513	4,841	4,836	3,619	2,174	2,174	2,174	2,174	2,174	2,174	2,174
online	battery	44	44	44	44	44	44	44	3	3	3	3
online	nuclear	-	-	-	-	-	-	-	-	-	-	-
online	solar	662	652	652	652	652	652	648	648	648	648	648
online	psh	199	199	199	199	199	199	199	199	199	199	199
online	unknown	4,749	2,215	2,192	2,160	2,111	2,112	2,077	2,078	2,074	2,058	2,048
development	wind_low_cf	-	-	-	-	-	-	-	-	-	-	-
development	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
development	biomass	-	44	44	44	44	44	44	44	44	44	44
development	cogen	-	-	-	-	-	-	-	-	-	-	-
development	geothermal	-	-	-	-	-	-	-	-	-	-	-
development	hydro	-	-	-	-	-	-	-	-	-	-	-
development	thermal	-	-	-	-	-	-	-	-	-	-	-
development	battery	6	251	261	261	260	256	252	252	252	250	249
development	nuclear	-	-	-	-	-	-	-	-	-	-	-
development	solar	-	-	-	-	-	-	-	-	-	-	-
development	psh	-	-	-	-	-	-	-	-	-	-	-
development	unknown	4	19	19	19	19	4	4	4	4	4	4
review	wind_low_cf	-	(3)	-	-	-	-	-	-	-	-	-
review	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
review	biomass	-	(14)	-	-	-	-	-	-	-	-	-
review	cogen	-	27	10	10	10	10	10	10	10	10	10
review	geothermal	-	-	-	-	-	-	-	-	-	-	-
review	hydro	-	-	-	-	-	-	-	-	-	-	-
review	thermal	-	3,773	3,322	2,912	-	-	-	-	-	-	-
review	battery	-	137	137	137	137	134	132	132	132	132	132
review	nuclear	-	-	-	-	-	-	-	-	-	-	-
review	solar	-	-	-	-	-	-	-	-	-	-	-
review	psh	-	-	-	-	-	-	-	-	-	-	-
review	unknown	-	881	796	2,156	2,256	486	486	486	486	486	486
planned_existing	wind_low_cf	-	-	67	87	87	87	90	90	90	135	135
planned_existing	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
planned_existing	biomass	-	-	-	-	-	-	-	23	48	48	48
planned_existing	cogen	-	-	-	-	-	-	-	-	-	-	-
planned_existing	geothermal	-	-	-	37	37	37	73	319	369	369	369
planned_existing	hydro	-	-	-	-	-	-	-	-	-	-	-
planned_existing	thermal	-	-	-	-	2,697	4,154	4,244	4,247	4,219	4,253	4,287
planned_existing	battery	-	-	-	-	-	-	-	-	-	-	-
planned_existing	nuclear	-	-	-	-	-	-	-	-	-	-	-
planned_existing	solar	-	80	80	80	80	80	80	80	80	80	101
planned_existing	psh	-	-	-	-	-	-	-	-	-	-	-
planned_existing	unknown	5	2,126	1,993	1,982	1,960	1,356	1,351	1,348	1,346	1,350	1,355
planned_new	wind_low_cf	-	-	-	-	-	-	-	-	-	-	-
planned_new	wind_high_cf	-	-	-	-	-	-	-	-	-	-	-
planned_new	biomass	-	-	-	-	-	-	-	-	-	-	-
planned_new	cogen	-	-	-	-	-	-	-	-	-	-	-
planned_new	geothermal	-	-	-	-	-	-	-	-	-	-	-
planned_new	hydro	-	-	-	-	-	-	-	-	-	-	-
planned_new	thermal	-	-	-	-	-	-	-	-	-	-	-
planned_new	battery	-	-	226	522	1,160	1,985	2,059	2,103	2,222	2,303	2,425
planned_new	nuclear	-	-	-	-	-	-	-	-	-	-	-
planned_new	solar	-	-	-	-	-	-	-	-	32	83	169
planned_new	psh	-	-	-	-	-	-	-	-	-	-	-
planned_new	unknown	-	90	90	-	-	-	-	-	-	-	-
TOTAL supply, NQC MW		17,024	16,903	16,293	16,213	15,209	15,080	15,225	15,480	15,642	15,833	16,090

[redacted]

As indicated in SCE's 38 MMT and 46 MMT System Reliability Progress Tracking Tables above, the respective RDTs indicate that SCE may not have sufficient resources to meet its system capacity requirements starting in 2024. However, this is incorrect. The RDT uses a static load ratio based on SCE's 2021 initial RA peak demand allocation. This static load ratio is used to derive SCE's peak load for all years in the RDT's System Reliability Progress Tracking Table. This static load ratio does not consider load departure beyond 2021. In contrast, pursuant to Commission requirements, SCE developed its portfolio based on SCE's bundled annual energy load forecast provided by the Commission on May 20, 2020,[89] which does include load departure beyond 2021.

SCE used its Commission-adopted annual energy load forecast and applied it to the 2019 IEPR hourly SCE TAC load profile to obtain an hourly load forecast to be used in SCE's modeling. In this process, an implied peak load is created that is significantly different than the peak load determined by the RDT. This peak load difference only increases when accounting for the 15 percent PRM as shown in Table III-14 below. Using the implied peak load provides a more accurate forecast of future peak load requirements because this method incorporates future forecasted load departure, which is not captured in the static allocation method used in the RDT. SCE strongly urges the Commission to improve the RDT to incorporate this change in future IRP cycles.

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[89] *See Administrative Law Judge's Ruling Correcting April 15, 2020 Ruling Finalizing Load Forecasts and Greenhouse Gas Benchmarks for Individual 2020 Integrated Resource Plan Filings*, R.16-02-007, May 20, 2020, at Attachment A.

Table III-14
Comparison Between the RDT and Commission Forecast Shaped by 2019 IEPR

Peak Comparison	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
RDT Peak (MW)	[redacted]										
CPUC Load Forecast Shaped by 2019 IEPR Peak (MW)	[redacted]										
Difference in Peak (MW)	[redacted]										
Difference in Peak +15% PRM (MW)	[redacted]										

When using the implied peak load, including a 15 percent PRM, SCE's resources are more than sufficient to demonstrate reliability for both the 38 MMT and 46 MMT Preferred Conforming Portfolios as shown in Table III-15 and Table III-16 below.

Table III-15
SCE's 38 MMT Preferred Conforming Portfolio Reliability – Implied Peak

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
TOTAL supply, NQC MW	17,074	16,953	16,343	16,263	15,259	15,171	15,381	15,661	15,799	15,917	16,054
Load (MW)	[redacted]										
Load +15% PRM (MW)	[redacted]										
Supply minus Load (MW)	[redacted]										

Table III-16
SCE's 46 MMT Preferred Conforming Portfolio Reliability – Implied Peak

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
TOTAL supply, NQC MW	17,024	16,903	16,293	16,213	15,209	15,080	15,225	15,480	15,642	15,833	16,090
Load (MW)	[redacted]										
Load +15% PRM (MW)	[redacted]										
Supply minus Load (MW)	[redacted]										

2. <u>SCE's Proposed Reliability Methodology</u>

While the System Reliability Progress Tracking Table results shown above indicate that SCE's Preferred Conforming Portfolios will meet its future RA requirements using the adjusted peak load forecast discussed above, this analysis is insufficient to determine if an LSE is providing sufficient resources to meet their contribution toward system reliability. SCE has two major concerns. Similar to the RA program, the System Reliability Progress Tracking Table uses ELCC values based on the current ELCC methodology to determine solar and wind capacity contributions during the peak. But as the electric system changes over time and the peak hour shifts to later in the day, these ELCC value will not capture these changes and potentially over-value solar and wind capacity contributions.

Moreover, a capacity analysis is no longer adequate to fully assess an LSE's contribution towards system reliability. As California's electric system transitions to powering 100 percent of retail sales with carbon-free electricity, the nature of the resources interconnected to the CAISO grid is evolving. While a peak-load focused reliability construct was adequate for a system dominated by thermal, hydroelectric, and other conventional generation where relatively few resources had physical constraints due to use limitations, the limitations of resources today are more frequently set by physical limitations and in some cases, regulatory limitations.
For example, solar and wind resources are limited in production to hours in which ambient conditions allow for production and battery storage technology typically has a dispatch duration of four hours with one to two cycles per day. A peak load-based reliability construct also fails to capture possible reliability issues arising outside of peak hours and struggles to reflect contributions of renewables, storage, and other resources providing off-peak energy, load shifting, and other reliability services. As the grid relies more on energy storage and other use-limited resources (e.g., renewables, demand response, etc.), LSEs will need to ensure that they have sufficient energy to support their load in hours beyond the peak hours and to charge their storage resources.

To address these two issues, SCE developed a proposed reliability methodology[90] that consists of three parts: (1) a capacity check performed on the net peak load; (2) an energy sufficiency analysis to ensure adequate energy can be provided by non-solar and non-wind resources; and (3) an energy storage charging check to ensure any energy storage can be charged by the LSE's resources.

First, the capacity check is performed on the net peak load, which subtracts solar and wind production from managed load to form a measure of the net peak load. The net peak load plus a PRM would need to be less than or equal to the total NQC of resources other than solar and wind. The capacity check uses hourly forecasted expected solar and wind generation to avoid the issues with static ELCC values. Additionally, performing the capacity check on the net peak load, rather than simply the peak hour, is beneficial because it captures reliability issues that may arise in hours after the peak hour in an electric system with increasing renewables and other use-limited resources.

Second, the energy sufficiency analysis provides insights into how much energy output the portfolio could provide by month. Similar to the capacity check, solar and wind hourly generation is subtracted from managed load, and it is assumed that thermal resources are 100 percent available. For use-limited resources, the hours of availability would be reduced. For instance, lithium-ion storage is assumed to provide its NQC for four hours per day or 120 hours per month for a 30-day month. Use-limited resources are also assumed to provide their energy to the highest hours of the net load curve. Using a 30-day month example, lithium-ion storage would be able to provide its energy across the highest demand hours up to the 120-hour limitation. Figure III-9 below illustrates how an LSE's non-solar and non-wind resource portfolio available energy output could serve its net load duration curve.

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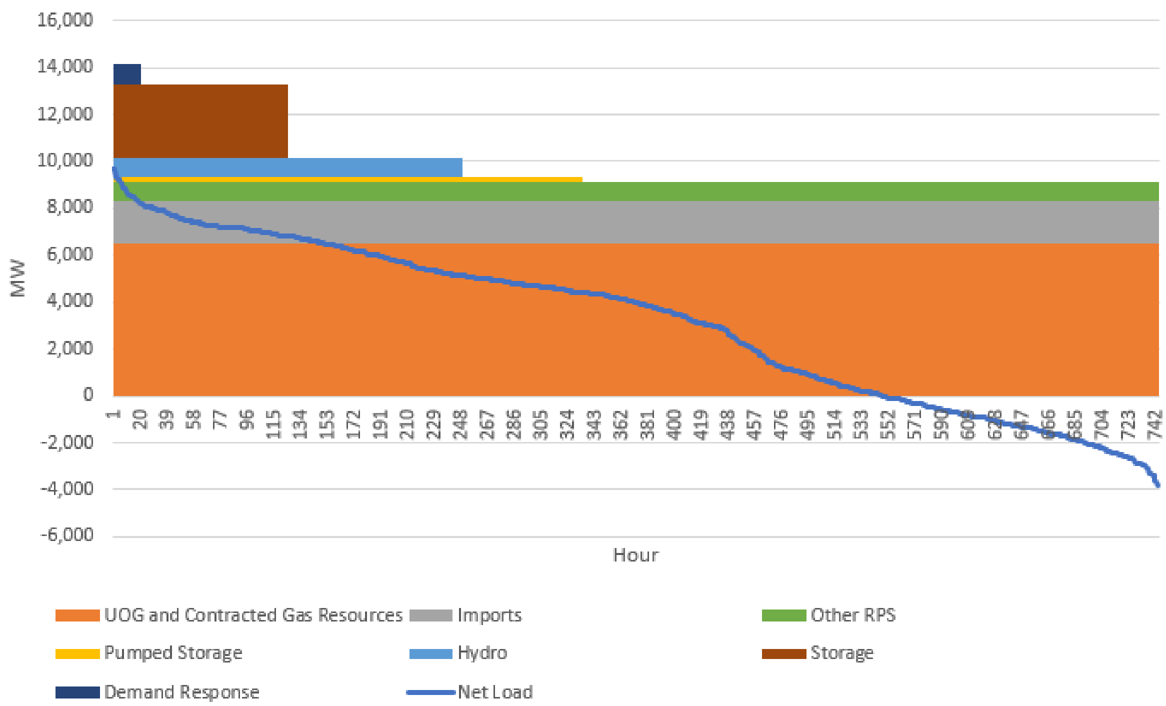
[90] SCE's proposed reliability methodology used in this IRP is generally the same as the new RA construct proposed by SCE and California Community Choice Association in Track 3.B of the RA proceeding, R.19-11-009. *See Southern California Edison Company (U 338-E) and California Community Choice Association's Track 3 Proposal*, R.19-11-009, August 7, 2020.

Figure III-9
Net Load Duration Curve and SCE's Non-Solar/Non-Wind Resources for August 2030



Third, an energy storage charging check ensures that any remaining energy not serving an LSE's net load is sufficient to charge the LSE's storage. This check also needs to consider the LSE's storage capacity as a limit to how much energy could be used to meet the capacity and energy sufficiency need. For example, if an LSE's resource portfolio has an excess 100 MWh of energy and the LSE has 100 MW of 4-hour batteries with expected energy charge and discharge capabilities of 400 MWh, the NQC that should count from the energy storage resources would be 25 MW to serve the minimum 4-hour duration of peak need.[91] Additional energy would be needed for the battery to count for the full 100 MW of potential NQC.

To demonstrate SCE's proposed reliability methodology, SCE performed the analysis on its 38 MMT Preferred Conforming Portfolio for the month of September for the two years of

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[91] Since the excess energy production available to charge the batteries in the example is 100 MWh and the batteries would require 400 MWh for the full 100 MW capacity of the batteries to be fully utilized, the NQC for the batteries would need to be derated to 25 percent of the total capacity or 25 MW. This derating could be avoided if the LSE could add an additional 300 MWh of energy to its portfolio.

2026 and 2030 against its bundled load. In Table III-17 below, SCE shows that it meets its net peak load and a 15 percent PRM with the remaining non-solar and non-wind resources. While SCE's system analysis shows a need to increase the PRM, SCE did not enforce a higher PRM in this analysis since the legacy 15 percent PRM is still required in the RA proceeding.

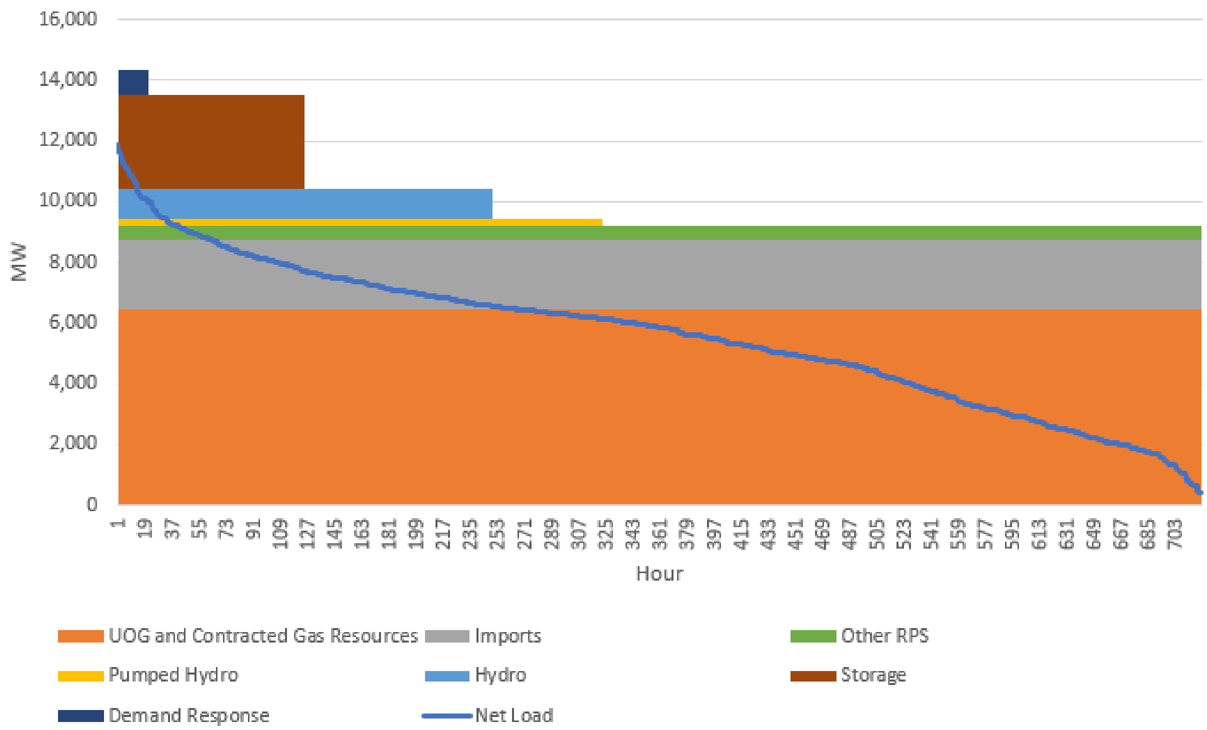
Table III-17
Table of Capacity Check Results

	2026	2030
Net Peak Load (MW)	11,837	12,077
Net Peak Load + 15% PRM (MW)	13,696	13,988
Non-Solar and Non-Wind Capacity During NPL (MW)	14,155	14,506
Supply minus Load (MW)	459	518

Because the net peak load falls in HE19, the solar contribution in this hour is zero. In contrast, the RDT and the associated System Reliability Progress Tracking Table use an ELCC value of 5 to 14 percent for September depending on the year and portfolio, which would overstate the capacity contribution of solar during this time.

In addition, the remaining non-solar and non-wind resources can sufficiently provide energy to serve all hours of September for both 2026 and 2030. Figure III-10 below for 2026 demonstrates how the various technologies (e.g., thermal, storage) could provide energy to serve the net load.

Figure III-10
Net Load Duration Curve and SCE's Non-Solar/Non-Wind Resources for September 2026



Finally, SCE's remaining available energy for charging energy storage is more than adequate to charge any storage. The total available energy after serving the net load is 3,277 gigawatt-hours ("GWh") and 4,409 GWh for September 2026 and 2030, respectively. Using SCE's energy storage capacity to limit charging, this amount is still 2,294 GWh and 2,351 GWh of usable energy for charging storage. These two values greatly exceed the 520 GWh needed to charge the storage.

SCE recommends the Commission adopt this proposed reliability methodology to help assess an LSE's resource portfolio contribution towards system reliability. The methodology could be used in aggregating LSEs' plans in this IRP cycle and adopted for the next IRP cycle. The three parts of SCE's reliability methodology provide a more accurate assessment of solar and wind capacity contributions to the net peak load, ensure an LSE's resource portfolio provides sufficient energy to meet its net load, and ensure an LSE's resource portfolio can provide sufficient energy to charge its energy storage if necessary. SCE performed its reliability methodology on its 38 MMT Preferred Conforming Portfolio to demonstrate how the Commission can implement these steps for all LSEs. Further details on the methodology are included in Appendix D.

G. Hydro Generation Risk Management

1. SCE's Hydroelectric Resources

SCE's utility-owned hydro resources can be divided into two groups: Big Creek and all other resources. Big Creek resources are the larger group, encompassing all SCE hydro facilities in the upper San Joaquin River watershed in the western Sierra Nevada Mountains. Big Creek is a composite of six major reservoirs, 16 tunnels driven through solid granite, and nine powerhouses, most of which are reservoir storage plants. Most of the Big Creek plants are directly connected to the 220 kV bulk power transmission system. In aggregate, the Big Creek generating capacity is approximately 1,015 MW, or about 86 percent of SCE's total hydro generation capacity. Most of the Big Creek plants have been in service since the early- to mid-twentieth century.

Big Creek utilizes six major reservoirs for water storage, as well as smaller reservoirs that supply some of the powerhouses. The maximum storage for the six major reservoirs is approximately 560,000 acre-feet. Due to flood risk mitigation and contractual constraints, the reservoirs are typically lowered during the winter months to minimum levels and filled to maximum levels during spring runoff from melting snowpack. The average annual runoff (with significant yearly variations) from the Big Creek watershed is approximately 1,830,000 acre-feet, with the majority of the runoff occurring during the months of April through August.
This creates a challenge for Big Creek to utilize as much of the runoff as possible for generation, while minimizing spill. Once a reservoir reaches a full level, inflows that exceed the hydraulic capacity of the downstream powerhouse will bypass the powerhouse as controlled spill.

Operation of Big Creek is subject to environmental and regulatory constraints.
The overriding objective for using all the SCE hydro powerhouses and water storage facilities is

the prudent use of the water resource, and safety. Water management on the project is governed by FERC licenses, U.S. Forest Service agreements, water rights, and contractual commitments, which include provisions for water releases and storage levels. Each reservoir has required storage levels at particular times of the year. The summer season typically requires nearly-full levels to satisfy recreational interests. Additionally, there are limits on seasonal carry-over storage that apply to the entire Big Creek project that relate to downstream water users (largely for agricultural irrigation).

Water management includes the need to lower reservoir levels for spring runoff, the conveyance of water downstream pursuant to contractual agreements, and the desire to create power when it is most beneficial for SCE customers. The total reservoir capacity of the Big Creek system is only about one-third of the average annual runoff of the watershed.
The majority of the peak runoff occurs within two to three months when late spring temperatures start to rise. A large volume of water must be moved downhill within a specific period to either meet obligations or reduce the potential of spill at various reservoirs that would reduce total generation. During instances when reservoirs are full and negative market prices occur it can be more economical to spill than generate.

Water planning largely depends upon the present runoff volume and the prior water year. Ample snowpack and high reservoir levels are indicative of large quantities of generation available for the market. There is a relationship between one water year and the next, with many reservoirs being lowered by the spring prior to the runoff from snowmelt, yet possibly retaining water depending upon the projected runoff forecast. This is always a balancing act with some uncertainty associated with the decisions.

All Big Creek reservoirs have certain restrictions affecting the water levels at certain times of the year. The Big Creek reservoir inflows are monitored continually to maintain required contract water flows. Contractual water releases are determined by reservoir inflows and are monitored for daily compliance. The monitoring also identifies reservoir levels for controlling the required maximum and/or minimum storage levels with minimal storage level fluctuations. The Big Creek generation schedules are adjusted daily to provide the best use of the required water releases for generating during periods when it is most economic, and to meet water release requirements as established in the FERC licenses for fish, water, and wildlife enhancement.

SCE's remaining hydro resources are in the Bishop and Mono Basin areas of the eastern Sierra Nevada Mountains, the Kern, Kaweah, and Tule River areas in the southern Sierra Nevada Mountains, and the Ontario, San Bernardino, and Banning areas in the San Gabriel and San Bernardino Mountains. These plants are connected to SCE's sub-transmission or distribution systems and collectively total approximately 161 MW of generating capacity, or about 14 percent of SCE's hydro generation capacity. Most of these resources have operated since the late-nineteenth and early-twentieth centuries. Some of these powerhouses utilize flow from diversion dams on rivers, whereas others utilize flow from relatively small (i.e., as compared to Big Creek) storage dams.

Due to the smaller size of the dams and operational constraints, most of these powerhouses are operated as run-of the-river plants. In those cases, the diversions will route from the stream to the powerhouse using the volume of water available to maximize generation. However, as noted above, if the unit is in an outage, this will result in outage bypassed energy. If the flow in the stream or volume available from the reservoir is less than the maximum capacity of the powerhouse, or a unit is on standby due to low water flow, the unit outage does not result in outage bypassed energy.

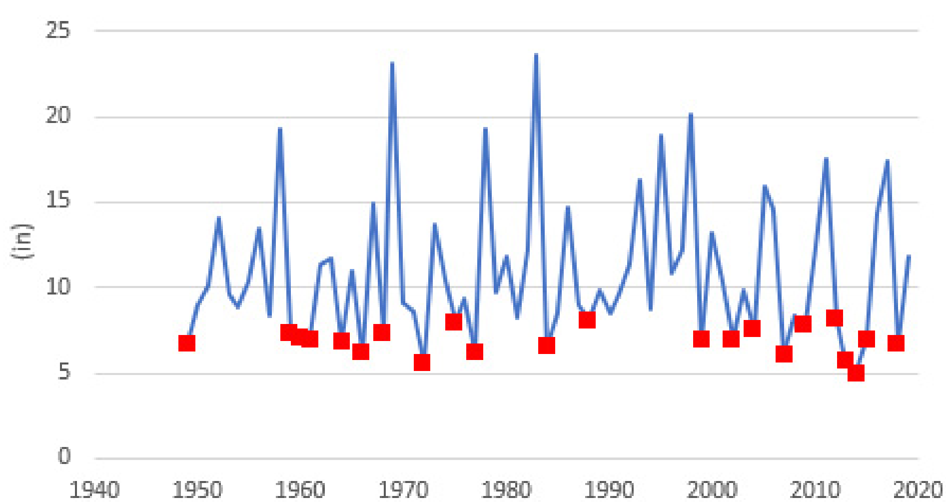
2. Water Supply Variability

When considering the impact of drought on hydroelectric operation, multi-year droughts are the most impactful since there are few mitigation options. To better understand the likelihood of having multi-year dry spells similar to the 2012 to 2015 period, SCE looked at two different metrics: methodologic drought, which looks at precipitation values compared to normal precipitation; and hydrological drought, which looks at flow values compared to normal flows.

High quality and long-term data are scarce. For precipitation, SCE analyzed data from Fresno Yosemite International Airport (1948-2020) and for flows, a U.S. Geological Survey gage at Bear Creek (1921-2019). Bear Creek is a headwater and unimpaired gage. It is located 7,366.94 feet above sea level with a 52.5 square miles drainage area. In contrast, the Fresno Yosemite International Airport station is located at the downstream of the Big Creek project located 333 feet above sea level.

During the 2012 to 2015 drought, total annual precipitation at Fresno station was constantly below 8.2 inches as shown in Figure III-11 below. SCE takes this as the reference meteorological drought threshold. Out of 71 years of precipitation data, 22 years (31 percent) fall below the 8.2 inch threshold. The 2012 to 2015 drought is the second multi-year event in the 1949 to 2019 period after the 1959 to 1961 drought.

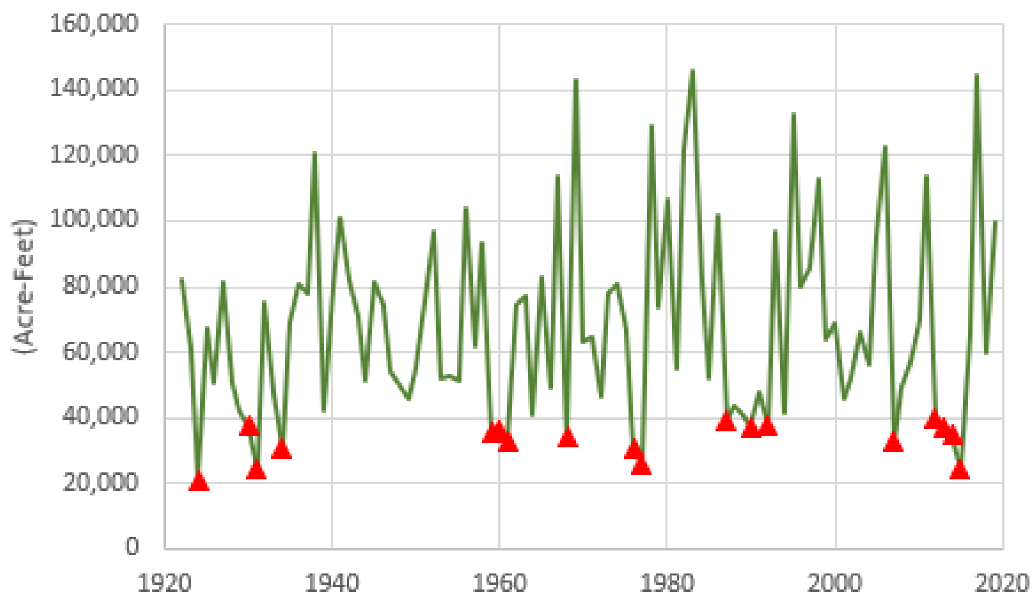
Figure III-11
Historical Annual Precipitation at Fresno Station



Years with red markers are the ones that are as dry as the 2012-2015 period.

During the 2012 to 2015 drought, the total annual flow at Bear Creek gage was constantly below 40,000 acre-feet as shown in Figure III-12 below. SCE takes this as the reference hydrological drought threshold. Out of 98 years of flow data, 18 years (18 percent) fall below the 40,000 acre-feet threshold. The 2012 to 2015 and the 1959 to 1961 droughts are the two multi-year events in the 1921 to 2019 period with three and four years length. In addition, 1930 to 1931 and 1976 to 1977 are two-year dry events below the 40,000 acre-feet.

Figure III-12
Historical Annual Precipitation at Bear Creek Station

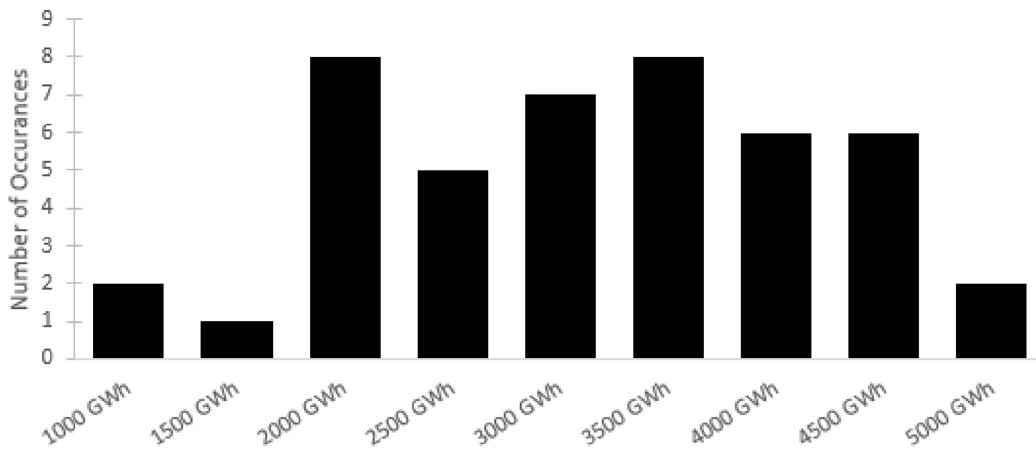


Years with red markers are the ones that are as dry as the 2012-2015 period.

3. <u>Generation Variability</u>

The significant variation in precipitation and streamflow leads to highly variable generation history at Big Creek as shown in Figure III-13 below. The median and mean annual generation is about 2,900 GWh. Dry years correspond to generation under 2,000 GWh and annual generation less than 1,500 GWh typically come in multi-year droughts. This variation in generation and wholesale market revenue can have an impact on overall energy portfolio cost.

Figure III-13
Historical Annual Generation at Bear Creek Station – 1975-2019



4. Impact of Variability on Portfolio Costs and Reliability

SCE assumed the normal hydro year condition with approximately 3,100 GWh expected energy from its utility-owned large hydro resources, including Big Creek and Eastwood, for all planning years in its bundled portfolio modeling analysis. In 2030, SCE's utility-owned large hydro resources contribute to approximately 5 percent of total energy generated from different types of resources in order to serve its bundled load. Given dry hydro year condition, the annual generation from SCE's utility-owned large hydro resources might decrease to around 2,000 GWh, which accounts for approximately 3.2 percent of total energy needed to serve SCE's bundled load in 2030.

From a capacity standpoint, the Commission recently adopted a new optional methodology for calculating the RA capacity of dispatchable hydroelectric resources, which captures the impacts of droughts by using a weighted average calculation based on the previous 10 years of actual availability.[92] For each of month of the previous 10 years, an exceedance calculation is performed on the Availability Assessment Hours to determine the 50 percent and 10 percent availability. The RA value is calculated using a 0.8 weighting of the 50 percent

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[92] *See* D.20-06-031 at OP 10.

exceedance value and 0.2 weighting of the 10 percent exceedance value. This methodology provides a conservative estimate of the RA capacity for hydro on a forward basis, which can be updated in the monthly RA filing as actual inflows are experienced.

In addition to SCE's utility-owned hydro resources, SCE owns 285 MW shares of Hoover, the hydroelectric power generation in Nevada. SCE's Hoover share not only contributes to SCE's system RA requirements but also provides approximately 0.4 percent of annual energy needed to serve SCE's bundled load.

In general, SCE's hydro generation represents a relatively small percentage share of SCE's generation fleet. The hydro variability might lead to deviations of the total annual energy from hydro generation resources, resulting in higher or lower GHG emissions and procurement costs. However, the overall impact of hydro variability on SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios should not be significant.

In the Commission's RSP, large in-state hydro contributes about 5 percent of total 2030 energy and approximately 6 percent of the total capacity of the portfolio in 2030. This is similar to the hydro share in SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios where large in-state hydro contributes approximately 5 percent of total energy and approximately 7 percent of the total capacity in 2030.

H. <u>Long-Duration Storage Development</u>

As discussed in Section III.A.1, SCE's 38 MMT CAISO System-Wide Portfolio includes 554 MW of 7-hour battery storage in 2030 for economical GHG reduction. Long-duration pumped storage was not selected because it is uneconomic through 2030 and does not provide any additional reliability benefits when compared to the use of shorter duration battery storage. SCE's LOLE reliability study[93] identified patterns that indicate unserved load typically occurs in HE18 to HE20 during summer peaks. Because these unserved load durations were three hours or less, 4-hour storage resources are sufficient and more economic to meet this reliability need.

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[93] *See* Appendix B.

Additionally, the flexibility of 4-hour storage is such that longer duration needs could be met through serial dispatch of numerous 4-hour duration energy storage systems to meet longer duration energy discharge needs. Indeed, SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios do not include any long-duration storage (including pumped storage) because the needs can be met more economically and reliably with the use of 4-hour battery storage. SCE is not currently pursuing any activities to support the development of pumped storage or other long-duration storage.

Before the Commission considers any actions to require investment in a costly, long-lived asset such as pumped storage, the Commission should develop and publicize more robust reliability analysis that demonstrates a need for the resource. As SCE previously commented,[94] it is unclear from the RESOLVE modeling why pumped storage was selected in the Commission's RSP and 38 MMT portfolio when there are no long (12-hour) duration needs identified. SCE is not rejecting consideration of pumped storage, other long-duration storage, or other resources a part of future resource portfolios; nevertheless, a more robust and transparent analysis should be completed before the Commission considers any actions to support pumped storage (or other long-duration storage) development.

Further, even if the pumped storage or other long-duration storage with similar attributes was determined to be an optimal resource for the system, the Commission and stakeholders must consider how LSEs can individually or collectively develop resources that may meet system needs, but not be the least-cost options for meeting individual LSE portfolio needs.

I. Out-of-State Wind Development

As discussed in Section III.A.1, SCE ran a CAISO system-wide sensitivity analysis for the 38 MMT GHG target scenario using an out-of-state wind portfolio to increase portfolio diversity and compared it to a solar and 4-hour energy storage-heavy optimal build-out.

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94 *See Opening Comments of Southern California Edison Company (U 338-E) on Proposed Decision Regarding 2019-2020 Electric Resource Portfolios to Inform Integrated Resource Plans and Transmission Planning*, R.16-02-007, March 12, 2020, at 8.

The analysis demonstrates that increasing the amount of out-of-state wind resources increases the LOLE value and required additional capacity to meet reliability standards, which also increases resource costs. Moreover, SCE is not confident that the transmission costs to access out-of-state wind resources are accurately represented in RESOLVE and such transmission costs are highly uncertain. Accordingly, SCE did not include out-of-state wind in its 38 MMT and 46 MMT Preferred Conforming Portfolios and SCE is not pursuing activities to support the development of out-of-state wind resources at this time.

J. Transmission Development

For both SCE's 38 and 46 MMT Preferred Conforming Portfolios, resources within SCE transmission zones were strategically placed to avoid exceeding known transmission capability limits and minimize transmission upgrades. SCE utilized the full capacity deliverability status ("FCDS") capability estimates from CAISO's latest transmission capability white paper,[95] as well as the Commission's 2019 RSP and 2019 30 MMT EO portfolios[96] as guides to locate new resources within transmission zones. SCE evaluated the feasibility of siting these new resource amounts and their impact to the transmission system by utilizing power flow base cases representing the year 2030 that were developed for the annual CAISO TPP.

This limited analysis did not consider Category P1-P7[97] contingency outages; however, resources were sited in such amounts that would allow for the use of Remedial Action Schemes

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95 *See* CAISO, *Transmission Capability Estimates as an input to the CPUC Integrated Resource Plan Portfolio Development* white paper, May 20, 2019, available at: https://www.caiso.com/Documents/WhitePaper-TransmissionCapabilityEstimates-InputtoCPUCIntegratedResourcePlanPortfolioDevelopment.pdf .

96 IRP 2019 portfolios available at: https://www.cpuc.ca.gov/General.aspx?id=6442464144.

97 Category P1-P7 contingencies are defined in the North American Electric Reliability Corporation reliability standard TPL-001-4, available at: https://www.nerc.com/_layouts/15/PrintStandard.aspx?standardnumber=TPL-001-4&title=Transmission%20System%20Planning%20Performance%20Requirements&jurisdiction=United%20States.

("RAS") to curtail generation to mitigate thermal overload and stability issues.[98] Utilizing CEC busbar mapping as a guide,[99] resource capacity was placed downstream of known transmission constraint areas and allocated down to the busbar level. Table III-18 and Table III-19 below show the placement of capacity additions in each SCE transmission zone for both portfolios.

Table III-18
Busbar Placement of 38 MMT Preferred Conforming Portfolio
(SCE transmission zones only)

SCE Transmission Zone	Gen (type)	Gen (MW)	Bus	Voltage (kV)	Gen (MW)
Kramer_Inyokern_Ex	Solar	151	Kramer	115	151
North_Victor-Greater_Kramer	Solar	204	Kramer	220	204
Riverside_East_Palm_Springs	Solar	1,443	Colorado River	220	540
			Devers	220	403
			Red Bluff	220	500
Mountain_Pass_El_Dorado	Solar	60	Eldorado (SCE-section)	220	60
Tehachapi	Solar	1,381	Highwind	220	281
			Windhub (Section A)	220	750
			Windhub (Section B)	220	350
	Wind	71	Windhub (Section A)	220	71
				Total MW =	3,310

Table III-19
Busbar Placement of 46 MMT Preferred Conforming Portfolio
(SCE transmission zones only)

SCE Transmission Zone	Gen (type)	Gen (MW)	Bus	Voltage (kV)	Gen (MW)
Riverside_East_Palm_Springs	Solar	514	Colorado River	220	514
Tehachapi	Solar	1,381	Highwind	220	281
			Windhub (Section A)	220	750
			Windhub (Section B)	220	350
				Total MW =	1,895

The analysis demonstrates that these capacity additions in SCE's planning area can be accomplished with no transmission network upgrades besides RAS. This conclusion is

[98] CAISO Planning Standards limit RAS tripping to 1,150 MW for single contingencies and 1,400 MW for double contingencies. See *California ISO Planning Standards,* September 6, 2018, at 11, available at http://www.caiso.com/Documents/ISOPlanningStandards-September62018.pdf.

[99] Available in "Dashboard_BUSBARALLOCATION_30MMTEO2-V2.1.xlsx" at: ftp://ftp.cpuc.ca.gov/energy/modeling/Dashboard_BUSBARALLOCATION_30MMTEO2-V2.1.xlsx.

dependent upon the precise placement and amount of resources as demonstrated above. Any deviation from what is shown may necessitate transmission upgrades to mitigate local area or export issues. Furthermore, since the 38 MMT and 46 MMT Preferred Conforming Portfolios reflect SCE's bundled load share only, a subset of the overall SCE TAC area load, transmission upgrades may still be required and identified through the ongoing CAISO TPP to collectively support the resource needs of all LSEs.

IV.

ACTION PLAN

SCE's action plan describes the activities needed to successfully implement SCE's 38 MMT Preferred Conforming Portfolio or 46 MMT Preferred Conforming Portfolio, including the actions the Commission should take to facilitate plan implementation and potential barriers or risks. SCE urges the Commission to adopt a 38 MMT GHG target for all LSEs and the PSP and to approve SCE's 38 MMT Preferred Conforming Portfolio. As such, this action plan centers on SCE's 38 MMT Preferred Conforming Portfolio, but also addresses where the action plan would be different under SCE's 46 MMT Preferred Conforming Portfolio.

SCE's action plan focuses on three main procurement activities. As explained in Sections I.B and III.A.1, SCE's 38 MMT CAISO System-Wide Portfolio demonstrates that the CAISO system has a significant need for system capacity to maintain reliability in 2024 through 2026 primarily caused by the expiration of recommended OTC unit compliance deadline extensions and the shutdown of Diablo Canyon – 1,697 MW in 2024 increasing to 5,381 MW in 2026. Therefore, first, the Commission should take expedited action by the first quarter of 2021 to mandate that all LSEs procure their share of the 2024 system reliability need of approximately 1,700 MW. Accelerated Commission action to address this 2024 system reliability need is necessary due to the short timeframe to develop and bring new system capacity resources online by 2024 and to avoid a rushed and more costly emergency procurement process. Moreover, requiring 2024 system reliability procurement in early 2021 is a "least regrets" strategy that would allow LSEs to begin developing new system capacity to address the even greater system reliability needs in 2025 and 2026 resulting from the retirement of Diablo Canyon.

Second, based on the Commission's more complete aggregation of LSEs' IRPs and development of the PSP, the Commission should act by the end of 2021 to require LSEs to procure the larger residual system reliability need for 2025 and 2026 driven by the shutdown of Diablo Canyon.

As explained in Sections III.A.2 and III.A.3, SCE also has a need for new clean energy resources beginning in 2026 (in SCE's 38 MMT Preferred Conforming Portfolio) or 2028 (in SCE's 46 MMT Preferred Conforming Portfolio). Depending on the outcome of the PCIA Working Group 3 process and whether any of SCE's current clean energy portfolio is allocated to other LSEs, SCE may also have a need to procure additional clean energy resources to backfill those that are allocated to other LSEs. Accordingly, the Commission should approve a flexible procurement framework for SCE to begin procuring clean energy resources to meet the needs identified in its Commission-approved Preferred Conforming Portfolio and also address any additional needs resulting from the PCIA Working Group 3 process.

This section also discusses the status of SCE's D.19-11-016 system reliability procurement and SCE's consideration of DACs in the procurement process.

A. Proposed Activities

SCE's proposed activities to implement its 38 MMT and 46 MMT Preferred Conforming Portfolios are largely focused on the procurement activities discussed in Section IV.B. SCE's procurement-related activities with respect to DACs are also addressed in Section IV.B. SCE's other actions to minimize GHG emissions and local air pollutants in DACs, existing and planned programs affecting DACs, and engagement with DACs are discussed in Section III.D.2.

B. Procurement Activities

SCE's Preferred Conforming Portfolios present roadmaps for how SCE is poised to support system reliability over the next decade and help California to reach its decarbonized and clean energy future. The following sections describe the procurement activities that SCE proposes to operationalize its portfolios.

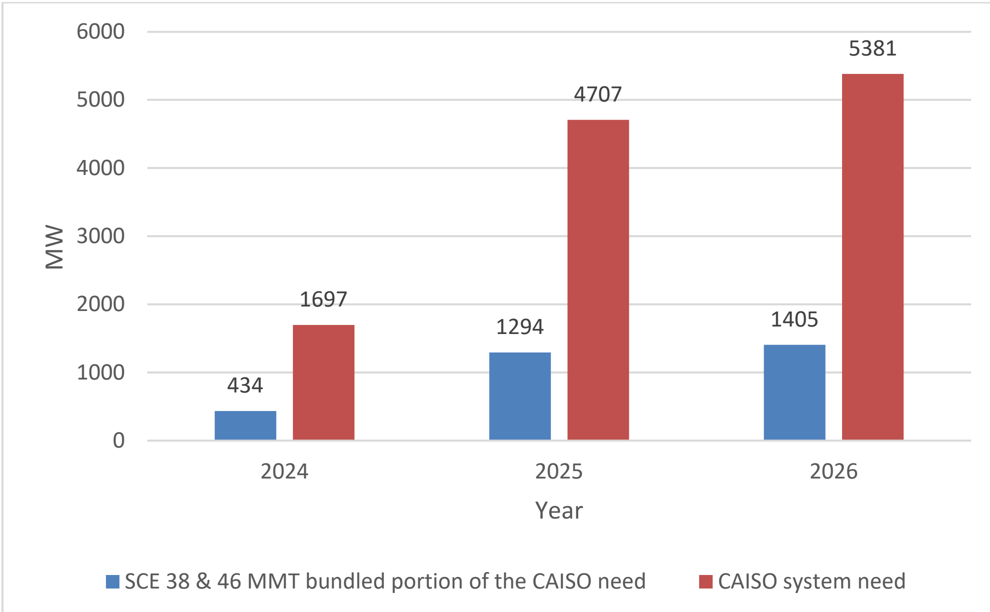
1. System Reliability Procurement for 2024 to 2026

a) SCE's CAISO System-Wide Analysis Confirms There is a Substantial System Capacity Shortfall in the 2024 Through 2026 Timeframe

As further explained in Sections II and III.A.1, SCE used robust capacity expansion modeling, PCM simulation, and LOLE reliability analysis to develop a least-cost, operable, and reliable 38 MMT CAISO-System Wide Portfolio. SCE's CAISO system-wide modeling demonstrates there is a substantial system capacity need in the 2024 to 2026 time period due to the retirement of the OTC units with recommended compliance deadline extensions by the end of 2023 and the retirement of Diablo Canyon units in 2024 and 2025. This system capacity is needed to maintain reliability regardless of whether a 38 MMT or 46 MMT GHG target is adopted.

In addition to the 3,300 MW of incremental system RA capacity procurement required by D.19-11-016, SCE's results show a need for an additional 5,381 MW of system capacity for 2024 through 2026 – specifically, 1,697 MW in 2024, an additional 3,010 MW in 2025, and an additional 674 MW in 2026. SCE's bundled share of the 2024 to 2026 system reliability need is identified in its 38 MMT and 46 MMT Preferred Conforming Portfolios in Sections III.A.2 and III.A.3. As shown in Figure IV-1 below, both SCE's 38 MMT and 46 MMT Preferred Conforming Portfolios identify a system capacity need for SCE's bundled load of 434 MW of 4-hour energy storage additions above the incremental system RA capacity procurement required in D.19-11-016 starting in 2024, increasing by an additional 860 MW of 4-hour energy storage in 2025, and an additional 111 MW of 4-hour energy storage in 2026. The resource additions in this 2024 through 2026 time period in SCE's Preferred Conforming Portfolios are also primarily driven by the planned shutdown of the OTC units and the retirement of Diablo Canyon.

Figure IV-1
CAISO System and SCE's 38 MMT and 46 MMT Preferred Conforming Portfolio System Capacity Need in 2024 to 2026[100]



b) <u>The Commission Should Mandate Procurement by All LSEs to Satisfy the 2024 System Reliability Need by the First Quarter of 2021</u>

Maintaining system reliability is a foundational requirement of the IRP process.[101] SCE's 38 MMT CAISO System-Wide Portfolio shows a clear system capacity need to maintain reliability in 2024, which only increases in 2025 and 2026. Accordingly, SCE strongly urges the Commission to act on the identified 2024 need by the first quarter of 2021 by requiring that all LSEs procure their share of the needed system capacity for 2024.

Expedited Commission action on the 2024 system reliability need is necessary to provide sufficient time to bring new resources online by the summer of 2024 while avoiding potentially costly rushed procurement. Beginning this procurement by early 2021 is a prudent approach that would allow LSEs and resource developers to start the often lengthy process to solicit and execute contracts for new resources, obtain Commission approval in the case of the IOUs,

[100] System capacity need depicted in this graph does not include 3,300 MW near-term incremental system capacity need identified in D.19-11-016.
[101] *See* Cal. Pub. Util. Code §§ 454.51(a), 454.52(a)(1)(E).

complete interconnection and permitting, complete construction, and initiate commercial operation. Waiting until late 2021 or early 2022 to initiate procurement for resources needed in 2024 may make it difficult for additional new capacity to come online by summer of 2024 and could close some of the options for optimal prices and resource types as occurred with the required procurement through D.19-11-016.[102]

SCE recognizes that the COVID-19 pandemic and the near-term reduction in forecasted energy demand from the ensuing recession may have implications on both the mid-term forecast and SCE's finding of need. However, the persistence of the demand reduction from COVID-19 and the recession is highly uncertain, while the retirement of Diablo Canyon is certain. Therefore, requiring LSEs to procure for a 2024 system capacity need is a "low-regrets" strategy. Even with the uncertainty of the lingering effects of the demand reduction from COVID-19, the system capacity need significantly increases in 2025 and 2026 with the retirement of Diablo Canyon, and any procurement targeted for 2024 will also be used to meet that need. Indeed, SCE's system-wide modeling shows a substantial increase in the need for system capacity of more than 3,000 MW from 2024 to 2025 (from 1,697 MW to 4,707 MW) and another 674 MW increase in 2026 (from 4,707 MW to 5,381 MW). Therefore, initiating procurement early will allow LSEs and market participants to get a head start on addressing this substantial need for system capacity to maintain reliability.

SCE recommends that the Commission use the proposed analysis of LSEs' aggregated plans in the first quarter of 2021 (in advance of the development of the PSP) to determine the 2024 system reliability procurement need,[103] and issue a decision requiring LSEs to conduct the 2024 system reliability procurement by no later than the first quarter of 2021. The Commission's first quarter 2021 decision requiring LSEs to procure to meet the 2024 system

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[102] For the D.19-11-016 procurement, there was less than two years from the Commission decision for LSEs to develop solicitations and procure incremental resources and for developers to bring such resources online by August 1, 2021, which significantly limited the number of projects that were far enough in the development process to meet that online date.

[103] *See Administrative Law Judge's Ruling Scheduling Prehearing Conference and Seeking Comments on Proposed Proceeding Schedule*, R.20-05-003, June 15, 2020, Attachment A at 2.

reliability need should, at a minimum, identify and equitably allocate the 2024 system capacity need and establish upfront the opt-out and backstop procurement framework and cost allocation mechanism for such procurement, which is also necessary to provide LSEs with certainty regarding the backstop procurement process and cost allocation mechanism for the D.19-11-016 procurement. It may be necessary to allocate the 2024 system reliability procurement based on peak load share given the expedited timeframe required to address the system capacity shortfall if insufficient new capacity is included in LSE IRPs to meet the 2024 need. The Commission can continue to work through refining the allocation methodology and other procurement policies prior to authorizing procurement for the 2025 and 2026 need after the PSP is complete. While this is not ideal, given the quickly approaching 2024 system reliability shortfall, it is more prudent to act expeditiously rather than wait until all of the analysis and modeling is complete.

c) The Commission Should Require Procurement by All LSEs to Meet the Residual 2025 and 2026 System Reliability Need Based on Development of the PSP by the End of 2021

Procurement activities to satisfy the residual 2025 to 2026 system capacity shortfall resulting from the shutdown of Diablo Canyon should be addressed in a subsequent procurement mandate issued by year-end 2021 that incorporates the results and needs identified in the PSP upon its completion in the third quarter of 2021. Once the PSP is complete and the mid-decade need has been confirmed based on a full and robust analysis of the aggregated procurement proposed by individual LSEs in their IRPs and development of the PSP, LSE-specific need determinations can be made. The PSP-derived 2025 to 2026 system reliability procurement need can be ratioed to LSEs based on the gap between the LSE's proposed procurement and the PSP-derived procurement need using a need-based allocation mechanism.

The second system reliability procurement tranche to address the 2025 to 2026 need would also work in concert with the early activities initiated for the 2024 need. Additional time will be available in the second tranche to develop a more efficient process and improved need assessment, so the procurement ordered in the first tranche can go through the PSP process and a true-up of the need with respect to the final amounts determined. If too much procurement was ordered in the first tranche for 2024, that would result in less procurement ordered for 2025 or vice versa. The two-tranche approach would allow the procurement for 2024 to 2026 to be "evened-out" as necessary.

Finally, in addition to mandating procurement by all LSEs to meet any residual 2025 to 2026 system reliability need based on a need-based allocation mechanism, the Commission's decision ordering system reliability procurement for 2025 and 2026 should adopt a comprehensive procurement framework establishing upfront the opt-out and backstop procurement process and cost allocation mechanism for the procurement, as well as guidance on how LSEs are required to demonstrate progress towards development of the resources identified in their IRPs and/or the procurement allocated to them through the IRP process, and the consequences if LSEs are not complying with their plans. Without a clearer link between planning and procurement that provides well-defined guidelines on how LSEs' IRPs will be operationalized, LSEs' responsibilities to enact their plans, and requirements for ensuring that LSEs are pursuing the procurement and other action plans set forth in their IRPs and that those resources are coming online, it is not clear whether the IRP proceeding's planning activities will actually translate into the procurement and new resource development needed to maintain grid reliability and reach California's decarbonization goals. There must be a meaningful framework to ensure the plans developed in the IRP process are being executed.

Some of these issues, including an upfront opt-out and backstop procurement process and the cost allocation mechanism for the procurement, should be established by the Commission when it orders LSEs to conduct 2024 system reliability procurement as discussed above. However, to the extent all of these issues are not addressed or further refinement to the procurement framework is necessary, the Commission should include them in a comprehensive procurement framework adopted in conjunction with the residual 2025 and 2026 system reliability procurement by the end of 2021.

2. **Clean Energy Procurement**

Both of SCE's Preferred Conforming Portfolios show a need for additional clean energy resources to meet GHG emissions targets and RPS requirements. As explained in Section III.A.2, SCE's 38 MMT Preferred Conforming Portfolio identifies a need for 251 MW of solar in 2026, which increases to a cumulative 3,964 MW of solar additions by 2030. The portfolio also adds 456 MW of in-state wind in 2030. As discussed in Section III.A.3, SCE's 46 MMT Preferred Conforming Portfolio also identifies a need for 362 MW of solar in 2028, which increases to a cumulative 1,895 MW of solar additions by 2030.

Moreover, SCE may have an earlier and greater need for clean energy resources pending a decision anticipated in the third quarter of this year in the PCIA proceeding, R.17-06-026. In Phase 2 of the PCIA proceeding, the Commission is considering issues regarding portfolio optimization and cost reduction, allocation, and auction in Working Group 3.[104] If the Commission adopts the Voluntary Allocation and Market Offer mechanism proposed in the Final Report of PCIA Working Group 3[105] or a similar mechanism that requires the IOUs to allocate RPS-eligible and/or GHG-free energy procurement from their portfolios to other LSEs, SCE may need to procure additional clean energy resources to backfill those resources. In that case, SCE may have a need for additional clean energy procurement before 2026 and a larger need than what is shown in SCE's 38 MMT Preferred Conforming Portfolio (or 46 MMT Preferred Conforming Portfolio).

Due to the quantity of clean energy resources that need to be added to SCE's portfolio over the next 10+ years, the circumstances created when all LSEs are soliciting for the same resources at the same time, and the potential to take advantage of near-term opportunities for cost competitive clean energy procurement that utilizes the ITC, SCE requests Commission authority

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[104] *See Phase 2 Scoping Memo and Ruling of Assigned Commissioner*, R.17-06-026, February 1, 2019, at 5-6.

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

to begin procuring clean energy resources to meet the needs identified in its Commission-approved Preferred Conforming Portfolio. SCE urges the Commission to approve SCE's 38 MMT Preferred Conforming Portfolio and authorize SCE to procure to meet its identified needs for clean energy resources in 2026 and beyond. SCE also requests authority to begin procuring additional clean energy resources that may be needed in SCE's Commission-approved Preferred Conforming Portfolio as a result of the outcome of the PCIA Working Group 3 process.

SCE requests that the Commission adopt a flexible procurement framework for clean energy resource procurement that would provide SCE the option to hold annual solicitations, or run concurrently with a reliability solicitation, to begin meeting the clean energy resource needs in its Commission-approved Preferred Conforming Portfolio, but to make a final determination on whether to hold a solicitation and how much of its clean energy need to procure in each solicitation based on the market response. Flexibly distributing procurement over a longer period affords SCE increased optionality to procure higher quantities when solicitations return competitive prices (or less when prices are higher than expected). For example, the procurement may need to be lumpier rather than smooth, e.g. if more attractive pricing is received in a certain time period because of the ITC or another factor in the market. SCE should also have the flexibility to backfill any clean energy resources that are allocated to other LSEs as a result of the PCIA Working Group 3 process over time to take advantage of the best market opportunities and avoid procuring a large amount of clean energy resources in a few solicitations that may result in a constrained market and market power.

Allowing SCE the flexibility to pursue this type of economic and cost competitive procurement will help minimize customers' rates. There are also other important benefits of this flexible approach. Distributing procurement over multiple years helps minimize interconnection process constraints. Spreading procurement across multiple years may also mitigate commercial development risk. To address the likelihood that some procured resources may be delayed past their commercial online dates or default entirely, it may be necessary to procure more resources than the forecast additions in SCE's Commission-approved Preferred Conforming Portfolio. Flexibility to procure more in early years if pricing proves competitive will mitigate the potential cost impacts of project delays or failures on SCE's bundled service customers.

For all of these reasons, SCE requests that the Commission authorize it to begin procuring clean energy resources to meet the identified clean energy need in SCE's Commission-approved Preferred Conforming Portfolio and to meet any additional clean energy need arising from the PCIA Working Group 3 process under the flexible procurement framework described above. While SCE requests flexibility in how it distributes the procurement over time, SCE's clean energy procurement would be limited by the overall clean energy needs in its Preferred Conforming Portfolio approved by the Commission. All resulting contracts should also be approved by the Commission through a Tier 3 advice letter process, the same approval process used for RPS contracts.

SCE has also filed a motion in the RPS proceeding, R.18-07-003, to update its Draft 2020 RPS Procurement Plan to request that the Commission grant SCE the option to hold an RPS solicitation to procure eligible renewable energy resources to address potential needs in 2026 and beyond resulting from the outcome of this IRP, including the approximately 250 MW of new GHG-free resources in the 2026 time period in SCE's 38 MMT Preferred Conforming Portfolio.[106] The Commission should resolve what IOU clean energy procurement can be authorized through the IRP proceeding and what IOU clean energy procurement can be authorized through the RPS proceeding, including consideration of resources needed to meet multiple needs such as GHG goals and reliability (e.g., hybrid or co-located solar plus storage resources). However, the Commission should not allow procedural barriers and inability to identify a venue prevent IOUs from pursuing important clean energy goals. In other words, the procurement of preferred and clean resources should be made easy and indications that RPS

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[106] *See Motion of Southern California Edison Company (U 338-E) to Update its Draft 2020 Renewables Portfolio Standard Procurement Plan*, R.18-07-003, August 12, 2020, at 2, Update to Draft 2020 Written Plan at 1-2, 6-7, 18.

resources can *only* be procured through an RPS Procurement Plan should be avoided. As such, SCE requests the discretion to choose to procure clean energy resources to meet the clean energy needs identified in its Commission-approved IRP portfolio through this IRP or the RPS procurement process.

3. D.19-11-016 System Reliability Procurement Status

On September 19, 2019, SCE launched its System Reliability RFO to meet its system reliability procurement requirements pursuant to D.19-11-016, as well as the procurement requirements of opt-out LSEs in SCE's TAC area who elected not to self-provide their procurement. To meet the procurement requirement for August 1, 2021 deliveries, SCE has already executed seven contracts with new stand-alone IFOM energy storage projects and new co-located IFOM energy storage projects added to existing solar projects in the Fast Track of its System Reliability RFO.[107] SCE submitted Advice Letter 4218-E seeking approval of those contracts, related solar amendments, and related tariff changes on May 22, 2020, and supplemental Advice Letter 4218-E-A submitting amendments to three of those contracts on July 16, 2020. The Commission approved SCE's Advice Letter 4218-E and 4218-E-A in their entirety in Resolution E-5101 on August 27, 2020. SCE is in the process of completing the

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107 [redacted]

Standard Track of its System Reliability RFO to meet the procurement requirements for August 1, 2022 and 2023 deliveries and expects to submit a Tier 3 advice letter for Commission approval of contracts executed in the Standard Track by no later than January 1, 2021.

As required by D.19-11-016,[108] SCE has included the required attestation from a senior executive of SCE as Appendix G. The additional information required by D.19-11-016 is included in SCE's RDTs attached as Appendices E.1 and E.2. SCE also provided the executed contracts to meets its procurement requirements for August 1, 2021 deliveries and a demonstration that the projects are incremental in SCE's Advice Letter 4218-E and 4218-E-A, which were approved by the Commission on August 27, 2020 in Resolution E-5101.

4. <u>Consideration of DACs in the Procurement Process</u>

In addition to Public Utilities Code Section 454.52(a)(1)(I)'s direction that LSEs "[m]inimize localized air pollutants and other greenhouse gas emissions, with early priority on disadvantaged communities," there are statutory provisions regarding consideration of DACs and environmental justice issues in the procurement process. Public Utilities Code Section 399.13(a)(8)(A) provides that, in soliciting and procuring eligible renewable energy resources for California-based projects, electrical corporations "shall give preference to renewable energy projects that provide environmental and economic benefits to communities afflicted with poverty or high unemployment, or that suffer from high emission levels of toxic air contaminants, criteria air pollutants, and greenhouse gases."[109] Public Utilities Code Sections 454.5(b)(9)(D)(i) states that, in soliciting bids for new gas-fired generating units, electrical corporations "shall actively seek bids for resources that are not gas-fired generating units located in communities that suffer from cumulative pollution burdens, including, but not limited to, high emission levels of toxic air contaminants, criteria air pollutants, and greenhouse gases." Electrical corporations shall also

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[108] *See* D.19-11-016 at OP 12; *LSE Instructions and Attestation for September 1, 2020 IRP Compliance Filing, R.20-05-003* email dated August 13, 2020.

[109] This section applies regardless of the procurement mechanism. *See* Cal. Pub. Util. Code § 399.13(a)(8)(B).

provide greater preference to resources that are not gas-fired generating units located in such communities when considering bids for, or negotiating contracts for, new gas-fired generating units.[110] SCE implements these requirements through its procurement evaluation criteria.

SCE typically uses a least-cost, best-fit methodology to evaluate and select resources to meet a specified need through competitive solicitations. The least-cost aspect of the methodology ensures that quantifiable attributes are considered and used to develop an NPV assessment of the proposed offer by subtracting the present value of costs from the present value of realizable benefits. These cost and benefit components include items such as fixed and variable contract payments, transmission and distribution upgrade costs, energy value, and RA value. The best-fit aspect of the methodology allows SCE to consider non-quantifiable attributes of the offer such as viability, location, counterparty concentration, technology preferences, and loading order.

SCE would assess the impact to a DAC from selecting an offer in a portfolio as part of the best-fit analysis (along with other factors) and explain this impact as part of its request for Commission approval of the procurement. It is difficult to know the impact of a portfolio selection on a DAC; however, having upfront flexibility in the procurement process allows SCE to consider DACs in the context of the full selection portfolio. This flexibility is consistent with Public Utilities Code Section 454.52(a)(2)(B), which allows the Commission to approve procurement that will reduce overall GHG emissions from the electric sector and meet other IRP goals, such as early prioritization of DACs, even if the resource does not compete favorably in terms of price with other resources over the time period of the IRP.

SCE's Preferred Conforming Portfolios do not include new natural gas generation and SCE is not proposing to develop any new natural gas generation or recontract with existing natural gas generation for a period of five years or more through this IRP. SCE will continue to ascribe a qualitative benefit to preferred resources and energy storage resources located in DACs

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[110] *See* Cal. Pub. Util. Code § 454.5(b)(9)(D)(ii).

during SCE's procurement valuation and selection. For example, in SCE's System Reliability RFO to procure incremental system RA capacity pursuant to D.19-11-016, SCE expressed a preference for preferred and energy storage resources over natural gas-fueled resources and also expressed a preference for preferred and energy storage resources located in DACs.[111] Two of the Fast Track contracts procured in that RFO for August 1, 2021 deliveries were for energy storage projects located in DACs.[112] To the extent SCE conducts procurement for renewable resources, SCE will provide qualitative preferences to projects that provide benefits to DACs or other communities meeting the criteria in Public Utilities Code Section 399.13(a)(8)(A).

These specific qualitative preferences, in combination with other qualitative preferences, could result in promoting a lower-NPV project onto the shortlist, eliminating a higher-NPV project not located in a DAC from shortlist consideration, or determining a tiebreaker between two projects with equivalent or near-equivalent NPVs, where one is located in a DAC. As such, SCE will continue to utilize the least-cost, best-fit methodology where SCE may select projects for its shortlist that do not have the highest NPVs, accounting for qualitative considerations such as DAC location.

SCE plans to conduct outreach and seek input from DACs that could be impacted by its procurement activities. SCE's specific outreach plans will depend on the location and other details of each solicitation. However, community outreach may include utilizing existing SCE's CEAWG and other existing advisory panels as described below, as well as outreach to government officials and community stakeholders in the DACs affected by the procurement.

C. Potential Barriers

This section addresses key potential barriers or risks associated with SCE's Preferred Conforming Portfolios and action plan.

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[111] *See* SCE Advice 4218-E at 17-18.
[112] *See id.*

1. Delayed Commission Action on Meeting 2024 System Capacity Needs

A key barrier to meeting the 2024 system capacity need shown in SCE's 38 MMT CAISO System-Wide Portfolio and Preferred Conforming Portfolios is if the Commission does not act expeditiously by the first quarter of 2021 to require LSEs to procure to meet the 2024 need. If this decision is delayed until after completion of the PSP, there is a risk that LSEs lose nearly a year in the timeline for procuring and bringing resources online by 2024, which could put at risk all LSEs' ability to procure the necessary amount of new system capacity to meet this approaching need, and result in more costly emergency procurement for customers.

2. Failure to Adopt a Robust Backstop Procurement Mechanism for Reliability-Based Procurement

In preparation to meet the 2024 to 2026 system capacity need, clear policies on backstop procurement are necessary to ensure that all LSEs can either plan to engage in procurement activities or opt-out of procurement and transition those responsibilities to the IOUs. It is critical that these policies be determined ahead of issuing the procurement mandate so that all LSEs are aware of their responsibilities and have sufficient time to procure the resources that are required to maintain reliability. Lack of a clear backstop procurement mechanism and requirements for LSEs to make sufficient progress on procuring new resources ahead of the requisite need date could form a barrier to ensuring the needed resources are developed and brought online in time to meet the system reliability needs. Clarity on the backstop procurement mechanism is also needed for the D.19-11-016 system reliability procurement.

It is also important that the adopted backstop procurement mechanism ensures that LSEs are making meaningful progress in meeting their procurement requirements on a realistic development path towards required online dates, while also giving the IOUs the needed time to conduct backstop procurement and bring backstop resources online as close as possible to the timelines required to maintain system reliability. There are real consequences to system reliability if the procurement requirements are not met. Accordingly, any backstop procurement mechanism must ensure the Commission has accurate information to determine if procured resources are on the right track to come online as needed, trigger IOU backstop procurement when they are not, and provide the IOUs with adequate time and opportunities to procure backstop resources that can be brought online when needed to maintain system reliability. SCE supports adoption of the proposed backstop procurement mechanism set forth in the *Administrative Law Judge's Ruling Seeking Comments on Backstop Procurement and Cost Allocation Mechanisms*, dated June 5, 2020, with some modifications to make the mechanism more meaningful, realistic, and effective.[113]

3. Failure to Adopt a 38 MMT GHG Target in the Current IRP Cycle

The Commission adopted a 46 MMT 2030 GHG target for the electric sector in D.20-03-028, but "reserve[d] the right to revisit this conclusion in the next cycle of IRP analysis" and "affirm[ed] that the selection of a 46 MMT GHG target for 2030 does not preclude the Commission from adopting a lower target in the 2019-2020 PSP, after consideration of individual IRPs."[114] However, in the same decision, the Commission noted the next IRP cycle will have the benefit of updated analysis from the joint agency SB 100 report, which will review the state's new goal of 100 percent zero-carbon electricity by 2045, and the new CARB Scoping Plan Update.[115] As stated previously, both Commission staff's 2045 Framing Study and SCE's *Pathway 2045* analysis show that economically reaching the state's 2045 decarbonization goals requires a 2030 electric sector GHG target between 30 and 38 MMT.[116]

A key barrier to reaching California's 2030 GHG emissions goal and effectively positioning the state to reach its 2045 decarbonization goals is deferring adoption of a 38 MMT GHG target to a later IRP cycle. If the Commission delays adopting a 38 MMT target, LSEs will

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[113] *See Opening Comments of Southern California Edison Company (U 338-E) on Administrative Law Judge's Ruling Seeking Comments on Backstop Procurement and Cost Allocation Mechanisms*, R.20-05-003, July 22, 2020, at 5-23.

[114] D.20-03-028 at 30-31.

[115] *See id.* at 31-32.

[116] *See* Appendix A; *Administrative Law Judge's Ruling Seeking Comment on Proposed Reference System Portfolio and Related Policy Actions*, R.16-02-007, November 6, 2019, Attachment A at 165.

not have sufficient time to collectively bring the needed resources online to meet that target, and the Commission and CAISO will not have sufficient time to study the implications of that target on reliability and to build additional transmission if needed to meet the state's goals. Further, if the Commission adopts a 46 MMT target for the PSP now and also moves to a three-year cycle for subsequent IRPs, LSEs will not have an opportunity to start procuring towards a lower target until 2024, which increases the risk that the 2030 target will not be met if the Commission were to move to a lower target in the next IRP cycle.

To minimize the risk of failing to bring the needed GHG-free and transmission resources online in time to meet the state's 2030 GHG reduction target and put California on a stable path to long-term decarbonization, it is crucial that the Commission set the GHG target correctly now by adopting a 38 MMT GHG target for the PSP.

4. Uncertainties Surrounding the Outcome of the PCIA Working Group 3 Process

As discussed in Section IV.B.2 above, there are significant uncertainties regarding future clean energy resource needs based on the outcome of the PCIA Working Group 3 process. If the Commission adopts the Voluntary Allocation and Market Offer mechanism proposed in the Final Report of PCIA Working Group 3 or a similar mechanism that requires the IOUs to allocate RPS-eligible and/or GHG-free energy procurement from their portfolios to other LSEs, SCE may need to procure additional clean energy resources due to the potential allocation of clean energy procurement in SCE's current portfolio to other LSEs. Specifically, SCE may have a need for additional clean energy procurement before 2026 and a larger need than the need shown in SCE's 38 MMT Preferred Conforming Portfolio (or 46 MMT Preferred Conforming Portfolio).

SCE proposes to address this uncertainty by requesting Commission authorization to begin procuring to meet the clean energy resource need in its Commission-approved Preferred Conforming Portfolio under a flexible procurement framework that allows SCE to account for any additional clean energy resource need resulting from a decision on the PCIA Working Group

3 proposals. Failure to account for this uncertainty will make it more difficult for SCE to meet its future clean energy needs at the least cost to its customers.

5. COVID-19 Pandemic

As discussed above, there is currently significant uncertainty associated with potential reductions to the load forecasts due to the COVID-19 pandemic that could impact the timing of new resource needs. Load reductions due to COVID-19 may result in less expected capacity need for the CAISO system and/or SCE's bundled service customers in the near- to mid-term. However, it is reasonable to expect that the impacts of the COVID-19 pandemic on demand and resource needs would revert back to the pre-COVID trajectory in the mid- to latter part of the decade. It is a "least regrets" strategy to procure for the 2024 need because even if the need is reduced, the system will be preparing for the 2025 to 2026 need that materializes with the loss of Diablo Canyon.

D. Commission Direction or Actions

Based on the study results set forth in Section III and the proposed procurement activities set forth in Section IV.B, SCE requests the following direction and actions from the Commission:

- The Commission should take expedited action by the first quarter of 2021 to mandate that all LSEs procure their share of the 2024 system capacity need of approximately 1,700 MW. The Commission's first quarter 2021 decision requiring LSEs to procure to meet the 2024 system reliability need should, at a minimum, identify and equitably allocate the 2024 system capacity need and establish upfront the opt-out and backstop procurement framework and cost allocation mechanism for such procurement.
- Based on the Commission's more complete aggregation of LSEs' IRPs and development of the PSP, the Commission should act by the end of 2021 to require LSEs to procure the larger residual system capacity need for 2025 and 2026 driven by the shutdown of Diablo Canyon. The Commission's decision ordering system

reliability procurement for 2025 and 2026 should adopt a comprehensive procurement framework establishing upfront the opt-out and backstop procurement process and cost allocation mechanism for the procurement, as well as guidance on how LSEs are required to demonstrate progress towards development of the resources identified in their IRPs and/or the procurement allocated to them through the IRP process, and the consequences if LSEs are not complying with their plans.

- The Commission should adopt a 38 MMT electric sector 2030 GHG target for all LSEs in the PSP.
- The Commission should approve SCE's 38 MMT Preferred Conforming Portfolio.
- SCE recommends that the Commission approve a 38 MMT portfolio for use in the 2021 TPP. It is critical that the CAISO have a portfolio for the next TPP that builds the resources needed to meet California's 2030 GHG target. The Commission should update and modify its 38 MMT portfolio to make it reliable and economic and provide it to the CAISO for the next TPP. In particular, SCE recommends making the following changes:
  - Update the 38 MMT portfolio to utilize the most recent IEPR demand forecast.
  - Update RESOLVE to ensure that it can select durations of storage less than 12-hour durations in order to select more economic resources than pumped storage.
  - Given the cost uncertainty of out-of-state wind, update out-of-state wind assumptions by increasing the costs of out-of-state wind or minimizing the potential that is selectable until more vetting of the costs can be completed.
  - Review the modeling decision to retire natural gas generation capacity given the tightness of capacity in the market through 2030 and the outcome of the 46 MMT RSP to maintain most of the natural gas generation for post-2030 capacity needs.

- Conduct LOLE analysis on the 38 MMT portfolio to ensure sufficient capacity is included in the portfolio to meet a 1-in-10 LOLE reliability standard.

- The Commission should authorize SCE to begin procuring clean energy resources to meet the identified clean energy need in SCE's Commission-approved Preferred Conforming Portfolio and any additional clean energy need arising from the PCIA Working Group 3 process under a flexible procurement framework.
- The Commission should reexamine the current PRM requirement in the IRP proceeding, in coordination with the RA proceeding, to develop a PRM that better reflects California's evolving electricity market and helps to better ensure system reliability.
- In the IRP and RA proceedings, the Commission should reassess the use of the current ELCC methodology based on a generic derating of capacity to measure the contributions of solar and wind resources to system reliability.
- The Commission should adopt strong reliability planning standards to guide the development of LSEs' IRP filings and ensure LSEs plan for their share of electric system needs. SCE's proposes a net peak load and energy sufficiency reliability methodology, which establishes a refined ELCC that accounts for the expected contribution of solar and wind resources to reliably serve load in each hour. SCE's proposed reliability methodology should be used in the Commission's review and aggregation of LSEs' plans in this IRP cycle and as a reliability planning standard in future IRP cycles.

E. Diablo Canyon Power Plant Replacement

In D.20-03-028, the Commission required all LSEs within the CAISO system to address their plans to assist in replacing the flexible baseload and/or firm low-emissions energy characteristics of Diablo Canyon when it retires in 2024 and 2025.[117] The Commission has determined that this does not mean that there cannot be any increase in GHG emissions when Diablo Canyon retires as long as the electric sector remains on track to meet California's GHG goals.[118]

As discussed in Sections I.B, III.A.1-III.A.3, and IV.B.1.a, SCE's 38 MMT CAISO System-Wide Portfolio and Preferred Conforming Portfolios show a significant system capacity need to maintain reliability when Diablo Canyon shuts down in 2024 and 2025. SCE strongly recommends that the Commission takes action by the end of 2021 to require all LSEs to procure the residual system capacity need for 2025 and 2026 driven by the shutdown of Diablo Canyon as discussed in Section IV.B.1.c.

Both SCE's 38 MMT and 46 MMT Preferred Conforming Portfolio build-outs of new resources to assist in replacing Diablo Canyon (as shown in Figure III-4 and Figure III-5) include flexible baseload and firm low-emissions energy characteristics, as well as GHG-free resources. No natural gas generation or GHG-emitting resources are included in the new resource additions for either of SCE's Preferred Conforming Portfolios. The flexible baseload resource additions for both of SCE's Preferred Conforming Portfolios include 434 MW of 4-hour energy storage additions by 2024, an additional 860 MW of 4-hour energy storage in 2025, and an additional 111 MW 4-hour energy storage in 2026, for total of 1,405 MW of cumulative 4-hour energy storage additions by 2026. These 4-hour energy storage resources more than replace SCE's share of the approximately 2,200 MW of system RA and flexible baseload characteristics attributed to Diablo Canyon. The remainder of SCE's Preferred Conforming Portfolio resource additions during the 2024 to 2026 time period are GHG-free renewables, including 251 MW of

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[117] *See* D.20-03-028 at OP 7.

[118] *See* D.19-04-040 at 148 ("The Joint Parties to the PFM would have us read the SB 1090 requirements and the D.18-01-022 commitments more narrowly, such that there would not be any increase in emissions at the very moment that the Diablo Canyon units go offline. For a number of reasons, this is not a reasonable reading of the intentions of the Legislature or the Commission…. Expecting an exact one-for-one replacement of energy from Diablo Canyon that is timed perfectly to coincide with the Diablo Canyon closure would be a costly and illogical way to ensure that the emissions trajectory of the electric sector is on track to meet the State's goals.").

solar in the 38 MMT Preferred Conforming Portfolio in 2026. This combination of resource additions for 2024 to 2026 are suitable substitutes for Diablo Canyon.

V.

LESSONS LEARNED

SCE offers the following lessons learned to enhance the effectiveness and efficiency of the IRP process.

A. IRP Review and Redesign Stakeholder Process

SCE has recommended that the Commission conduct a stakeholder process to consider necessary improvements to the structure and design of the IRP process to be completed in the second and third quarters of 2021 before the beginning of the next IRP cycle.[119] This IRP review and redesign process should consider issues such as whether the RSP and PSP are both needed in their current form, the appropriate length of the IRP cycle, an assessment of alternative capacity expansion modeling platforms that could replace RESOLVE, establishing stronger reliability planning standards with which LSEs must demonstrate compliance when developing their IRPs, and developing and adhering to a schedule that provides sufficient opportunities for LSEs to review Commission staff's modeling inputs and analysis, and time for staff to incorporate changes into the models and plans prior to final adoption.

The RSP modeling process also yielded several additional process improvement opportunities for future IRP cycles. Adopting these changes will help ensure development of a more robust, reliable, and economic RSP that meets GHG targets.

- Provide actual modeling datasets earlier in the process for stakeholder review so that stakeholders can commence their modeling. While it is helpful and necessary to have

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[119] *See Comments of Southern California Edison Company (U 338-E) on Order Instituting Rulemaking to Continue Electric Integrated Resource Planning and Related Procurement Processes*, R.20-05-003, June 15, 2020, at 5-9; *Reply Comments Of Southern California Edison Company (U 338-E) On Order Instituting Rulemaking And Comments On Proposed Proceeding Schedule*, R.20-05-003, July 6, 2020, at 3-5.

an adopted inputs and assumptions document early on in this process, it is unclear how some of those inputs and assumptions will be implemented in the modeling process. Therefore, it is important that stakeholders have access to the actual data inputs early in the process for review and comment prior to the modeling work being done and the results being provided for stakeholder review.

- Ensure that Commission staff has sufficient time to effectively iterate between capacity expansion and production costs models to design an RSP that meets the GHG targets in the more rigorous production cost modeling process, not just in the capacity expansion modeling process which is a coarser tool, as well as meeting the 1-in-10 LOLE reliability standard.
- If high cost resources are selected in the Commission's RSP modeling process, SCE requests that the Commission provide stakeholders more detailed insights, including modeling results and analysis that indicate why the modeling selects the resources. The market will take important signals from the IRP process about what resources are needed. As such, it is critical for the Commission to clarify what system needs are driving the resource selection and the justification for the higher costs resources. For example, the most recent RSP selected 12-hour pumped storage and out-of-state wind, but the Commission provided no analytical details on why these more expensive resources were selected or how they benefit the system.

B. Reliability Planning Standard

The Commission's filing requirements currently lack clear guidance and structure for LSEs to develop their IRP portfolios in way that ensures they are adequately meeting their share of system reliability and not leaning on the system for more than their fair share. In addition, the Commission does not have a transparent method to evaluate whether LSEs' IRPs meet system reliability needs prior to the aggregation of LSEs' plans and PSP development process.

The Commission should prioritize the development of robust reliability planning standards to guide the development of LSEs' IRP filings and ensure that the Commission will produce a portfolio of resources that meets reliability needs when it aggregates all LSEs' plans into the PSP. As described in Section III.F.1, the current System Reliability Progress Tracking Table generated by the RDT does not accurately assess an LSE's resource portfolio due the use of a static load allocation, which does not consider future load migration to calculate an LSE's capacity requirement. Because of this issue, the reliability tracking table is not an accurate representation of an LSE's future reliability obligation. Moreover, SCE believes that a capacity check, like the reliability tracking table, is no longer sufficient to determine if a portfolio is reliable. SCE recommends the Commission implement its proposed reliability methodology based on a net peak load and energy sufficiency metric as described in Section III.F.2 and Appendix D, which includes three components, a capacity check, energy sufficiency analysis, and a storage charging verification. This methodology could be used in the review and aggregation of LSEs' IRPs in this IRP cycle and as a reliability planning standard for the next IRP cycle.

C. **<u>CSP Calculator Improvements</u>**

As discussed in Section III.C.2., the CSP Calculator produces GHG emissions that are higher than those resulting from SCE's internal modeling, which could potentially result in unnecessary over-procurement and increase customer costs. The Commission should explore why the CSP Calculator results in higher GHG emissions when compared to other models. SCE provides recommendations for CSP Calculator improvement including using consistent hourly managed load shapes, standardizing line loss factors, and allowing LSEs to customize their CHP information to accurately reflect their specific portfolios. These issues are discussed in more detail in Section III.C.2.

D. <u>Transmission Costs</u>

SCE recommends that transmission costs be evaluated more thoroughly within the IRP process. More transparent and updated information about transmission costs would help LSEs determine the tradeoffs among resource locations, especially between out-of-state and in-state resources, which would help LSEs to develop optimal portfolios. Transmission costs in RESOLVE are currently characterized by a single levelized cost without a description of the inputs, assumptions, and methodology that was used to determine that cost. More transparency on these issues could allow stakeholders to provide more useful feedback on the transmission costs in RESOLVE and provide LSEs with more assurance that such costs are reasonable.

Respectfully submitted,

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September 1, 2020

RULE 1.11 VERIFICATION

I am an officer of the applicant corporation herein and am authorized to make this verification on its behalf. I am informed and believe that the matters stated in the foregoing document are true.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 27th day of August, 2020 at Seal Beach, California.

/s/ Carla J. Peterman

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Rosemead, California 91770

Appendix A

SCE's Pathway 2045 – Update to the Clean Power and Electrification Pathway

November 2019

SEE NOTICE OF AVAILABILITY FOR APPENDIX A

Appendix B

Loss-of-Load Expectation Reliability Study

SCE performed additional testing of CAISO system-wide resource portfolio reliability by calculating the LOLE using a Monte Carlo simulation approach to ensure that the resource portfolio is reliable by meeting the LOLE reliability standard. Monte Carlo simulation is a common approach to risk analysis that examines a multitude of possibilities to arrive at statistics about the possible outcomes. Studying resource portfolios with this approach plus a sensitivity analysis provides significant insights about the reliability of high-renewable power systems.

There were four primary conclusions from SCE's LOLE reliability study:

1. The final 38 MMT CAISO System-Wide Portfolio of resource additions produced by the ABB CE capacity expansion model using the Commission's baseline resource assumptions is reliable, meeting a 1-in-10 LOLE reliability standard in the test years 2024, 2026, and 2030.
2. An out-of-state wind-heavy portfolio does not economically improve system reliability as compared to a heavy solar and 4-hour energy storage portfolio by 2030.
3. Long-duration storage such as 12+-hour pumped storage does not offer additional reliability benefits over 4-hour energy storage, which is the most economic selection for meeting the system capacity needs and covers the loss-of-load hours.
4. The PRM is dependent on the resource mix. The Commission should reexamine the current PRM requirement in the IRP proceeding, in coordination with the RA proceeding, to develop a PRM that better reflects California's evolving electricity market and helps to better ensure system reliability.

Monte Carlo simulation was used to arrive at the above conclusions by testing some of the most uncertain variables from earlier resource planning steps. The variables of interest selected for this study were electricity demand, solar output, wind output, and conventional generation forced outages. For each resource portfolio, a range of outcomes were represented by 500 different combinations of electricity demand, renewable energy output, and outages. Each of the 500 possibilities were made by combining one of 20 different weather possibilities with one of 500 unique generation outage patterns. Depending on the weather, electricity demand may be higher or lower, solar output may be higher or lower, and wind energy output may be higher or lower. Similarly, depending on outages, individual conventional generators may have different outage patterns.

For each portfolio, these 500 possibilities were all checked for times when there is not enough energy production to meet demand – also known as loss-of-load events. For example, suppose that case number 001 out of 500 represents a year with very helpful weather from a power system perspective. The weather would not be too hot and therefore peak electricity demand would not be extreme. Helpful weather would also have generous wind output and relatively few clouds covering solar farms. Suppose further that there happened to be a below average amount of generator outages that year. Under those conditions, case number 001 out of 500 would most likely not have a loss-of-load event because the conditions happened to be highly amenable to a smoothly operating power system. Therefore, case 001 would tend to lower the expected loss-of-load events when all 500 are considered.

On the other hand, other cases out of 500 have the opposite conditions with high demand, low renewable output, and possibly critical generators experiencing outages. Once all 500 simulations are complete, the number of loss-of-load events are counted, a probability distribution is applied over the 500 combinations, and the LOLE is calculated as the probability-weighted average count of loss-of-load events.

SCE applied the appropriate reliability standard of 0.1 loss-of-load events per year as defined by the Commission. Resource portfolios only passed the reliability standard if the expected value of loss-of-load events was strictly less than 0.1. A loss-of-load event is defined as a day in which at least one hour does not have enough resources to meet electricity demand and reserve requirements. Having less than one event per year means that a year usually does not have any loss-of-load events at all, but one might be expected every 10 years.

A handful of simplifying assumptions were needed to make the process viable with such a large number of simulations. First, SCE focused on the years 2024, 2026, and 2030 because important events are occurring in California's electric system during those years. The system reliability procurement required by D.19-11-016 will be completed and resources are expected to be online by August 2023. Diablo Canyon will be fully retired by 2026. Moreover, California has established policy goals of a 60 percent RPS and 40 percent GHG reductions below 1990 levels by 2030.

Second, supply and demand data were developed using the 2019 IEPR mid Baseline mid AAEE case and the Commission's 2019 SERVM load and renewables profiles. The conventional generator forced outage rates were determined based on the North American Electric Reliability Corporation historical outage database.

Demand was derived in two steps by recalibrating the 20 weather years of SERVM inputs to match key parameters from the 2019 IEPR mid Baseline mid AAEE case. Energy Division previously documented the appropriate equations.[1]

In the first step, the hourly CAISO system baseline consumption data of the SERVM inputs was recalibrated. The hourly baseline consumption from the 2019 IEPR mid Baseline mid AAEE for each of the 20 versions has the exact same peak demand and annual total demand, which is exactly equal to the peak demand annual total from 2019 IEPR mid Baseline mid AAEE. There were 20 versions of 2024 baseline consumption, 20 versions of 2026 baseline consumption, and 20 versions of 2030 baseline consumption depending on the weather. The weather was assumed to affect the pattern of baseline consumption but not the maximum or total annual baseline consumption, which remained as forecasted in the IEPR.

In the second step, three load modifier values were added from the 2019 IEPR mid Baseline mid AAEE case to arrive at managed net load from baseline consumption. These were BTM solar, BTM storage losses, and AAEE. This load data development process confirmed the expectation that peak managed net load is significantly affected by weather, varying 47 to 51 gigawatts ("GW"), while the median was consistent at 25 GW. Forecasted growth of BTM solar

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[1] *See* Energy Resource Modeling Section, Energy Division, *Unified Resource Adequacy and Integrated Resource Plan Inputs and Assumptions – Guidance for Production Cost Modeling and Network Reliability Studies*, March 29, 2019, at 29.

reduced the minimum load – from 15 to 16 GW forecasted for 2020 to 10 to 12 GW in 2030 depending on the weather. Renewable energy output data was developed by multiplying the energy portfolio buildout (MW) by the hourly SERVM solar and wind profiles. For solar, the technology blend was 75 percent single-axis tracking and 25 percent fixed-tilt. Geothermal production did not vary with the weather, but generated at its average capacity factor all year in each case.

Finally, the chance of outages was specified in the data using two parameters for each conventional generation resource – forced outage rate ("FTR") and mean time to repair ("MTTR"). The actual outage history of each generator was examined to estimate FTR and MMTR, then these two values were inputted into the simulation as a characteristic of that generator. The simulation software can utilize the FTR and MTTR to generate outages by treating the FTR as a probability. When a generator is out in one of 500 simulations, optimization searches for the next-best possible way to serve the load. If there is none, this triggers a loss-of-load event.

When the resource portfolios failed LOLE testing, they were sent back to capacity expansion modeling for refinement iteratively. SCE tested its 38 MMT CAISO system-wide resource build-out for 2024, 2026, and 2030, as well as a heavy out-of-state wind sensitivity featuring additional out-of-state wind in New Mexico and Wyoming. A heavy out-of-state wind portfolio yielded an inferior LOLE result compared to a heavy solar and 4-energy storage portfolio which contained about 7,000 additional MW of solar, about 1,000 additional MW of 4-hour energy storage, and about 1,000 additional MW of 7-hour energy storage. This is mainly because the 4-hour energy storage converts the non-dispatchable intermittent resources to dispatchable resources and serves the load during the peak load hours.

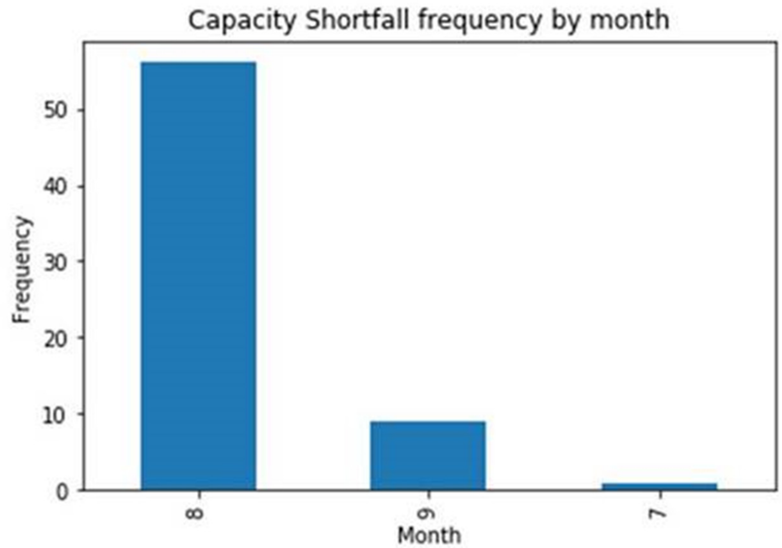
SCE's LOLE testing revealed that longer duration storage (greater than 4-hour) does not provide additional reliability beyond what would be provided by 4-hour energy storage.
As previously mentioned, storage with a 7-hour duration was selected for the 38 MMT CAISO system portfolio in order to fill an GHG emissions gap of 1.5 MMT between capacity expansion

modeling and PCM. All of the observed loss-of-load events occurred with a 3-hour window during HE18 to HE20. The 4-hour energy storage can meet the system capacity needs of these hours by completing a daily cycle.

SCE also concluded that the PRM for the CAISO system needed to be increased to 16.5 percent by 2024 and 17.5 percent by 2026 if the 0.1 LOLE reliability standard was to be met. The current PRM of 15 percent was developed for earlier power systems with very little intermittent energy sources and high amounts of controllable resources that can fill emerging shortages. Although a power system with mostly natural gas generation can sustain an LOLE measure of 0.1 at only 15 percent excess capacity, additional excess capacity is needed in a power system including significant solar and wind resources that are dependent on the weather. The 1.5 and 2.5 percentage point increases in the PRM were estimated using the loss-of-load events from the 500 simulations.

In addition, SCE summarized the pattern of loss-of-load events of SCE's CAISO system-wide portfolio modeling for all three study years. The study results demonstrate that loss-of-load events consistently occur between HE18 and HE20 for three summer months from July to September. Figures B-1, B-2, and B-3 below show the pattern of loss-of-load events for 2024, 2026, and 2030, respectively. Moreover, when loss-of-load events occur during the late afternoon or early evening hours, their duration never exceeds three hours for all 500 scenarios for each study year. This result demonstrates that long-duration storage does not improve system reliability since unserved load is identified in the summer, primarily between HE18 and HE20 where 4-hour energy storage is sufficient and effective to satisfy the peak needs.

Figure B-1
Loss-of-Load Event Pattern for Study Year 2024



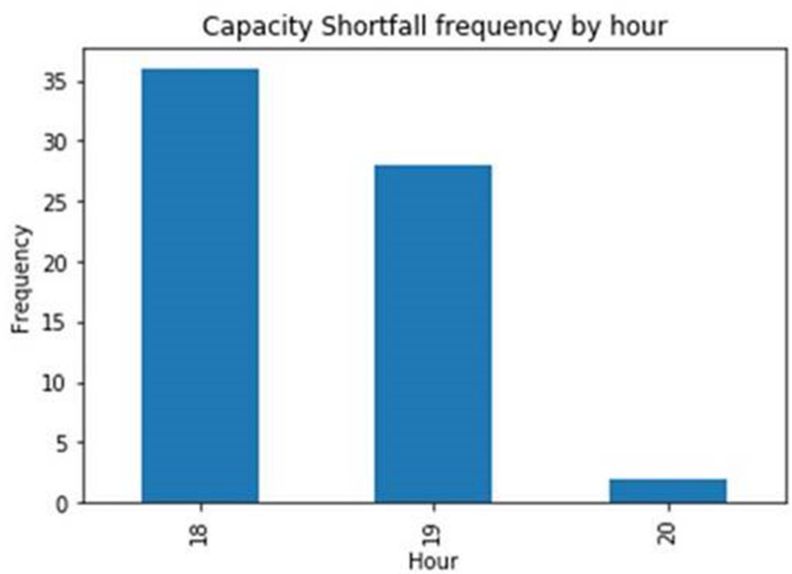


Figure B-2
Loss-of-Load Event Pattern for Study Year 2026

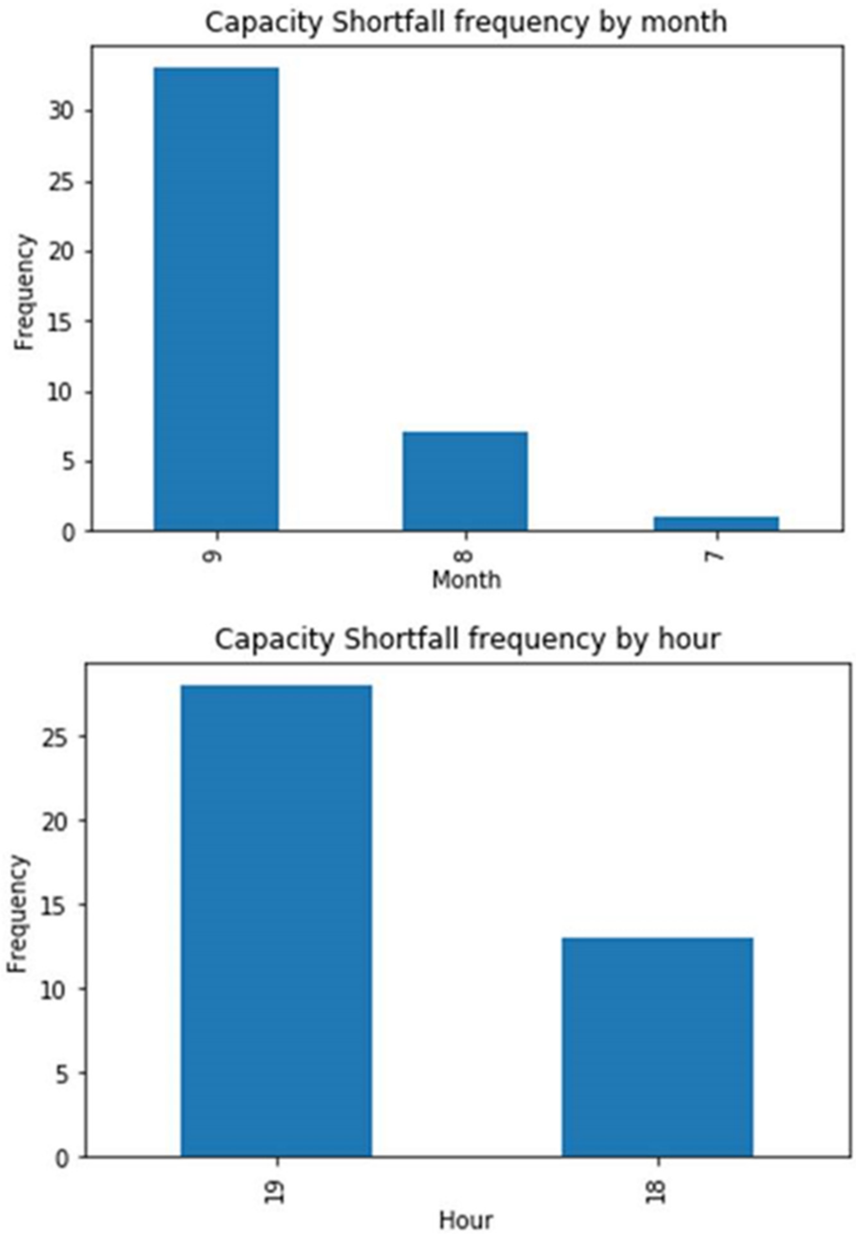
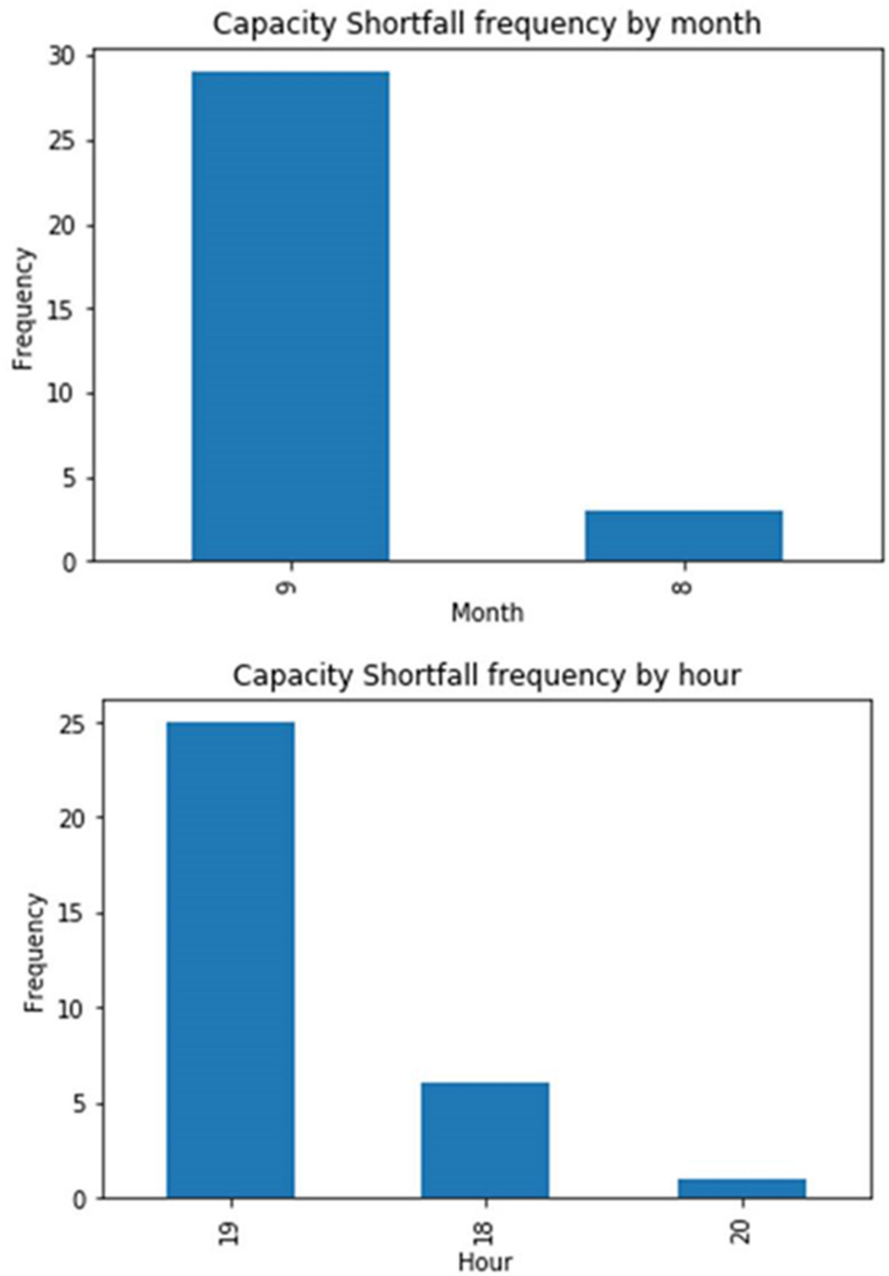


Figure B-3
Loss-of-Load Event Pattern for Study Year 2030



Given SCE's *Pathway 2045* view that decarbonizing California's electric sector coupled with electrification of high GHG content fuels and end uses is the most feasible and economic path to decarbonizing California, it is critical to vigilantly plan for maintaining system reliability as the grid evolves. This study was prepared to gain a better understanding of the range of outcomes for high-renewable power systems. Uncertain variables of weather and outages were tested for their effects on simulated loss-of-load events. This study provides insights that the Commission can consider for future resource planning efforts as mentioned above. Additionally, it demonstrates how an iterative process can be used to achieve a least-cost, operable, and reliable resource portfolio, and provides additional understanding of the range of outcomes for the CAISO system during the critical reliability years of 2024, 2026, and 2030.

Appendix C

Demographics of DAC-Designated Census Tracts Aggregated to County Subdivision, in SCE's Service Area

Introduction

This Appendix contains demographic information on the DACs located within SCE's distribution service area. The document includes references to California averages regarding age, income, and educational attainment. These averages are as follows:

- Median age: 36.3 years
- Per capita income: $35,021
- Household income: $71,228
- High school diploma attainment: 82.9%
- Bachelor's degree or higher attainment: 33.3%

Demographic data in this Appendix is sourced from the Knight Foundation's *Census Reporter* tool.[1] SCE used the CEC's ArcGIS open source mapping tool to determine power plant locations.[2]

Anaheim-Santa Ana-Garden Grove

There are 52 DAC-designated census tracts in this subdivision, comprising 303,526 people out of a total population of 1,704,670 – 18% of the population. Anaheim-Santa Ana-Garden Grove is located in southwestern Orange County, along the I-5, CA-39 and CA-55 freeways. DACs in this subdivision are primarily clustered in the western half of the subdivision and the most highly-impacted DACs are near transit corridors. The average age in the county subdivision is 35.4, which is younger than the California average. Household income is higher than the state average, with per capita income lower. The largest ethnic group is Hispanic (48%), followed by White (28%) and Asian (20%). The most common language other than English spoken is Spanish, and 35% of adults speak this language at home. High school graduation and college graduation rates are lower than the California averages. The AES

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1 *See Census Reporter*, available at: https://censusreporter.org/.

2 *See* CEC, *California Operational Power Plant*, updated March 23, 2020, available at: http://caenergy.maps.arcgis.com/apps/webappviewer/index.html?id=ad8323410d9b47c1b1a9f751d62fe495.

Huntington Beach power plant is located in the subdivision, but not in a DAC. Barre Peaker is located in Stanton, also a DAC. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Gregory Scott of the Community Action Partnership of Orange County and Dr. Robin Avelar La Salle of Orenda Education.

Barstow

There are four DAC-designated census tracts in this subdivision, comprising 17,210 people out of a total population of 43,291 – 40% of the population. Barstow is located in the High Desert region, a major thoroughfare connecting traffic from the Los Angeles basin to Nevada and major western traffic corridors. The DACs are clustered around the city of Barstow. The median age in the county subdivision is 32.8 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (39.9%), followed by White (39.6%) and Black (11%). The most common language spoken other than English is Spanish, and 18% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There are several solar facilities in the western end of the subdivision. There is one combined cycle power plant in the region, the High Desert Power Plant, located in the neighboring Victorville-Hesperia county subdivision. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and relationships with the Mojave Valley United Way, the Barstow Senior Center, and the Barstow College Foundation. Gloria Harrison of the Inland Empire Community Newspapers and Carole Beswick of Inland Action, Inc. are members of the Consumer Advisory Panel.

Blythe

There is only one DAC census tract in this San Bernardino County subdivision, comprising 3,341 people out of a total population of 15,060 – 22% of the population. The DAC is in the southern half of city of Blythe along the I-10 freeway. The median age in the county subdivision is 34.4 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic groups are Hispanic (59%), White (28%), and Asian (2%). The most common language other than English is Spanish, and 41% of adults speak it at home. High school and college graduation rates are lower than the California averages. There is a large natural gas-fired combined cycle plant located outside Blythe, although it is not in the DAC census tract. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Gloria Harrison of the Inland Empire Community Newspapers and Carole Beswick of Inland Action, Inc.

Central Coast

There are two DAC-designated census tracts in this subdivision, comprising 9,507 people out of a total population of 257,762 – 4% of the population. Central Coast is located in southern Orange County bordered by the Newport coast and the I-405 freeway. The majority of the subdivision's census tracts are not rated as DACs, and the two census tracts that are designated as DACs are in industrialized and commercial areas. The median age in the county subdivision is 36.2 years old, which is about the same as the California median. Household and per capita income are higher than the state averages. The largest ethnic group is White (59%), followed by Hispanic (22%) and Asian (14%). The most common language other than English is Spanish, and 15% of adults speak this language in the home. High school and college graduation rates are higher than the California averages. There are no large power plants in the region.
SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Gregory Scott of the Community Action Partnership of Orange County.

Compton

There are 62 DAC-designated census tracts in this subdivision, comprising 306,588 people out of a total population of 351,459 – 87% of the population. This is one of the most impacted subdivision areas. The subdivision runs along the heavily congested I-710 corridor, transporting goods to and from the Port of Long Beach. The median age in the county subdivision is 33.1 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (63%), followed by Black (22%) and Asian (9%). The most common language other than English is Spanish, and 55% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There are two gas-powered plants in the subdivision (Carson Cogeneration, Watson Cogeneration) and a gas digester (Total Energy). SCE regularly engages with the DAC-designated communities in this subdivision, including through representatives through its Local Public Affairs staff and through members of the Consumer Advisory Panel, such as Cesar Zaldivar-Motts of the Southeast Community Development Corporation, together with Patricia Watts of FCI Management, who sits on both the Consumer Advisory Panel and the Clean Energy Access Working Group. SCE has started working with the Clean Power Alliance on an early-stage community solar project in Willowbrook, a city within this subdivision, to provide underserved community members access to locally produced solar energy.

Corona

There are nine DAC-designated census tracts in this subdivision, comprising 50,372 people out of a total population of 187,078 – 27% of the population. Located in Riverside County, the most heavily impacted census tracts in the subdivision are along the 91 freeway. Household income is higher than the state average, although per capita income is lower than average. The median age in the county subdivision is 35 years old, which is slightly younger than the California median. However, the subdivision also includes some areas that are non-

DAC and fairly affluent, so this data may not be DAC-representative. The largest ethnic group is Hispanic (45%), followed by White (36%) and Asian (11%). The most common language other than English is Spanish, with 30% of adults speaking this language in the home. The high school graduation rates is higher than the California average, and the college graduation rate is lower than the California average. There are two gas-powered plants in the subdivision (Corona Cogeneration, Clear Water Cogeneration). SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Gloria Harrison of the Inland Empire Community Newspapers and Carole Beswick of Inland Action, Inc. SCE also engages with this community through a variety of community and civic engagements led by SCE's Local Public Affairs staff (Soroptomist International of Corona) and our corporate philanthropy efforts (YMCA, United Way).

Delano-McFarland

There are five DAC-designated census tracts in this subdivision, comprising 38,469 people out of a total population of 70, 536 – 55% of the population. The Delano-McFarland subdivision is located in the San Joaquin Valley. The most heavily impacted DACs are in the rural agricultural areas, outside of the more densely populated cities of McFarland and Delano. The median age in the county subdivision is 29.6 years old, which is much younger than the California median. Household and per capita income are much lower than the state averages. The largest ethnic group is Hispanic (81%) followed by White (39.6%) and Asian (20%). The most common language other than English is Spanish, and 66% of adults speak this language in the home. High school and college graduation rates are much lower than the California averages. The Wellhead Power plant is located in this county subdivision. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Dinuba

There are two DAC-designated census tracts in SCE's service area in this Tulare County subdivision, comprising 10,144 people out of a total population of 35,162 – 29% of the population. Most of the subdivision falls in Pacific Gas and Electric Company's ("PG&E") service area and the overlap of the subdivision and SCE's service area may be the result of ArcGIS layering issues, but SCE has decided to include it because of the proximity. The media age in the county subdivision is 27.9 years old, which is much younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (81%) followed by White (16%) and Asian (2%). The most common language other than English is Spanish, and 63% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There are no large power plants in the subdivision, although there are several solar facilities. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Downey-Norwalk

There are 49 DAC-designated census tracts in this subdivision, comprising 243,273 people out of a total population of 419,001 – 58% of the population. The most heavily impacted DACs are along the transportation corridors of the I-710, I-605, and I-5. The median age in the county subdivision is 35.8 years old, which is slightly younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (62%) followed by Asian (17%) and White (13%). The most common language spoken other than English is Spanish, and 49% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There are four gas-powered generators in the subdivision (Center Peaker, Norwalk Energy, Biola University and Lundy-Thagard). SCE regularly engages with the DAC-designated communities in this subdivision, including through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Romel Pascual of CicLAvia and Isela Gracian of the Nonprofit Finance Fund. SCE also engages through its work with environmental justice organizations such as East Yard Communities, and its corporate philanthropic engagement in the area, including with the Los Angeles County Public Library Foundation for Science Technology Engineering Art Math ("STEAM") education programs.

Earlimart

There is one DAC-designated census tracts in this subdivision, comprising 7,682 people out of a total population of 15,094– 51% of the population. Earlimart subdivision is a rural agricultural area in the San Joaquin Valley, along the CA-99 transportation corridor. Some of the subdivision falls in PG&E's service area and the overlap of the subdivision and SCE's service area may be the result of ArcGIS layering issues, but SCE has decided to include it because of the proximity. The median age in the county subdivision is 30.3 years old, which is slightly younger than the California median. Household income is much lower than the state average, with per capita income also lower. The largest ethnic group is Hispanic (91%) followed by Asian (4%) and White (3%). The most common language spoken other than English is Spanish, and 86% of adults speak this language in the home. High school and college graduation rates are much lower than the California averages. There are a number of solar generation facilities in the western border of the subdivision. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working

Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

East Kern County

There is one DAC-designated census tract in this subdivision, comprising 5,152 people out of a total population of 80,859 – 6% of the population. The DAC surrounds, but does not include, the census tracts of California City. The median age in the county subdivision is 34.6 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is White (53%), followed by Hispanic (28%) and Black (10%). The most common language spoken other than English is Spanish, and 17% of adults speak this language in the home. The high school graduation rate is higher than the California average, but the college graduation rate is lower. There are a number of wind generators located in the Tehachapi Pass in the lower quadrant of the subdivision. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

East San Gabriel Valley

There are 69 DAC-designated census tracts in this subdivision, comprising 331,912 people out of a total population of 958,160– 35% of the population. The most heavily impacted DACs are along the transportation corridor of the I-605 freeway, and where it intersects with I-210, I-10, and CA-60. This area is heavily industrialized. The median age in the county subdivision is 36.9 years old, which is roughly the same as the California median. Household income is higher than the state average, while per capita income is lower. The largest ethnic group is Hispanic (55%), followed by Asian (22%) and White (17%). The most common language spoken other than English is Spanish, and 38% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There are two gas-powered generators in the subdivision (Walnut Creek, Pacific Palms Cogen) and two biogas generators as part of the Puente Hills Landfill (Puente Hills Recovery). SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Community Advisory Panel, including Isela Gracian of the Nonprofit Finance Fund.

Elsinore Valley

There are two DAC-designated census tracts in this subdivision, comprising 9,752 people out of a total population of 125,809 – 8% of the population. Elsinore Valley is located in western Riverside County along the I-15 freeway. The median age in the county subdivision is 33.6 years old, which is younger than the California median. Household income is above the state average, while per capita income is lower. The largest ethnic group is Hispanic (48%), followed by White (38%) and Asian (6%). The most common language spoken other than English is Spanish, and 33% of adults speak this language in the home. The high school graduation rate is roughly the same as the California average, but the college graduation rate is lower. There are no large power plants in the subdivision. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Community Advisory Panel, including Carole Beswick of Inland Action, Inc. and Gloria Harrison of Inland Empire Community Newspapers.

Exeter

There are two DAC-designated census tracts in this subdivision, comprising 11,332 people out of a total population of 26,285 – 43% of the population. The DACs represent the agricultural areas of Farmersville and surrounding area in the San Joaquin Valley. The median age in this subdivision is 32.9 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (62%), followed by White (35%) and Black (10%). The most common language spoken other than English is Spanish, and 49% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There are no large power plants in the region. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Hanford

There are five DAC-designated census tracts in this subdivision, comprising 27,070 people out of a total population of 68,743 – 39% of the population. Many of the DACs are located in the central and southern portions of the City of Hanford, which is in SCE's service area. For at least one large rural DAC located to the south of the city, that tract is in PG&E's service area. The median age in the county subdivision is 33.2 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (51%), followed by White (37%) and Asian (4%). The most common language spoken other than English is Spanish, and 29% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There is one large power plant in the subdivision, the Hanford Emergency Peaker. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Hemet-San Jacinto

There are four DAC-designated census tracts in this subdivision, comprising 23,523 people out of a total population of 169,300 – 14% of the population. These DACs include the downtown and northwest sections of the City of Hemet. The median age in the county subdivision is 36.2 years old, which is the same as the state median. Household and per capita income are lower than the state averages. The largest ethnic groups are Hispanic (46%), White (41%), followed by Black (6%). The most common language spoken other than English is Spanish, and 29% of adults speak this language at home. The high school graduation rate is slightly lower than the state average, while the college graduation rate is one-third the state average. There are no large power plants in the subdivision. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Community Advisory Panel, including Carole Beswick of Inland Action, Inc. and Gloria Harrison of Inland Empire Community Newspapers.

Inglewood

There are 57 DAC-designated census tracts in this subdivision, comprising 269,449 people out of a total population of 374,562 – 72% of the population. Many customers live in DACs, the worst of which lie along the west side of the I-710 corridor, which transports goods to and from the Port of Long Beach. The median age in the county subdivision is 35 years old, which is slightly younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (53%), followed by Black (28%), Asian (8%), and White (8%). The most common language spoken other than English is Spanish, and 46% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There are no large power plants in the subdivision. There are several small cogeneration facilities in the broader South Bay region, including adjacent subdivisions. SCE engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and members of the Consumer Advisory Panel, including

Romel Pascual of CicLAvia, several representatives on its Clean Energy Access Working Group (Village Solutions Foundation, Business Resource Group, Grid Alternatives), and through its corporate philanthropy (including El Camino Community College, Grid Alternatives, I Have a Dream Foundation, Infinite Learning, Our Community Works, Social Justice Learning Institute, South Bay Workforce Investment Board, and Urban Scholars Academy).

Jurupa

There are 14 DAC-designated census tracts in this subdivision, comprising 74,907 people out of a total population of 165,422 – 45% of the population. The DACs are located primarily along the CA-60 freeway to the west of the city of Riverside. The median age in the county subdivision is 32.6 years old, which is younger than the California median. Household income is higher than the state average, with per capita income lower than the state average. The largest ethnic group is Hispanic (59%), followed by White (21%) and Asian (12%). The most common language other than English spoken is Spanish, and 45% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There are two power plants in the area, comprised of two gas units owned by the city of Riverside. SCE's Mira Loma peaker gas plant sits just on the western edge of the area. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Community Advisory Panel, including Carole Beswick of Inland Action, Inc. and Gloria Harrison of Inland Empire Community Newspapers.

Lake Arrowhead

There is one DAC-designated census tracts in this subdivision, comprising 5,338 people out of a total population of 20,654—26%% of the population. The DAC census tract is located along the transportation corridors of I-215 and I-15. The median age in the county subdivision is 43.8 years old, which is older than the California median. Household and per capita income are lower than the state average. The largest ethnic groups are White (69%), followed by Hispanic (8%) and two or more races (3%). The most common language spoken other than English is

Spanish, with 11% of adults speaking this language at home. The high school graduation rate is higher than the California average, but the college graduation rate is lower. SCE engages with the DAC-designated communities through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Gloria Harrison of the Inland Empire Community Newspapers.

Lake Isabella

There is one DAC-designated census tract in this Kern County subdivision, comprising 6,158 people out of a total population of 14,969 – 41% of the population. The median age in the county subdivision is 55.3 years old, which is older than the California median. Household income is higher than the state average, with per capita lower than the state average. The largest ethnic group is White (87%), followed by Hispanic (8%) and Native (2%). The most common language spoken other than English is Spanish, and 4% of adults speak this language in the home. The high school graduation rate is higher than the California average, and the college graduation rate is lower than the California average. There are no large power plants in the subdivision. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group.

Lake Mathews

There are two DAC-designated census tracts in this subdivision, comprising 10,226 people out of a total population of 28,420 – 36% of the population. The DACs within this subdivision are next to the I-15 freeway. The median age in the county subdivision is 34.7 years old, which is younger than the California median. Household income is higher than the state average, with per capita income lower than the state average. The largest ethnic groups are Hispanic (55%), followed by White (33%) and Black (7%). The most common language spoken other than English is Spanish, and 39% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. The Lake Mathews Hydro Recovery plant is located in this subdivision. SCE engages with the DAC-designated communities through its Local Public Affairs staff and through members of the Consumer Advisory Panel.

Lindsay

There is one DAC-designated census tract in this subdivision, comprising 3,395 people out of a total population of 18,277 – 19% of the population. Lindsay county subdivision is located in the San Joaquin Valley. The median age in the county subdivision is 31.5 years old, which is younger than the California median. Household and per capita income are much less than the state average. The largest ethnic group is Hispanic (81%), followed by White (16%) and Asian (1%). The most common language spoken other than English is Spanish, and 70% of adults speak this language in the home. High school and college graduation rates are much lower than the California averages. There are no large power plants in the county subdivision, but there are several solar photovoltaic plants throughout the broader region. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Long Beach-Lakewood

There are 59 DAC-designated census tracts in this subdivision, comprising 279,702 people out of a total population of 577,138 – 48% of the population. The DACs are located primarily along Pacific Coast Highway and the I-710 freeway, the latter being a major transportation corridor continually traversed by freight trucks and other vehicles. The median age in the county subdivision is 35.1 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is

Hispanic (42%), followed by White (29%) and Asian (14%). The most common language spoken other than English is Spanish, and 31% of adults speak this language in the home. High school and college graduation rates are slightly lower than the California averages. Several gas power plants are situated nearby the I-710 transit corridor and within the DAC area. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Patricia Watts of Faith Com, Inc, dba/FCI Management, who also serves on the Clean Energy Access Working Group.

Los Angeles

There are 63 DAC-designated census tracts in this subdivision, comprising 257,691 people out of a total population of 2,598,846 – 10% of the population. Many of the DACs in this subdivision fall along the major truck routes from the ports to metropolitan Los Angeles – the I-110 and I-710 freeways. Other census tracts within this subdivision are serviced by Los Angeles Department of Water and Power ("LADWP") and make up the western section of the subdivision. The median age of the subdivision is 34.9 years old, which is slightly lower than the California median. Household income is the lower than the California average, while per capita is about the same. The largest ethnic group is Hispanic (48%), followed by White (26%), Asian (12%), and Black (12%). The most common language spoken other than English is Spanish, and 40% of adults speak Spanish only. The high school graduation rate is lower than the state average, and the college graduation rate is slightly higher. There are several gas-powered plants in the subdivision, but they fall outside of SCE's service area. SCE engages with the DAC-designated communities through its Local Public Affairs staff in the area and through members of the Consumer Advisory Panel, including Romel Pascua, of CicLAvia.

Newberry Springs-Baker

There is one DAC-designated census tract in this subdivision, comprising 3,846 people out of a total population of 12,711 – 30% of the population. The subdivision comprises a large area of open land in the Mojave National Preserve extending to the Nevada border. The median age in the county subdivision is 24.3 years old, much younger than the California median. Household and per capita income are both lower the state averages. The largest ethnic group is White (53%), followed by Hispanic 19% and Black (14%). The most common language spoken other than English is Spanish, with 11% of adults speaking this language in the home. The high school graduation rate is higher than the California average, while the college graduation rate is lower. The Ivanpah Solar Electric Generating System is housed in the northeast corner of the county subdivision. SCE engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through its corporate philanthropy (Barstow College Foundation, Barstow Senior Citizen Center, United Way).

North Antelope Valley

There is one DAC-designated census tract in this subdivision, comprising 4,514 people out of a total population of 192,039 – 2% of the population. The DAC is located in the city of Lancaster, near Palmdale Regional Airport. The majority of the subdivision's census tracts are not rated as DACs and the overlap of the subdivision and SCE's service area may be the result of ArcGIS layering issues, but SCE has decided to include it because of the proximity to DAC-designated areas. The median age in the county subdivision is 33.8 years old, which is slightly younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (39%), followed by White (35%) and Black (19%). The most common language spoken other than English is Spanish, and 20% of adults speak this language in the home. The high school graduation rate is the same as the California average, and the college graduation rate is about half of the California average. There are several solar facilities in the subdivision. There is one combined cycle power plant in the region, the High Desert Power Plant, located in the neighboring Victorville-Hesperia county subdivision. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff in the area.

North Coast

There are four DAC-designated census tracts in this subdivision, comprising 26,569 people out of a total population of 378,947 – 7% of the population. The DACs are located primarily along the SR-22 and I-405 freeways. The median age in the county subdivision is 43.1 years old, which is older than the state median. Household and per capita income are higher than the state averages. The largest ethnic group is White (50%), followed by Asian (25%) and Hispanic (20%). The most common language spoken other than English is Asian/Islander, and 20% of adults speak this language in the home. High school and college graduation rates are higher than the California averages. Two gas power plants are in the Huntington Beach area near the coast. One is owned by AES and the other by the Orange County Sanitation District. The sanitation district owns and operates another gas plant in nearby Fountain Valley.
SCE regularly engages with the DAC-designated communities in the North Coast subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Gregory Scott of Community Action Partnership of Orange County and Charles Dorsey of the National Diversity Coalition.

Ontario

There are 53 DAC-designated census tracts in this subdivision, comprising 259,238 people out of a total population of 658,659 – 39% of the population. The DACs are located in the heart of the subdivision and especially near transit corridors (e.g., I-10 and CA-60 freeways) and near Ontario International Airport. The median age in the county subdivision is 35.2 years old, which is slightly younger than the California median. Household income is higher than the state average, with per capita income lower than the state average. The largest ethnic group is Hispanic (50%), followed by White (27%) and Asian (13%). The most common language spoken other than English is Spanish, and 32% of adults speak this language in the home.
The high school graduation is higher than the California average, and the college graduation rate is slightly lower than the California average. There are several power plants in the area:

the Etiwanda generating station (owned by NRG), Etiwanda peaker plant (owned by SCE), and Etiwanda hydro recovery plant (owned by the Metropolitan Water District) are all located in the northern portion of the subdivision in a DAC area. Ontario Linerboard Mill, a gas plant owned by New-Indy Ontario LLC, is also located in a DAC area. SCE regularly engages with the DAC-designated communities in the Ontario subdivision through representatives its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Carole Beswick of Inland Action, Inc. SCE also engages through its Clean Energy Access Working Group representative (Paul Francis, KIGT and Los Angeles Cleantech Incubator).

Orosi-Cutler

There is one DAC-designated census tract in this subdivision, comprising 6,200 people out of a total population of 18,197 – 34% of the population. Orosi-Cutler county subdivision is located within the San Joaquin Valley and some census tracts within this subdivision fall under PG&E's service area. The median age in the county subdivision is 38.6, which is younger than the California median. Household income is half of the state average, and per capita income is just over one-third of the state average. The largest ethnic group is Hispanic (87%), followed by White (6%) and Asian (4%). The most common language spoken other than English is Spanish, with 71% of adults speaking this language in the home. High school and college graduation rates are lower than the California averages. There are no large power plants within this subdivision. SCE regularly engages with organizations and individuals who represent this region. Courtney Kalashian, Executive Director of the San Joaquin Valley Clean Energy Organization, is a member of SCE's Consumer Advisory Panel and Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Oxnard

There are six DAC-designated census tracts in this subdivision, comprising 26,914 people out of a total population of 244,530 – 11% of the population. The DACs are located primarily in the northern section of the subdivision, near the US-101 freeway and the Camarillo Airport, and in the south near the Port Hueneme naval base. The median age in the county subdivision is 31.9 years old, which is slightly younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (72%), followed by White (17%) and Asian (7%). The most common language spoken other than English is Spanish, and 55% of adults speak this language in the home. The high school graduation rate is lower than the California average, and the college graduation rate is about half of the California average. There are several power plants scattered throughout the subdivision. Two of those plants are located in the south, in the heart of the DAC area: the New-Indy Containerboard Ontario plant (owned by New-Indy Oxnard LLC) and the Ormond Beach generating station (owned by GenOn). SCE regularly engages with the DAC-designated communities in the Oxnard subdivision through its Local Public Affairs staff.

Perris Valley

There are 10 DAC-designated census tracts in this subdivision, comprising 69,061 people out of a total population of 301,084 – 23% of the population. The DACs are located in the heart of the valley along the I-215 and CA-74 freeways. The median age in the county subdivision is 32.5 years old, slightly younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (54%), followed by White (28%) and Black (10%). The most common language spoken other than English is Spanish, and 39% of adults speak this language in the home. The high school graduation rate is lower than the California average, and the college graduation rate is less than half the California average. There is one power plant located in the subdivision, near the I-215 freeway and in proximity to DACs: a gas plant owned by the Inland Empire Energy Center. SCE regularly engages with the DAC-designated communities in the Perris Valley subdivision through its Local Public Affairs staff and through two Clean Energy Access Working Group representatives in the Riverside area, Bambi Tran and Lisa Castilone of Grid Alternatives Inland Empire.

Pixley

There is one DAC-designated census tracts in this subdivision, comprising 6,529 people out of a total population of 6,529 – 100% of the population. Pixley census subdivision is located in the San Joaquin Valley. The median age in the county subdivision is 25.1 years old, far lower than the California median. Household income is less than half the state average, with per capita income also less than one-third the state average. The largest ethnic group is Hispanic (89%). The most common language spoken other than English is Spanish, and 81% of adults speak this language in the home. High school and college graduation rates are substantially lower than the California averages. There is one large power plant in this subdivision, the Pixley biogas facility. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Porterville

There are six DAC-designated census tracts in this subdivision, comprising 37,676 people out of a total population of 75,030 – 50% of the population. This subdivision is located in the San Joaquin Valley. The median age in the subdivision is 30.4 years old, which is lower than the California median. Household income is around half that state average and per capita income is also lower than the state average. The largest ethnic group is Hispanic (66%), followed by White (26%) and Asian (5%). The most common language spoken other than English is Spanish, and 52% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. There are no large power plants in the county subdivision, but there are several solar photovoltaic plants throughout the broader region.
SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including

Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is also a member of the Clean Energy Access Working Group.

Riverside

There are 27 DAC-designated census tracts in this subdivision, comprising 115,879 people out of a total population of 481,375 – 24% of the population. The DACs are located along the CA-91 and CA-60 freeways, near the city of Riverside and to the north, and include March Air Reserve Base to the east. The median age in the subdivision is 31.3 years old, which is slightly younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (55%), followed by White (27%) and Black (8%). The most common language spoken other than English is Spanish, and 37% of adults speak this language in the home. High school and college graduation rates are lower than the California averages. Two power plants lie at the edges of this subdivision, along with four gas plants situated just over the line in San Bernardino County. All of these power plants are located within DACs. SCE regularly engages with the DAC-designated communities in the Riverside subdivision through its Local Public Affairs staff and with two Clean Energy Access Working Group representatives in the Riverside area, Bambi Tran and Lisa Castilone of Grid Alternatives Inland Empire.

San Bernardino

There are 90 DAC-designated census tracts in this subdivision, comprising 502,705 people out of a total population of 848,257 – 59% of the population. The DACs are located in the heart of the subdivision along the I-10 and I-215 freeways near the city of San Bernardino. The median age in the subdivision is 31 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (64%), followed by White (19%) and Black (9%). The most common language spoken other than English is Spanish, and 46% of adults speak this language in the home. The high school graduation rate is lower than the California average, and the college graduation rate is less than half the California average. Several gas power plants are scattered throughout this subdivision: Drews-Agua Mansa and Century Alliance (both owned by Colton Power LP), Loma Linda Cogeneration (owned by the city), and Mountainview, Ontario 1, and Ontario 2 (owned by SCE). All of these power plants are located within DACs. SCE regularly engages with the DAC-designated communities in the San Bernardino subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Gloria Harrison of the Inland Empire Community Newspapers.

San Fernando Valley

There are seven DAC-designated census tracts in this subdivision, comprising 32,301 people out of a total population of 1,860,414 – 2% of the population. Many of the communities within this subdivision are served by LADWP or other municipal utilities. The DACs are located in the heart of the valley along the I-5, SR-170, and I-210 freeways. The median age in the county subdivision is 37.7 years old, which is older than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (42%), followed by White (40%) and Asian (11%). The most common language spoken other than English is Spanish, and 34% of adults speak this language at home. High school and college graduation rates are the same as the California averages. Several power plants are scattered throughout the subdivision and not far from the freeways: a gas plant owned by Burbank Water and Power, a gas plant associated with Mission Hospital, and three gas plants owned by the LADWP. SCE regularly engages with the DAC-designated communities in the San Fernando Valley subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Manju Kulkarni, of A3PCON, and relationships with several Los Angeles-based Clean Energy Access Working Group representatives.

San Gorgonio Pass

There is one DAC-designated census tract in this subdivision, comprising 2,109 people out of a total population of 99,779 –2% of the population. This county subdivision is located where the CA-60 and I-10 freeways diverge, connecting traffic from the Los Angeles basin to the Coachella Valley. The median age in the county subdivision is 38.4 years old, which is slightly higher than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is White (43%), followed closely by Hispanic (41%) and Black (6%). The most common language spoken other than English is Spanish, with 23% of adults speaking this language at home. The high school graduation rate is the same as the California average, and the college graduation rate is much lower than the California average. Several large wind farms are located within the region. SCE engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff.

Santa Monica

There is one DAC-designated census tract in this subdivision, comprising 5,867 people out of a total population of 92,078 – 6% of the population. This is a singular DAC surrounded by a large urban non-DAC area. The median age in the county subdivision is 39.9 years old, slightly older than the California median. Household income is higher than the state average, with per capita income more than double the state average. The largest ethnic groups are White (64%), Hispanic (16%), and Asian (10%). The most common language spoken other than English is Spanish, although only 11% of adults speak this language at home. High school and college graduation rates are much higher than the California averages. There are no large power plants in the region. SCE engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff.

South Gate - East Los Angeles

There are 110 DAC-designated census tracts in this subdivision, comprising 470,027 people out of a total population of 497,962 – 94% of the population. South Gate – East Los Angeles is located along the I-170 corridor and intersects with the I-10 and CA-60 freeways at the northern end of the subdivision. The median age in the county subdivision is 31 years old, which is younger than the California median. Household and per capita income are much lower than the state averages. The largest ethnic group is Hispanic (95%), followed by White (2.3%) and Black (1.4%). The most common language spoken other than English is Spanish, and 85% of adults speak this language at home. High school and college graduation rates are much lower than the California averages. The Malburg Generating Station is located in the northwest corner of this subdivision, in the city of Vernon. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Cesar Saldivar-Motts of the Southeast Community Development Corporation, and environmental justice stakeholders (EarthJustice, Right to Zero, East Yard Communities). SCE also regularly engages these stakeholders on transportation electrification issues.

Southwest San Gabriel Valley

There are 24 DAC-designated census tracts in this subdivision, comprising 107,520 people out of a total population of 323,808 – 33% of the population. This subdivision is located in the western portion of the San Gabriel Valley, with the DACs centered between the 1-10 and CA-60 truck routes. The median age in the county subdivision is 40.9 years, which is older than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Asian (49%), followed by Hispanic (41%) and White (7%). The most common language spoken other than English is Asian/Islander, and 46% of adults speak this language at home. High school graduation and college graduation rates are slightly lower than the California averages. There are no large power plants in the county subdivision. There are several small cogeneration facilities in the broader region, including in adjacent subdivisions. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Isela Gracian of the Nonprofit Finance Fund.

Strathmore

There is one DAC-designated census tract in this subdivision, comprising 7,837 people out of a total population of 7,848 – about 100% of the population. Strathmore county subdivision is located in the San Joaquin Valley. The median age in the county subdivision is 35.9 years old, which is the same as the California median. Household income is less than half the state average, with per capita income also lower than the state average. The largest ethnic group is Hispanic (66%), followed by White (34%). The most common language spoken other than English is Spanish, and 56% of adults speak this language at home. High school and college graduation rates are lower than the California averages. There are no large power plants in the county subdivision, but there are several solar photovoltaic plants throughout the broader region. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Terra Bella

There is one DAC-designated census tracts in this subdivision, comprising 6,628 people out of a total population of 6,628 – 100% of the population. The Terra Bella county subdivision is located on the outskirts of the City of Delano in the San Joaquin Valley. The median age in the county subdivision is 33.8 years old, which is younger than the California median. Household and per capita income are half of the state averages. The largest ethnic group is Hispanic (82%) followed by White (17%). The most common language spoken other than

English is Spanish, and 70% of adults speak this language at home. High school and college graduation rates are much lower than the California averages. There are no large power plants in the county subdivision, but there are several solar photovoltaic plants throughout the broader region. SCE engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff, and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group, and through its corporate philanthropy (Bakersfield College – Delano). Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Tipton

There is one DAC-designated census tract in this subdivision, comprising 6,446 people out of a total population of 7,420 – 87% of the population. Tipton county subdivision is located in the San Joaquin Valley. The median age in the county subdivision is 26.3 years old, which is younger than the California median. Household and per capita income are significantly lower than the state averages. The largest ethnic group is Hispanic (87%), followed by White (12%). The most common language spoken other than English is Spanish, and 80% of adults speak this language at home. High school graduation and college graduation rates are much lower than the California averages. There are no large power plants in the county subdivision. The Pixley cogeneration facility is in an adjacent subdivision, and there are solar photovoltaic plants throughout the region. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Torrance

There is one DAC-designated census tracts in this subdivision, comprising 5.928 people out of a total population of 146,392 – 4% of the population. The DAC census tract is located in the eastern Torrance county subdivision, adjacent to several DAC census tracts in the Compton county subdivision and overall South Bay region. The median age in the county subdivision is 41.7 years old, which is older than the California median. Household and per capita income are higher than the state averages. The largest ethnic group is White (38%), followed by Asian (36%) and Hispanic (18%). The most common language spoken other than English is Asian/Islander, and 23% of adults speak this language at home. High school graduation and college graduation rates are higher than the California averages. There are no large power plants in the county subdivision. There are several small cogeneration facilities in the broader South Bay region, including adjacent subdivisions. The general region also contains gas refineries. SCE engages with organizations and individuals who represent this region. SCE also regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff. Derek Steele, Health Equity Programs Director for the Social Justice Learning Institute, participates in the Clean Energy Access Working Group. The Social Justice Learning Institute is based in Inglewood, California, which is adjacent to the Torrance county subdivision.

Tulare

There are six DAC-designated census tracts in this subdivision, comprising 21,573 people out of a total population of 72,348 – 30% of the population. Tulare is located in the San Joaquin Valley and some census tracts within this subdivision fall within PG&E's service area. The median age in the county subdivision is 29.2 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (61%), followed by White (32%) and Black (3%). The most common language spoken other than English is Spanish, and 40% of adults speak this language at home. High school graduation and college graduation rates are lower than the California averages.

There are no large power plants in the county subdivision. There are several solar photovoltaic plants throughout the broader region. SCE regularly engages with the DAC-designated communities in this subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Upper San Gabriel Valley

There are 33 DAC-designated census tracts in this subdivision, comprising 145,713 people out of a total population of 332,369 – 44% of the population. The DACs are located primarily along the I-10, I-210 and I-605 freeways. The median age in the county subdivision is 39.5 years old, which is slightly older than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (45%), followed by Asian (34%) and White (16%). The most common language spoken other than English is Spanish, and 34% of adults speak this language at home. Additionally, 32% of adults speak Asian/Islander as their primary language in this county subdivision. High school and college graduation rates are lower than the California averages. There are no power plants located in the subdivision. SCE regularly engages with the DAC-designated communities in the Upper San Gabriel Valley subdivision through its Local Public Affairs staff and through members of the Consumer Advisory Panel, including Isela Gracian of the Nonprofit Finance Fund.

Ventura

There are two DAC-designated census tracts in this subdivision, comprising 10,001 people out of a total population of 115,360 – 9% of the population. The majority of the subdivision's census tracts are not rated as DACs and the overlap of the subdivision and SCE's service area may be the result of ArcGIS layering issues. However, SCE has included it here due to its proximity DAC-designated areas. The median age in the county subdivision is 39.1 years old, which is slightly older than the California median. Household income is the same as the state average, with per capita income slightly lower than the state average. The largest ethnic groups are White (54%), followed by Hispanic (37%) and Asian (4%). The most common language spoken other than English is Spanish, and 22% of adults speak this language at home. High school and college graduation rates are higher than the California averages. There are several small power plants scattered throughout the subdivision. SCE regularly engages with the DAC-designated communities in the Ventura subdivision through its Local Public Affairs staff in the area.

Victorville-Hesperia

There are six DAC-designated census tracts in this subdivision, comprising 37,389 people out of a total population of 386,049 – 10% of the population. Victorville-Hesperia county subdivision is located in the High Desert region, traversed by I-15, a major thoroughfare connecting traffic from the Los Angeles basin to Nevada and major western traffic corridors. The median age in the county subdivision is 32.9 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (49%), followed by White (35%) and Black (10%). The most common language spoken other than English is Spanish, and 27% of adults speak this language at home. High school and college graduation rates are lower than the California averages. The High Desert Power Plant is an 855 MW combined cycle power plant located in Victorville, but the plant is located in census tract 6071980200, which does not qualify as a DAC. That census tract does not have enough population to be able to quantify its CalEnviroScreen score, but its pollution burden is in the 49th percentile statewide. There are several small facilities in the general region, including solar photovoltaic power plants. SCE engages with the community through its Local Public Affairs staff in the area.

Visalia

There are seven DAC-designated census tracts in this subdivision, comprising 58,612 people out of a total population of 144,817 – 40% of the population. Visalia county subdivision is located within the San Joaquin Valley and some census tracts within this subdivision fall within PG&E's service area. The median age in the county subdivision is 31.6 years old, which is younger than the California median. Household and per capita income are lower than the state averages. The largest ethnic group is Hispanic (51%), followed by White (39%) and Asian (5%). The most common language spoken other than English is Spanish, and 29% of adults speak this language at home. High school graduation and college graduation rates are lower than the California averages. There is one large power plant operating in the region, owned by MM Tulare Energy and run on landfill gas. There are several solar photovoltaic plants throughout the broader region. SCE regularly engages with organizations and individuals who represent this region. Courtney Kalashian of the San Joaquin Valley Clean Energy Organization is a member of SCE's Consumer Advisory Panel and serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is a member of the Clean Energy Access Working Group.

Wasco

There is one DAC-designated census tract in this Kern County subdivision, comprising 3,937 people out of a total population of 29,617 – 13% of the population. Many of the census tracts in this subdivision fall within PG&E's service area. The median age in the county subdivision is 29.1 years old, which is younger than the California median. Household income is about half of the state average and per capita income is about one-third the state average. The largest ethnic group is Hispanic (83%), followed by White (19%) and Asian (7%). The most common language other than English spoken by adults at home is Spanish, and 68% of adults speak this language in the home. High school and college graduation rates are much lower than the California averages. A large gas plant operated by Texaco is located within the subdivision, and there are several solar photovoltaic plants throughout the broader region. SCE regularly engages with the DAC-designated communities in this subdivision, including through Courtney Kalashian of the San Joaquin Valley Clean Energy Organization, who also serves on the Clean Energy Access Working Group. Tom Knox, Executive Director of Valley Clean Air Now, is also a member of the Clean Energy Access Working Group.

Whittier

There are 31 DAC-designated census tracts in this subdivision, comprising 136,467 people out of a total population of 325,545 – 42% of the population. The DACs are clustered along the I-605 freeway and just south of the 60 freeway. The median age in the county subdivision is 36.9 years old, about the same as the California median. Household income is lower than the state average, and per capita income is slightly lower than the state average. The largest ethnic group is Hispanic (71%), followed by White (19%) and Asian (7%). The most common language spoken other than English is Spanish, and 47% of adults speak this language at home. High school and college graduation rates are lower than the California averages. Several power plants are located throughout the subdivision: Rio Hondo (a hydro plant owned by the Metropolitan Water District), Puente Hills Energy Recovery (owned by LA County Sanitation Districts and run on landfill gas), Whittier LFG (owned by J&A Santa Maria and run on landfill gas), Center Peaker (a gas plant owned by SCE), and gas plants owned by Biola University and Wheelabrator Technologies Inc. SCE regularly engages with the DAC-designated communities in the Whittier subdivision through its Local Public Affairs staff and relationships with several Los Angeles-based Clean Energy Access Working Group representatives.

Appendix D

SCE's Proposed Reliability Methodology Based on a Net Peak Load & Energy Sufficiency Metric

Introduction

This document provides background information on SCE's proposed reliability methodology using a net peak load and energy sufficiency ("NPL&ES") metric, an overview of the three components of the metric, and the methodology of how SCE implemented the metric in this IRP filing.

Background

SCE's proposed reliability methodology used in this IRP is generally the same as the new RA construct proposed by SCE and California Community Choice Association in Track 3.B of the RA proceeding, R.19-11-009.[1] This new NPL&ES metric is meant to address several deficiencies with the current peak load-based reliability constructs used in the RA and IRP proceedings. These deficiencies include the need for a quicker, more accurate way to assess the capacity contributions of solar and wind resources over time and the need to address other reliability concerns beyond capacity during the peak load hour.

The NPL&ES metric would add to the current capacity demonstration completed in the RA proceeding to include two additional checks, an energy sufficiency check and a storage charging check. The NPL&ES metric therefore helps assess reliability across three domains:

1. **Capacity check** – A capacity check is currently part of the RA construct, but the capacity contributions of solar and wind resources are measured by an ELCC with a generic derating of the capacity (i.e., NQC) of such resources. In the SCE NPL&ES metric, the capacity attributed from solar and wind resources would be based on the average energy production in the hour of the net peak for a given month. This would form a refined reliability assessment that accounts for the expected contribution to reliably serving load in each hour. Subtracting the hourly load served by solar and wind from the managed load would result in the net load. The LSE's remaining

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[1] *See Southern California Edison Company (U 338-E) and California Community Choice Association's Track 3 Proposal*, R.19-11-009, August 7, 2020.

capacity (net of solar and wind) would then be compared to the net peak load plus a PRM to determine if there is sufficient capacity in an LSE's portfolio.

2. **Energy sufficiency check** – Ensures an LSE would be able to supply its load with the energy generated by its resource portfolio. This is calculated by assessing whether the net load duration curve exceeds available generation.

3. **Storage charging check** – Ensures an LSE's storage could be charged by its own resource portfolio if necessary. This calculation would be assessed by ensuring that any remaining excess energy from an LSE's resources exceeds the storage energy requirement. The remaining excess monthly energy would be calculated by subtracting the LSE's net load from the total energy provided by an LSE's resources.

Methodology

Step 1 – Determining Net Load

The first step in SCE's NPL&ES metric is to determine the hourly net load. To calculate the hourly net load, two pieces of information are needed, an hourly SCE managed load for its bundled customers and the hourly generation of SCE's solar and wind resources.

To obtain the hourly SCE managed load for its bundled service customers, SCE first obtained the CEC IEPR's 2019 California Energy Demand ("CED") hourly results for SCE's TAC area for the Mid demand – mid AAEE case.[2] The hourly managed load was then scaled to match SCE's bundled load as provided in the May 20, 2020 Ruling finalizing the load forecasts and GHG emissions benchmarks for LSEs.[3]

To calculate the hourly generation associated with SCE's solar and wind resources, SCE used the same hourly solar and wind profiles used in its capacity expansion modeling.

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[2] *See* CEC's 2019 IEPR, CED 2019 Hourly Results - SCE - MID-MID TN-231567, available at: https://efiling.energy.ca.gov/GetDocument.aspx?tn=231567&DocumentContentId=63382.

[3] *See Administrative Law Judge's Ruling Correcting April 15, 2020 Ruling Finalizing Load Forecasts and Greenhouse Gas Benchmarks for Individual 2020 Integrated Resource Plan Filings*, R.16-02-007, May 20, 2020.

These hourly solar and wind profiles were developed from reconstructing the solar and wind shapes found in RESOLVE, which simplifies the shapes into 37 day-types. The hourly solar and wind profiles were then multiplied by the nameplate capacity of SCE's solar and wind resources. For each hour, the solar and wind generation was then summed to obtain aggregated solar and wind generation.

The final step was to take the hourly SCE bundled load and subtract the hourly aggregated solar and wind generation. The resulting hourly load is the net load for SCE's bundled service customers. Once SCE's hourly bundled load is obtained, the three checks can be performed.

Step 2 - Capacity Check

In order to perform the capacity check, there are two necessary steps that SCE performed. The first step identifies the day and hour of the net peak load and the magnitude of that peak. The second step is to determine if the sum of all non-solar and non-wind capacity contributions is greater than the net peak load plus a PRM.

As mentioned above, the first step identifies the magnitude of the net peak load for a given year. In addition to the magnitude, the day and hour needs to be identified to find the corresponding managed load during the net peak load. The managed load will be used to determine the PRM.

The second step is to calculate if SCE's net peak load and a PRM is less than or equal to the sum of all other resource capacity contributions (e.g., storage, thermal, imports).
SCE assumed a PRM of 15 percent for its NPL&ES metric analysis in this example.
The resource capacity contribution towards the peak was obtained from SCE's RDT using the NQC values for each resource. The equation below mathematically demonstrates the capacity check.

$$SCE\ Net\ Peak\ Load\ (MW) + PRM\ (MW, 15\ percent\ of\ SCE's\ bundled\ load\ during\ net\ peak\ load) \leq NonSolar\ and\ NonWind\ Capacity\ Contribution\ (MW)$$

If the capacity check indicates that the non-solar and non-wind resource capacity contributions are greater than the net peak load and the PRM, then the LSE is deemed to have sufficient resources to serve its own load from a capacity standpoint.

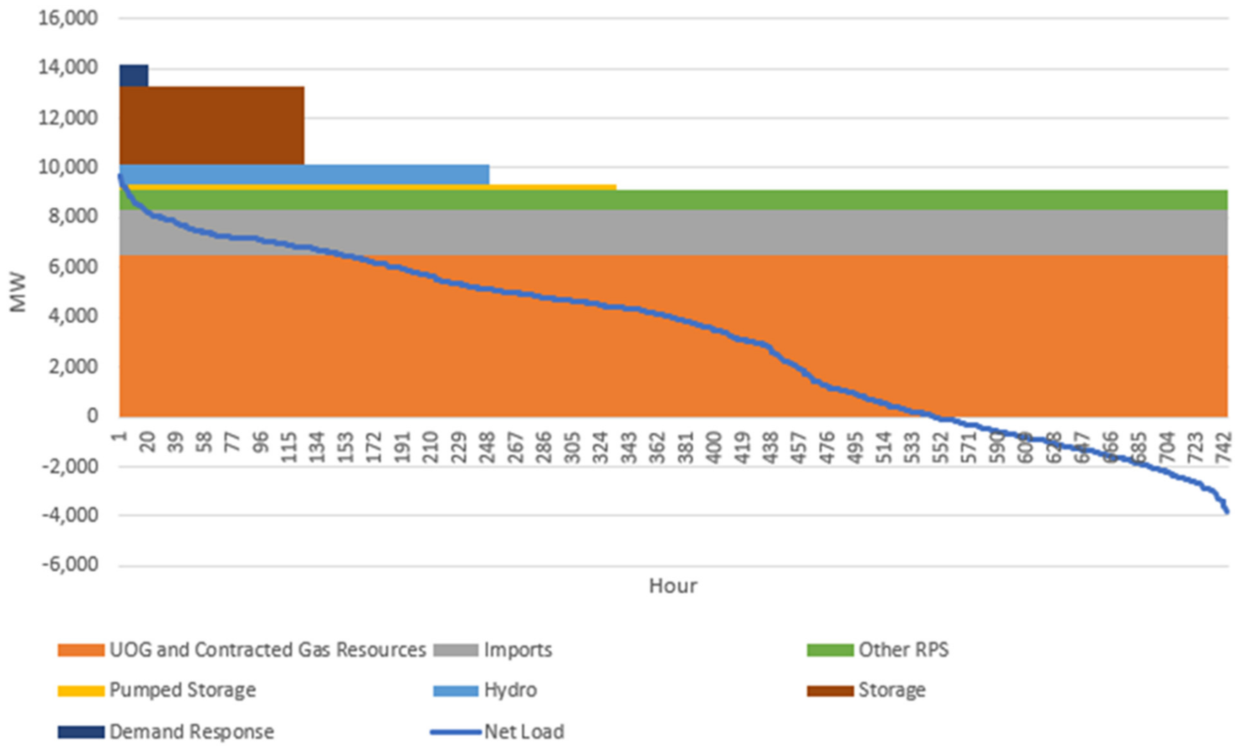
Step 3 - Energy Sufficiency Check

At a high level, the energy sufficiency check takes the peak load month of an LSE's hourly net load, sorts the net loads highest to lowest to generate a net load duration curve, and determines if resources can provide energy to meet the net load duration curve.

The first step is to determine the month of when the net peak load occurs. In SCE's case, the net peak load occurs during September for all years in the IRP planning horizon (2020 to 2030). The hourly net loads for that given month of one year are then sorted by largest to smallest. This sorting generates a net load duration curve (the orange line in the example graph below).

The net load duration curve is then compared to the available energy provided by non-solar and non-wind resources. As shown in Figure D-1 below, graphically the area under the net load duration curve would need to be served by a mixture of the LSE's resource portfolio excluding solar and wind resources. To calculate the "blocks" of the available energy from various resources, SCE assumed that resources could provide up to their NQC for differing hours depending on the technology. For resources that do not have any use restrictions (e.g., thermal, nuclear), those resources were assumed to be available all hours and provide up to their NQC. Use-limited resources were assumed to be available for a more limited number of hours providing their NQC. Hydro resources were assumed to be available eight hours per day. Lithium-ion storage resources were assumed to be available four hours per day. Pumped storage resources were assumed to be available 10.74 hours per day.[4] Demand response was assumed to be available for 20 hours per month.

Figure D-1
Net Load Duration Curve and SCE's Non-Solar/Non-Wind Resources for August 2030



If an LSE demonstrated that the "blocks" of energy covered all areas under the net load duration curve, then the LSE is deemed to have sufficient resources to serve its energy across the month.

Step 4 - Storage Charging Check

As mentioned before, this check ensures that any remaining energy output that the LSE's resources could produce exceeds the storage energy requirement (which includes energy for discharge and efficiency losses). The remaining portfolio energy of the LSE would be calculated

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4 SCE used the RESOLVE roundtrip efficiency for pumped storage of 81 percent. Due to the 81 percent efficiency for pumped storage, the maximum hours that a facility can be dispatch in a day while still having sufficient time to fully recharge for the next day is only 10.74 hours.

by subtracting the LSE's net load from the total portfolio energy that could be provided by an LSE's resources.

The following steps need to be completed to perform the storage charging check:

1. Identify hourly net load for an LSE's net peak load month. This can be obtained from the information when performing the energy sufficiency check.
2. Identify the hourly monthly energy that an LSE's resource portfolio (excluding energy storage) can provide. This can be calculated from the information from the energy sufficiency check.
3. Identify the total energy required to charge storage for the month including losses. Assumes one dispatch per day.
4. Calculate the total remaining hourly energy by subtracting an LSE's total hourly net load from an LSE's total available hourly energy from their portfolio (excluding energy storage). Solar and wind energy could charge the storage device if there is more solar and wind generation than managed load. This would be captured when the net load becomes a negative value. While the remaining hourly energy may be significant, the total capacity of an LSE's storage would limit the amount of energy that could be charged in a given hour. Thus, hourly usable energy, the amount of energy that can actually be used to charge storage, is the lesser of the remaining energy or the total storage capacity.
5. Calculate if the total usable energy is greater than the total energy storage required for one dispatch per day.

The equation below demonstrates the storage charging check.

$$\begin{aligned}&\mathit{total\ charging\ energy\ for\ the\ month}\\ &\leq \sum_{hour}^{hours\ in\ mo.} \min\left(\mathit{total\ available\ energy\ from\ nonsolar\ and\ nonwind\ resources}\right.\\ &\left.-\ \mathit{net\ load\ OR\ storage\ capacity}\right)\end{aligned}$$

If an LSE demonstrated that its storage could be charged by its own resources, it is deemed to have sufficient resources to meet any charging requirements for its own storage.

Appendix E.1

Resource Data Template – SCE's 38 MMT Preferred Conforming Portfolio

SEE NOTICE OF AVAILABILITY FOR APPENDIX E.1

Appendix E.2

Resource Data Template – SCE's 46 MMT Preferred Conforming Portfolio

SEE NOTICE OF AVAILABILITY FOR APPENDIX E.2

Appendix F.1

Clean System Power Calculator – SCE's 38 MMT Preferred Conforming Portfolio

SEE NOTICE OF AVAILABILITY FOR APPENDIX F.1

Appendix F.2

Clean System Power Calculator – SCE's 46 MMT Preferred Conforming Portfolio

SEE NOTICE OF AVAILABILITY FOR APPENDIX F.2

Appendix G

SCE Senior Executive Attestation

Senior Executive Attestation

Compliance Filing for LSEs Electing to **Self-Provide** the Integrated Resource Planning Procurement Required by D. 19-11-016

August 28, 2020

CA Public Utilities Commission (CPUC)
505 Van Ness Avenue, 4th Floor
San Francisco, CA 94102-3298

Re: September 1, 2020, Individual Integrated Resource Plan Senior Executive Attestation Pursuant to Decision (D). 19-11-016 adopted in R. 16-02-007

Pursuant to Ordering Paragraph (O.P.) 12 of Decision (D.) 19-11-016, adopted in R.16-02-007 on November 5, 2019, Southern California Edison Company submits this attestation.

Background

D.19-11-016 requires that all Load Serving Entities (LSEs) file their individual integrated resource (IRP) plans by May 1, 2020 [*revised to September 1, 2020*][1]. The decision also requires that all LSEs directed in the Decision shall present in their IRP plans an attestation from a senior executive in the company that the necessary capacity required in this Decision shall be provided if the LSE is electing to self-provide the capacity required.[2] This Decision states that the attestation shall be accompanied by <u>a detailed list of projects, capacities, and dates by which the LSE expects the projects to be providing service to the LSE, as well as a demonstration that the projects are incremental, to meet the 2021, 2022, and 2023</u> requirements of the decision.

Resource Data Template

The Resource Data Template to be used for the September 1, 2020, IRP filing has been developed to identify the required information in O.P. 12 D.19-11-016; consequently, this attestation refers to the template contents to obviate the need for a separate compliance document. The "Certification of Information" section at the bottom of this attestation refers to the specific data fields in the Resource Data Template referenced in Table 1 below, which map to the requirements in O.P. 12 of D.19-11-016.

<u>Table 1</u>
Resource Data Template Reliability Procurement Fields Related to O.P. 12, D.19-11-016

O.P. 12 Requirement	Corresponding Field in Resource Data Template
Detailed List of Projects	"Monthly_GWH_MW" tab; Columns B, C, & K
Capacities	"Monthly_GWH_MW" tab; Columns F, G, & H
Dates by which LSE expects projects to be	"Unique Contracts" tab; Columns G, H, & I

[1] Decision (D.)20-03-028 modified the filing date from May 1, 2020 to September 1, 2020 at page 67.
[2] The LSEs directed in the Decision are named in OP 3 and by CPUC staff as discussed in OP 4.

providing service to LSE[3]	
Demonstration projects are incremental	"Unique Contracts" tab; Columns M & N

Attestation Requirements

To satisfy the requirements in O.P. 12 of D. 19-11-016, a senior executive shall sign the "Certification of Information" section below and submit this attestation as part of their compliance filing in the IRP Proceeding by September 1, 2020. No additional documentation is required at this time.

Certification of Information

Consistent with Rules 1 and 2.4 of the CPUC's Rules of Practice and Procedure, the individual IRP compliance filing has been verified by a senior executive who shall expressly certify, under penalty of perjury, the following:

(1) The necessary incremental Resource Adequacy capacity required of Southern California Edison Company in Decision (D.) 19-11-016 shall be provided in compliance with the terms established in D.19-11-016 and January 3, 2020, ruling finalizing baseline resources.

(2) I have reviewed the Resource Data Template data fields referenced in Table 1 above (and any information provided to meet Milestone 1 of the backstop mechanism proposed in the June 5, 2020, Backstop Procurement and Cost Allocation Mechanisms Ruling) submitted in my company's individual IRP compliance filing in the IRP Proceeding.

(3) Based on my knowledge, information or belief, the compliance filing information referenced in (2) above is an accurate reflection of the LSE's plans to self-provide its obligation of the incremental Resource Adequacy capacity and the terms identified in D.19-11-016, and does not contain any untrue statement of a material fact or data or omit to state a material fact or data necessary to make the statements true.[4]

(4) Based on my knowledge, information, or belief, the compliance filing information referenced in (2) above contains all of the information required to be provided by CPUC orders, rules, and regulations.

Senior Executive Signature:

William V. Walsh

Vice President, Energy Procurement and Management

[signature]

August 28, 2020

[3] See Section IV.B.3 of Southern California Edison Company's Integrated Resource Plan, September 1, 2020, for additional information on the status of the D.19-11-016 procurement.

[4] *Id.*