Report on Resource Adequacy Slice of Day Implementation and Year Ahead Showings

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CALIFORNIA PUBLIC UTILITIES COMMISSION
ENERGY DIVISION

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https://www.cpuc.ca.gov/RA/

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I. Introduction

This report provides a summary on several key aspects regarding California Public Utilities Commission ("Commission") Energy Division Staff's ("ED Staff") implementation of the Slice of Day (SOD) Resource Adequacy (RA) Framework for Test Year 2024.

In accordance with the directives in Decision (D.) 23-04-010, throughout 2023, ED Staff released several tools necessary for SOD implementation to the RA Proceeding (R.21-10-002 and R.23-10-011) service lists and sought informal comments from parties. This report provides a comprehensive summary of the key SOD implementation activities undertaken in 2023 and stakeholders' feedback throughout the process, and is intended to inform ongoing refinements to the SOD Framework.

Public presentations, templates, and related materials from SOD workshops, office hours, and implementation are referenced throughout the report and available on the Commission's website at the following links:

- Materials for Slice of Day filings are available at: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage/resource-adequacy-compliance-materials
- Materials for Slice of Day workshops, office hours, and ED Staff analysis are available at: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage/resource-adequacy-history

Energy Division notes the complexity of implementing the SOD Framework—the first of its kind in the United States—and would like to thank parties for their participation and valuable comments and feedback throughout the implementation process.

Additionally, Energy Division's Electric Market Design Section would like to recognize Donald Brooks, Robert Hansen, and Mounir Fellahi of Energy Division's Energy Resource Modeling Section and Lynn Marshall of the California Energy Commission (CEC) for their significant contributions toward implementing the SOD Framework.

II. Background

In 2019, the Commission issued an Order Instituting Rulemaking (OIR) establishing Rulemaking (R.) 19-11-009 as part of its efforts to continue oversight of the RA Program. This Order specified that "it may be necessary to re-examine the structure and processes of the Commission's RA program."[1]

On January 22, 2020, the Commission released a Scoping Memo which established the following issues for consideration under Track 3 of the proceeding:

> "Examination of the broader RA capacity structure to address energy attributes and hourly capacity requirements, given the increasing penetration of use-limited resources, greater reliance on preferred resources, rolling off of a significant amount of long-term tolling contracts held by utilities, and material increases in energy and capacity prices experienced in California over the past years."[2]

Subsequently, the Commission issued two Amended Scoping Memos[3] that established Track 3B.2 of R.19-11-009. In these Amended Scoping Memos, the Commission directed consideration of "the direction the Commission intend[ed] to move in with respect to larger structural changes (e.g., capacity construct addressing energy attributes and reliance on resource use-limitations, forward energy requirement construct)."[4]

In July 2021, the Commission approved D.21-07-014, which set five key principles for addressing concerns regarding the existing RA framework and the objectives of the RA Program:

- **Principle 1:** To balance ensuring a reliable electrical grid with minimizing costs to customers.
- **Principle 2:** To balance addressing hourly energy sufficiency for reliable operations with advancing California's environmental goals.
- **Principle 3:** To balance granularity and precision in meeting hourly RA needs with a reasonable level of simplicity and transactability.
- **Principle 4:** To be implementable in the near-term (e.g., 2024).
- **Principle 5:** To be durable and adaptable to a changing electric grid.

Further, in D.21-07-014, the Commission determined that Pacific Gas and Electric Company's (PG&E) proposal for a SOD Framework—which seeks to ensure that load will be met in all hours of the day (not just during gross peak demand hours) and that there is sufficient energy on the

[1] R.19-11-009 Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Forward Resource Adequacy Procurement Obligations dated November 7, 2019 at 5.
[2] R.19-11-009 Assigned Commissioner's Scoping Memo and Ruling dated January 22, 2020 at 7.
[3] Amended Scoping Memos in R.19-11-009, dated July 7, 2020 and December 11, 2020.
[4] R.19-11-009 Amended Scoping Memo dated December 11, 2020 at 4.

system to charge energy storage resources—best addresses the identified principles and concerns with the existing RA framework.[5]

In June 2022, the Commission approved D.22-06-050, which determined that Southern California Edison Company's (SCE) 24-hour SOD proposal, which built on PG&E's original SOD proposal, best satisfied the principles and objectives of D.21-07-014.[6] Under the 24-hour SOD Framework, each load serving entity (LSE) must demonstrate sufficient capacity to satisfy its specific gross load profile, including the planning reserve margin (PRM), in all 24 hours on the California Independent System Operator's (CAISO) "worst day" in that month. The Commission in D.22-06-050 defined "worst day" as the day of the month that contains the hour with the highest coincident peak load forecast, while it acknowledged that this definition could evolve over time if another attribute (e.g., steepest ramping requirement) is found to be more challenging to reliability than the coincident peak.[7]

In April 2023, the Commission approved D.23-04-010, which resolved remaining RA Reform issues. The Decision also adopted implementation details for the 24-hour SOD Framework, including compliance tools, resource counting rules, and a methodology to translate the PRM to the SOD Framework. The decision further directed Energy Division, as it developed the necessary tools for SOD implementation, to publish these tools and to solicit informal party comments on these tools, along with the Year Ahead SOD showings.

ED Staff solicited informal party comments throughout 2023 after most releases of the various tools. In December 2023, ED Staff provided a final opportunity for informal comments on the latest versions of the tools and other topics related to SOD implementation. These comments are summarized throughout.

[5] D.21-07-014 at 38.
[6] D.22-06-050 at 74.
[7] D.22-06-050, Appendix A at 1.

III. Load Serving Entity Showing Tool

A. Background

As part of the RA Reform working group process, the Commission directed development of an LSE Showing Tool, which was described in D.22-06-050 as a "spreadsheet tool used by each LSE to submit their monthly, 24-hour showing to the Commission."[8] Further, the Commission directed the following characteristics to be included as part of the LSE Showing Tool:

- A standard format for listing the resources in an LSE's portfolio, including the resource ID found in the Master Resource Database, the megawatt (MW) quantity associated with the must-offer requirement, and the capacity used in each of the 24 hours of the showing.
- A pass/fail logic identical to the Commission Verification Tool, so that LSEs know in advance if they will pass Commission verification.

The Commission also indicated that this showing may be used to provide CAISO the information it will need to determine the must-offer requirements of all resources as well as the correct RA capacity values to use when performing its single-hour deficiency test.

Under the RA Reform working group process, SCE proposed a showing tool that listed resources in an LSE's portfolio, including resource ID, MW quantity associated with the must-offer obligation requirement, and capacity used in each of the 24 hours. Clean Power Alliance ("CPA") proposed another showing tool similar to SCE's, but with the goal of altering two main functions. First, CPA's tool incorporated a temporal charging and a PMin component to the validation tool so that the excess energy an LSE needed to charge any storage resource would match that resource's actual charging parameters. The second change was to determine an LSE's energy sufficiency to charge all of its shown single-cycle energy resources in the aggregate across all hourly short positions, with the goal of reducing the burden on an LSE's need to manually manipulate hourly capacity values to determine compliance.[9]

In D.23-04-010, the Commission determined that SCE's showing tool satisfied the direction outlined in D.22-06-050 and adopted the approach. It additionally authorized Energy Division to implement, to the extent possible, CPA's energy storage sufficiency logic into SCE's showing tool approach. Energy Division was further directed to publish a draft LSE Showing Tool on the Commission's website and to solicit informal party comments.[10]

B. Initial Release of LSE Showing Tool (August 30, 2023)

ED Staff released its first public version of the LSE Showing Tool on August 30 and hosted a workshop presenting the tool on September 7. During this workshop, ED Staff reviewed the LSE

[8] D.22-06-050, Appendix A at 8.
[9] RA Reform Workshop Report at 17.
[10] D.23-04-010 Ordering Paragraph (OP) 3.

Showing Tool's design functions and validation tests, and provided initial guidance for LSEs as they prepared showings ahead of the 2024 Year Ahead SOD filing deadline of November 30, 2023. Additionally, ED Staff established a set of three Office Hours on September 21, October 19, and November 16, providing stakeholders several opportunities to contribute feedback and ask questions as ED Staff further developed the LSE Showing Tool templates.

After the initial release of the LSE Showing Tool on August 30, ED Staff continued to refine the template in response to feedback and questions received during the Office Hours sessions and from email. At the time of the Year Ahead SOD filings, the template had undergone 25 revisions from the initial template (only five of these releases were made public to avoid confusion). A changelog with full details of changes to the template over time are detailed in the LSE Showing Tool User's Guide.[11]

C. Informal Comments (December 22, 2023)

LSEs filed their Year Ahead SOD filings for 2024 on November 30, 2023. Following this milestone, in December 2023, ED Staff offered a final opportunity for informal comments from parties on the various tools/analyses released throughout 2023, including the LSE Showing Tool. In response to this solicitation, the Alliance for Retail Energy Markets ("AReM"), AVA Community Energy ("AVA"), PG&E, SCE, Shell Energy North America ("SENA"), and Silicon Valley Clean Energy ("SVCE") filed informal comments on the LSE Showing Tool on December 22.

SENA, SVCE, and SCE commented on the LSE Showing Tool's storage optimization function. SENA stated that the LSE Showing Tool's "Profile Optimization" tab contains instructions mismatched to the layout, making it difficult to navigate, and that errors and discrepancies with resource IDs and net qualifying capacity (NQC) values further need to be corrected and consistent in order for queries to work properly. SVCE and SCE both expressed concerns with the storage optimization function's ability to produce a better optimized portfolio than LSE staff themselves. While SVCE recommended that ED Staff prioritize errors in the tool necessary for 2025 RA compliance over further refinement of the optimization function, SCE recommended removal of the optimization function entirely, stating that the Commission's allowance of storage to be shown flexibly makes full automation challenging and has added confusion to the process.

AReM and PG&E recommended additional functionalities for the LSE Showing Tool. AReM stated that LSEs should have a line of sight into their residual RA positions by resource and that the current inability to do so creates portfolio optimization inefficiencies. AReM recommended addition of a table that shows hourly resource contribution by contract, where each resource shown on the "LSE Showing" tab would be reported on an hourly basis. PG&E suggested that, if possible, the LSE Showing Tool should include a metric on its "Hourly Availability" chart to show

[11] Recordings of the Office Hours sessions and the most recent version of the User's Guide can be accessed on the Resource Adequacy History website at: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage/resource-adequacy-history.

the LSE's charging sufficiency compliance requirement and the delta (positive or negative) of the shown resources, rather than a simple color-coded "Pass" or "Fail" indication.

PG&E and SVCE raised issues with errors in the LSE Showing Tool's validation checks. PG&E identified that differences between allocations and validations lead to errors in the validation checks, since the two values are being validated against each other but one number is rounded and the other is not. SVCE commented on its experience with the SOD Year Ahead filing, noting that the optimization function at one point optimized a resource beyond its interconnection limit, prompting the validation check to fail despite the resource not needing to be optimized as there were other available storage resources that would have satisfied the short position. Further, SVCE stated that it had found several mapping errors which led to false errors within the validation checks.

Finally, several parties commented generally on updates to the LSE Showing Tool. AVA requested that documentation and guidance changes be clearly communicated, and that ED Staff collaborate with LSEs and stakeholders ahead of significant compliance tool changes. SVCE requested that the Commission provide guidance in the near-term on what criteria LSEs will be held to for compliance well in advance of the 2025 Year Ahead filing. SVCE requested that, alternatively, the Commission be flexible when assessing battery optimization compliance, especially if sufficient resources exist to meet the battery charging requirement in aggregate. SENA commented that improved ease of use is of great value, particularly regarding entry of hybrid and storage resources; it encouraged ED Staff to continue addressing this through workshops/webinars or additional Office Hours.

D. Questions for Consideration

- How, if necessary, can the LSE Showing Template be simplified?
- What changes, if any, should be made to the profile optimization function? Is there value in removing the optimization function entirely?
- What features should be added to the LSE Showing Tool, if any, to make it clear to LSEs which enforceable obligations they may be deficient in?

E. Next Steps

ED Staff will continue to release updates to the LSE Showing Tool in response to the informal comments in order to implement improvements and resolve problems ahead of the 2025 RA Compliance Year. Further, ED Staff will hold additional Office Hours as necessary and answer questions on the templates that arise therein.

IV. Load Forecast Process

A. Background

In D.22-06-050, the Commission determined that the "worst day" approach was the appropriate method for the 24-hour SOD Framework. Under this approach, each LSE is required to demonstrate that it has enough capacity to satisfy its specific gross load profile, including PRM, in all 24 hours on CAISO's "worst day" in that month, where "worst day" is defined as the day of the month that contains the hour with the highest coincident managed peak load forecast.

In D.22-06-050, the Commission further determined that CEC Staff's proposal for establishing individual LSE hourly load forecasts was reasonable. This approach was described as a "bottoms-up approach" similar to the current RA load forecast process. First, CEC Staff would extract the worst day load profiles from the Integrated Energy Policy Report (IEPR) demand forecast. For coincidence adjustments, CEC Staff would conduct an analysis similar to the existing process in order to adjust multiple slices of hours. LSEs would then submit a non-coincident forecast that includes their peak demand and, at minimum, a 24-hour forecast of the LSE's own peak day. The decision found that a dry run load forecast in 2022 for 2023 was necessary and requested that Energy Division conduct a dry run load forecast filing, in coordination with CEC Staff, to identify challenges and determine if refinements to the methodology were needed.[12]

As directed, CEC Staff undertook a dry run forecast process in August 2022 and directed LSEs to provide a load forecast for 24 hours per month for the day of their non-coincident peak. Following the dry run, CEC Staff proposed an approach for adapting the current load forecasting process (which allocates a share of the total load forecast to each LSE) to the 24-hour SOD Framework using submitted forecasts. The steps were as follows:

1. Develop a reference forecast for each transmission access charge (TAC) area by removing historical load shapes for non-Commission-jurisdictional entities and removing automatic transmission load adjustment, because transmission losses may only apply to peak hours.
2. Apply an hour- and LSE-specific coincidence adjustment to LSE forecasts comparable to the current approach but focused on system peak hours. LSE forecasts may also be adjusted based on a comparison of LSE forecasts to a benchmark based on recorded loads, load migration activity, LSE forecast submittals, and weather-adjusted loads.
3. Adjust all forecasts so that the sum is within 1% of the reference forecast.

In D.23-04-010, the Commission determined that CEC Staff's outlined process for adapting the current load forecasting process to the 24-hour SOD Framework was reasonable. The decision

[12] D.22-06-050 at 78.

also allowed for process modifications in a future phase of the RA Proceeding, and to the extent the forecast process for the test year required further refinement, the CEC was directed to raise those issues with the Commission as soon as practicable.[13]

B. Test Year 2024 Slice of Day Load Forecasts

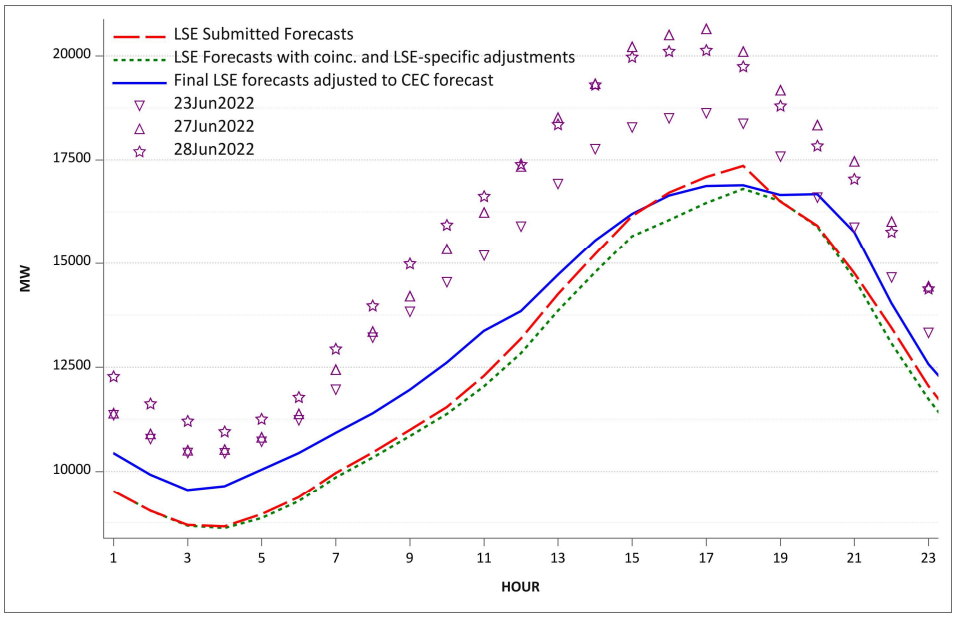
CEC Staff provided an update on its hourly load forecasting process for the SOD test year at the September 7, 2023 workshop hosted by Energy Division. CEC Staff explained that it first followed the existing process for monthly coincident peak forecast determination, and then used that as input into hourly forecast development. CEC Staff used the following steps:

- **Step 1: Monthly Peak Process**
  a. Develop reference forecast for investor-owned utility (IOU) service areas and direct access.
  b. Develop reference current peak demand estimate for LSEs based on available data. Evaluate need for LSE-specific adjustments.
  c. Estimate and apply coincidence factors to LSE forecasts.
  d. Apply adjustments for demand side credits.
  e. Apply pro rata adjustments to bring the total of the forecasts to within 1% of the CEC service area forecast.
- **Step 2: Hourly Forecast Process**
  a. Calculate hourly coincidence factors using historic loads, which account for differences between load shapes on the system peak day and the LSE's peak day.
  b. Apply a curve-fitting formula to fit LSEs' submitted load shapes with coincidence adjustments to the adjusted monthly peak and energy from Step 1.
  c. Calibrate to coincident peak hour forecast from Step 1 if needed.
  d. Apply load credits. This includes additional achievable energy efficiency (AAEE), load-modifying demand response (LMDR), and in the SCE TAC area, utility-owned storage (negative in charging hours).
  e. Apply pro rata to within 1% of 2022 IEPR 1-in-2 hourly forecast for the monthly coincident peak day, by TAC area.

During the September 7 workshop, CEC Staff explained several important aspects of the 2024 load hourly load forecasts. First, using an example of the June 2024 load forecast for the SCE TAC area, CEC Staff noted that while pro rata adjustments were somewhat small for peak hours, there were fairly large pro rata adjustments (~10%) in the early morning and late evening hours. CEC Staff explained that a common pattern with the IEPR forecast is that it generally has higher morning loads and a longer peak in the evening than LSE-submitted forecasts.

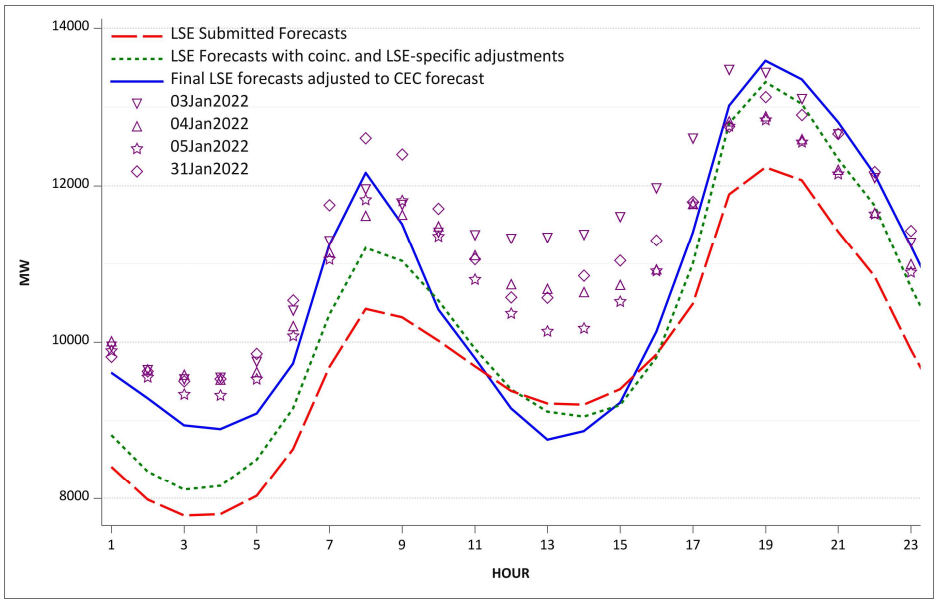
[13] D.23-04-010 at 17.

Figure 1. SCE Transmission Access Charge Area Draft June 2024 Forecast (as of September 7, 2023).



Second, CEC Staff used an example of the January 2024 load forecast for the PG&E TAC area and noted the large positive pro rata adjustments in morning and evening hours, but negative pro rata adjustments at midday. CEC Staff explained that this was in part due to the way it modeled behind-the-meter photovoltaics (BTM PV) in hourly load forecasts (using an average PV profile based on historic data, which is not always well-correlated with PV production on a system peak day), in that LSE forecasts assume less BTM PV production relative to the IEPR forecast.

Figure 2. PG&E Transmission Access Charge Area Draft January 2024 Forecast (as of September 7, 2023).



Finally, CEC Staff noted that the CEC was working on several improvements within the next few years to improve the IEPR demand load forecasting process, including enhancing modeling of climate change, revising historic data sources for PV generation, and looking at other methodologies for modeling PV generation. These changes would, at the earliest, be implemented in 2024 for the 2025 RA cycle.

CEC Staff provided ED Staff with final 2024 hourly LSE load forecasts in mid-September 2023. These load forecasts were used in the LSE Showing Tool templates transmitted to LSEs on October 6 and subsequent template revisions transmitted to LSEs on October 24 and November 17. Prior to the Year Ahead SOD test filings, some parties raised concerns with their load forecasts showing early morning peaks, which did not fit with actual historical hourly load shapes. CEC Staff determined that the large morning pro rata adjustments, especially in non-summer months, were affecting the load shapes of high load factor energy service providers (ESPs) the most and that while revisions could be made to more realistically reflect their actual loads, it would imply changes to other LSEs' forecasts. LSEs who believed they were affected by this issue were encouraged to contact both CEC and ED Staff by mid-November to receive an alternative load forecast. Additionally, they were asked to file their SOD Year Ahead filings containing both the original and alternative load forecasts for informational purposes.

In December 2023, ED Staff offered a final opportunity for informal comments from parties on the various tools/analyses released throughout 2023, as well as the load forecasting process. In response to this solicitation, AReM, AVA, SENA, and SCE submitted informal comments on the load forecasting process on December 22.

AReM, whose comments were echoed by SENA, reiterated its concerns surrounding the early morning peak phenomenon within the load forecasts for ESPs and stated that it is imperative that ESPs be provided reasonably accurate load shapes for 2025 SOD compliance filings. AReM stated that if the load shapes are not reflective of the types of customers that the LSE serves, the result would be cost shifts to the customers of the LSEs with inaccurate load shapes. Further, AReM noted that significant unexpected changes to the load shape over time would hinder forward RA contracting in today's tight RA market. In summary, AReM recommended that the CEC and the Commission thoroughly review the current process and understand all causes of the early-peaking load shapes, correct any errors prior to generating the 2025 load forecasts, and set a schedule allowing load forecasts to be provided to LSEs in draft form as soon as they are available to allow for any necessary corrective action earlier in the process.

AVA and SCE commented on the transparency of the SOD load forecast process. SCE recommended that the Commission hold a public workshop with the CEC early in 2024 to help stakeholders understand the 2024 SOD load forecast process and allow for stakeholder feedback to enhance the 2025 Year Ahead SOD load forecast process. AVA expressed the need for LSEs to understand the SOD load forecast process well in advance of the Year Ahead showings in order to adapt their internal forecasting processes to align better with the compliance framework.

C. Questions for Consideration

- What are improvements to the load forecasting process that could reasonably be made in time for the 2025 Compliance Year?

D. Next Steps

The 2023 IEPR demand forecast planned to be used in the SOD load forecast adjustment process is expected to be adopted at the CEC's February 14, 2024 Business Meeting. The draft hourly forecast, published on January 31, 2024 in the CEC's IEPR docket[14], shows significant improvements to the hourly shapes that are anticipated to help mitigate the pro rata 1% IEPR adjustment as the shapes are more in line with actual historical load shapes.

Further, the CEC is planning improvements to the forecast adjustment methodology to reduce inappropriate distortions to load shapes, including addressing morning loads specifically and changes to the shaping and coincidence adjustment steps. CEC and ED Staff will also hold a workshop in Q1 2024 to discuss the process.

In accordance with the established load forecasting process, LSEs are scheduled to receive their initial adjusted hourly SOD forecasts for the 2025 Compliance Year in July 2024 and final hourly SOD forecasts in September 2024.

[14] Available at https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2023-integrated-energy-policy-report.

V. Planning Reserve Margin Calibration Tool

A. Background

Transitioning from the existing monthly peak demand RA framework to the SOD Framework requires calibration of the PRM, determined under existing qualifying capacity (QC) methodologies, to using SOD accounting (for example, use of exceedance rather than effective load carrying capability (ELCC)). In D.22-06-050, the Commission adopted a minimum 17% PRM for 2024 and stated that once a refreshed loss of load expectation (LOLE) study was released in the ongoing Integrated Resource Planning (IRP) Proceeding (R.20-05-003), conversion of the outputs to the SOD Framework counting rules would need to be completed.[15] Further, the Commission in both D.22-06-050 and D.23-04-010 stated that for initial SOD implementation, one PRM would apply to all hours of the year.[16]

During the RA Reform working group process, Natural Resources Defense Council (NRDC) proposed a tool to convert the 2022 LOLE study portfolio into monthly PRM values aligned with monthly portfolios identified in the LOLE study. To determine each month's PRM, NRDC's tool used Excel Solver to determine the maximum PRM that could be sustained while meeting the following constraints:

1. Instantaneous storage output must not exceed total storage power capacity;
2. Cumulative daily storage output must not exceed total storage energy capacity;
3. The resource mix must be sufficient to meet the compliance requirement in all hours;
4. The resource mix must be sufficient to provide excess capacity to charge all dispatched storage.

SCE presented a PRM calibration tool similar to NRDC's, designed to incorporate specific limitations of resources, with the following steps:

1. Determine volume and mix of resources that achieve reliability and other targets;
2. Convert nameplates and characteristics to SOD counting;
3. Create a system level 24-hour slice stack consistent with Steps 1 and 2 that maximizes the PRM achieved for the highest load day while satisfying the SOD requirements;
4. The resulting PRM becomes the RA PRM.

Following the RA Reform working group process, ED Staff performed a LOLE study released in January 2023[17], which modeled the existing fleet of resources with updates for recent development and IRP filings, and made revisions to methodologies based on comments in 2022 on prior LOLE studies. ED Staff performed the LOLE study using the current Strategic Energy &

[15] D.22-06-050, Appendix A at 2.
[16] D.22-06-050, Appendix A at 2, and D.23-04-010 at 59.
[17] ED Staff performed additional LOLE studies in September and October 2023 in support of the IRP Preferred System Plan, however, the LOLE study performed in January 2023 is the main study utilized for PRM calibration for 2024.

Risk Valuation Model (SERVM) dataset, which includes the 2021 IEPR demand forecast and the 2022 baseline resource file as inputs. Additionally, ED Staff no longer included any Renewable Integration Solutions (RESOLVE) build out in the study and calibrated the model to identify LOLE events using the import constraint as the tuning variable instead of retiring thermal generation.

In D.23-04-010, the Commission authorized Energy Division to integrate, to the extent possible, the PRM calibration tools developed by both NRDC and SCE in the RA Reform working group process in order to translate the results of the RA LOLE study to the SOD Framework. After making modifications to the calibration tool, Energy Division was directed to publish the draft PRM Calibration Tool on the Commission's website and solicit informal party comments. Further, in D.23-06-029, following the updated LOLE study and a consideration of RA market conditions, the Commission established a 17% PRM for both 2024 and 2025 under the existing RA framework.[18]

B. Initial PRM Calibration Tool (October 24, 2023)

ED Staff released its initial PRM Calibration Tool using the portfolio results of the 2024 RA LOLE study (published in January 2023) to the R.21-10-002 and R.23-10-011 service lists on October 24, 2023, and held a workshop on the tool on October 25.

In the 2021 IEPR Mid-High Additional Transportation Electrification (ATE) load forecast, the worst day (day with the highest forecasted managed load) for the CAISO balancing area authority in 2024 is September 3; the load forecast for this day was used in calculating the SOD PRM using the PRM Calibration Tool. Additionally, September-specific NQC profiles were utilized for the resource stack determining the SOD PRM. This initial tool indicated a 6.2% PRM for the SOD test year. At the October 25 workshop, it was determined that fixing a formula error within the tool resulted in an 8.2% PRM.

Following the October 25 workshop and the public release of the initial PRM Calibration Tool, ED Staff solicited informal party comments on the tool through November 13. Informal comments on the initial PRM Calibration Tool were submitted by CAISO, the Commission's Public Advocates Office ("Cal Advocates"), California Community Choice Association ("CalCCA"), Calpine Corporation ("Calpine"), Middle River Power ("MRP"), and PG&E.

Several parties expressed concerns with the sufficiency of the 8.2% PRM, stating that it was too low (CAISO, Calpine) and questioning whether a single or September-based PRM was sufficient to meet a 0.1 LOLE reliability standard (CAISO, Cal Advocates, Calpine, PG&E, MRP). Additionally, several parties (CAISO, Cal Advocates, PG&E, and MRP) recommended stress testing/monthly benchmarking to ensure a September PRM was sufficient to cover reliability in months with identified LOLE (July, August, and September). PG&E suggested that June, July, and August be tested at a minimum. Cal Advocates recommended that stress testing utilize

[18] D.23-06-029 OP 7. As discussed later in this report, the Commission must determine how to translate this 17% PRM to a SOD PRM for 2025.

resource portfolios that reflect the actual levels of capacity shown by LSEs in the relevant months.

Calpine recommended an approach for developing monthly PRMs:

1. Start with a PRM derived from Energy Division's proposed translation approach for September or another month;
2. Identify monthly portfolios that meet the SOD requirements implied by that PRM;
3. Test that those 12 monthly portfolios in combination yield 1-in-10 LOLE on an annual basis in SERVM;
4. If Step 3 fails, repeat Steps 2 and 3 with a higher PRM.

Parties also expressed concerns with the resource output profiles used in the initial PRM Calibration Tool. PG&E and MRP both noted that storage capacity in the tool was derated for efficiency losses on the dispatch side rather than the charging side, resulting in undercounting of available storage capacity on the grid. Cal Advocates suggested that battery storage and pumped storage hydro dispatch profiles should match the aggregated LSE showings for the SOD test year.

Additionally, regarding the resource portfolio used in the initial PRM Calibration Tool, Cal Advocates recommended that ED Staff incorporate resources that came online after January 2023. MRP stated that it was not clear how much nameplate capacity was added to yield 2,200 MW of perfect capacity added to achieve a 0.1 LOLE, and they requested that ED Staff publish workpapers providing further information.

Finally, CAISO and MRP recommended that ED Staff hold additional workshops on the PRM Calibration Tool. CalCCA recommended that the Commission develop a draft PRM and effective PRM for 2025, for inclusion in this report.

C. Revised PRM Calibration Tool (November 17, 2023)

Upon internal deliberation and reviewing submitted comments, ED Staff released a revised PRM Calibration Tool and resulting PRM on November 17. This revised tool indicated a 15.43% PRM for the September peak month and was the final PRM to be applied to all Test Year 2024 SOD filings.

The revised PRM Calibration Tool, like the October 24 release, utilized the SOD exceedance and NQC-based portfolio and worst day managed load data for September 2024, but made significant changes to storage discharge allocation via the use of an optimization function run through Excel's Solver. Instead of placing storage in flat blocks across peak hours, the optimization allocated available storage resource capacity throughout the 24 hours to maximize the minimum PRM evaluated on an hourly basis, while also minimizing the variance in PRM among the hours. There was also significant validation of the resource fleet used in the SOD calibration; notably, ED Staff had inadvertently excluded large amounts of batteries that were

under construction but nevertheless included in the LOLE modeling. The process included the following steps:

1. Input 1-in-2 managed IEPR hourly managed load values for the respective month.
2. Input all resources used for the LOLE study (both existing and under construction), having derated each by its unit-specific NQC instead of nameplate. For resources not yet online, use the technology factors (shapes) to calculate NQC.
3. In the "Storage" tab, add storage capacity. Additionally, add storage energy using this formula:

   Stored Energy Limit (MWh) = Nameplate Capacity (MW) * Duration (hours)

4. The "Profiles" tab contains capacity values by resource type and 24-hour generation profiles for each, based on the applicable counting methodology (and available in the Master Resource Database). This includes an import capacity assumption of 4,000 MW across all 24 hours.
5. The "Final Output" tab calculates the MW by hour based on the profiles by unit category.
6. The "Dashboard" tab reflects the hourly NQC MW values of each resource type, as well as managed load and total hourly supply with and without storage.
7. The "PRM Setting" tab calculates the PRM using a Solver function by first seeking the minimum PRM across 24 hours without storage, then optimizes by integrating storage to maximize the minimum PRM on an hourly basis, while minimizing the variance in PRM among the hours. Additionally, the Solver function ensures that the storage allocations do not exceed the existing storage MW capacity for any hour and that sufficient energy is available for storage charging at all times.

In December 2023, ED Staff offered a final opportunity for informal comments from parties on the various tools/analyses released throughout 2023, including the PRM Calibration Tool. In response to this solicitation, AVA, Cal Advocates, Calpine, MRP, SCE, and SVCE filed informal comments on the PRM Calibration Tool on December 22.

Comments submitted through this informal process were largely similar to comments filed November 13. Calpine stated that while the 15.43% PRM was more reasonable than the 8.2% PRM previously put forth, this PRM was still not proven to achieve a 0.1 LOLE. Cal Advocates, similar to other parties' previous suggestions, recommended stress testing the September PRM against July and August portfolio assumptions.

SCE stated that following the release of the revised PRM Calibration Tool, it still had concerns around unspecified imports to CAISO and the treatment of perfect capacity included in the LOLE portfolio. Specifically, SCE stated that the exact amount of unspecified imports that are currently under contract should be included in the PRM setting to properly account for unspecified import resources' contribution to LOLE modeling, or Energy Division should develop

a methodology to determine the minimum hourly imports actually required in the peak day to meet the LOLE standard.

SCE further put forward an approach for unspecified imports in LOLE studies for PRM setting, stating that, "[s]ince the most important output of the LOLE model is the portfolio required to meet the reliability standard, it seems imprudent to let the CAISO portfolio deviate between LOLE scenario runs." To address this, SCE suggested that unspecified imports be fixed at some amount for each hour in each run. From this, the exact amount of required imports would be known since the resulting portfolio would have the same imports in each scenario, and the peak day import profile could then be used directly in the PRM Calibration Tool.

With regards to use of perfect capacity in the PRM Calibration Tool, SCE stated that it is also important to know exactly how much perfect capacity was required to meet the reliability standard and directly include the perfect capacity in the PRM Calibration Tool, because attempting to "translate" perfect capacity into combinations of other resource types will unnecessarily add errors into the process.

Finally, several parties expressed concerns with the overall process, stating that frequent changes to the PRM is challenging for planning and that extra transparency is needed surrounding the PRM setting.

D. Questions for Consideration

- What improvements, if any, should be made to the current version of the PRM Calibration Tool?
- How should the Commission translate the 17% PRM adopted in D.23-06-029 to a SOD PRM for 2025?

E. Next Steps

Energy Division acknowledges the concerns around transparency and will plan additional discussions of the current version of the PRM Calibration Tool. Additionally, both ED Staff's and stakeholders' proposals on this topic (submitted on January 19, 2024) will be deliberated under the current RA Proceeding, R.23-10-011, and discussed at the Track 1 workshop scheduled for February 14, 2024.

Additionally, ED Staff has proposed additional LOLE modeling as part of Track 2 in R.23-10-011, including the development of an Inputs and Assumptions document that will guide that modeling. LOLE modeling will further be conducted in early summer 2024 that will guide calculation of the 2026 required RA obligations via the SOD framework. This modeling work will also include one or more stress tests to ensure that the PRM is sufficient to cover reliability in all months with identified LOLE.

VI. Master Resource Database

A. Background

In D.22-06-050, the Commission laid out several parameters for the development of a Master Resource Database (MRD), which would capture important characteristics for hourly capacity showings from all resources qualified to provide RA capacity to LSEs, via the RA Reform working group process. These characteristics were described as follows:

- Contains a list of all resources (within the CAISO) eligible to sell RA, their resource ID, their maximum RA capacity, and hours of availability within a 24-hour window.
- For solar and wind, identifies the profile associated with the resource.
- For storage, includes the charging efficiency and maximum continuous energy.
- For hybrid and co-located resources, includes configurations to describe capabilities.
- Contains data for each month.
- Information is public and available to inform trading and resource portfolio development.[19]

During the RA Reform working group process, ED Staff proposed a MRD process that would use public data sources and default values to populate the database, rather than CAISO's Master File, which introduces confidentiality issues and administrative complexity to track scheduling coordinator and generation owner affirmations. The MRD would be published on the Commission's website and sent to the service list with a request to generators to respond with corrections, similar to the NQC process. Feedback from suppliers would be incorporated into the database and compared to information in CAISO's Master File, with ED Staff contacting suppliers for corrections for any data inconsistencies. Finally, the MRD would be updated annually for deliverability and NQC updates.

Energy Division proposed using several public sources and default assumptions as follows:

- **Public Sources**
  - Master generator capability lists
  - NQC list
  - Local sub-area list
  - CAISO's grid interconnection queue
  - Other public information
- **Default Assumptions**
  - All batteries will be assumed to be 4-hour, one cycle per day
  - Maximum daily energy will be 4 x August NQC
  - Storage efficiency will be set at a conservative value of 0.8

[19] D.22-06-050, Appendix A at 7.

- First and last hour available are assumed to be 1 and 24 for most resources
- For hybrids, generic sub-IDs will be listed to facilitate showing of all components

In D.23-04-010, the Commission found that Energy Division's proposed process to develop the MRD was reasonable. Additionally, the Commission directed that monthly updates to the MRD be made to account for new resources coming online and changes in capacity values.[20]

B. Release of Master Resource Database (July 7, 2023)

ED Staff had released two separate drafts of the MRD on September 1, 2022, and February 3, 2023, encouraging feedback from parties and generators on both. On July 7, 2023, ED Staff released its first comprehensive MRD, updated to include solar and wind exceedance profiles as well as changes to default values provided by generators. Additionally, ED Staff added a grid charging column specifically for paired resources, with a default value of "No".

Informal comments on the July 7 version of the MRD were accepted through July 28, 2023. Several parties submitted corrections/updates to values contained with the MRD. Only PG&E and Cal Advocates submitted comments, although Cal Advocates' comments focused mostly on the exceedance values included within the MRD rather than the MRD itself (exceedance is discussed later in this report).

PG&E's comments focused primarily on how NQC and deliverability were represented within the MRD. PG&E questioned how hourly QC values for SOD would reflect (or not) the transmission constraints that CAISO applies to monthly NQC values, as well as reflect the co-located haircuts that apply to monthly NQC values. Further, PG&E questioned whether energy only (EO) resources on the CAISO NQC List would continue to have non-zero SOD QC values. PG&E pointed to co-located solar resources within the MRD that had non-zero values for "VER Hourly QC", whereas all other EO solar and wind resources received a zero QC value for SOD, questioning the "decision to allow the EO side of co-located resources claim the full QC value for SOD."

C. Further Releases of Master Resource Database

On October 4, 2023, ED Staff released an updated MRD to the R.21-10-002 service list. Changes included the following:

- New resources on NQC list as of June 28, 2023 were added
- Utilized updated versions of the master generator list, CAISO's effective flexible capacity (EFC) list, resource key, and CAISO's 2024 local capacity requirements (LCR) study
- Incorporated generator corrections to values from the July 7 release

ED Staff updated the resources in the MRD further on November 17, prior to the SOD Year Ahead filing due date.

[20] D.23-04-010 OP 1.

In December 2023, ED Staff offered a final opportunity for informal comments from parties on the various tools/analyses released throughout 2023, including the MRD. In response to this solicitation, AVA, PG&E, and SVCE filed informal comments on the MRD on December 22.

AVA commented that it was important to clarify who is responsible for updating the information in the MRD—whether that is the LSE, asset owner, or someone else—and stated that ED Staff's current practice of welcoming informal, ad hoc updates should ultimately move towards a more standardized and predictable process. AVA further commented on the need to explain the relationship between the fields in the MRD and the fields in the CAISO Master File because LSEs and asset owners can interpret fields differently (e.g., battery efficiency).

PG&E, in its comments, requested that Energy Division consider publishing the MRD more frequently than monthly in order to capture new resources coming online and any changes to NQCs. Further, PG&E commented that not all resources appeared to be given the same treatment within the MRD; for example, PG&E noticed that some out-of-state EO resources had non-zero monthly NQCs, but hourly values of 0 MW across all hours.

SVCE commented that when reviewing errors within the LSE Showing Tool that could not be readily explained with ED Staff, it became apparent that many of the errors tied back to issues within the MRD that "were not easily identifiable due to the complexity of the tool." To mitigate such errors, SVCE recommended that ED Staff develop an ongoing process for validating resource assumptions that "includes a transparent mapping of how data points from the MRD flow into the LSE Showing Tool to ensure accuracy."

ED Staff clarifies that consistent with current NQC update process, generators must request to be added to the CAISO's NQC list, as they do today. This process is essential as it allows for resources to be added to CAISO's Customer Interface for Resource Adequacy (CIRA) system, which is confirmed against the Master File data and Commercial Online Date (COD) and Commercially Available for Markets (COM) notices and is necessary for CAISO supply plan confirms and energy market bidding. Also, the CAISO NQC process serves as a key input into the development and maintenance of the MRD.

ED Staff will use the monthly NQC updates provided by CAISO to update and post the MRD monthly (as it does today with the NQC list included within). ED Staff recognizes that default value fields will require information from generators (beyond what has been provided by the NQC list) to ensure that the MRD reflects the actual values of the resource rather than the default values. Therefore, ED Staff expects that generators that seek to update their MRD fields provide ED Staff with this information ahead of being added to the NQC list (via CAISO's process) to ensure a timely process of updating the MRD list ahead of compliance showings.

Currently, there are several fields in the MRD that are subject to a default value. These include:

- Hybrid Sub-ID (generic sub-IDs used for hybrid resources only)
- Battery Efficiency

- Maximum Continuous Energy
- Maximum Daily MWh
- Daily Storage Cycles
- First Available (HE)
- Last Available (HE)
- Max Daily Run Hours
- Allows Grid Charging

Resources that are seeking to be added (or to change values) on the monthly MRD list should send their information to Energy Division before the NQC request is made to CAISO to ensure that the MRD list reflects the actual values associated with the resource (rather than the default values).

D. Questions for Consideration

- What changes are needed for the monthly MRD update process to ensure that resources are accurately and timely represented for compliance?
- What would be a reasonable schedule for a regular MRD feedback update process?
- Which fields within the MRD, if any, need to be clarified with parties, so that a mutual understanding is achieved amongst ED Staff, LSEs, and generators?
- What further issues need to be addressed within the MRD calculation and update process to ensure resources are shown properly and timely within the LSE Showing Tool?

E. Next Steps

The MRD will continue to be updated on a monthly basis ahead of the monthly posting of the MRD list (which flows into Month Ahead compliance). Generators/resource owners are responsible for updating resource values in the MRD and are encouraged to reach out to ED Staff directly if their resources are being misrepresented. LSEs may further notify generators if a value is misrepresented. This process is consistent with the current NQC process, however, ED Staff will continue to evaluate this process and propose additional refinements to the MRD or MRD update process if needed.

In addition to the MRD process outlined here, ED Staff clarify that in the future, resources that are shown in RA filings yet still under construction need to be verifiable against the Generator Interconnection Resource ID report that stems from CAISO's New Resource Implementation (NRI) database.[21] To effectuate this cross-check, resources that want to be shown as "under

[21] The Generator Resource ID report is published each week by the CAISO and shows the name of the resource, the Queue # (and/or Wholesale Distribution Access Tariff number), the Resource ID, and the type of resource. The report is found on the CAISO Interconnection Queue page

construction" in the MRD should also be shown on the "under construction" list for the NQC list. ED Staff will be working with the CAISO to determine how the under construction tab in the NQC file can be incorporated into the MRD, and how best to reference the NRI data in the NQC file.

VII. Solar and Wind Exceedance

A. Background

In D.22-06-050, the Commission determined that the existing single monthly ELCC methodology for valuing solar and wind resources needed to be adjusted to determine the hourly contribution for 24 hours of each month under the SOD Framework, and that an exceedance approach to establish hourly ELCC values was an appropriate means to quantify the contribution of solar and wind resources under a 24-hour framework. Further, it noted that the legislative history of California Public Utilities Code Section 399.26(d) gives the Commission discretion to determine how to calculate the ELCC values in establishing the contribution of wind and solar resources.[22] Under the RA Reform working group process, ED Staff and stakeholders worked to determine the appropriate methodology for establishing appropriate exceedance levels and hourly profiles of solar and wind resources.

During the RA Reform working group process, PG&E proposed a seasonal approach, with a 70% exceedance level applied in all hours of the summer months and a 50% exceedance level applied in all hours of the non-summer months. PG&E further proposed that these exceedance levels be applied to resources at the technology and geography level using five years of recorded CAISO data.

To arrive at its seasonal proposal, PG&E used the following six-step "Top 5 Days" methodology:

1. Identify the top five highest load days in each month during each year of the dataset;
2. Review solar and wind performance during those days for all hours, and convert to capacity factors using net dependable or "interconnection" capacity at the time;
3. Average data across all years to arrive a high-load day profile;
4. Set up exceedance profiles using the dataset;
5. Compare high-load day performance to the exceedance production at a given level, with a focus on loss of load hours from IRP's LOLE studies;
6. Select the exceedance level that results in minor differences between that level and the high-load day profile.

(https://www.caiso.com/planning/Pages/GeneratorInterconnection/Default.aspx), and it is available at https://www.caiso.com/Documents/Generator-Interconnection-Resource-ID-Report.xlsx

[22] D.22-06-050 at 83.

In D.23-04-010, the Commission did not adopt PG&E's seasonal proposal of 70%/50% exceedance levels, however, it found that PG&E's six-step Top 5 Days methodology for arriving at the proposal provides a reasonable means to determine solar and wind profiles benchmarked to stressed system conditions, with modifications. PG&E's Top 5 Days data set would be modified to add any days on which CAISO called a Flex Alert, Warning, Stage 1-3 Emergency, or Energy Emergency Alert (EEA) 1-3 condition. The exceedance methodology would then be applied to six years of historical data to generate technology (solar fixed/tracking/thermal; wind) and regional profiles.[23]

B. Initial Solar and Wind Exceedance Analysis (July 20, 2023)

ED Staff, in accordance with PG&E's Top 5 Days methodology, released its initial exceedance analyses and resulting profiles for solar and wind resources to the R.21-10-002 service list on July 20, 2023. ED Staff put forth two separate workbooks for in-state and out-of-state resources. Each workbook contained historical settlement data from 2017-2022 aggregated by resource technology and location (and modeled data from Energy Division's Energy Resource Modeling team where there was a lack of historical data) and provided details on the "worst day" generation profiles of each resource type, the exceedance levels chosen for summer (June through October) and non-summer (all other) months, the resulting generation profiles from applying those exceedance levels, and a comparison of the worst day generation profiles versus the exceedance generation profiles at the chosen exceedance levels.

To choose the exceedance levels, ED Staff plugged exceedance levels ranging from 50% to 85% (in 5% increments for simplicity) into the workbooks and chose what appeared to be the best fit exceedance levels while looking to minimize overcounting in LOLE hours. Neither D.23-04-010 nor the six-step methodology described in the RA Reform Workshop Report prescribed a strict process for determining which exceedance level was appropriate. As detailed below, ED Staff chose to apply a 70% all-year exceedance level applied to all solar technologies (fixed/tracking/thermal) in both northern and southern California, whereas the chosen exceedance levels for wind resources were more varied:

- **Solar**
  - **All technologies/locations** – 70% all-year
- **Wind**
  - **Northern California** – 80% summer and 65% non-summer
  - **Southern California** – 75% all-year
  - **Arizona/New Mexico** – 65% summer and 75% non-summer
  - **Washington/Oregon** – 70% summer and 60% non-summer

ED Staff solicited informal comments on the exceedance analyses and resulting profiles through August 10, 2023. In response to this solicitation, Cal Advocates, California Wind Energy

[23] D.23-04-010 at 32 and OP 5.

Association ("CalWEA"), NRDC, Pattern Energy Group LP ("Pattern"), SCE, and Solar Energy Industry Association ("SEIA") submitted informal comments.

Several parties expressed concerns with ED Staff's methodology for choosing exceedance levels. Specifically, Cal Advocates noted that the chosen exceedance levels ended in numbers rounded to "0" or "5" and stated that ED Staff should not allow "round number bias" to affect its selection of exceedance profiles. SEIA commented that not all hours have the same importance for reliability and recommended focusing on the 4 PM to 9 PM peak period for choosing exceedance levels.

Both SCE and SEIA recommended that ED Staff use different seasons in choosing exceedance levels and setting exceedance generation profiles. SEIA recommended that ED Staff use a June through September summer season rather than June through October on the basis that only SDG&E uses June through October as a summer season, whereas PG&E and SCE use June through September; in combination with its recommendation to focus on the 4 PM to 9 PM peak period, SEIA stated that 70% summer and 60% non-summer exceedance levels were a better fit for solar resources. SCE commented that it supported all of ED Staff's chosen exceedance levels with the exception of those chosen for southern California wind. For these resources, SCE suggested using spring (March through June) and non-spring (all other months) seasons for a better fit, recommending exceedance levels of 75% for spring and 60% for non-spring months.

Pattern mainly expressed concerns pertaining to the treatment of New Mexico wind resources. Firstly, it recommended use of IRP SERVM data to evaluate New Mexico wind instead of CAISO settlement data, stating that the sample period appeared to draw upon only approximately 300 MW of resources from New Mexico, while over 2,000 MW had come online since 2020 and more than 3,500 MW were under construction. Pattern stated that this small sample size skews the exceedance results and overstates the impacts of outages and transmission curtailment. Further, Pattern recommended that ED Staff differentiate between Arizona and New Mexico wind resources, citing differences in wind speeds and capacity factors between the two.

Cal Advocates, CalWEA, and Pattern expressed their preference for utilizing a different methodology entirely—applying a 50% exceedance level (median level) not to historic settlement data, but to the Top 5 Day sample instead, in order to develop exceedance generation profiles. Both Cal Advocates and Pattern claimed that this methodology would be consistent with the Commission's direction in D.23-04-010, with Cal Advocates stating that doing so would "allay growing stakeholder concerns about unduly penalizing variable energy resources by arbitrarily and subjectively selecting an exceedance level." CalWEA also stated that this would be consistent with ED Staff's interpretation of D.23-04-010 as requiring application of an exceedance level, but disagreed with that interpretation overall and recommended that ED Staff utilize the Top 5 Day profiles themselves as the profiles for solar and wind resources.

NRDC's comments stated that its previously-documented concerns with the direction of the Top 5 Day methodology to "select the exceedance level that results in minor differences between that level and the high-load day profile in loss of load hours," or "exceedance matching step," were demonstrated within ED Staff's July 20 analysis. To illustrate, NRDC included analysis showing the hourly capacity value difference between the worst day profiles and translated exceedance value in solar and wind resources. NRDC explained that large differences, or "lost" capacity, occurred more prominently in valuation of the wind resources, with low exceedance results driven by their variability in production. This effect was smaller with solar resources, and in the case of solar tracking resources, NRDC pointed out that they were actually valued above their worst day benchmark for August in ED Staff's analysis using a 70% exceedance level. In order to develop resource counting rules "durable to the changing system," NRDC suggested that the Commission 1) explore the use of modeled SERVM weather data instead of settlement data, 2) consider methodologies that directly subset and weight resource profiles based on reliability risk, and 3) remove the exceedance matching step entirely.

C. Revised Solar and Wind Exceedance Analysis (October 4, 2023)

In response to informal comments filed on August 10, ED Staff revised certain aspects of its methodology (in line with the directives of D.23-04-010) for choosing exceedance levels using the Top 5 Day methodology. In its edits, ED Staff attempted to address stakeholder concerns with the "eyeballing" methodology by providing a clear, replicable method for choosing exceedance levels while prioritizing (weighting) higher-risk hours. ED Staff released its updated exceedance analysis to the R.21-10-002 service list on October 13, 2023 (the exceedance profiles resulting from this updated analysis had already been included in the October 4 update of the MRD). Major changes included the following:

- Exceedance levels were chosen by implementing a mean-squared error approach using an Excel Solver function, which chooses an exceedance level for each season by utilizing the following steps:
  - For each exceedance level, the "Avg Worst Day vs Exceedance" resulting month/hour overcounting or undercounting value is multiplied by two weighting coefficients (below) and squared.
    - Hourly coefficient based on reliability risk:
      - Loss of Load Expectation (LOLE) hours = 3
      - Availability Assessment Hours (AAHs) = 2
      - All other hours = 1
    - Overcounting/undercounting coefficient, prioritizing minimization of overcounting relative to undercounting:
      - Overcounting/positive = 2
      - Undercounting/negative = 1

- The total sum of these values across the months/hours at each exceedance level is calculated in the Objective cell.
- Solver finds the two exceedance levels that minimize the Objective cell, subject to the following additional constraints:
  - No overcounting greater than 10% in any hour relative to the Worst Day profile
  - No overcounting greater than 2% in LOLE hours relative to the Worst Day profile
  - Exceedance levels have a lower bound of 50% and upper bound of 85%

- Out of State wind resources in Arizona and New Mexico were given separate profiles, with New Mexico profiles based on a combination of modeled and actual data.
- Southern California wind resources utilized spring (March through June) and non-spring seasons, which yielded better fit profiles when comparing the Worst Day and exceedance profiles. All other profiles continued to utilize summer (June through October) and non-summer seasons.

With these changes, the chosen exceedance levels for several resource classes shifted. Generally, the chosen exceedance levels decreased for non-summer months, whereas exceedance levels tended to be similar for summer months, although southern California solar tracking resources saw a 7% increase in exceedance level.

The tables below summarize the changes in chosen exceedance levels from the initial July 20 analysis to the revised October 4 analysis (the October 4 southern California wind exceedance levels are highlighted to note the shift from using summer/non-summer to spring/non-spring months):

Table 1. Comparison of Chosen Solar Exceedance Levels.

	Solar (Fixed)						Solar (Tracking)						Solar (Thermal)		
	Northern California			Southern California			Northern California			Southern California			Southern California		
	July 20	October 4	Change	July 20	October 4	Change	July 20	October 4	Change	July 20	October 4	Change	July 20	October 4	Change
Summer	70%	68%	-2%	70%	66%	-4%	70%	72%	2%	70%	77%	7%	70%	73%	3%
Non-Summer	70%	59%	-11%	70%	62%	-8%	70%	62%	-8%	70%	61%	-9%	70%	63%	-7%

Table 2. Comparison of Chosen Wind Exceedance Levels.

	Wind														
	Northern California			Southern California			Arizona			New Mexico			Washington/Oregon		
	July 20	October 4	Change	July 20	October 4	Change	July 20	October 4	Change	July 20	October 4	Change	July 20	October 4	Change
Summer / Spring	80%	81%	1%	75%	69%	-6%	65%	63%	-2%	65%	65%	0%	70%	69%	-1%
Non-Summer / Non-Spring	65%	57%	-8%	75%	60%	-15%	75%	69%	-6%	75%	58%	-17%	60%	56%	-4%

This revised release informed the hourly capacity values used in the Test Year 2024 SOD Year Ahead showings. Generally, the changes to exceedance levels resulted in modest increases to generation profiles (i.e., more capacity) for non-summer months and small decreases to generation profiles (i.e., less capacity) for summer months, with New Mexico wind receiving the

largest changes across its hourly generation profiles. The table below summarizes the average increases/decreases across all months/hours between the July 20 and October 4 exceedance generation profiles.

Table 3. Summary of Average Changes in Generation Profiles Across All Hours.

	Northern California			Southern California				Arizona	New Mexico	Washington/ Oregon
	Solar Fixed	Solar Tracking	Wind	Solar Fixed	Solar Tracking	Solar Thermal	Wind	Wind	Wind	Wind
Average Increase (All Hours)	3%	4%	3%	1%	4%	6%	4%	4%	13%	2%
Average Decrease (All Hours)	0%	-1%	-1%	0%	-2%	-3%	0%	0%	-7%	0%

Looking at the LOLE hours only (HE 19 to HE 23 for August, HE 18 to HE 23 for September), which were most heavily weighted in the updated exceedance methodology used by ED Staff, the largest changes were seen for wind resources. Changes to solar generation profiles in these hours were minimal due to solar production being at or near 0 MW for most LOLE hours. The table below summarizes the average change for the different resource classes specifically during the LOLE hours.

Table 4. Summary of Average Changes in Generation Profiles During Loss of Load Expectation Hours

	Northern California			Southern California				Arizona	New Mexico	Washington/ Oregon
	Solar Fixed	Solar Tracking	Wind	Solar Fixed	Solar Tracking	Solar Thermal	Wind	Wind	Wind	Wind
Average Change in Profile (LOLE Hours Only)	0%	0%	-1%	0%	0%	-1%	9%	2%	-11%	0%

In December 2023, ED Staff offered a final opportunity for informal comments from parties on the various tools/analyses released throughout 2023. In response to this solicitation, Cal Advocates, CalWEA, MRP, Pattern, and SVCE filed informal comments on the updated exceedance analysis on December 22.

Generally, parties expressed concerns with ED Staff's analysis and how it comported with the direction in D.23-04-010, recommending a workshop to discuss. CalWEA commented that it did not believe ED Staff's analysis to be supported by "a fair and reasonable reading of the Commission's reference to 'PG&E's Top 5 Day methodology' in view of PG&E's final recommendation." SVCE stated that it encouraged the Commission to "provide regulatory certainty in the near-term to help minimize complexity and risk in an already complex market."

Cal Advocates commented that it generally supported the new exceedance approach, including ED Staff's use of minimization of mean-squared error and disaggregating of New Mexico and Arizona wind datasets, but continued to recommend that ED Staff implement monthly rather than seasonal exceedance values (as described in previous comments on this topic). Cal

Advocates stated that that would ensure that wind and solar resources receive "full value for their expected reliability contributions via more precise counting estimates." Cal Advocates further stated that alternatively, the same level of precision from monthly exceedance levels could be achieved by simply using the monthly Top 5 Day performance profile.

Pattern commented that it recommended evaluation of the use of modeled data from the IRP Proceeding and encouraged ED Staff to "evaluate whether a larger sample size in certain regions, like New Mexico, would provide a more robust data set." Pattern further stated that developing a more robust dataset would better align the procurement signals in the IRP Proceeding, which "show considerable system value for out-of-state wind resources." Additionally, Pattern recommended that ED Staff tailor exceedance profiles to hours with higher LOLE expectation while using average profiles in hours of lesser concern and conduct calibration exercises to align the selected exceedance profiles more closely with average generation in each month. Finally, Pattern recommended that the Commission focus on performance of generation data as reflected in historic generation or modeled data, emphasizing that transmission-related outages and curtailment should not factor into exceedance profiles.

D. Questions for Consideration

- What alterations, if any, should be made to the current exceedance methodology for valuing solar and wind resources under the SOD Framework?
- In utilizing the Top 5 Day methodology adopted in D.23-04-010, what is the most reasonable approach for assessing whether chosen exceedance levels best capture the reliability contributions of solar and wind resources?
- Would modeled weather data provide a more accurate generation profile for solar and wind, as opposed to CAISO settlement data (requiring a change to the adopted methodology)?
- If CAISO settlement data continues to be used, how can the Commission account for transmission outages and/or curtailment present in the data used in the current exceedance methodology?
- In light of the exceedance analysis released by ED Staff on July 20 and October 4, should the Commission revisit the topic of monthly, rather than seasonal, exceedance levels? What would be the pros and cons of moving to a different exceedance methodology such as this one?
- Should the exceedance profiles be updated annually, for use in compliance, or should they be set/fixed for a period of time?

E. Next Steps

In addition to considering possible refinements to the current exceedance methodology for solar and wind resources, ED Staff will update the exceedance profiles to use the latest six years

of available CAISO settlement data (2018-2023) for the 2025 RA Compliance Year. Updated profiles will be included in the MRD and will flow into the NQC list.

VIII. 2024 Slice of Day Year Ahead Showings

A. Background

In D.22-06-050, the Commission determined that given the complexities of implementing the new statewide SOD RA framework, 2024 would be a test year for SOD prior to full implementation in the 2025 RA Compliance Year.[24]

In D.23-04-010, the Commission described its goals during the test year as 1) for LSEs and ED Staff to test the new showing and compliance tools, as well as the new SOD rules to determine whether adjustments are needed, and 2) for LSEs to adjust their procurement practices and RA portfolios in preparation for the 2025 full implementation year. The Commission further directed that test year SOD filings would be limited to a Year Ahead compliance showing (May through September) due November 30, 2023, and Month Ahead showings for March, June, and September, submitted on the first day of the showing month. The exception to this test year filing timeline is if an LSE chooses to show standalone energy storage resources in maximum cumulative capacity (MCC) bucket 4, in which case the LSE is required to show sufficient charging capacity for the storage capacity shown in MCC bucket 4 in the applicable month by the existing Month Ahead deadlines (i.e., 45 days before the first day of the showing month).[25]

B. Summary of Aggregate Slice of Day Year Ahead Showings

All 38 LSEs under the Commission's jurisdiction submitted SOD Year Ahead test showings. ED Staff discovered that confusion regarding how to enter resources contracted under the existing framework required adjustments to ensure that hourly profiles were being properly loaded within the templates. This was an issue primarily for solar and wind resources, whose QC methodology differed between the existing RA framework (using ELCC) and the SOD Framework (using exceedance), which required LSEs to scale their contracted NQC properly. ED Staff clarifies here that the QC methodology for variable energy resources (VERs) utilized within the SOD templates is exceedance and that the need to scale the contracted NQC for the SOD templates only applies to the test year, where there is a difference in QC methodologies being applied to the solar and wind resources between the two frameworks.

After contacting LSEs regarding any errors within their SOD Year Ahead test showings, ED Staff compiled the hourly capacity values in the five Year Ahead months (May through September) and compared them against the 90% Year Ahead and 100% Month Ahead requirements with a 15.43% PRM applied to each hour.[26] Due to time constraints and data issues, ED Staff only

[24] D.22-06-050 Finding of Fact (FOF) 11.
[25] D.23-04-010 at 71-72.
[26] 15.43% was the SOD PRM indicated by ED Staff's PRM Calibration Tool, as discussed earlier in this report.

compared the hourly capacity showing data on the "LSE Showing Complete" tab of the templates (which the LSE Showing Tool automatically populates based on LSE inputs on the "LSE Showing" tab) against hourly capacity requirements from the LSE allocation files. At the time of this report, ED Staff has not reviewed the aggregate energy sufficiency checks or other checks, but plans to do so in future analyses.

Based on the showings, the most constrained hour (the hour with the lowest aggregate position) for June, July, and August was Hour Ending (HE) 22, whereas in May and September, the most constrained hours were HE 20 and HE 19, respectively. In aggregate, the Commission-jurisdictional LSEs passed the hourly Year Ahead requirements in all months with the exception of September, in which HE 19 showed a negative aggregate position (deficiency) of 87 MW. However, there were individual LSEs with hourly deficiencies across all hours. The largest deficiencies in aggregate occurred in HE 22 for May through August, whereas they occurred in HE 19 for September.

Additionally, ED Staff examined the aggregate Year Ahead showings against the CEC's draft California Energy Demand (CED) 2023 load forecast to better understand how the revised load shapes would impact the overall positions for the 2025 RA Compliance Year. Under this draft load forecast, the most constrained hour is HE 22 for all months except May, which shows the most constraint at HE 23. The aggregate positions at these constrained hours, however, are higher under the 2025 estimated SOD RA requirements than the 2024 SOD RA requirements.

Below, there are two tables and one graph reflecting the aggregate SOD Year Ahead showings for each month.[27] The first table reflects the aggregate position against the 90% Year Ahead SOD showing requirement by hour and the aggregate deficiencies across all LSEs by hour. The second table reflects the aggregate position by hour against an estimate of the 2025 hourly 90% Year Ahead SOD requirements.[28] The graph for each month illustrates these positions with a breakdown of aggregate shown capacities by resource type relative to hourly requirements.

[27] The "Aggregate System Showings" figures include all Cost Allocation Mechanism (CAM), CPE, Modified Cost Allocation Mechanism (MCAM), and demand response (DR) resource allocations provided to LSEs. Although the LSE Showing Tool nets these allocations off of LSEs' individual hourly requirements (with the exception of storage and CAM peaker allocations), the aggregate SOD RA requirements in the summary tables and charts presented throughout this report are not inclusive of any allocations.

[28] The 2025 hourly SOD requirements were calculated from the draft 2023 CED CAISO load forecast results (issued January 31, 2024) by backing out 10% to account for non-Commission-jurisdictional LSEs within the CAISO, another 10% for the Year Ahead showing requirement, and applying a 17% PRM.

Table 5. Aggregate 2024 Slice of Day Year Ahead Showings for May.

May	Aggregate System Showings	2024 90% YA Requirement + 15.43% PRM	Aggregate Position	Aggregate Deficiencies
HE 1	32,459	23,721	8,738	(420)
HE 2	32,250	22,490	9,760	(350)
HE 3	32,105	21,834	10,270	(310)
HE 4	32,073	21,976	10,097	(316)
HE 5	31,822	22,695	9,127	(453)
HE 6	31,552	23,684	7,869	(572)
HE 7	33,236	24,016	9,219	(198)
HE 8	38,067	23,564	14,503	(101)
HE 9	41,286	22,907	18,379	(60)
HE 10	42,494	22,818	19,676	(82)
HE 11	43,024	23,191	19,834	(95)
HE 12	43,207	23,727	19,480	(111)
HE 13	43,281	24,857	18,424	(102)
HE 14	43,710	26,905	16,806	(118)
HE 15	43,802	28,937	14,864	(197)
HE 16	43,987	30,973	13,014	(226)
HE 17	43,988	33,156	10,832	(340)
HE 18	47,145	34,495	12,650	(120)
HE 19	44,236	34,685	9,550	(153)
HE 20	40,193	34,721	5,472	(362)
HE 21	39,517	33,257	6,260	(328)
HE 22	36,026	30,292	5,734	(572)
HE 23	33,231	27,519	5,712	(424)
HE 24	33,041	25,892	7,149	(248)

Table 6. Aggregate 2024 Slice of Day Year Ahead Showings vs. Estimated 2025 Load Forecast for May.

May	Aggregate System Showings	2025 Load Forecast + 17% PRM	Aggregate Position
HE 1	32,459	23,285	9,174
HE 2	32,250	22,130	10,120
HE 3	32,105	21,347	10,758
HE 4	32,073	21,192	10,880
HE 5	31,822	21,769	10,052
HE 6	31,552	22,426	9,126
HE 7	33,236	23,307	9,929
HE 8	38,067	23,777	14,290
HE 9	41,286	23,440	17,846
HE 10	42,494	23,193	19,301
HE 11	43,024	22,938	20,086
HE 12	43,207	23,492	19,715
HE 13	43,281	24,619	18,662
HE 14	43,710	26,203	17,507
HE 15	43,802	28,251	15,551
HE 16	43,987	30,047	13,940
HE 17	43,988	31,726	12,262
HE 18	47,145	32,792	14,353
HE 19	44,236	32,937	11,298
HE 20	40,193	32,151	8,043
HE 21	39,517	31,065	8,452
HE 22	36,026	28,867	7,160
HE 23	33,231	26,646	6,586
HE 24	33,041	25,126	7,915

Figure 3. Aggregate 2024 Slice of Day Year Ahead Showings for May.

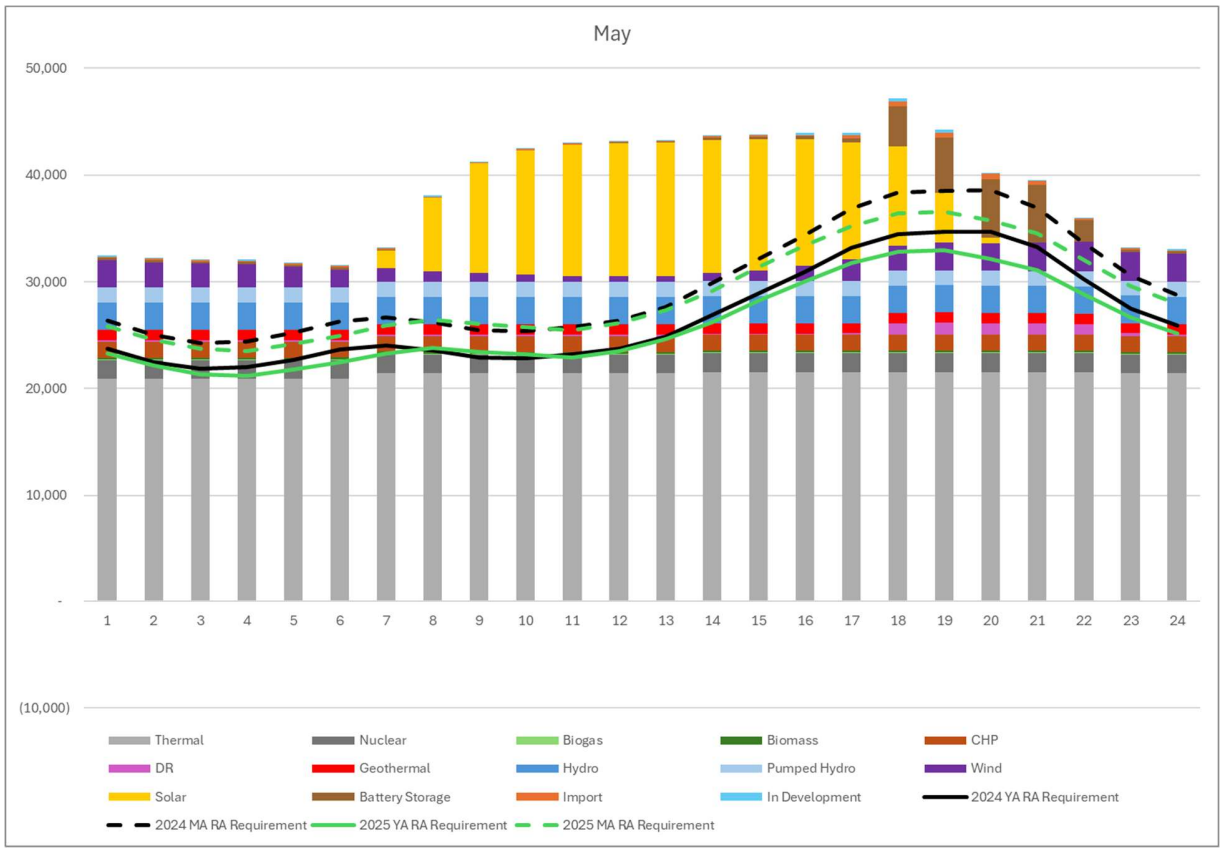


Table 7. Aggregate 2024 Slice of Day Year Ahead Showings for June.

June	Aggregate System Showings	2024 90% YA Requirement + 15.43% PRM	Aggregate Position	Aggregate Deficiencies
HE 1	35,462	25,451	10,011	(449)
HE 2	35,344	24,204	11,140	(359)
HE 3	35,094	23,361	11,733	(295)
HE 4	34,916	23,509	11,407	(324)
HE 5	34,753	24,474	10,278	(432)
HE 6	34,526	25,491	9,036	(564)
HE 7	36,331	26,017	10,314	(256)
HE 8	41,180	26,209	14,971	(108)
HE 9	44,197	26,357	17,840	(66)
HE 10	45,437	26,953	18,484	(77)
HE 11	46,093	27,824	18,269	(119)
HE 12	46,450	28,584	17,866	(133)
HE 13	46,511	30,343	16,168	(226)
HE 14	46,704	32,298	14,407	(314)
HE 15	47,059	34,570	12,489	(324)
HE 16	47,364	36,685	10,679	(323)
HE 17	47,983	38,351	9,633	(382)
HE 18	52,771	39,667	13,103	(284)
HE 19	49,209	39,679	9,530	(326)
HE 20	44,842	39,459	5,383	(552)
HE 21	43,753	37,742	6,011	(456)
HE 22	36,682	34,032	2,650	(743)
HE 23	35,771	30,626	5,145	(641)
HE 24	35,723	28,069	7,654	(412)

Table 8. Aggregate Slice of Day Year Ahead Showings vs. Estimated 2025 Load Forecast for June.

June	Aggregate System Showings	2025 Load Forecast + 17% PRM	Aggregate Position
HE 1	35,462	26,217	9,246
HE 2	35,344	24,632	10,712
HE 3	35,094	23,640	11,455
HE 4	34,916	23,401	11,515
HE 5	34,753	24,087	10,665
HE 6	34,526	24,921	9,606
HE 7	36,331	26,249	10,082
HE 8	41,180	26,822	14,358
HE 9	44,197	26,958	17,239
HE 10	45,437	27,315	18,122
HE 11	46,093	28,010	18,083
HE 12	46,450	29,247	17,203
HE 13	46,511	31,306	15,205
HE 14	46,704	33,704	13,001
HE 15	47,059	36,208	10,851
HE 16	47,364	38,027	9,337
HE 17	47,983	39,644	8,340
HE 18	52,771	40,057	12,714
HE 19	49,209	39,334	9,875
HE 20	44,842	37,587	7,255
HE 21	43,753	35,977	7,777
HE 22	36,682	33,115	3,567
HE 23	35,771	30,187	5,584
HE 24	35,723	28,284	7,439

Figure 4. Aggregate 2024 Slice of Day Year Ahead Showings for June.

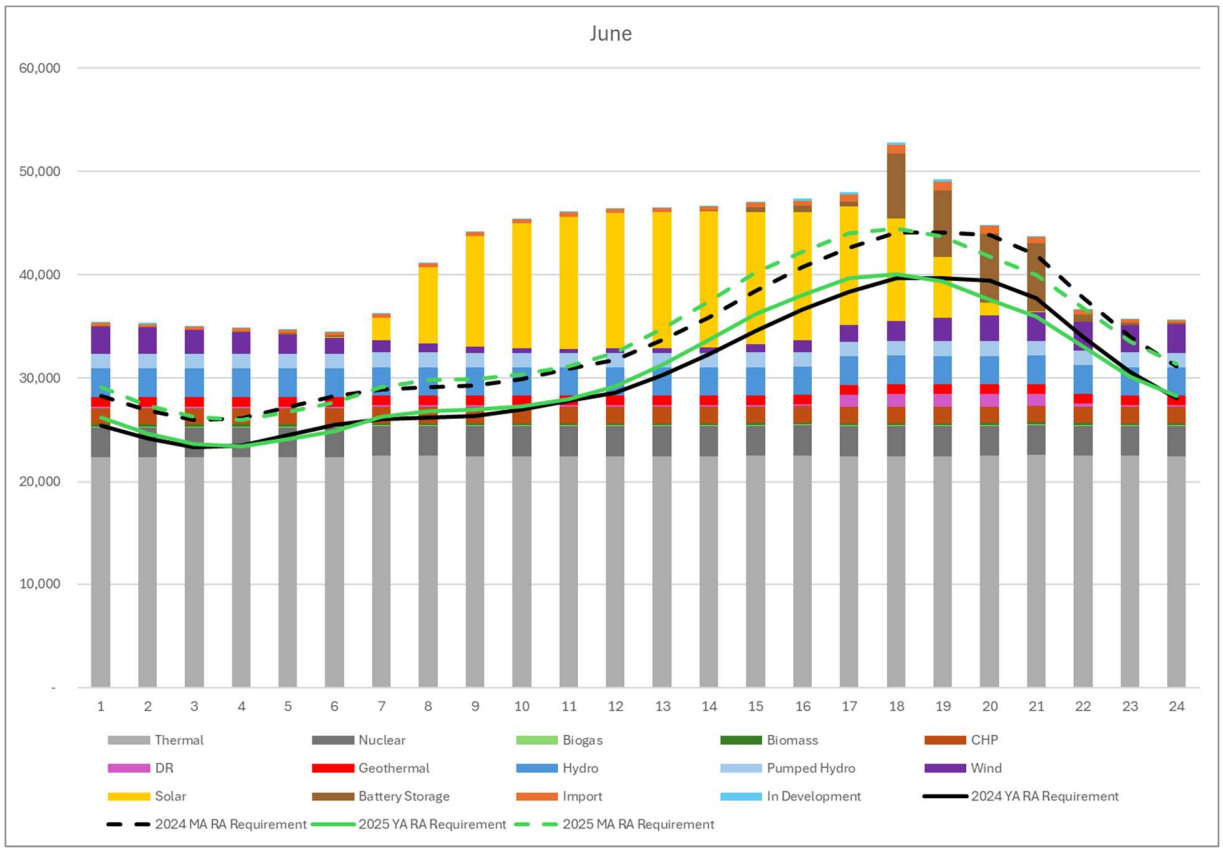


Table 9. Aggregate 2024 Slice of Day Year Ahead Showings for July.

July	Aggregate System Showings	2024 90% YA Requirement + 15.43% PRM	Aggregate Position	Aggregate Deficiencies
HE 1	36,302	26,538	9,763	(534)
HE 2	36,085	25,279	10,805	(439)
HE 3	35,874	24,536	11,338	(372)
HE 4	35,628	24,574	11,054	(398)
HE 5	35,346	25,402	9,944	(478)
HE 6	35,177	26,477	8,700	(558)
HE 7	36,473	27,551	8,921	(329)
HE 8	40,562	28,048	12,514	(175)
HE 9	44,292	28,202	16,090	(123)
HE 10	46,078	28,912	17,166	(172)
HE 11	46,898	30,116	16,782	(191)
HE 12	47,299	31,243	16,056	(233)
HE 13	47,411	33,500	13,911	(287)
HE 14	47,474	35,616	11,858	(330)
HE 15	47,530	38,427	9,103	(506)
HE 16	47,715	40,680	7,034	(512)
HE 17	48,676	42,329	6,347	(518)
HE 18	54,137	42,654	11,482	(382)
HE 19	50,374	42,222	8,152	(486)
HE 20	46,191	41,558	4,633	(725)
HE 21	45,229	39,820	5,409	(655)
HE 22	37,596	35,777	1,819	(949)
HE 23	36,723	32,240	4,483	(625)
HE 24	36,598	29,473	7,125	(410)

Table 10. Aggregate 2024 Slice of Day Year Ahead Showings vs. Estimated 2025 Load Forecast for July.

July	Aggregate System Showings	2025 Load Forecast + 17% PRM	Aggregate Position
HE 1	36,302	28,481	7,821
HE 2	36,085	26,727	9,358
HE 3	35,874	25,698	10,176
HE 4	35,628	25,401	10,227
HE 5	35,346	26,034	9,312
HE 6	35,177	27,140	8,036
HE 7	36,473	28,588	7,885
HE 8	40,562	29,516	11,045
HE 9	44,292	29,970	14,322
HE 10	46,078	30,626	15,452
HE 11	46,898	31,905	14,993
HE 12	47,299	33,343	13,956
HE 13	47,411	35,656	11,755
HE 14	47,474	39,006	8,468
HE 15	47,530	41,542	5,988
HE 16	47,715	43,307	4,407
HE 17	48,676	43,863	4,813
HE 18	54,137	43,666	10,470
HE 19	50,374	42,800	7,574
HE 20	46,191	40,650	5,541
HE 21	45,229	38,968	6,261
HE 22	37,596	35,646	1,950
HE 23	36,723	32,518	4,205
HE 24	36,598	30,201	6,397

Figure 5. Aggregate 2024 Slice of Day Year Ahead Showings for July.

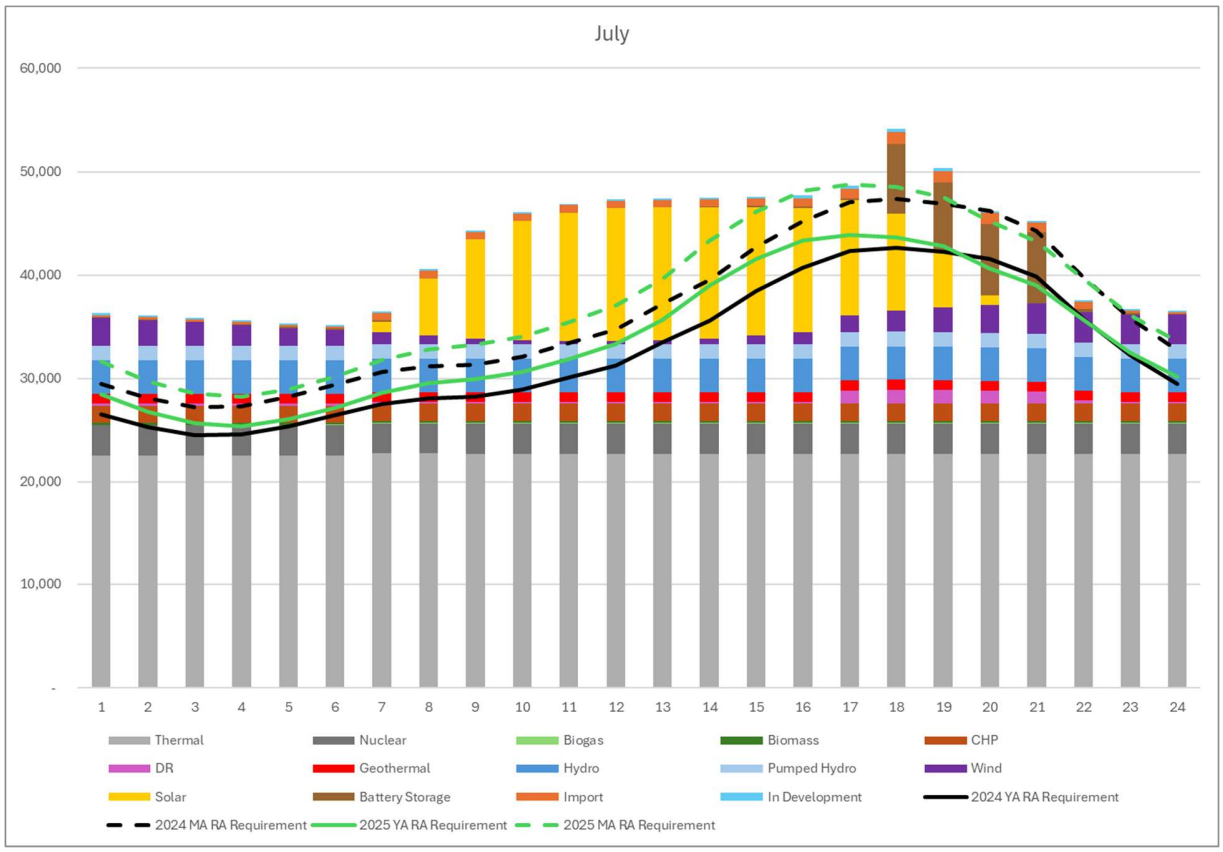


Table 11. Aggregate 2024 Slice of Day Year Ahead Showings for August.

August	Aggregate System Showings	2024 90% YA Requirement + 15.43% PRM	Aggregate Position	Aggregate Deficiencies
HE 1	35,452	26,660	8,792	(673)
HE 2	35,322	25,210	10,113	(536)
HE 3	35,125	24,377	10,747	(477)
HE 4	34,860	24,280	10,580	(465)
HE 5	34,598	25,258	9,340	(587)
HE 6	34,487	26,841	7,646	(784)
HE 7	35,634	27,689	7,945	(514)
HE 8	38,933	28,018	10,914	(306)
HE 9	43,648	28,273	15,374	(241)
HE 10	45,818	28,983	16,835	(217)
HE 11	46,763	30,058	16,704	(273)
HE 12	47,219	31,134	16,086	(323)
HE 13	47,347	33,457	13,890	(442)
HE 14	47,263	35,935	11,328	(545)
HE 15	47,345	38,696	8,649	(784)
HE 16	47,393	41,172	6,221	(893)
HE 17	47,652	42,495	5,158	(914)
HE 18	52,395	43,131	9,265	(791)
HE 19	48,084	42,533	5,551	(963)
HE 20	45,710	41,610	4,100	(1,220)
HE 21	45,258	38,956	6,302	(1,047)
HE 22	37,147	34,860	2,287	(1,256)
HE 23	36,146	31,009	5,138	(928)
HE 24	36,029	28,760	7,268	(670)

Table 12. Aggregate 2024 Slice of Day Year Ahead Showings vs. Estimated 2025 Load Forecast for August.

August	Aggregate System Showings	2025 Load Forecast + 17% PRM	Aggregate Position
HE 1	35,452	27,461	7,991
HE 2	35,322	25,841	9,481
HE 3	35,125	24,856	10,269
HE 4	34,860	24,653	10,207
HE 5	34,598	25,447	9,151
HE 6	34,487	26,758	7,729
HE 7	35,634	27,841	7,793
HE 8	38,933	28,468	10,465
HE 9	43,648	28,542	15,106
HE 10	45,818	29,036	16,782
HE 11	46,763	29,984	16,779
HE 12	47,219	31,496	15,723
HE 13	47,347	33,994	13,353
HE 14	47,263	36,500	10,763
HE 15	47,345	39,513	7,832
HE 16	47,393	40,857	6,536
HE 17	47,652	42,348	5,304
HE 18	52,395	42,646	9,749
HE 19	48,084	41,467	6,617
HE 20	45,710	39,214	6,496
HE 21	45,258	37,182	8,076
HE 22	37,147	34,109	3,038
HE 23	36,146	31,166	4,980
HE 24	36,029	29,274	6,755

Figure 6. Aggregate 2024 Slice of Day Year Ahead Showings for August.

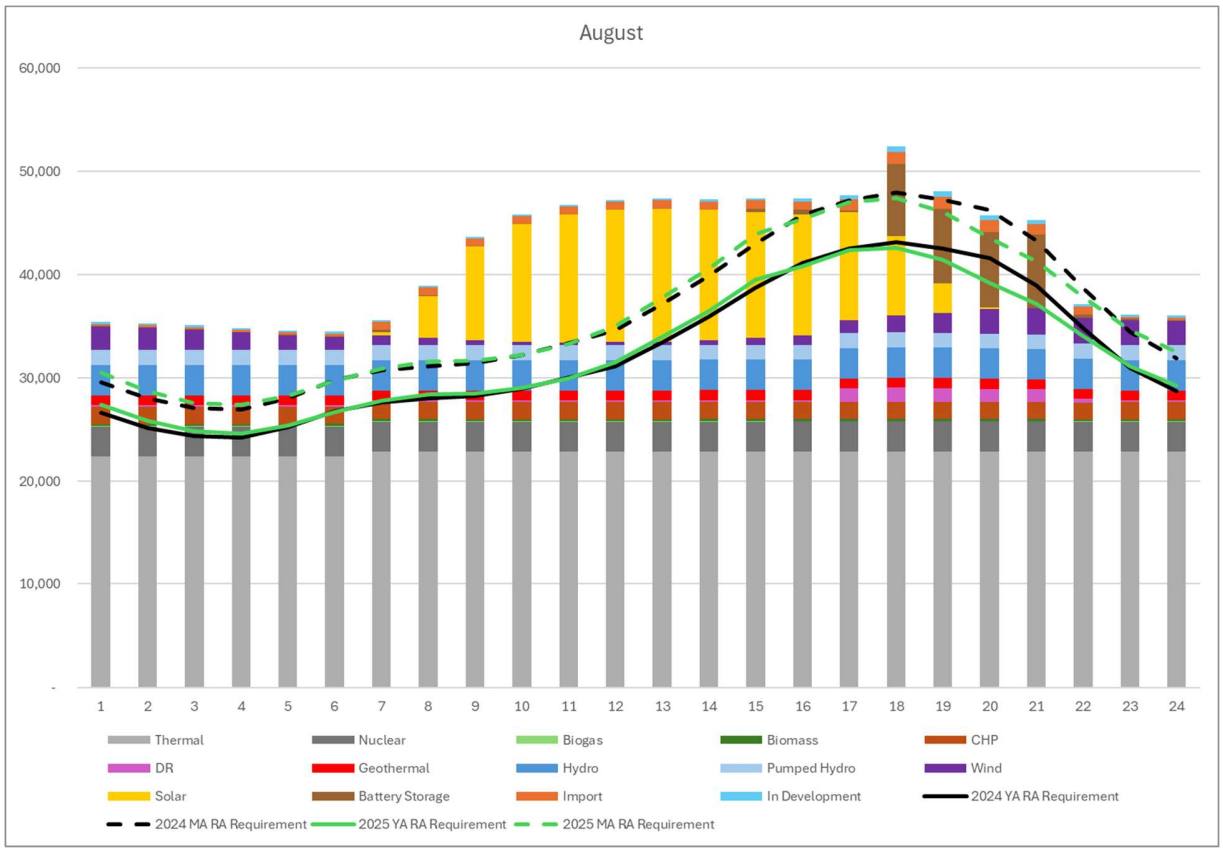


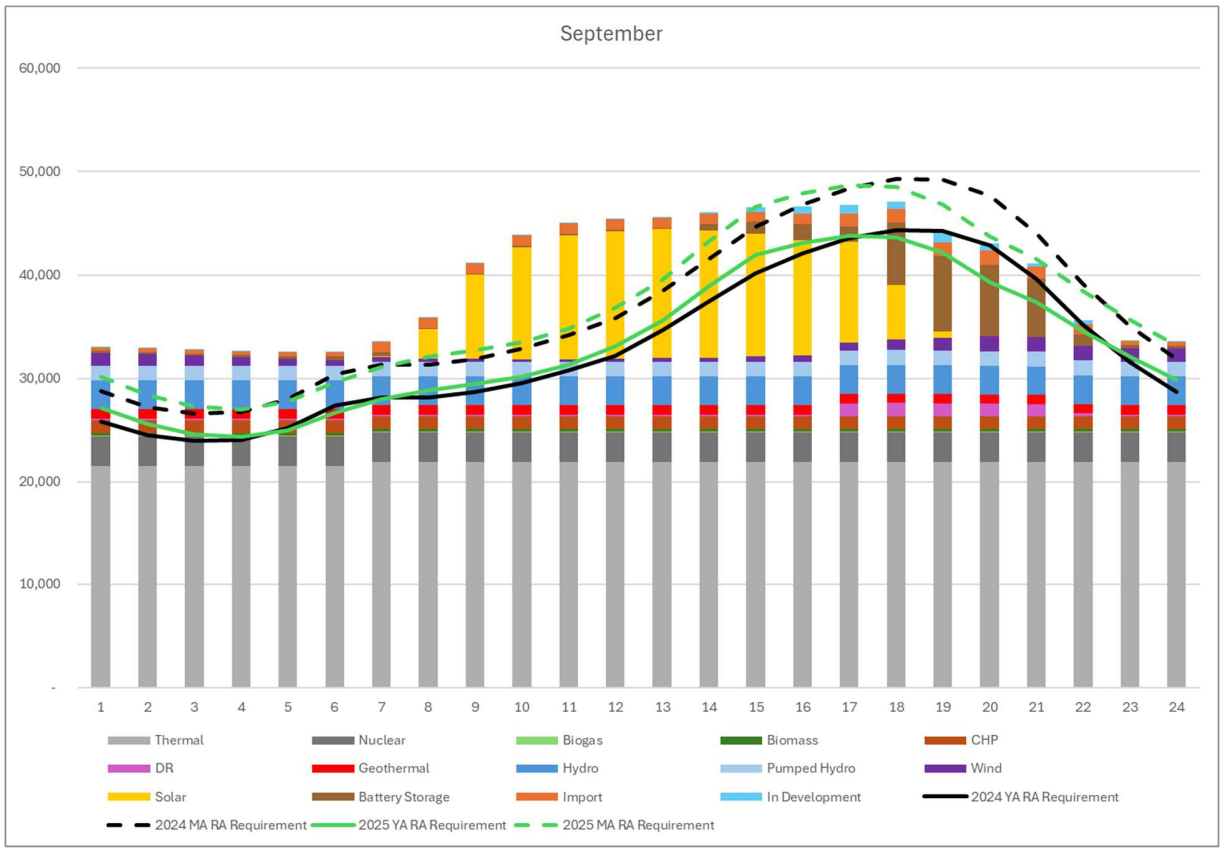
Table 13. Aggregate 2024 Slice of Day Year Ahead Showings for September.

September	Aggregate System Showings	2024 90% YA Requirement + 15.43% PRM	Aggregate Position	Aggregate Deficiencies
HE 1	33,078	25,866	7,211	(758)
HE 2	32,953	24,524	8,429	(606)
HE 3	32,827	23,931	8,896	(534)
HE 4	32,676	24,053	8,623	(542)
HE 5	32,572	25,172	7,400	(685)
HE 6	32,534	27,351	5,183	(911)
HE 7	33,560	28,179	5,381	(543)
HE 8	35,939	28,185	7,754	(395)
HE 9	41,217	28,689	12,528	(327)
HE 10	43,922	29,577	14,345	(385)
HE 11	45,069	30,804	14,265	(471)
HE 12	45,476	32,218	13,258	(562)
HE 13	45,647	34,641	11,006	(776)
HE 14	46,048	37,427	8,621	(998)
HE 15	46,530	40,157	6,373	(1,295)
HE 16	46,615	42,118	4,498	(1,340)
HE 17	46,798	43,566	3,232	(1,450)
HE 18	47,074	44,343	2,731	(1,189)
HE 19	44,214	44,301	(87)	(1,458)
HE 20	43,035	42,885	149	(1,454)
HE 21	41,120	39,612	1,508	(1,316)
HE 22	35,654	35,239	415	(1,323)
HE 23	33,671	31,562	2,109	(1,019)
HE 24	33,546	28,699	4,847	(765)

Table 14. Aggregate 2024 Slice of Day Year Ahead Showings vs. Estimated 2025 Load Forecast for September.

September	Aggregate System Showings	2025 Load Forecast + 17% PRM	Aggregate Position
HE 1	33,078	27,134	5,944
HE 2	32,953	25,566	7,387
HE 3	32,827	24,576	8,250
HE 4	32,676	24,318	8,358
HE 5	32,572	25,011	7,560
HE 6	32,534	26,656	5,878
HE 7	33,560	27,975	5,585
HE 8	35,939	28,874	7,065
HE 9	41,217	29,456	11,761
HE 10	43,922	30,181	13,741
HE 11	45,069	31,337	13,732
HE 12	45,476	33,147	12,329
HE 13	45,647	35,585	10,062
HE 14	46,048	38,922	7,127
HE 15	46,530	41,914	4,616
HE 16	46,615	43,121	3,494
HE 17	46,798	43,788	3,010
HE 18	47,074	43,683	3,392
HE 19	44,214	42,156	2,058
HE 20	43,035	39,327	3,707
HE 21	41,120	37,389	3,731
HE 22	35,654	34,601	1,053
HE 23	33,671	32,067	1,604
HE 24	33,546	29,875	3,671

Figure 7. Aggregate 2024 Slice of Day Year Ahead Showings for September.



C. Comparison of Current Resource Adequacy Framework to Slice of Day Framework

Although the system in aggregate passed in all hours in each of the Year Ahead showing months (except HE 19 in September), the number of LSEs meeting obligations satisfactorily under the SOD Framework was significantly lower than the number of LSEs meeting obligations under the existing compliance framework.

Table 15 below provides a comparison of the number of LSEs (of the 38 total) that passed the current RA framework as opposed to the hourly requirements under the SOD Framework. Further, Table 16 breaks down the deficient LSEs by LSE type across the Year Ahead months.

Table 15. Number of Load Serving Entities Meeting 2024 Year Ahead Requirements Under the Slice of Day and Current Frameworks.

May		June		July		August		September	
SOD	23	SOD	19	SOD	20	SOD	20	SOD	15
Current	38	Current	38	Current	34	Current	32	Current	27

Table 16. Deficient Load Serving Entities Under Slice of Day by Month and Type.

	May	June	July	August	September
IOU	0	1	1	0	0
CCA	7	12	10	10	15
ESP	8	6	7	8	8

ED Staff observed that in July, larger shares of the aggregate deficiencies under the SOD Framework were from LSEs that were deficient under SOD but had passed under the existing framework, whereas in August and September, the aggregate deficiencies were driven by LSEs that failed under both frameworks.

To better understand why some LSEs may be passing under the current RA framework but failing under the SOD Framework, ED Staff looked at the aggregate portfolios of LSEs that were meeting current RA obligations but failing SOD hourly requirements and compared them against the aggregate portfolios of LSEs meeting both current RA obligations and SOD obligations.

For this analysis, ED Staff chose to examine showings in May (where there were no deficiencies in the current RA framework, but several deficient LSEs under the SOD Framework) and September (the most constrained month for 2024). For May and September, ED Staff provides two figures each for LSEs passing both frameworks and LSEs passing only the current framework. The first figure shows the aggregate hourly resource capacity showings against SOD RA requirements and the second figure shows the hourly resource capacities' percentage share of the aggregate portfolio.

Overall, Energy Division observes that LSEs passing both the current and SOD frameworks have more diverse portfolios than LSEs only passing the current framework. In addition to the differences in diversity of portfolios, ED Staff plan to conduct further analysis to review what may be driving the differences between outcomes (including data quality, individual load shapes, and/or storage placement, including use of default vs. custom profiles).

Figure 8. Aggregate Portfolio of Load Serving Entities Passing Both Frameworks for May.

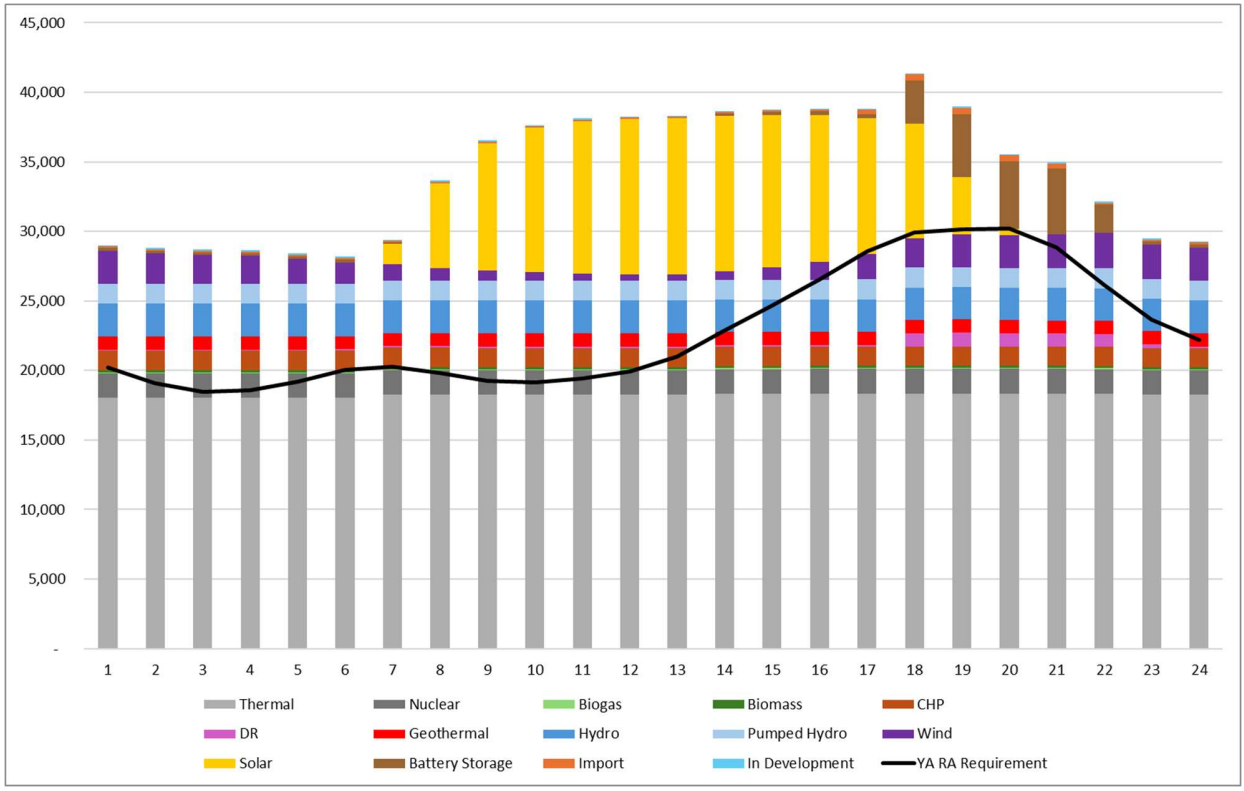


Figure 9. Resource Portfolio Breakdown of Load Serving Entities Passing Both Frameworks for May.

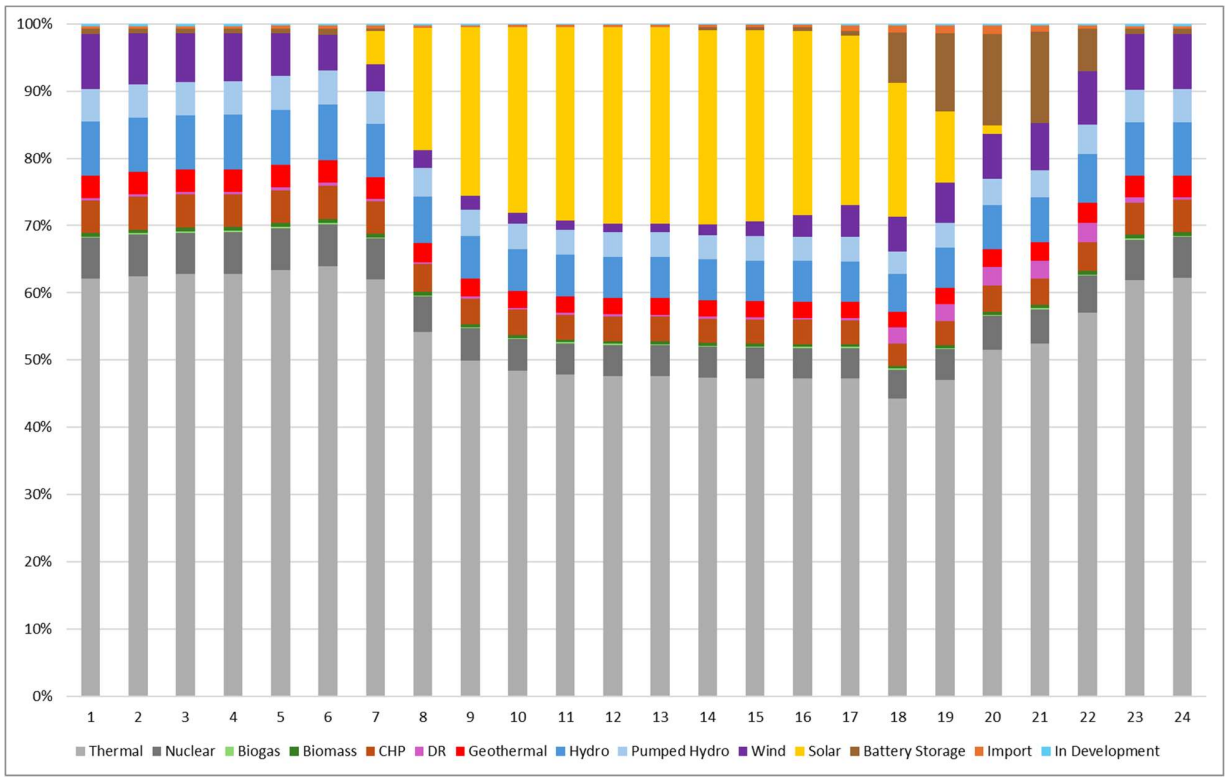


Figure 10. Aggregate Portfolio of Load Serving Entities Only Passing Current Framework for May.

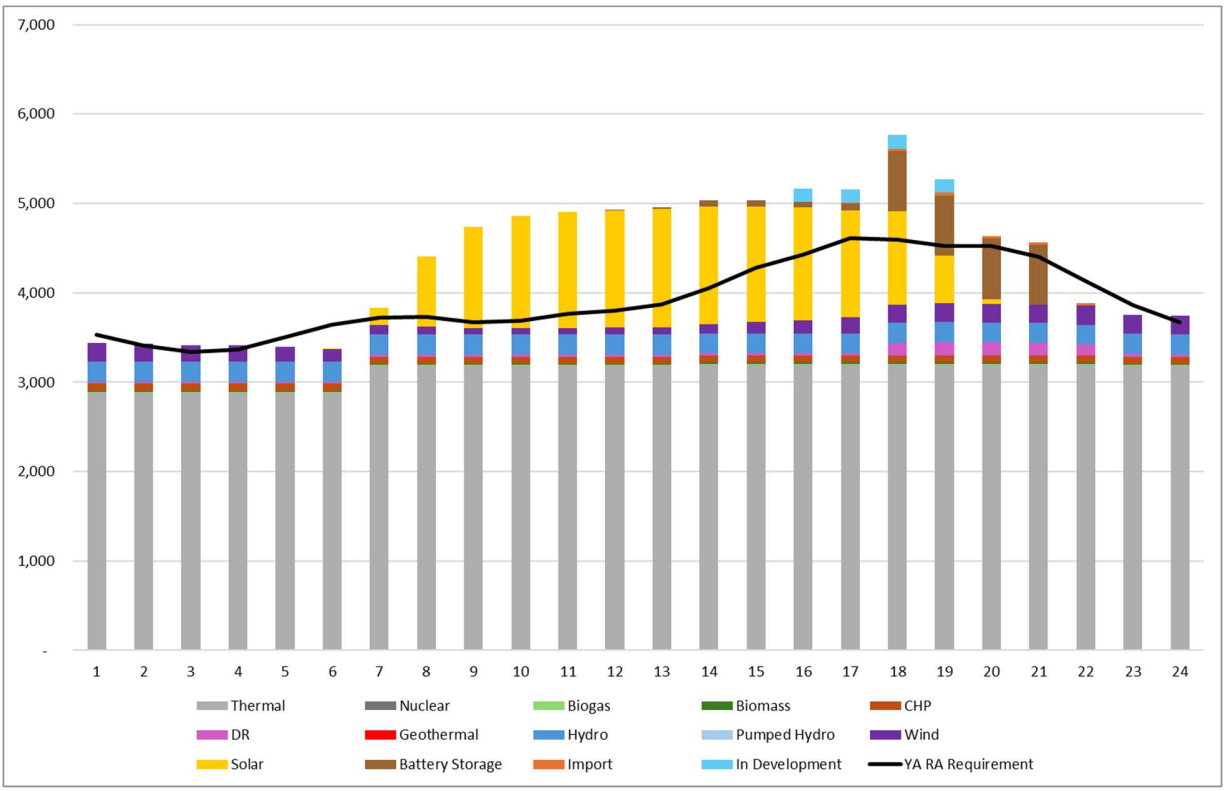


Figure 11. Resource Portfolio Breakdown of Load Serving Entities Only Passing Current Framework for May.

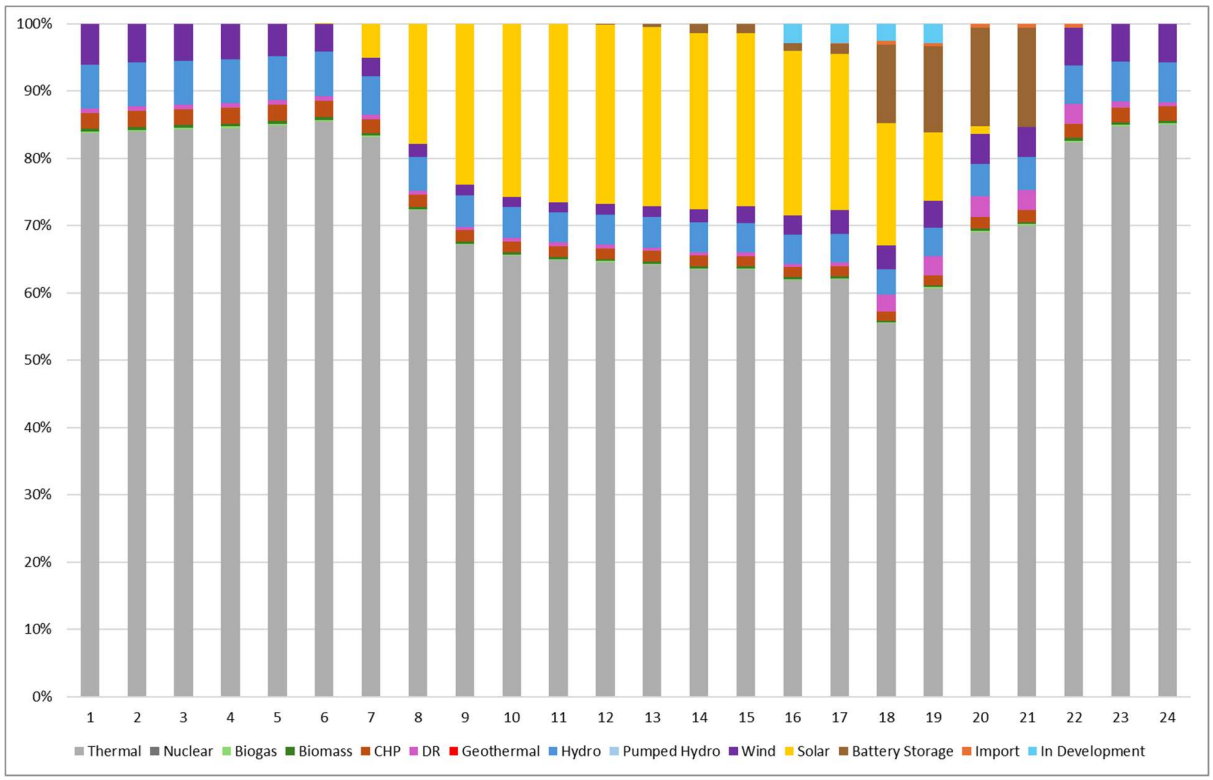


Figure 12. Aggregate Portfolio of Load Serving Entities Passing Both Frameworks for September.

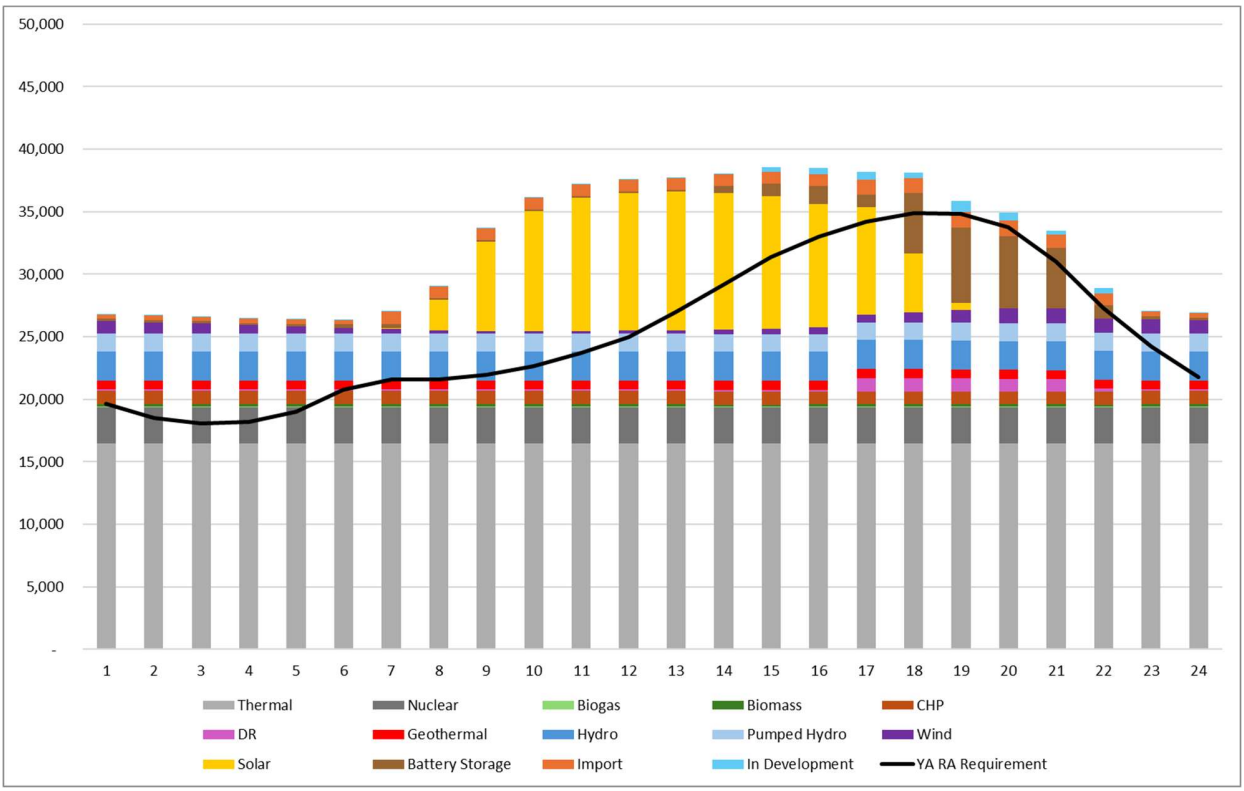


Figure 13. Resource Portfolio Breakdown of Load Serving Entities Passing Both Frameworks for September.

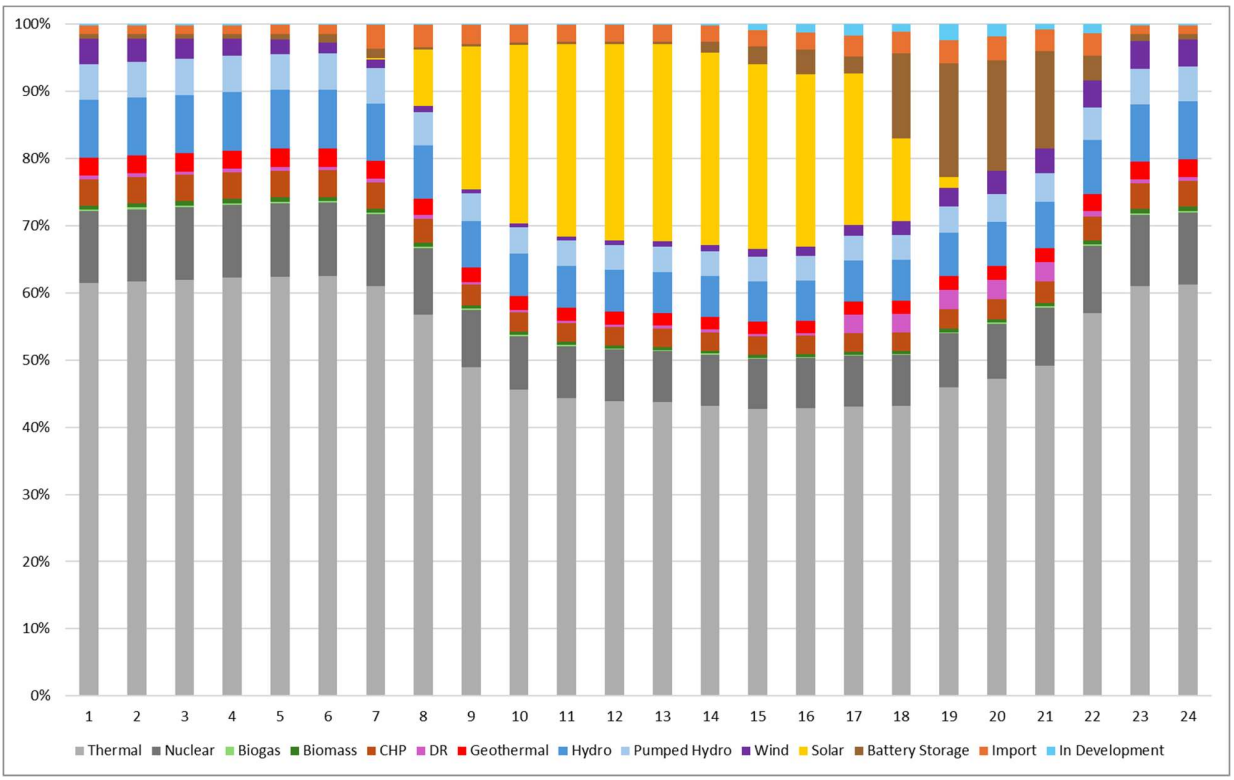


Figure 14. Aggregate Portfolio of Load Serving Entities Only Passing Current Framework for September.

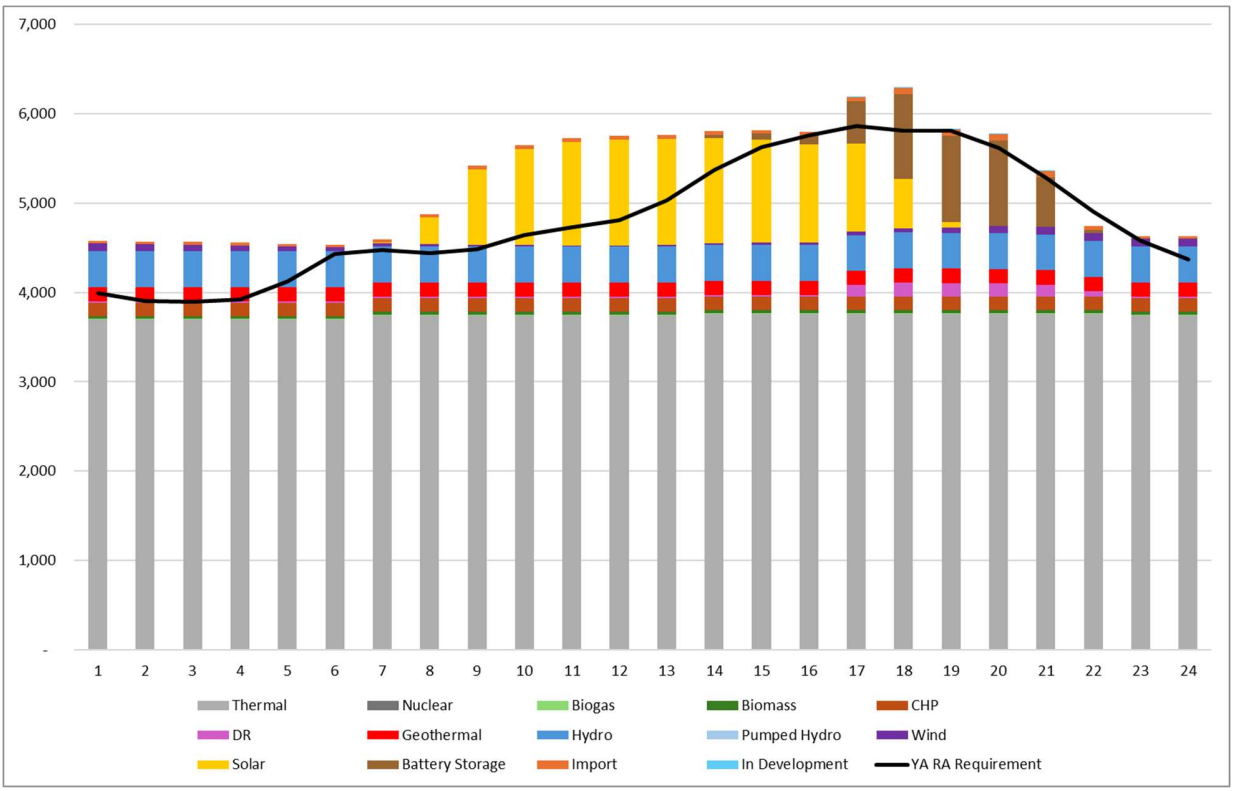
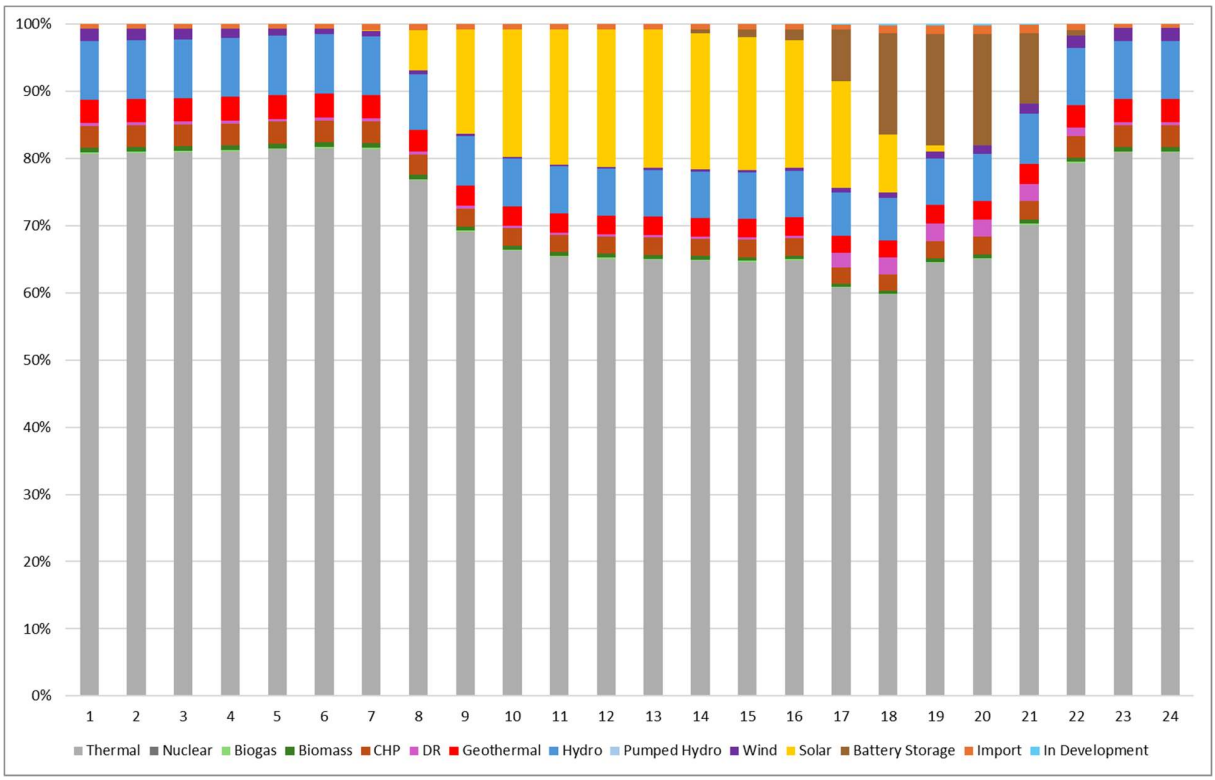


Figure 15. Resource Portfolio Breakdown of Load Serving Entities Only Passing Current Framework for September.



D. Stack Analysis

To assess whether enough resources are available on the CAISO grid to meet hourly demand on the forecasted worst days in 2024, ED Staff performed a stack analysis for the months of highest concern: July, August, and September. The following stack analysis graphs show there is sufficient capacity on the system to meet estimated Month Ahead hourly SOD obligations. The month of September shows the tightest supply margins, consistent with the stack analysis Staff performed of the current RA framework. Across all three months, the evening peak hours show the tightest supply (HE 19-22).

Energy Division recognizes that there are multiple ways to perform stack analyses to assess reliability, and the CPUC and CEC recently coordinated on a quarterly Joint Agency Reliability Planning Assessment[29], or Senate Bill (SB) 846 report, which contains a stack analysis. The

[29] Joint Agency Reliability Planning Assessment (Senate Bill 846 Fourth Quarterly Report) was most recently released in December 2023, available at https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/summer-2021-reliability/tracking-energy-development/joint-reliability-planning-assessment-sb-846-fourth-quarterly-report.pdf.

assumptions used in the most recent SB 846 quarterly report vary slightly from the analysis herein.

In light of the need to assess the SOD Framework, especially in comparison to the current RA program, CPUC performed this stack analysis using the following inputs and assumptions:

- **Demand Assumptions**
  - The CEC's 2022 IEPR managed hourly load forecast (system scenario) was used to set CAISO load requirements. The worst day load forecast for 2024 was used to represent the 2024 SOD test year demand. This forecast is reflected in the solid black lines of the stack analysis figures.
  - A 15.43% planning reserve margin was applied on top of the CED 2022 forecast. This is reflected in the dashed black lines in the stack analysis figures.
  - Staff also included the draft 2023 CED forecast (for 2025) with a 17% PRM to show an estimate of what CAISO-level hourly RA requirements may look like for the 2025 compliance year. This is reflected in the solid and dashed green lines in the stack analysis figures. The draft CED 2023 forecast for 2025 shows demand peaks shifting to earlier in the day with increases seen in HE 12-17 and decreases seen in the evening peak hours.
- **Supply Assumptions**
  - The hourly stack analyses were made using the available supply of online resources as shown in the November 17, 2023 version of the MRD, taking both NQC and exceedance values. The monthly stack analyses were made using the available supply of online resources as shown in the November 16, 2023 version of the NQC list.
  - Specified imports were removed from the MRD list, and instead replaced with a consistent import value (as not all specified imports are committed to CAISO load). The imports assumptions include both specified and unspecified imports. There are two import categories—"Imports" and "Max Imports"—that reflect the range of imports that CAISO RA needs can expect to be met with. The category "Imports" is 4,500 MW and alone reflects a very conservative import assumption. The category "Max Imports" is 2,300 MW and when added to the "import" category reflects a more optimistic import assumption. Both categories of imports are assumed to be 24-hour products. There is an additional ~3,200 MW of simultaneous import capacity that physically can flow into CAISO above the "Max Imports"; however, these additional imports (up to a total of ~10,000 MW) are available when economic and not typically considered in stack analyses.[30]

[30] CAISO's Maximum Import Capability for 2024, available at https://www.caiso.com/Documents/ISOMaximumResourceAdequacyImportCapabilityforYear2024.pdf.

- For battery storage resources, the analyses assumed that the storage units are able to do one four-hour cycle per day, but also are capable of spreading out their provision of energy to the grid to more than four hours. Each battery assumes five hours of capacity, with the first and the fifth providing half capacity. In other words, a 10 MW battery could provide 10 MW of capacity for four hours in a row, but in this study, it is allowed to provide 5 MW in the first and the fifth hours, and 10 MW in the second through fourth hours. This allows the analysis to more closely reflect actual hourly grid needs. For September, the under-construction battery storage capacity was only applied across hours HE 18 to HE 21, as these were more strained than HE 22.
- For the under-construction resource assumption, the analyses used a conservative assumption based on the resources reported as under construction in the Year Ahead RA compliance filings for the current RA program. The term "under construction" means that the project was not yet on the NQC list as of the time of the NQC List or Master Resource Database used in the Year Ahead filings. Even though under construction resources were not online at the time of the RA filings, staff understands that the expected resources shown in the RA Year Ahead compliance filings are a conservative assumption, since there are additional expected resources under development that were not shown in RA filings.

Figure 16. July 2024 Hourly Stack Analysis.

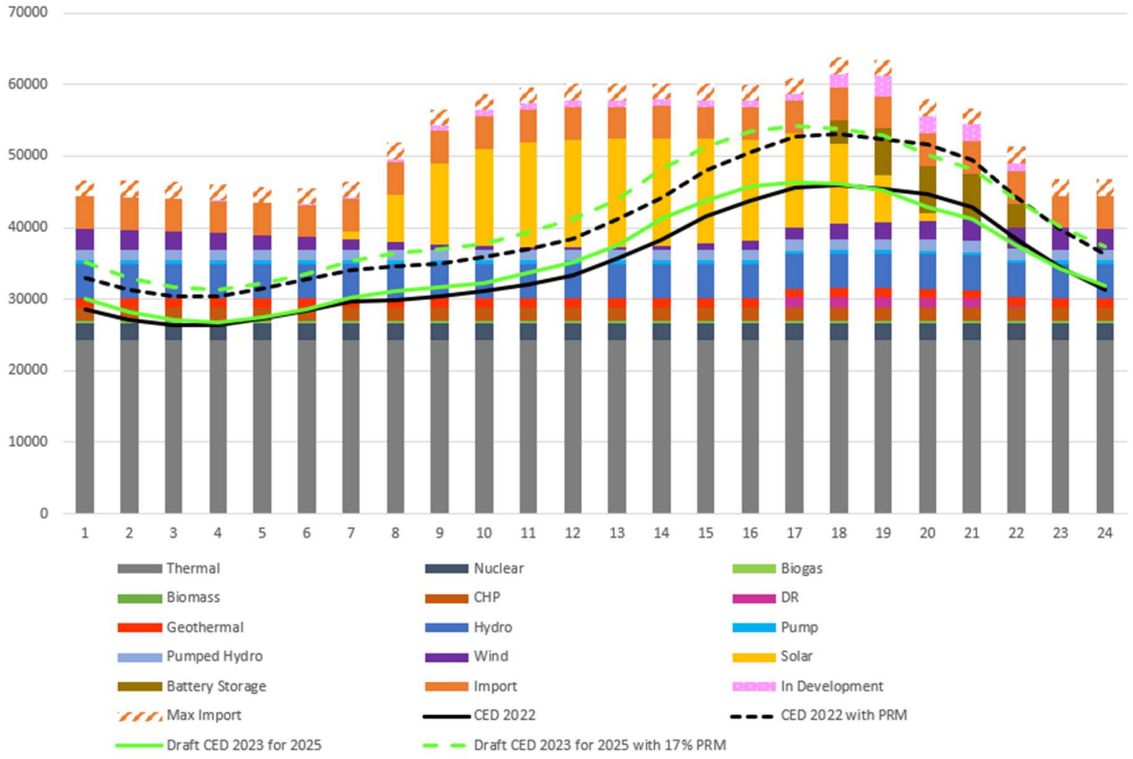


Figure 17. August 2024 Hourly Stack Analysis.

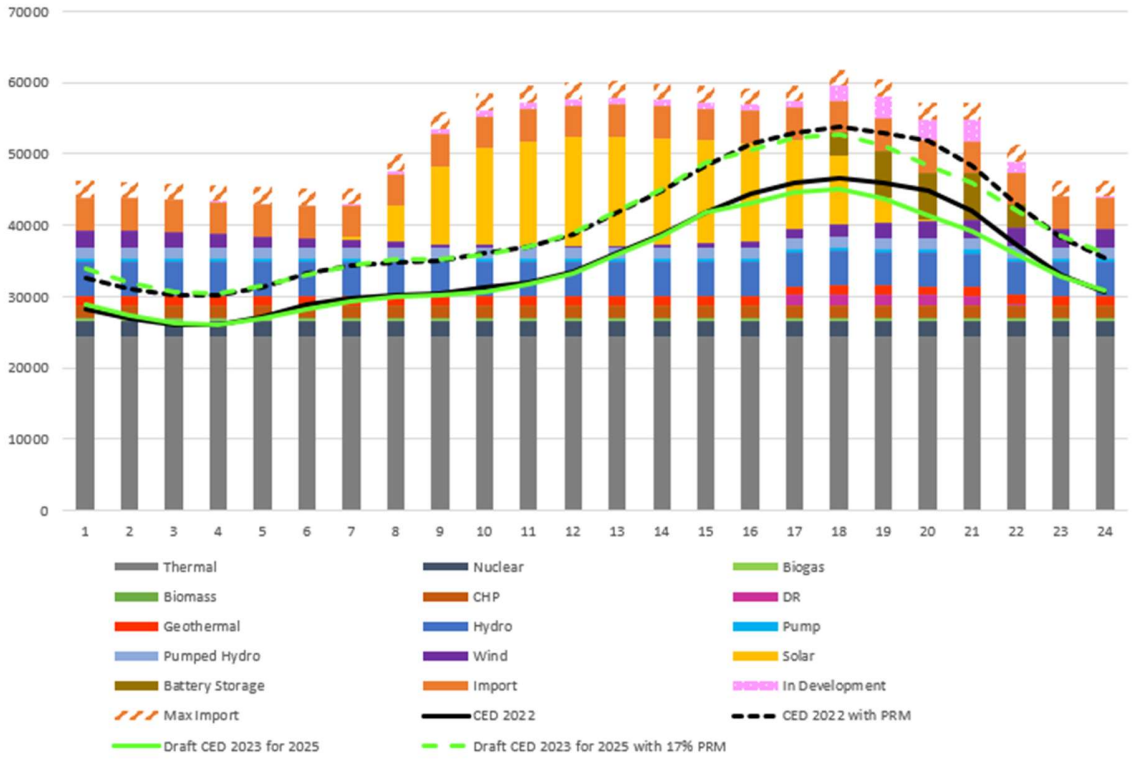
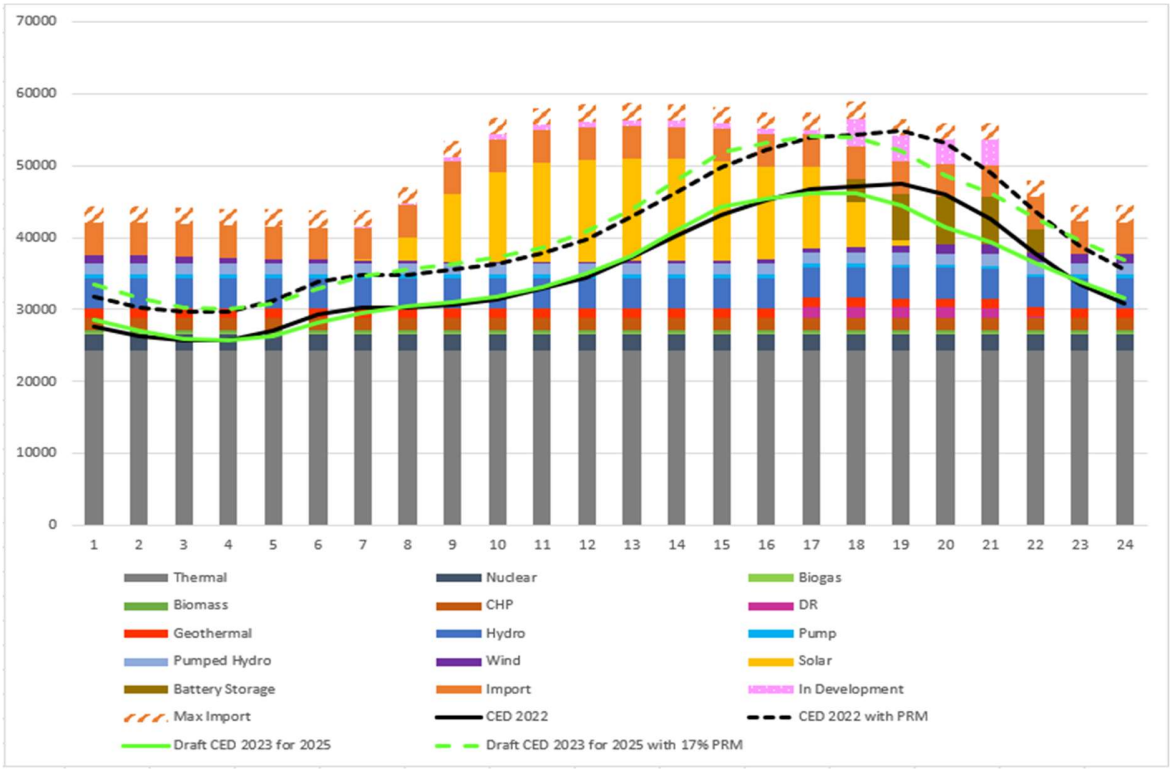
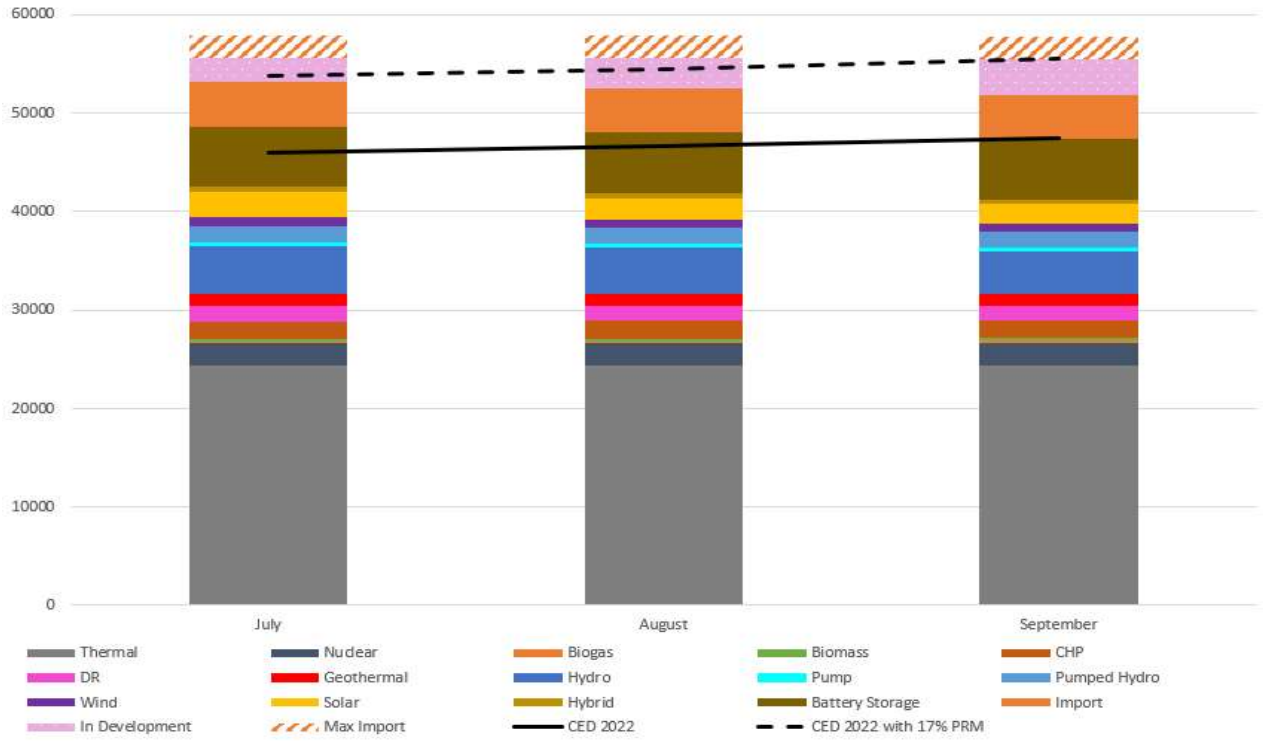


Figure 18. September 2024 Hourly Stack Analysis.



The figure below provides a stack analysis of July, August, and September 2024 using the current RA framework counting rules. The figure shows very similar tightness compared to the most constrained hours in the hourly stack analyses charts. Here, September is also the most constrained month consistent with the hourly stack analyses figures.

Figure 19. Stack Analysis of Current Resource Adequacy Framework for July – September 2024.



E. Informal Comments (December 22, 2023)

Following LSEs' submittals of their 2024 SOD Year Ahead showings, in December 2023, ED Staff offered a final opportunity for informal comments from parties on the various tools/analyses released throughout 2023, as well as the SOD Year Ahead showing process/experience and the 2024 SOD allocations. In response to this solicitation, AReM, AVA, Pattern, and SVCE filed informal comments on the SOD Year Ahead showing process/experience on December 22. Additionally, AReM, PG&E, and SVCE commented on the SOD allocations.

AReM stated that some of its members experienced confusion in reporting the correct "Slice of Day NQC Under Contract" value in the "LSE Showing" tab of the LSE Showing Tool. Although the formula for calculating the Slice of Day NQC Under Contract was included within the User's Guide for the LSE Showing Tool, it was only in a footnote and did not explain what "Compliance NQC" referred to (at Office Hours #3, it was explained as the NQC from the ELCC-based compliance framework for 2024). Further, AReM stated that some of its members experienced

confusion in using the same calculation for hybrid resources due to mismatches in how hybrid sub-ID NQCs are reported between the two frameworks. Finally, AReM noted that many LSEs have long-term RA contracts that will have been signed pre-SOD and need clear guidance on how these purchases will translate into the SOD Framework.

AVA commented on various aspects of the resource input process that it found complex or challenging, including inputting capacity from VERs, in-development resources, and shaped imports. AVA also noted that resources were able to exceed their interconnection limits in some hours, and that it had had significant challenges using the LSE Showing Tool's optimization function. Finally, AVA stated that the Commission should consider limiting the number of revisions to the LSE Showing Tool in any given year so LSEs can adapt to and work with the tools required to meet RA obligations.

Pattern encouraged the Commission to publish aggregated data on SOD Year Ahead showings, such that market participants can tailor their offerings based on a clear understanding of which specific hours are of greatest concern to the Commission. The aggregated data has been included in this report.

SVCE stressed the need for a stable compliance tool and that given the ongoing edits to the LSE Showing Tool, SVCE suggested that the Commission consider an "off-ramp" date well in advance of the 2024 Year Ahead filing deadline and encouraged the Commission to finalize all issues for SOD implementation by June 2024. Finally, SVCE suggests that if by June 2024 there remain errors in compliance tools or key factors of the RA structure, that 2025 be used as an additional test year, with LSEs providing both Year Ahead and all Month Ahead filings using both compliance frameworks.

With regards to the 2024 SOD allocations, both AReM and PG&E recommended creating a separate summary worksheet showing LSEs their allocations and obligations. ED Staff note that it intends to do so during the test year, however, these efforts have been sidetracked in favor of other more urgent areas of SOD implementation (e.g., finalization of the PRM Calibration Tool, LSE Showing Tool, and review of the SOD Year Ahead filings).

SVCE requested that the Commission direct the Central Procurement Entities (CPEs) to provide clarification on what is in the CPE portfolio as soon as feasible, including the resource type, to account for the resource profile in their hourly needs. ED Staff transmitted the estimated CPE allocations for 2024-2026 to LSEs on November 22, 2023, and while specific resource IDs were not divulged for either the PG&E or SCE CPE in the worksheets, the worksheets provided monthly values for one technology type, "CPE CAM Flat Profile," and the presence of this one resource type was intended to indicate that the value provided for each month would apply for all 24 hours in that month (i.e., all CPE resources were flat profile resource). Further, ED Staff clarify that both the system and flexible CPE allocations described in the transmitted worksheets were already included within the SOD templates transmitted to LSEs; these

worksheets were informational-only and required no action from LSEs with regards to entering these values into the template.

ED Staff will update the CPE procurement data for the requested information and will post the data to the Resource Adequacy Compliance website, provided there are no confidentiality or market sensitivity concerns. Parties will be notified via the R.23-10-011 service list when this information is available.

F. Questions for Consideration

- Should the Commission consider delaying full implementation of the SOD Framework until 2026, to allow more time for development of compliance tools and other key aspects of the framework? If so, which aspects of the framework, if any, could be implemented for 2025 compliance?
- How should the penalty structure look for the first binding year of the SOD Framework?
- What specific clarifications are needed (to the policy and/or the templates) to ensure compliance metrics are clear to LSEs?
- What improvements to both the SOD compliance filing processes and SOD LSE Showing Tool templates, if any, should be made to reduce complexity with SOD showings?
- What additional analysis should be considered in comparing the aggregated (and individual) compliance outcome differences between the current framework and the SOD framework?

G. Next Steps

The Test Year 2024 SOD Month Ahead showings for March, June, and September are due to Energy Division on March 1, June 1, and September 1, 2024, respectively. ED Staff expect to release an updated LSE Showing Tool two weeks prior to the March 1 filing due date; updated templates will be transmitted to LSEs individually.

Additionally, while LSEs currently can see their SOD requirements and allocations for 2024 in the "Requirements and Allocations" tab of their LSE Showing Tool templates, ED Staff plan to circulate informational-only worksheets providing a further breakdown of these totals, including CPE, Cost Allocation Mechanism (CAM), Modified Cost Allocation Mechanism (MCAM), and demand response (DR) allocations for 2024. For the 2025 RA Compliance Year, these worksheets will also be provided at the same time LSEs receive their LSE Showing Tool templates.

IX. Timeline for Upcoming Slice of Day Refinements

The recent December 18, 2023 Scoping Memo in R.23-10-011 divided the proceeding into three tracks. Track 1 is dedicated to the most time-sensitive issues in the RA Proceeding, including refinements to the SOD Framework for the 2025 RA Compliance Year. The adopted Track 1

schedule is listed below, with the caveat that if the schedule is delayed by motions or other scheduling issues, some issues may be incorporated into a later track.

Table 17. Schedule for Track 1 of Resource Adequacy Proceeding (R.23-10-011)

Track 1 Schedule (Excluding FCR and LCR Issues)	
Track 1 party proposals filed	January 19, 2024
LIP Simplification Working Group Report issued	January 2024
Energy Division Report on SOD Framework issued	By February 1, 2024
Workshop on Energy Division and party proposals	February 14, 2024
Revised SOD proposals filed	February 23, 2024
Opening comments on all proposals filed	March 8, 2024
Reply comments on all proposals filed	March 22, 2024
Proposed Decision on Track 1	May 2024
Final Decision on Track 1	June 2024

In addition to the schedule above, ED Staff will provide further informal opportunities for party engagement to address issues with compliance materials and processes. To stay apprised of these opportunities, parties are encouraged to add themselves to the R.23-10-011 service list by contacting processoffice@cpuc.ca.gov if they have not already done so.

X. Conclusion

Energy Division has appreciated the continued participation from stakeholders throughout the implementation process and looks forward to continuing working with stakeholders to successfully implement the SOD Framework.