BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local and Flexible Procurement Obligations for the 2019 and 2020 Compliance Years	Rulemaking 17-09-020 (Filed September 28, 2017)

CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION TRACK 2 REPLY COMMENTS

Pursuant to the discussion at the August 1, 2018, pre-hearing conference in this proceeding, the California System Operator Corporation (CAISO) provides comments regarding both (1) the process, scope, and schedule for Track 2 and (2) substantive responses to opening testimony filed on July 10, 2018 (July 10 Testimony).[1] Adopting and implementing a multi-year resource adequacy requirement should be the primary focus in this proceeding. The Commission should defer other issues requiring significant Commission and stakeholder effort, including those the CAISO raised in its July 10 Testimony, to Track 3 of this proceeding.

I. Procedural Recommendations

A. The Commission Should Prioritize Adopting and Implementing a Multi-Year Resource Adequacy Framework in Track 2

Based on the July 10 Testimony and discussions at the workshop held on July 19, 2018, it is clear there are fundamental multi-year resource adequacy framework issues that require additional focus and resources to fully consider. To ensure that the Commission can make a decision on multi-year resource adequacy requirements in Track 2, the CAISO believes it is essential to identify all fundamental issues on which a Commission decision is needed, implement a process to further refine those issues, and then provide the necessary information to allow the Commission to consider and decide them in a timely manner. The CAISO describes these elements in more detail below.

[1] The CAISO's July 10 Testimony is included as Attachment A to these comments.

1. Issue Identification

It is imperative that parties identify the multi-year resource adequacy procurement issues that require a Commission decision. The CAISO has identified the issues it believes the Commission must decide in Track 2.

a. Issue 1: What resources will be procured?

The Commission's prior direction provided that the multi-year resource adequacy procurement should include local resource adequacy requirements. Parties subsequently presented proposals that refined or expanded the scope of resources to be procured. For example, the CAISO advocated for three-year forward procurement of system and flexible resource adequacy resources in addition to local capacity resources. Even within the subset of local resources, parties had different recommendations regarding what should be procured. For example, many parties, including the CAISO, have advocated for setting local capacity procurement obligations at the more granular local area and sub-area level rather than at the broader transmission access charge (TAC) level to align procurement more closely with the CAISO's operational needs and reduce the need for CAISO backstop procurement. In addition, the CAISO recommended that the Commission require the procurement of certain essential reliability resources within a local area. These are important issues that the Commission should decide in Track 2.

The Commission must also determine the length of the multi-year procurement obligation, whether to apply this to local resources or more expansively, and the percentage of resources required to be procured after the first year.

In summary, the Commission must decide exactly what suite of resources must be procured under its multi-year resource adequacy framework.

b. Issue 2: Who will be the central buyer?

The Commission has directed all party proposals to include a central buyer to procure at least some portion of resource adequacy requirements. Parties introduced several competing proposals regarding who the central buyer should be. The Commission must decide who the central buyer will be. As the CAISO explains in more detail in its substantive comments in Section II, the CAISO is not willing to be the central buyer.

c. Issue 3: What resources will the central buyer procure?

The Commission must also consider what the role of the central buyer is vis-à-vis the role of load-serving entities (LSEs) in meeting multi-year resource adequacy obligations. The Commission must determine what resources the central buyer will procure and how the resources, and their attributes, will be allocated to LSEs. The Commission must clearly state what resource attributes the central buyer is authorized to procure, *e.g.*, whether the central buyer will procure all attributes or only the local attributes.

d. Issue 4: When will the central buyer conduct procurement?

The Commission must decide when the central buyer will conduct procurement. Specifically, the Commission must decide whether the central buyer will conduct procurement for certain resources before LSEs have had an opportunity to procure them, whether the central buyer will act after LSEs have conducted procurement and/or made resource adequacy showings, or both. The Commission must also consider whether it is appropriate to modify the resource adequacy procurement timeline to better accommodate the annual planning and procurement processes.

e. Issue 5: How will the central buyer procure resources?

Parties have proposed competing methodologies for central buyer procurement, including through a request for offers process and a capacity auction mechanism. The Commission must decide how the central buyer will procure the resources it is responsible for securing and how it will allocate associated costs.

f. Issue 6: Is there a need for a transition period?

Several proposals recommend a transition period for multi-year resource adequacy procurement until a full solution can be developed. For example, some parties suggest that if a special procurement entity is tasked as the central buyer, it may be necessary to develop a transitional framework to procure multi-year requirements. The Commission's answers to Issues 1-5 could affect a determination whether a transitional period is necessary and how any transitional elements should be implemented.

2. Procedural Steps and Issue Refinement

The list above is not an exhaustive list of issues that the Commission must decide in Track 2, but answering these fundamental questions will provide a basis for the Commission and stakeholders to develop a comprehensive multi-year resource adequacy procurement framework

by June of 2019, for the 2020 resource adequacy year. The CAISO believes the Commission should follow an iterative process that includes several workshops and opportunities for Commissioner guidance to refine the list of issues and the potential options under consideration.

The Commission should also schedule additional workshops as soon as possible to address the fundamental issues identified above. After these workshops, Energy Division staff should compile a list of fundamental issues and potential solutions for the Commission, along with support for each proposal.[2] This will provide the Commission with a clearly identified set of foundational issues and an overview of where there is consensus and disagreement. Commissioner guidance may be necessary prior to the proposed decision to facilitate parties' efforts to develop a comprehensive multi-year framework. If possible within a reasonable timeframe, the Assigned Commissioner could then issue an Assigned Commissioner Ruling providing guidance regarding preferred resolution of outstanding foundational issues and a refined list of second-order issues. This guidance could inform a second round workshop to address second-order issues that would inform the ultimate proposed decision in Track 2.

The CAISO does not believe that hearings or additional testimony are necessary in this proceeding; although, it may be beneficial for parties to present a final round of post-workshop comments to clarify final positions on multi-year resource adequacy issues. As several parties pointed out at the pre-hearing conference, resource adequacy issues are typically issues of policy, versus disputed facts, best vetted through workshops. As such, traditional hearings, testimony, and cross-examination are not as informative as the collaborative workshop and comment process.

3. Consideration of Other Issues

As the CAISO stated above, the Commission should focus solely on the multi-year resource adequacy framework, including the role of the central buyer, for the remainder of Track 2. The Commission should also update its "transitional" effective load carrying capability (ELCC) values for wind and solar resources in Track 2. The Commission should adopt updated ELCC values in this proceeding because no additional work needs to be done to adopt the more accurate ELCC values identified in D. 17-06-027. The Commission should defer any other issues requiring additional Commission or stakeholder resources, including more substantive

[2] The CAISO notes that Energy Division has already compiled a similar list, though additional workshops will inform the proposed decision by identifying foundational versus second-order issues.

reforms to the ELCC methodology, to Track 3.

II. Substantive Responses to Opening Testimony

A. The CAISO Is Not a Viable Central Buyer

Numerous parties recommended the CAISO as their preferred central buyer in the Commission's multi-year procurement framework. However, the CAISO will not voluntary accept a role as central buyer, and the Commission should explore other options. The CAISO also cautions against over reliance on its capacity procurement mechanism (CPM) as a central procurement mechanism. The CPM was developed by the CAISO and approved by the Federal Energy Regulatory Commission (FERC) as a backstop procurement mechanism, not a primary procurement vehicle.

B. The CAISO Supports Load Disaggregation by Local Capacity Area and Sub-Area

Energy Division and several other parties propose to disaggregate local areas, particularly in the Pacific Gas & Electric transmission access charge (TAC) area. The CAISO strongly supports load disaggregation by local capacity area and sub-area. Disaggregating by local capacity area and sub-area will more closely tie procurement requirements with local capacity needs and operational requirements, thereby reducing the potential for inefficient local procurement and CAISO backstop procurement.

The CAISO also notes that it publishes a report each year after LSEs file annual resource adequacy showings that detail local capacity areas and sub-areas capacity shortfalls. After years of local resource adequacy procurement and reporting, there is clear and full knowledge of the areas and sub-areas on the system where a resource or collection of resources may possess market power. Therefore, one of the primary premises that led to the aggregation of local procurement (*i.e.,* mitigating market power) is no longer valid. For this reason, the CAISO, and numerous other parties have proposed that the Commission recognize and provide for cost-of-service procurement of such essential reliability resources. Although the CAISO agrees that local market power concerns must be addressed, cost-of-service procurement or price caps are better tools to address market power than aggregating local capacity area procurement by TAC area.

C. The CAISO Will Not Implement Multi-Year Backstop Procurement for the Initial Multi-Year Procurement Cycle

Implementing multi-year backstop procurement mechanisms and associated tariff changes that complement the Commission's multi-year procurement framework will require a separate CAISO stakeholder initiative. The CAISO fully supports the Commission moving forward with multi-year procurement requirements for the 2020 procurement cycle. However, the CAISO does not plan to implement this additional backstop procurement authority for the initial multi-year procurement cycle (specifically, the 2020 procurement cycle). Instead, the CAISO will conduct its own stakeholder initiative to implement multi-year backstop procurement commencing with the 2021 procurement cycle. This will allow sufficient time for the CAISO conduct an independent stakeholder process and obtain FERC approval for any necessary tariff changes.

D. Unexpected Downward Variability In Local Capacity Requirements Is Unlikely

Several parties noted that variability in actual local capacity requirements could lead to potential over-procurement of local resources in some situations. The CAISO believes these analyses overstate the risk of over-procurement, which has primarily financial impacts, while ignoring the risk of under-procurement, which has both reliability and financial/economic impacts. Reductions in local capacity requirements are largely driven by transmission system upgrades, which the CAISO and stakeholders typically know about years in advance and would be accounted for in the CAISO's multi-year local capacity studies.

In contrast, sudden increases in local capacity requirements can be driven by significant, unpredictable and unplanned changes in the topology of the grid. The retirement of the San Onofre Nuclear Generating Station (SONGS), for example, resulted in significant unplanned increases in local capacity requirements in the Southern California area. Some of those increases were subsequently mitigated by the installation of CAISO-approved transmission projects, such as installing synchronous var condensers throughout Southern California. Although the initial increase in local capacity requirements due to the loss of SONGS was unpredictable, the subsequent mitigations were predictable and planned.

The CAISO notes that some downward variability in local capacity requirements has occurred as a result of changing California Energy Commission (CEC) demand forecasts. In certain local areas, the demand forecast has changed considerably on a year-over-year basis, thereby resulting in significant changes in local capacity requirements. The CAISO has publicly noted its concern with divergent year-over-year local area demand forecasts and believes the CEC is working to address this issue.

For the reasons discussed above, the risk of unexpected decreases in local capacity requirements, and attendant over procurement, is less likely and less consequential than unexpected increases, and associated under procurement. Under procurement can result in backstop procurement and, in the worst case, local reliability issues, if resources are no longer available. As a result, the CAISO recommends that the Commission act prudently to maintain high levels of required procurement in its multi-year resource adequacy procurement framework, especially in the second year of each procurement cycle, to mitigate the risk of resource retirement.

III. Conclusion

The CAISO appreciates this opportunity to file these reply comments and looks forward to collaborating with the Commission to adopt and implement multi-year resource adequacy requirements for the 2020 resource adequacy year.

Respectfully submitted,

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Date: August 8, 2018

Attachment A

BEFORE THE PUBLIC UTILITIES COMMISSION
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CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION TRACK 2 TESTIMONY

CHAPTER 1: INTRODUCTION AND BACKGROUND

BEFORE THE PUBLIC UTILITIES COMMISSION
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CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION TRACK 2 TESTIMONY

CHAPTER 1: INTRODUCTION AND BACKGROUND

I. Introduction

In its June 25, 2018 Track 1 decision (D.18-06-030) in this proceeding, the Commission requested that parties file testimony to support proposals in Track 2. Specifically, the Commission requested testimony to support proposals for a multi-year local resource adequacy requirement with a three-to-five-year duration, with implementation beginning in the 2020 resource adequacy compliance program year. The January 18, 2018 Scoping Memo and Ruling of Assigned Commissioner and Administrative Law Judge (Scoping Memo), as modified, established the procedural schedule for filing testimony and proposals. Consistent with that schedule, the California Independent System Operator Corporation (CAISO) hereby submits testimony for the following Track 2 proposals requesting the Commission to:

(1) Establish a rolling three-year procurement requirement for local, system, and flexible resource adequacy capacity (testimony sponsors: Karl Meeusen, Senior Advisor, Infrastructure and Regulatory Policy and John Goodin, Manager, Infrastructure and Regulatory Policy);

(2) Revise the annual resource adequacy compliance timeline to better accommodate resource adequacy processes and decision making (testimony sponsor: Karl Meeusen, Senior Advisor, Infrastructure and Regulatory Policy);

(3) Adopt a 1-in-5 year demand forecast during months with the highest peak demand uncertainty (testimony sponsor: Robert Emmert, Manager, Interconnection Resources);

(4) Fully adopt an effective load carrying capability methodology that accurately reflects the reliability contribution of wind and solar resources (testimony sponsor: Karl Meeusen, Senior Advisor, Infrastructure and Regulatory Policy); and

(5) Recognize the impact of availability-limited resources and adopt the CAISO's hourly load and resource analysis to determine availability needs in local capacity areas (testimony sponsors: John Goodin, Manager, Infrastructure and Regulatory Policy and Nebiyu Yimer, Regional Transmission Engineer Lead, Regional Transmission South).

II. Background

The Commission's resource adequacy program has served a critical and useful purpose for many years, securing resources in advance to be operationally available when and where needed, and with the right attributes, to ensure the safe and reliable operation of the grid. As the grid transforms and decarbonizes, the resource adequacy program must also transform. In this context, the CAISO believes the current resource adequacy program must transform in three primary ways:

In structure - from a single to a multi-year procurement paradigm for all capacity types (system, local, and flexible) and a central buyer to ensure procurement of essential reliability resources and facilitate efficient procurement of residual capacity needs;

In substance - moving to multi-year forecasting and needs assessments, addressing load migration, and adjusting how certain resources are counted and qualified as resource adequacy resources; and

In process - adjusting the resource adequacy timeline to ensure key information is available, assessments are completed, and informed procurement and retirement decisions can occur with sufficient time and notice.

As the Commission develops a multi-year, central buyer resource adequacy framework, the CAISO believes an important first step is to identify appropriate enhancements to the current resource adequacy program to better align procurement with the transforming operational needs

of the grid. To that end, the CAISO believes that the following issues must be addressed in Track 2 of this proceeding:

- Creating a sustainable path forward to secure essential resources in a high load migration environment – Greater load migration means the traditional, large investor-owned utility (IOU) buyers have difficulty forecasting their capacity obligations multiple years into the future. This leads IOUs to execute fewer long-term resource adequacy contracts in order to reduce potential stranded costs. Additionally, the proliferation of more and smaller load-serving entities (LSEs) make it more challenging to fully procure large resources, leading to increased transaction costs and uncertainty for resource owners that are financially dependent on contracting their entire facility.
- Ensuring adequate capacity and energy is procured to meet operational challenges that extend beyond the peak hour – The meaning of resource adequacy has changed from having sufficient capacity secured to serve an annual coincident peak load to having sufficient capacity *and energy* to meet the gross load peak and the net load peak,[1] and the speed and energy needed to ramp from minimum to maximum net load. In 2017, the most significant operational challenges the CAISO faced occurred around sunset—during the net load peak—not during the traditional coincident peak load hour.[2]
- Properly counting the reliability contribution of different resource types – The planning reserve margin, which is designed to ensure that the system has sufficient capacity to meet an annual peak demand forecast, is growing less relevant as new capacity additions are increasingly use or availability limited or intermittent. The Commission can no longer assume that securing sufficient

[1] Gross load is defined as the load served by the CAISO system. Net load is defined as gross load minus wind and solar production.

[2] For example, on September 1, 2017, the CAISO reached a near record system peak. This gross peak of 50,116 MW occurred at 15:58. However, at approximately 19:30 the net load peaked at 47,168 MW, with the solar production at nearly zero. This net load peak would have exceeded the peak gross load in 16 out of the past 20 years the CAISO has served as the balancing authority.

resource adequacy capacity to serve the gross peak load will provide sufficient energy to serve the system's needs during all hours of the year and during all local contingencies. The resource adequacy program must properly count resources relative to their contribution to reliability, especially in local capacity areas, where the energy needs of the local capacity area depend on the availability and capability of the resources within that local area.

- Creating a path to orderly retirement – The current one year resource adequacy program does not provide a clear signal to resources as to whether they will be needed in subsequent years. This can potentially result in resources that are essential to reliability providing notice of their intent to retire before suitable replacements are developed and available. This issue is exacerbated by the Commission assuming resources will continue to operate in its Integrated Resource Planning (IRP) studies even if those resources do not have a forward contract. Their inclusion in its IRP studies implies resources will remain available in future years, even though the existing resource adequacy program has no mechanism to ensure resources needed for reliability in subsequent years are in fact under contract. With the addition of new resources to meet RPS, storage, and other procurement mandates and requirements, and with the growth of distributed energy resources, many essential reliability resources may be at-risk of retirement given their cost and the limited opportunities to secure long-term contracts. The Commission must create a clear path to secure essential reliability resources until suitable alternatives are developed.
- Procuring resources where the need exists – Currently, LSEs can meet local capacity requirements by procuring resources broadly within any local capacity area in their Transmission Access Charge (TAC) area. However, the CAISO establishes local capacity needs based on transmission constraints into specific local capacity areas, which are geographically smaller than the TAC areas. This misaligned procurement relative to operational needs can result in LSEs meeting

procurement requirements "on paper," but because the right resources in the right places where not procured, deficiencies remain in local capacity areas, leading to potential backstop procurement by the CAISO to cure the deficiency. To avoid collective deficiencies and mitigate the need for the CAISO's backstop procurement, the Commission must require LSEs to procure adequate local resource adequacy for each individual local capacity area.

Given the need for changes in the structure, process, and substance of the existing resource adequacy program to address current and expected conditions, the CAISO has prepared five distinct proposals aimed at collectively addressing the issued discussed above. The following five chapters include testimony supporting the CAISO proposals. A brief summary of the CAISO's proposals is included below.

- CAISO Proposal No. 1 (Chapter 2): The Commission should establish a rolling three-year procurement requirement for local, system, and flexible capacity.
- CAISO Proposal No. 2 (Chapter 3): The Commission should revise the annual resource adequacy compliance timeline to better accommodate resource adequacy processes and decision making.
- CAISO Proposal No. 3 (Chapter 4): The Commission should adopt a 1-in-5 year demand forecast during months with the highest peak demand uncertainty.
- CAISO Proposal No. 4 (Chapter 5): The Commission should fully adopt a comprehensive effective load carrying capability methodology that accurately reflects the reliability contribution of wind and solar resources.
- CAISO Proposal No. 5 (Chapter 6): The Commission should recognize the impact of availability-limited resources and adopt the CAISO's hourly load and resource analysis to determine availability needs in local capacity areas.

The CAISO understands that these proposals will require additional inputs from the CAISO to facilitate these proposals. Specifically, if the CAISO's proposals are adopted, the CAISO will (1) perform local and flexible capacity needs assessments over the multi-year resource adequacy procurement horizon, including information on resource availability needs in local capacity

areas; (2) identify any Essential Reliability Resources in local capacity areas or sub-areas that must be procured over the multi-year resource adequacy procurement horizon; and (3) revise its tariff and backstop procurement provisions, as necessary, to accommodate and support a multi-year forward procurement framework.

In Chapters 2-6, the CAISO describes its proposals in detail and explains why the Commission should adopt the proposals to ensure the long-term success of the resource adequacy program.

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CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION TRACK 2 TESTIMONY

CORRECTED CHAPTER 2: MULTI-YEAR RESOURCE ADEQUACY PROCUREMENT REQUIREMENTS

SPONSORS: Karl Meeusen, Senior Advisor, Infrastructure and Regulatory Policy[1]

John Goodin, Manager, Infrastructure and Regulatory Policy[2]

Proposal No. 1: The Commission Should Establish a Rolling Three-Year Procurement Requirement for Local, System, and Flexible Capacity

In its June 25, 2018 Track 1 Decision (D.) 18-06-030 in this proceeding, the Commission requested that parties submit multi-year local resource adequacy procurement proposals that incorporate a central buyer structure.[3] The California Independent System Operator Corporation (CAISO) agrees that the Commission should adopt multi-year local resource adequacy requirements, but recommends that the Commission also adopt a holistic multi-year resource adequacy framework that includes three-year forward procurement requirements for system and flexible capacity. Simultaneously adopting a multi-year procurement framework for all three capacity products provides significant benefits, which include simplifying multi-year capacity allocations, ensuring more optimal and effective resource procurement, and informing the more fundamental challenge of providing for orderly retirement of non-essential gas-fired generation.

[1] *See* Karl Meeusen's statement of qualifications, attached hereto as Appendix A.
[2] *See* John Goodin's statement of qualifications, attached hereto as Appendix B.
[3] *See* the Proposed Decision, http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M216/K634/216634123.PDF at p. 32.

I. A Comprehensive Multi-Year System, Flexible, and Local Resource Adequacy Framework Provides Administrative Efficiencies and Simplifies Cost Allocation.

In its comments on the Track 1 Proposed Decision, San Diego Gas & Electric Company (SDG&E) raised concerns about implementing a new procurement framework for local resource adequacy without a consistent procurement framework for System and Flexible resource adequacy. Specifically, SDG&E stated:

> [f]rom a technical perspective, if capacity is procured as solely Local or System (*i.e.*, the Flexible attribute is not recognized in the transaction), it is not possible to later amend the transaction to provide Flexible; the procurement of Flexible must occur at the time of the transaction. Thus, procuring only Local RA eliminates the fungibility of the capacity product – capacity that could be used for Flexibility purposes would be stranded since the Flexibility attribute was not recognized in the original transaction. Creating a stand-alone multi-year Local resource adequacy requirement means that LSEs would procure a multi-year Local-only capacity product, without the Flexible attribute.[4]

The CAISO agrees. At a minimum, the Commission would have to clarify in its policy guidance what the local capacity procurement requirements are across the procurement horizon, while the flexible attribute is only allocated for the next resource adequacy compliance year. Likewise, given the Commission's policy of bundling local capacity with system capacity,[5] by setting up a multi-year central buyer for local capacity, the Commission would, in essence, tacitly set up a multi-year central buyer for system capacity as well. Under these circumstances, it makes sense to establish multi-year resource adequacy requirements for all local, system and flexible capacity commencing with the 2020 resource adequacy compliance year.

At a minimum, if the Commission adopts only multi-year local capacity procurement requirements, it must clarify the cost allocation process for system or flexible capacity procured by a central buyer, given the temporal split in how resource attributes would be allocated in year one versus across the multi-year procurement horizon. There is a clear efficacy and simplicity to establishing multi-year procurement now for all resource adequacy capacity types.

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[4] *See* SDG&E's comments, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M216/K330/216330821.PDF at p. 5.
[5] *See* 2018 Filing Guide for System, Local and Flexible Resource Adequacy (RA) Compliance Filings, http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442454920 at p. 13.

II. System Needs Warrant Multi-Year System and Flexible Resource Adequacy Requirements.

The CAISO notes that 2017 was one of the more operationally challenging years over the past ten years. The CAISO was able to maintain reliability, but it made several capacity procurement mechanism (CPM) designations and declared the first Stage 1 system emergency[6] since 2007.[7] Challenges extend beyond local resource adequacy issues. The CAISO is concerned about the challenges ahead meeting the net load peak and enabling existing resources to undertake necessary capital maintenance and remain available as the system grows more dependent on availability-limited and intermittent resources. The CAISO's 2018 Summer Assessment shows, largely due to below average hydro conditions, a 50 percent probability that the CAISO may call a Stage 2 system emergency in 2018.[8] Establishing a multi-year procurement framework for system, local, and flexible capacity now would enable parties to focus efforts on designing the holistic solution, which would avoid the time, effort, and energy required to come back later and revisit how best to add-on a multi-year system and flexible capacity procurement framework to an existing multi-year local capacity procurement framework. The Commission has the unique opportunity to holistically address these issues now, and avoid unnecessary churn and major revisions at a later date.

The CAISO also notes the central procurement entity can optimize procurement across all available resources to maximize efficient overall procurement and ratepayer benefits. Limiting multi-year procurement to only local resource adequacy capacity may prevent opportunities to procure cost-effective system and flexible capacity across the multi-year procurement horizon from local capacity resources. Establishing a multi-year resource adequacy procurement framework that addresses all needs simultaneously helps ensure the overall lowest procurement

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[6] *See* the CAISO's System Alerts Warning and Emergencies Fact Sheet at https://www.caiso.com/Documents/SystemAlertsWarningsandEmergenciesFactSheet.pdf.

[7] A complete summary of CAISO declared Restricted Maintenance Operations, Alerts, Warnings, Emergencies, and Flex Alert Notices Issued from 1998 to Present can be found here: http://www.caiso.com/Documents/Alert_WarningandEmergenciesRecord.pdf.

[8] Specifically, in its 2018 Load and Resource Assessment, the CAISO finds that "over half of the 2,000 scenarios (1,055) produce at least one hour of potential Stage 2 Emergency conditions with the majority of these (767 = 541+226) being only 1-2 hours over the entire summer season." http://www.caiso.com/Documents/2018SummerLoadsandResourcesAssessment.pdf, at p. 29.

cost for the greatest number of capacity products, thereby yielding the greatest opportunity for rate payer savings.

III. Multi-Year System, Local, and Flexible Resource Adequacy Requirements Will Facilitate Orderly Retirement.

As noted above, the CAISO believes an important objective of a multi-year resource adequacy framework is to inform procurement *and* retirement decisions. Including system and flexible capacity in the multi-year resource adequacy framework will better inform and facilitate the orderly retirement of resources by identifying and providing advance notice to resources that are necessary to maintain reliability. Additionally, including multi-year resource adequacy requirements for system and flexible will also better align resource adequacy with procurement conducted under the Commission's IRP and other related proceedings by providing better information regarding how actual procurement aligns with the IRP study assumptions.

IV. Multi-Year Resource Adequacy Procurement Obligations.

For system and local resource adequacy needs, the CAISO proposes 100 percent resource adequacy capacity procurement obligations for the first and second compliance years and 80 percent in the third year. Requiring 100 percent procurement obligations in the first two years for system and local is necessary to facilitate a systematic retirement process. For example, a resource that is designated resource adequacy capacity in year one, but not in years two or three, has a clear indication that it will not likely be needed in the future. Requiring two-year forward 100 percent procurement also ensures that essential resources are procured if needed. Any procurement level less than 100 percent in the second year would potentially risk the retirement of marginal resources essential to maintaining reliability, before they can be replaced. Additionally, multi-year resource adequacy requirements provide resource owners additional information to determine whether to make investments in major maintenance to keep the resource operationally reliable.

The CAISO's proposal recognizes that flexible resource adequacy procurement obligations are in flux. The CAISO's Flexible Resource Adequacy Criteria and Must-Offer Obligation – Phase 2 (FRACMOO2) stakeholder initiative is substantively aligned with the

CAISO's Day-Ahead Market Enhancement (DAME) initiative, by ensuring that forward procurement of flexible resource attributes supports the CAISO's operational needs. With the scheduled delay in the DAME, a commensurate one-year deferral of FRACMOO2 is necessary. The CAISO recognizes a delay in reforming flexible resource adequacy needs could create regulatory risk for LSEs procuring multi-year flexible capacity. As a result, the CAISO proposes lower flexible resource adequacy procurement obligations until FRACMOO2 is concluded.

More specifically, the CAISO proposes that for the first annual multi-year resource adequacy program cycle (2020 to 2022), flexible resource adequacy requirements should be set to 100 percent for 2020 and to 80 percent for the 2021 and 2022 resource adequacy compliance years.[9] The FRACMOO2 policy is scheduled to be finalized and implemented by fall 2020. Thus, the CAISO proposes that for the second annual multi-year resource adequacy program procurement cycle (2021 to 2023), the flexible capacity procurement requirements should be set consistent with system and local, *i.e.*, at 100 percent for the first two compliance years, and 80 percent for the third year for the prudent reasons described above. The CAISO's proposed procurement targets are detailed in Table 1 below.

Table 1

Procurement Amounts by Capacity Type across the Procurement Horizon

Capacity Type	**Year 1**	**Year 2**	**Year 3**
System	100%	100%	80%
Local	100%	100%	80%
Flexible (pre-FRACMOO2)	100%	80%	80%
Flexible (post-FRACMOO2)	100%	100%	80%

[9] The CAISO has reviewed resource adequacy showings relative to the currently proposed flexible capacity products in the FRACMOO2 initiative. Based on this review and the broader need to ensure sufficient system capacity is procured, the CAISO does not foresee the currently proposed FRACMOO2 capacity requirements having a material impact on the resource mix procured to meet system resource adequacy requirements in the short term (*i.e.,* two to three years into the future).

V. The CAISO Is Prepared to Conduct Studies to Support Multi-Year Procurement Obligations as Necessary.

The CAISO understands that any transition to multi-year resource adequacy procurement will require changes to existing CAISO study processes. The CAISO is currently reviewing all of its study processes and believes it is capable of performing all of the needed studies to support a multi-year resource adequacy framework. For example, in the most recent resource adequacy cycle, the CAISO provided a forecast for the next three years of flexible resource adequacy requirements, demonstrating the CAISO is capable of meeting some of the additional study needs. To date, the CAISO has not identified any critical obstacle to providing the local or flexible analyses that would be necessary to support any multi-year resource adequacy procurement framework.

Appendix A

Statement of Qualifications

Karl Meeusen, Senior Advisor, Infrastructure and Regulatory Policy

Statement of Qualifications

Dr. Karl Meeusen – Senior Advisor, Infrastructure & Regulatory Policy at the California ISO

Prior to joining the California ISO, Dr. Meeusen served as Energy Advisor to President Michael Peevey of the California Public Utilities Commission (CPUC) on demand response and Federal Energy Regulatory Commission (FERC) related issues. Dr. Meeusen also worked as a Public Utility Regulatory Analyst in the Energy Division of the CPUC as a lead analyst on demand response and FERC related issues. Prior to joining the CPUC, Dr. Meeusen held research positions at the National Regulatory Research Institute and the U.S. Department of Justice, Antitrust Division and worked as an independent consultant. Dr. Meeusen joined the California ISO in 2011. Dr. Meeusen has represented the California ISO in several CPUC proceedings, including resource adequacy and joint reliability framework.

Dr. Meeusen's current responsibilities at the California ISO (CAISO) include:

- Developing and evaluating new wholesale electricity market designs related to ongoing efforts to integrate renewable resources into the CAISO electricity market and electric grid.
- Assessing changing resource adequacy needs as a result of the increased penetration of renewable resources to ensure that sufficient flexible capacity resources are available to effectively integrate resources.
- Leading the CAISO studies on shorter-term flexibility requirements in the multi-year proceedings.

Dr. Meeusen holds a Ph.D. in Agricultural, Environmental, and Development Economics from The Ohio State University and a Bachelor's of Science in Philosophy and Economics from the State University of New York, College at Brockport.

Appendix B

Statement of Qualifications

John Goodin, Manager, Infrastructure and Regulatory Policy

Statement of Qualifications

John Goodin – Manager, Infrastructure and Regulatory Policy at the California ISO

Mr. Goodin has over 30 years' experience in the electric industry. In 1997, he was a part of the original start-up team for the California ISO (CAISO). Prior to joining the California ISO, Mr. Goodin worked at Pacific Gas & Electric Company for 10 years serving in various roles.

Mr. Goodin's current responsibilities at the California ISO include:

- Managing the Infrastructure and Regulatory Policy Team. This team is responsible for formulating the CAISO's market design and policies related to:
    - Resource adequacy and procurement
    - Transmission Infrastructure
    - Demand Response
    - Distributed Energy Resources

Mr. Goodin holds a Bachelor of Science in Mechanical Engineering from California Polytechnic State University, San Luis Obispo.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local and Flexible Procurement Obligations for the 2019 and 2020 Compliance Years	Rulemaking 17-09-020 (Filed September 28, 2017)

CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION TRACK 2 TESTIMONY

CHAPTER 3: RESOURCE ADEQUACY COMPLIANCE TIMELINE AND CENTRAL BUYER

SPONSOR: Karl Meeusen, Senior Advisor, Infrastructure and Regulatory Policy[1]

Proposal No. 2: Revise the Resource Adequacy Compliance Timeline to Better Accommodate Resource Adequacy Processes and Decision Making

I. Introduction

The California Energy Commission (CEC), California Independent System Operator Corporation (CAISO), and Commission's processes to establish annual resource adequacy requirements must be conducted in sequence. Delays at one step in the process often have a cascading effect that compress the time left to conduct any remaining steps and reduce the time that load serving entities (LSEs) and resource owners have to finalize procurement for the subsequent resource adequacy compliance year.

In addition, the current resource adequacy cycle (1) provides insufficient time and information to resource owners to make retirement and major maintenance decisions and (2) can result in CAISO annual backstop procurement that is not completed before some monthly resource adequacy showings are due. Currently, the resource adequacy compliance year runs from January through December. Resource owners have insufficient lead time to make informed retirement or major maintenance decisions because final procurement can occur almost simultaneously with the beginning of the resource adequacy compliance year. Additionally, the CAISO does not finalize annual resource adequacy validations and backstop procurement until

[1] *See* Karl Meeusen's statement of qualifications, attached hereto as Appendix A.

after LSEs submit their January and February monthly resource adequacy showings for the subsequent resource adequacy compliance year.[2] As a result, LSEs only receive resource adequacy credit for annual backstop procurement conducted by the CAISO for 10 out of 12 months of the year.

To remedy these concerns, the CAISO proposes that the Commission revise the current resource adequacy timeline, including the start and end of the resource adequacy compliance year, to allow additional time to conduct and vet necessary studies, incorporate central buyer activities, allow time for informed retirement and major maintenance decisions, and ensure that a full year of resource adequacy credit is allocated to all LSEs for any CAISO backstop procurement. Importantly, the CAISO's revised resource adequacy timeline provides LSEs and resource owners with information regarding the CAISO's needs across the resource adequacy procurement horizon for certain essential reliability resources (ERRs), thereby providing LSEs, and/or a central buyer, the opportunity to procure these resources and prevent CAISO backstop procurement. Additionally, this early identification of ERRs provides resource owners with advance notice of the resources that are essential for reliability.

The CAISO recognizes the value and role a central buyer or multiple central buyers could play in supplementing California's bilateral capacity market structure. The CAISO believes that a central buyer can help ensure that backstop procurement is truly a last resort that occurs only if the forward procurement actions of LSEs and a central buyer prove deficient. The CAISO defers to the Commission, its jurisdictional LSEs, and resource owners to designate a central buyer. The CAISO's revised resource adequacy timeline provides the Commission with flexibility regarding the authority, roles, and responsibilities of a central buyer. In its revised resource adequacy timeline, the CAISO has proposed opportunities in which for a central buyer to participate in the overall resource adequacy process (*see* Figure 2, below). The Commission and the affected parties should determine whether a central buyer acts early or late in the resource adequacy procurement window and what role a central buyer plays if individual or collective

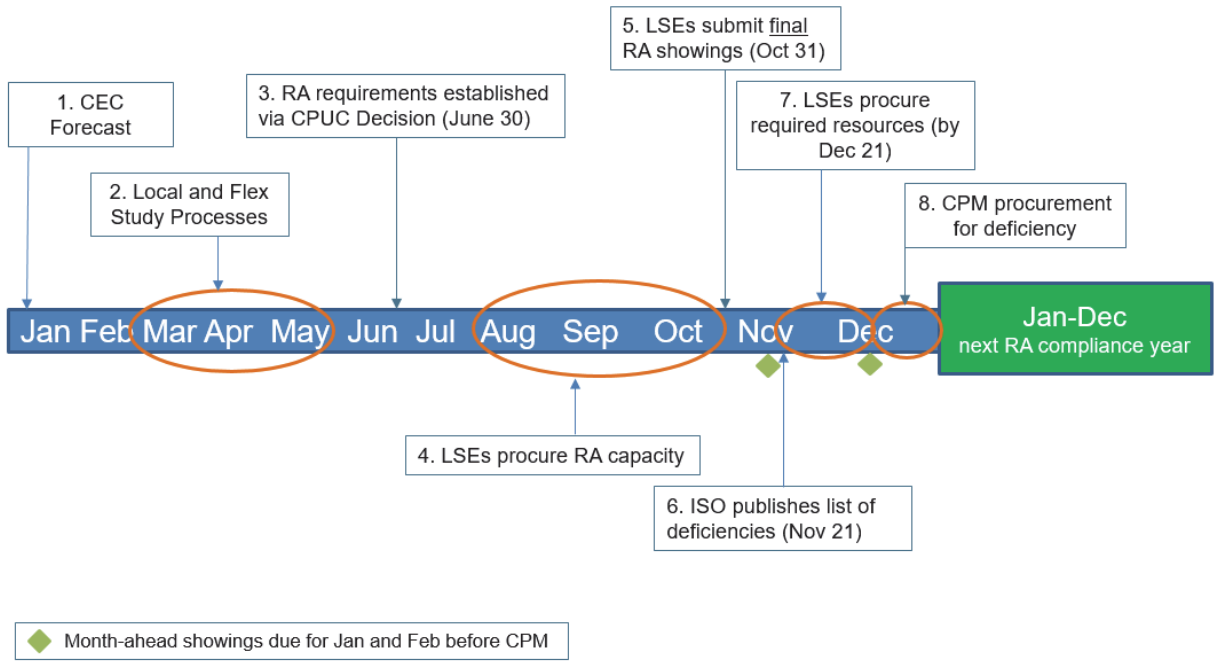
[2] January monthly resource adequacy showings are due t-45 days prior to January 1, and February monthly resource adequacy showings are due t-45 days prior to February 1. This means these showings are made by about November 15 and December 15, respectively.

deficiencies are identified by the CAISO. The CAISO will evaluate LSE showings at the designated times, which should include any allocations to the LSEs from a central buyer.

Finally, the CAISO's proposed timeline works under a multi-year resource adequacy procurement framework, allowing LSEs and a central buyer to conduct procurement and make showings for the second and third resource adequacy compliance years as easily as it does for the first.

II. Challenges Under the Existing Resource Adequacy Timeline

Figure 1: Year-Ahead Timeline Under Current Resource Adequacy Framework

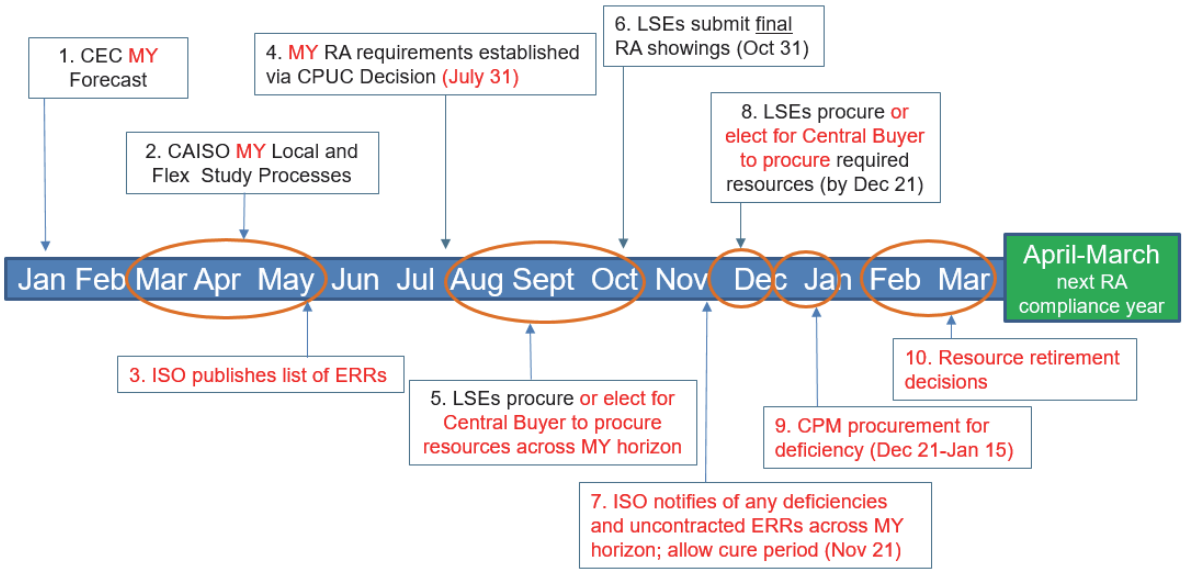


As portrayed in Figure 1, the current resource adequacy compliance year runs from January 1 through December 31. Resource adequacy planning and residual procurement processes occur primarily in the year prior to the resource adequacy compliance year. The initial planning input is the load forecast developed by the CEC. The CEC aims to publish the load forecast in December, prior to the planning and residual procurement processes. The CAISO uses this load forecast as the basis of its flexible and local capacity technical studies and deliverability studies. If the CAISO receives the final demand forecasts by December, it posts drafts of these studies in early March of the year prior to the resource adequacy compliance year,

and the CAISO attempts to post the final results in early May (and no later than the end of June), for the resource adequacy compliance year beginning the subsequent January. The Commission uses the results of the CAISO's local and flexible resource adequacy studies to set its LSEs' resource adequacy procurement requirements. LSEs currently have from August[3] through October to procure any residual resource adequacy capacity and must submit their final resource adequacy showings to the CAISO by the last business day in October prior to the resource adequacy compliance year. After LSEs submit their final resource adequacy showings, the CAISO has 21 calendar days to post a report documenting individual and collective deficiencies. LSEs then have 30 calendar days to procure and show additional resource adequacy capacity to address deficiencies, if they so choose. After those 30 days, the CAISO may exercise its backstop authority to cure any remaining annual deficiencies, as necessary. This final step in the process occurs in late December, after the January and February monthly resource adequacy showings have been made.

III. Enhancing the Resource Adequacy Process by Shifting the Timeline.

Figure 2: April to March Year-Ahead Timeline with Central Buyer Under Multi-Year (MY) Procurement Framework



Note: new timeline resolves current problem where Jan and Feb month-ahead showings occur before final CPM.

[3] Although the Commission currently issues its final decision in the annual RA proceeding, it is subject to requests for rehearing for 30 days after the Commission approves the final decision.

To remedy challenges under the existing resource adequacy timeline, the CAISO proposes the Commission shift the resource adequacy compliance year and the associated planning and procurement processes as illustrated in Figure 2. The most significant proposed change is moving from a January 1 to December 31 resource adequacy compliance year to an April 1 to March 31 resource adequacy compliance year. To transition to the new April to March resource adequacy compliance year for the first year in 2020, the CAISO recommends the Commission extend the 2020 resource adequacy compliance year by three months so that it begins on January 1, 2020 and runs through March 31, 2021. After the first year, the future resource adequacy compliance years would run from April 1 through March 31. Therefore, the 2021 resource adequacy compliance year would run from April 1, 2021 through March 31, 2022. This option is preferable to a shortened, three-month resource adequacy compliance period between 2019 and 2020, which would add unnecessary complexity relative to approving a simple extension of the 2019 resource adequacy compliance year. This change can be accomplished in Track 2 with relative ease and it offers procedural and informational benefits to the planning entities, LSEs, and resource owners.

IV. Shifting the Resource Adequacy Compliance Year Allows Additional Time for Planning and Procurement Processes.

Under this revised resource adequacy timeline, the CEC will have adequate time to complete its annual forecasts. Recent history shows the CEC has challenges generating its annual load forecast by December due to the growing complexity and granularity of the forecast. The CAISO's revised resource adequacy timeline would enable the CEC to submit its multi-year load forecast by late-January or early February of the year prior to the resource adequacy compliance year. With final demand forecasts produced by the CEC in late January or early February, the CAISO would then be able to publish draft multi-year local and flexible resource adequacy studies in mid- to late March and final results by mid-May. The CAISO's revised schedule provides that the Commission will issue a decision adopting resource adequacy requirements by the end of July. This schedule provides an additional month to vet the CAISO's local and flexible capacity study results compared to the resource adequacy process.

The Commission's July resource adequacy decision would contain the allocation of resource adequacy requirements to LSEs and identify a central buyer, and specify its roles and responsibilities, including when a central buyer will act within the procurement period. The primary procurement period would remain from August to October, with LSEs and/or a central buyer submitting final multi-year procurement showings on the last business day in October.

After submittal of the final multi-year resource adequacy showings, the CAISO would conduct reliability assessments based on the procured resources and identify any deficiencies within the multi-year window. Upon completion of these assessments, the CAISO would publish identified deficiencies and list any remaining ERRs not procured or only partially procured. The LSE or a central buyer, as designated by the Commission, would have a one-month period to cure any deficiencies and procure remaining ERR capacity. The CAISO includes a cure period to resolve any deficiencies that could occur based on the effectiveness of the initial LSE and/or central buyer procurement. The cure period could be abbreviated to allow more time for other resource adequacy processes if a central buyer is the sole entity responsible for curing deficiencies. However, if the LSEs are permitted to individually resolve any collective deficiencies before a central buyer takes additional action, more time may be needed. Thus, the CAISO's proposal provides a lengthier cure period to accommodate LSE procurement, should this be the Commission's preference. Finally, the LSEs or a central buyer would be required to submit a showing of any additional procurement by December 21. Following this cure period, the CAISO could then exercise its backstop procurement authority to fill any remaining deficiencies and procure any remaining ERRs by January 15.

V. The Revised Resource Adequacy Process Provides Advance Notice to LSEs and Resource Owners if there are Essential Resources Necessary to Maintain Reliability.

In addition to publishing the flexible and local resource adequacy studies, the CAISO proposes to identify resources in local areas that are necessary for reliability over the three-year procurement horizon. The CAISO's existing local capacity technical studies identifies capacity needs in areas and sub-areas, and also identifies resources – and their effectiveness factors – that

could meet the needs. This provides general direction to inform LSE procurement. However, the CAISO proposes to provide additional information about resources essential to reliability when the area or sub-area need is dependent on one specific resource or a set of specific resources for which there is no viable competition or alternative.

Identifying the ERRs is a logical extension of the CAISO's existing study efforts, and the additional clarity this provides will reduce uncertainty in subsequent procurement processes conducted by LSEs. Providing notice of the ERRs to LSEs and resource owners enables LSEs and/or a central buyer to consider these resources when making their procurement decisions. It will facilitate procurement of needed resources in the first instance by LSEs, reduce the need for CAISO procurement, and send a signal to certain generators that they are required for reliability, thus assuring them of a revenue stream and supporting any major maintenance efforts.

The CAISO proposes to identify and publish a list of ERRs in mid-May, concurrently with the final local capacity technical study. ERRs are those resources, or specific combination of resources, in a local capacity area or sub-area that are essential to reliability and no other resources exist serve that area's needs. For example, a sub-area has two 300 MW resources, and the resource adequacy requirement is 500 MW. The CAISO would classify both resources as ERRs since both resources are essential. However, if a local area has six resources and only four are required to meet the local resource adequacy requirement, then there is some opportunity for LSEs to procure a variety of different combinations of these resources to meet the local need, so those resources would not be listed as ERRs, even though four of the six resources will be essential in the end.

The CAISO will refine how it classifies ERRs, but the critical piece of the CAISO's proposal is that a list of ERRs will be published in advance indicating which resources must be procured for local reliability across the resource adequacy procurement horizon (three years) or if the ERR is replaced during the procurement horizon with a suitable alternative.

VI. The Revised Resource Adequacy Timeline Allows the CAISO to Allocate Annual Capacity Procurement Mechanism Designations Prior to and Monthly Showings.

By shifting the resource adequacy compliance year to April 1 through March 31, the CAISO's capacity procurement mechanism (CPM) designations would occur prior to the first month ahead showing of the resource adequacy compliance year, which would be due in mid-February for the month of April. This ensures that LSEs submit all month-ahead showings after the CPM designations are made. Because the first monthly resource adequacy showings are not due until February 15, all LSEs would receive credit for any annual CPM designations for the entire resource adequacy compliance year. Under the multi-year resource adequacy construct, backstop procurement of ERRs would occur across the three-year procurement horizon, or until replacement resources are expected to be in place.[4]

Because the CAISO's proposed time allows for a central buyer to procure capacity well in advance of when the CAISO conducts its backstop procurement, the CAISO is not recommending a limit on how much procurement an LSE can defer to a central buyer. The amount of procurement an LSE defers to a central buyer would be up to each individual LSE. This deferment works under the proposed framework since any LSE with an individual deficiency would be allocated procurement costs first by a central buyer (and by the CAISO should backstop procurement be necessary). Additionally, by introducing a central buyer, the Commission could remove its waiver rule to provide optionality and flexibility to LSEs who want to use the procurement services and buying power of a central buyer.

VII. The Revised Resource Adequacy Timeline Provides Resource Owners Additional Time to Make Informed Retirement Decisions.

Moving to an April 1 through March 31 resource adequacy compliance year provides additional time after the CAISO's backstop procurement process for resource owners to make more informed retirement and major maintenance decisions. Under the proposed timeline, the CAISO would seek to finalize CPM designations by January 15 and the resource adequacy

[4] The CAISO recognizes it would have to develop a multi-year CPM capability to align with the multi-year resource adequacy procurement framework.

compliance year would begin April 1. Therefore, resource owners would have an additional two months between CPM designation and the beginning of the resource adequacy compliance year to plan retirement decisions.

Appendix A

Statement of Qualifications

Karl Meeusen, Senior Advisor, Infrastructure and Regulatory Policy

Statement of Qualifications

Dr. Karl Meeusen – Senior Advisor, Infrastructure & Regulatory Policy at the California ISO

Prior to joining the California ISO, Dr. Meeusen served as Energy Advisor to President Michael Peevey of the California Public Utilities Commission (CPUC) on demand response and Federal Energy Regulatory Commission (FERC) related issues. Dr. Meeusen also worked as a Public Utility Regulatory Analyst in the Energy Division of the CPUC as a lead analyst on demand response and FERC related issues. Prior to joining the CPUC, Dr. Meeusen held research positions at the National Regulatory Research Institute and the U.S. Department of Justice, Antitrust Division and worked as an independent consultant. Dr. Meeusen joined the California ISO in 2011. Dr. Meeusen has represented the California ISO in several CPUC proceedings, including resource adequacy and joint reliability framework.

Dr. Meeusen's current responsibilities at the California ISO (CAISO) include:

- Developing and evaluating new wholesale electricity market designs related to ongoing efforts to integrate renewable resources into the CAISO electricity market and electric grid.
- Assessing changing resource adequacy needs as a result of the increased penetration of renewable resources to ensure that sufficient flexible capacity resources are available to effectively integrate resources.
- Leading the CAISO studies on shorter-term flexibility requirements in the multi-year proceedings.

Dr. Meeusen holds a Ph.D. in Agricultural, Environmental, and Development Economics from The Ohio State University and a Bachelor's of Science in Philosophy and Economics from the State University of New York, College at Brockport.

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CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION TRACK 2 TESTIMONY

CORRECTED CHAPTER 4: SYSTEM RESOURCE ADEQUACY DEMAND FORECASTS

SPONSOR: Robert Emmert, Manager, Interconnection Resources[1]

Proposal No. 3: The Commission Should Adopt a 1-in-5 Year Demand Forecast During Months with the Highest Peak Demand Uncertainty

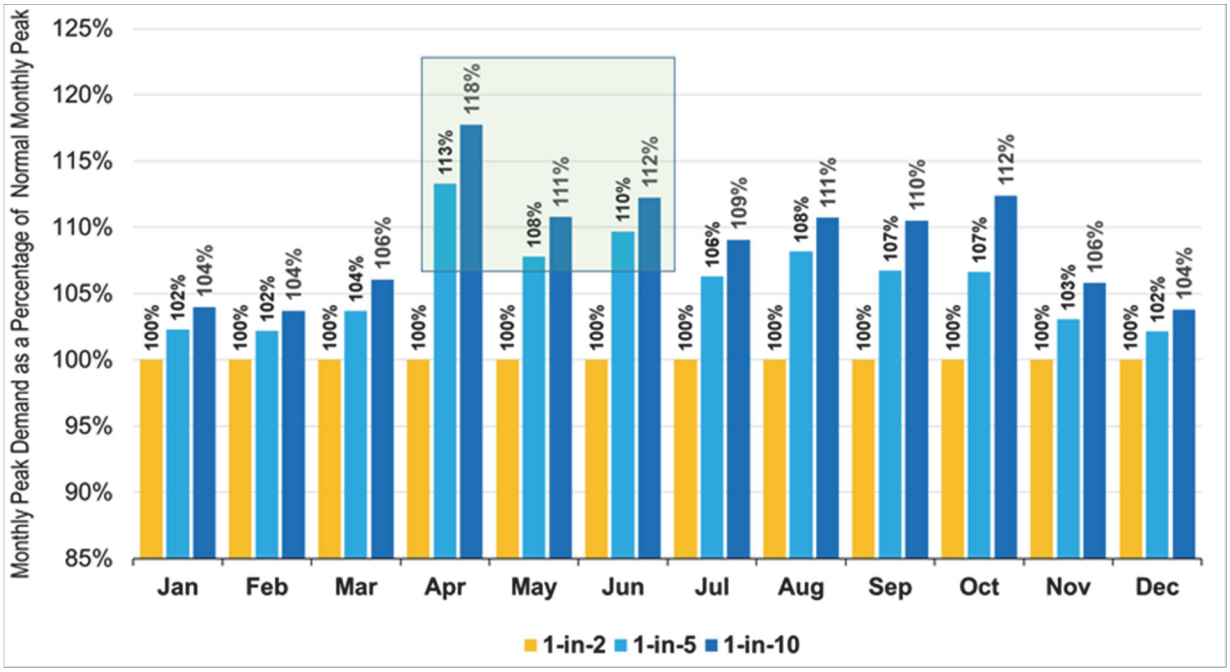
The California Independent System Operator Corporation (CAISO) proposes using a 1-in-5 peak demand forecast basis with the current planning reserve margin to set system resource adequacy requirements for April, May, and June, instead of the currently applicable 1-in-2 peak demand forecast. Changing the forecast demand basis better reflects the risk and operational challenges during the months with highest peak demand uncertainty, especially in the spring months when the weather can vary significantly before and during the transition into summer.

The current 1-in-2 peak demand forecast (*i.e.*, the average peak forecast) by definition overlooks the potential and actual occurrence of extreme variability in temperatures that can occur in the transition months. The CAISO analyzed 23 years of weather-driven historical demand[2] for all 12 months comparing 1-in-2, 1-in-5, and 1-in-10 demand levels. The CAISO determined the 1-in-5 and 1-in-10 monthly peak demand is relative to the 1-in-2 peak demand as illustrated in Figure 1. For simplicity, each monthly peak demand is normalized to the 1-in-2

[1] *See* Robert Emmert's statement of qualifications, attached hereto as Appendix A.
[2] Source: Itron's MetrixND platform, based on 23 years of historical weather data from 1995 through 2017 across 24 weather stations in California.

peak demand. The results of this analysis are included with this testimony as Appendix B and Appendix C, respectively.

Figure 1: Comparison of Normal Peak Demand to Above Normal Weather Peak Demand (peak demand normalized in 1-in-2, e.g., 1-in-2 equivalent to 100%)



The analysis shows that the peak demand during 1-in-5 weather conditions are significantly above normal weather peak demand from April through October – ranging between 106 to 113 percent higher. This demonstrates greater demand volatility within these months. The planning reserve margin accounts for some variability in demand, in addition to unplanned resource outages and other operational issues, but it does not account for this larger variability in demand above 1-in-2 peak levels. In other words, the current use of the 1-in-2 demand basis underestimates the potential demand in a way that decreases the effectiveness of the planning reserve margin. Although a case can be made to increase the underlying forecast for all months from April through October, the CAISO proposes to focus on April, May, and June because the greatest weather-driven demand variability occurs in these transition months. This is largely driven by increased variability in temperature as the season changes from spring to summer.

Appendix A

Statement of Qualifications

Robert Emmert, Manager, Interconnection Resources

Statement of Qualifications

Robert Emmert – Manager, Interconnection Resources, at the California ISO

Mr. Emmert has over 30 years' experience in the electric industry including generation interconnections; resource planning and load forecasting; renewable project development; power plant engineering; and natural gas supply and marketing.

Mr. Emmert's current responsibilities at the California ISO (CAISO) include:

- Managing the Interconnection Services process, including:
  - Ensuring the timely and accurate study of new energy resources through the ISO interconnection procedures.
  - Leading Interconnection stakeholder initiatives and policy development.
- Managing the Loads and Resources group, including:
  - The CAISO seasonal loads & resources assessments
  - Production cost modeling of reliability and renewable integration requirements
  - Mid-term load forecasting
  - NERC standards compliance
  - FERC and WECC reliability reporting and data submission requirements

Mr. Emmert received a Bachelor of Science in Mechanical Engineering from Oregon State University.

Appendix B

CAISO Monthly Peak Forecast Calculations

CAISO Monthly Peak Forecast (before adjustment)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1-in-2	30,625	29,772	29,160	30,928	37,287	40,466	44,182	44,870	42,530	34,364	30,230	32,120
1-in-5	31,115	30,215	30,036	34,810	39,919	44,090	46,640	48,213	45,083	36,392	30,948	32,589
1-in-10	31,416	30,460	30,517	35,927	40,762	44,814	47,543	49,027	46,369	38,107	31,552	32,887

Notes:

[1]: Based on historical peak load from Itron's MetrixND platform, using 23 years of historical weather data from 1995 through 2017 across 24 weather stations in California under 7 weather scenarios. Includes adjustment for pumping load.

[2]: 1-in-2 forecast calculated for each month based on the 50th percentile.

[3]: 1-in-5 forecast calculated for each month based on the 80th percentile.

[4]: 1-in-10 forecast calculated for each month based on the 90th percentile.

2018 Annual Peak Forecast

2018	Annual Peak	Ratio
1-in-2	46,625	1.04
1-in-5	48,636	1.05
1-in-10	51,632	1.05

Notes:

[1]: The 2018 Annual Peak Forecast for CAISO is derived from Itron's MetrixND platform (shown in first column).

[2]: CAISO calculates monthly results based on each individual month's weather.

Therefore the monthly data is then normalized to match with the annual peak forecast result.

The ratio for the 1-in-2 forecast is calculated as the the 2018 1-in-2 annual peak divided by the CAISO 1-in-2 August Peak Forecast (before adjustment).

The ratio for the 1-in-5 forecast is calculated as the average ratio of the 1-in-2 and 1-in-5 ratios.

The ratio for the 1-in-10 forecast is calculated as the the 2018 1-in-10 annual peak divided by the CAISO 1-in-10 August Peak Forecast (before adjustment).

CAISO Monthly Peak Forecast by the CAISO (after adjustment)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1-in-2	31,823	30,937	30,301	32,138	38,745	42,049	45,910	46,625	44,193	35,708	31,413	33,376
1-in-5	32,551	31,608	31,422	36,415	41,760	46,124	48,791	50,437	47,162	38,071	32,375	34,093
1-in-10	33,086	32,079	32,139	37,836	42,928	47,196	50,070	51,632	48,833	40,132	33,229	34,635

Notes:

[1]: 1-in-2 forecast adjusted by a ratio of 1.04.

[2]: 1-in-5 forecast adjusted by a ratio of 1.05.

[3]: 1-in-10 forecast adjusted by a ratio of 1.05.

Comparison of Normal Peak Demand to Above Normal Weather Peak Demand 1-in-2 Peak Demand Equivalent to 100%

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1-in-2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1-in-5	102%	102%	104%	113%	108%	110%	106%	108%	107%	107%	103%	102%
1-in-10	104%	104%	106%	118%	111%	112%	109%	111%	110%	112%	106%	104%

Notes:

[1]: 1-in-2 set to 100%.

[2]: 1-in-5 calucated as a ratio of the 1-in-5 forecast to the 1-in-2 forecast.

[3]: 1-in-10 calucated as a ratio of the 1-in-10 forecast to the 1-in-2 forecast.

Appendix C

CAISO Monthly Peak Forecast Data

Omitted as Attached Document – *See* Attached Excel File

(Served on all persons designated to receive service in Proceeding No. R.17-09-020.)

BEFORE THE PUBLIC UTILITIES COMMISSION
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CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION TRACK 2 TESTIMONY

CHAPTER 5: EFFECTIVE LOAD CARRYING CAPACITY

SPONSOR: Karl Meeusen, Senior Advisor, Infrastructure and Regulatory Policy[1]

Proposal No. 4: The Commission Should Fully Adopt a Comprehensive Effective Load Carrying Capability Methodology that Accurately Reflects the Reliability Contribution of Wind and Solar Resources

In its Decision (D.) 17-06-027 (Decision),[2] the Commission adopted qualifying capacity values based on an Effective Load Carrying Capability (ELCC) methodology designed to accurately value the reliability contributions of grid connected wind and solar resources. In its Decision, the Commission adopted an Energy Division proposal[3] for wind and solar qualifying capacity values aimed at smoothing the transition to ELCC for these resource types. However, in its Decision, the Commission did not specify how long the proposed ELCC calculation would be effective, instead stating that "[g]oing forward, the process used to calculate monthly ELCC values will be subject to changes, improvements and refinements as needed."[4] The California Independent System Operator Corporation (CAISO) believes that improvements and refinements are necessary and should be addressed in Tracks 2 and 3 of this proceeding.

[1] *See* Karl Meeusen's statement of qualifications, attached hereto as Appendix A.
[2] *See* the Commission's D. 17-06-027, adopting qualifying capacity values based on an Effective Load Carrying Capability at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M192/K027/192027253.PDF.
[3] Referred to as "Energy Division's second proposal."
[4] *See* the Decision, at p. 21.

Specifically, the CAISO is concerned that continued reliance on the existing ELCC methodology results in an over-estimation of the reliability contribution from wind and solar resources, especially as incremental solar capacity is added to the system. In its Decision, the Commission recognized that the adopted ELCC values for wind and solar resources exceeded the actual reliability contribution of such resources, but it nonetheless adopted those values to provide for a transition period. Specifically, the Commission stated:

> We agree with PG&E and other parties that moving to an ELCC approach such as Calpine's proposal or Energy Division's first proposal could result in an overly abrupt and significant change in RA values, particularly of solar resources, and would be unnecessarily disruptive. Both Energy Division's second proposal and PG&E's approach address this issue, but we believe that Energy Division's second proposal, which seeks to remove the influence of behind-the-meter solar, has a stronger analytical basis, and is less of a stopgap measure than PG&E's proposal.[5]

This over-counting of wind and solar resource's contribution to resource adequacy results in the under-procurement of other resource adequacy capacity that is able to serve load across a larger set of hours, including during and shortly after the net load peak. If the qualifying capacity value of solar resources are overstated, it increases the likelihood that the CAISO will need to make capacity procurement mechanism designations for additional resources to serve the net load peaks. As a result, the CAISO proposes in Track 2 of this proceeding that the Commission adopt a clear framework to transition to an ELCC methodology that both fully accounts for the growth of behind-the-meter solar and does not inappropriately inflate the qualifying capacity values of wind and solar resources. The Commission should aim to complete implementation of that framework by the conclusion of Track 3. Specifically, in Track 2, the Commission should determine (1) whether behind-the-meter solar should be treated as a supply resource or load modifier and (2) whether the ELCC value of wind and solar resources should be calculated using average or marginal impacts. Once the Commission makes these determinations in Track 2, the ELCC values for wind and solar should be re-calculated in Track 3 and applied in full without any transitional adjustments for the 2020 resource adequacy compliance year.

[5] *See* the Decision at p. 21.

The CAISO notes that its proposal to use a 1-in-5 demand forecast to set system resource adequacy requirements in April, May, and June relies critically on moving forward with refinements in the ELCC methodology to ensure adequate amounts of resource adequacy capacity can serve post-solar production demands. The CAISO clearly documented this issue in its 2018 Summer Loads and Resources Assessment as the most significant concern impacting system reliability for the summer months.[6] Absent refinements to the current ELCC methodology, the CAISO would propose applying the 1-in-5 demand forecast to set resource adequacy requirements more broadly, from April through October.

[6] *See* the CAISO's 2018 Summer Load and Resources Assessment, available on the CAISO's website at http://www.caiso.com/Documents/2018SummerLoadsandResourcesAssessment.pdf

Appendix A

Statement of Qualifications

Karl Meeusen, Senior Advisor, Infrastructure and Regulatory Policy

Statement of Qualifications

Dr. Karl Meeusen – Senior Advisor, Infrastructure & Regulatory Policy at the California ISO

Prior to joining the California ISO, Dr. Meeusen served as Energy Advisor to President Michael Peevey of the California Public Utilities Commission (CPUC) on demand response and Federal Energy Regulatory Commission (FERC) related issues. Dr. Meeusen also worked as a Public Utility Regulatory Analyst in the Energy Division of the CPUC as a lead analyst on demand response and FERC related issues. Prior to joining the CPUC, Dr. Meeusen held research positions at the National Regulatory Research Institute and the U.S. Department of Justice, Antitrust Division and worked as an independent consultant. Dr. Meeusen joined the California ISO in 2011. Dr. Meeusen has represented the California ISO in several CPUC proceedings, including resource adequacy and joint reliability framework.

Dr. Meeusen's current responsibilities at the California ISO (CAISO) include:

- Developing and evaluating new wholesale electricity market designs related to ongoing efforts to integrate renewable resources into the CAISO electricity market and electric grid.
- Assessing changing resource adequacy needs as a result of the increased penetration of renewable resources to ensure that sufficient flexible capacity resources are available to effectively integrate resources.
- Leading the CAISO studies on shorter-term flexibility requirements in the multi-year proceedings.

Dr. Meeusen holds a Ph.D. in Agricultural, Environmental, and Development Economics from The Ohio State University and a Bachelor's of Science in Philosophy and Economics from the State University of New York, College at Brockport.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local and Flexible Procurement Obligations for the 2019 and 2020 Compliance Years	Rulemaking 17-09-020 (Filed September 28, 2017)

CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION
TRACK 2 TESTIMONY

CORRECTED CHAPTER 6: AVAILABILITY LIMITED RESOURCES

SPONSOR: John Goodin, Manager, Infrastructure and Regulatory Policy[1]

Nebiyu Yimer, Regional Transmission Engineer, Lead, Regional Transmission South[2]

Proposal No. 5: The Commission Should Recognize the Impact of Availability Limited Resources and Adopt the CAISO's Hourly Load and Resource Adequacy Analysis to Determine Availability Needs in Local Capacity Areas

I. The Commission Should Recognize the Impact of Availability-Limited Resources.

The California Independent System Operator Corporation (CAISO) defines availability-limited resources as those resources that have significant dispatch limitations such as limited duration hours (*e.g.*, per year, season, month, or day) or event calls (e.g., per year, season, month or consecutive days) that would limit the resources' ability to respond to a contingency event within a local capacity area. The CAISO's definition is limited to resources that count towards meeting a local capacity area or sub-area need. The CAISO strongly urges the Commission to adopt this definition.

[1] *See* John Goodin's statement of qualifications, attached hereto as Appendix A.
[2] *See* Nebiyu Yimer's statement of qualifications, attached hereto as Appendix B.

The resource adequacy program is currently based on meeting a peak capacity requirement defined in megawatts (MWs) without consideration of other resource availability needs. For example, under today's paradigm, a 10 MW/40 MWh resource has the same resource adequacy capacity value as a 10 MW/80 MWh resource. If a local capacity area requires 10 MW of capacity for an eight hour period during a contingency event, only the latter resource is capable of meeting this reliability need. Yet from a resource adequacy perspective, these hypothetical resources provide equivalent resource adequacy value because the resource adequacy program does not consider availability limitations. In recent years, the quantity of resources with some level of availability limitations, such as certain preferred and energy storage resources, has increased considerably. To continue this progression toward increasing levels of preferred and energy storage resources, the CAISO and the Commission must identify and account for availability limitations within local capacity areas and sub-areas to ensure that sufficient resources are procured to meet reliability requirements in all hours and during contingency situations.

II. The Commission Should Adopt the CAISO's Proposed Hourly Load and Resource Analysis to Determine Availability Needs in Local Capacity Areas.

In recent transmission planning studies, the CAISO demonstrated that simply satisfying the peak capacity needs in a local capacity area does not assure reliability consistent with the Local Capacity Technical Study criteria. Specifically, the CAISO's Moorpark Sub-Area Local Capacity Alternative Study and Supplemental Local Capacity Assessment for the Santa Clara Sub-Area (Moorpark and Santa Clara Studies) show that availability-limited resources with a four-hour minimum duration were insufficient, due to a lack of energy (*i.e.*, available MWh), to fully address the contingency events identified in the local capacity criteria.[3] In the Moorpark and Santa Clara Studies, the CAISO developed and performed detailed hourly load and resource analyses to determine whether there were binding availability limits in the local capacity sub-

[3] CAISO, Moorpark Sub-Area Local Capacity Alternative Study, August 16, 2017, https://www.caiso.com/Documents/Aug16_2017_MoorparkSub-AreaLocalCapacityRequirementStudy-PuentePowerProject_15-AFC-01.pdf; and Santa Clara Sub-Area Local Capacity Technical Analysis, June 18, 2018, http://www.caiso.com/Documents/2023LocalCapacityTechnicalAnalysisfortheSantaClaraSub-Area.pdf.

area to better inform regulatory proceedings and specify more precisely the local capacity procurement needs in those areas. The CAISO proposes to conduct similar analysis to inform Commission's resource adequacy proceeding and corresponding load serving entity (LSE) or central buyer procurement efforts. The Commission should adopt the CAISO's hourly load and resource analysis to set local resource adequacy procurement requirements that are designed to meet both capacity and energy needs for each local area. If the Commission adopts this proposal, the CAISO plans to submit the results of its hourly load and resource analysis for each applicable local capacity area and sub-area in the Commission's 2019 resource adequacy proceeding (for the 2020 compliance year).

The CAISO notes that the Commission currently uses the CAISO's Local Capacity Technical Study as the basis for determining local resource adequacy capacity requirements. The CAISO conducts its local capacity technical study annually, and the Commission sets local capacity procurement obligations each year after reviewing the CAISO's recommendations. The Commission issues a decision requiring its LSEs procure a MW capacity amount; it does not expressly consider other needs, such as energy delivery or how availability limited resources satisfy these other critical needs in local capacity areas. The hourly load and resource analysis adds a layer of detail to the Local Capacity Technical Study that is necessary to ensure reliability as LSEs increasingly procure availability-limited resources to meet local capacity requirements. By adopting the CAISO's hourly load and resources analysis, the Commission will be taking important steps toward better informed LSE procurement in local capacity areas and minimizing the potential for CAISO backstop procurement.

III. The CAISO's Hourly Load and Resource Analysis Is Based on Existing Local Capacity Technical Study with Additional Steps to Ensure Energy Sufficiency.

The CAISO proposes to maintain the existing Local Capacity Technical Study process with certain changes described below, which will add detailed hourly load and resource analyses to determine the availability needs for each viable local capacity area and sub-area. The CAISO will continue to conduct its annual Local Capacity Technical Study to determine the local capacity requirements (in MW) for each local capacity area and sub-area, but the hourly load and

resource analysis will provide additional critical information regarding availability needs in each local capacity area.[4] This analysis will require the additional inputs and study steps that are not included in the current Local Capacity Technical Study. The CAISO details these additional inputs and study steps below.

A. Additional Inputs for Hourly Load and Resource Analysis.

- **Projected hourly load data** for each local capacity area and sub-area, for each year of analysis under a multi-year resource adequacy framework. The projected load data should include the impact of BTM PV but exclude the impact of supply-side demand response resources. In prior analyses, the CAISO relied on data from either the California Energy Commission (CEC) or the participating transmission owners (PTOs). The CAISO is open to exploring additional sources. As a default, the CAISO suggests using CEC data, if available, followed by the PTOs as the data source.
- **Determine the voltage stability or thermal area load limit** for the critical contingency with variable and availability-limited resources excluded for each local capacity area and sub-area, for each year of analysis under a multi-year resource adequacy framework. In the determination of the load limit, CAISO will assume all conventional (non-availability-limited, non-variable) resources that have not announced to retire will be available throughout the multi-year resource adequacy horizon. The CAISO needs to conduct this additional assessment to determine the MW limit where non-availability-limited local resources will need to be dispatched to serve the local or sub-area load to avoid voltage collapse. Voltage collapse or thermal overloads for contingency events are typically the most limiting condition and often set the local area requirements.

[4] The CAISO's hourly load and resources analysis will maintain the same criteria and assumptions—such as the requirements to adhere to North American Electric Reliability Corporation (NERC) reliability standards, Western Electricity Coordinating Council (WECC) regional requirements, the CAISO transmission planning standards and the local capacity technical study criteria set out in the CAISO tariff. CAISO Tariff Section 40.3.1.1 provides that "[t]he Local Capacity Technical Study will determine the minimum amount of Local Capacity Area Resources needed to address the Contingencies identified in Section 40.3.1.2."

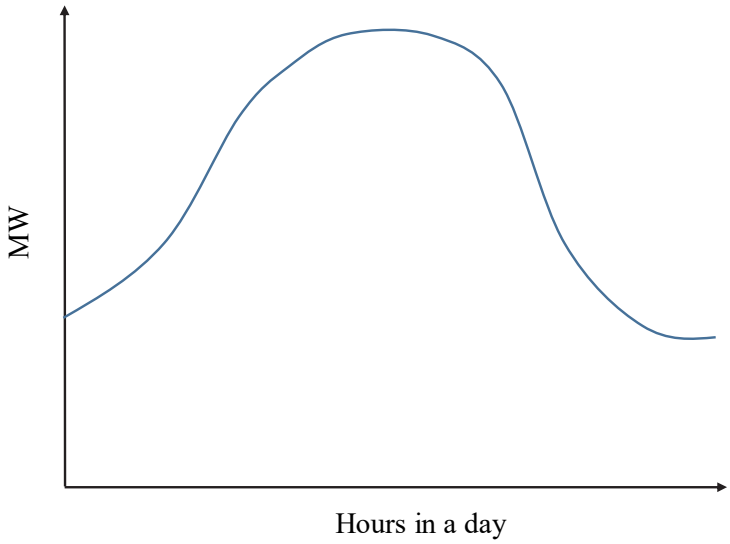
- **Hourly output data for supply side solar PV located in the area or sub-area** will also be needed to develop the net load shape.

B. Additional Study Steps for Hourly Load and Resource Analysis.

After receiving the additional inputs and using information available from the current Local Capacity Technical Study (such as existing and expected online resources in each local area and sub-area), a spreadsheet-based hourly load and resource analysis must be performed for each local capacity area and sub-area.[5] The figures below help to illustrate the steps the CAISO will take as part of the hourly load and resource analysis.

- **Determine the hourly load shape for each year of analysis under a multi-year resource adequacy framework.** Figure 1 below provides a graphical representation of the hourly load data that will be provided in the spreadsheet.

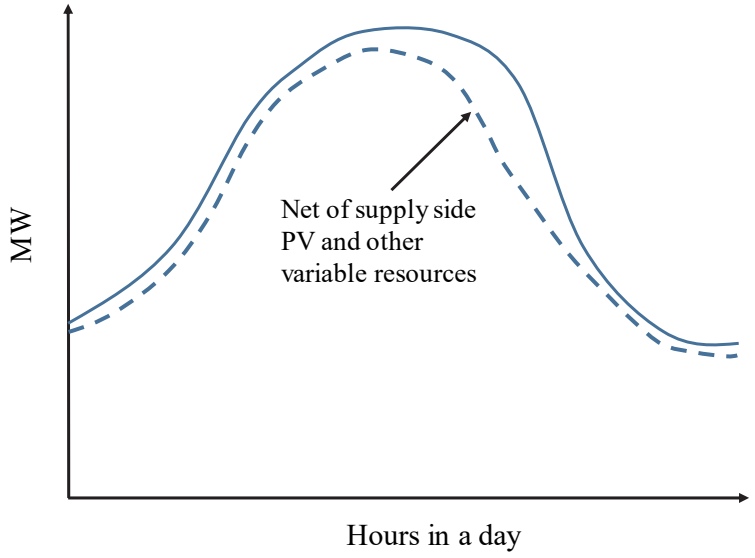
Figure 1: Illustrative Hourly Load Shape



- **Starting with the projected hourly load, subtract supply-side solar PV and other variable supply side resources not used in the derivation of the voltage-stability or thermal-load limit.** These resources are assumed to provide load reduction or generation largely based on their profiles. This net load is shown as the dotted blue line in Figure 2.

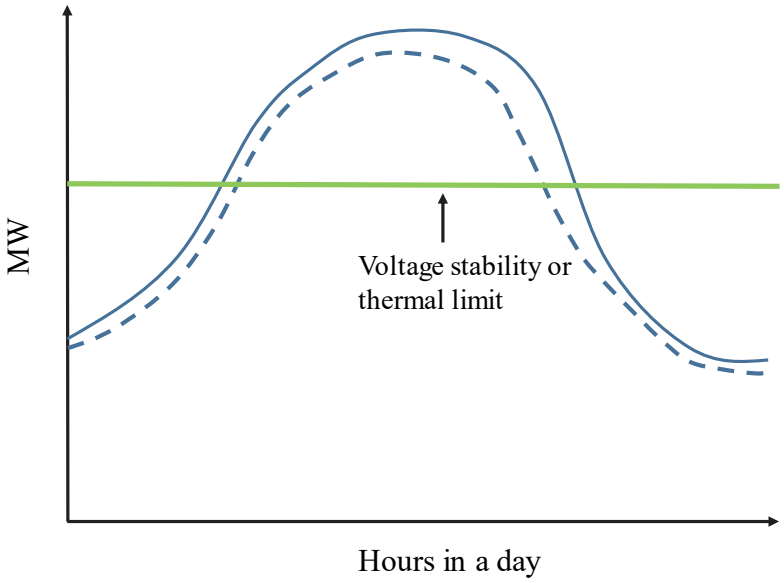
[5] *See* Moorpark Study, Appendix A – Hourly Load and Resource Analysis Worksheets.

Figure 2: Illustrative Hourly Load Shape Net of Supply Side Solar PV and Other Variable Resources



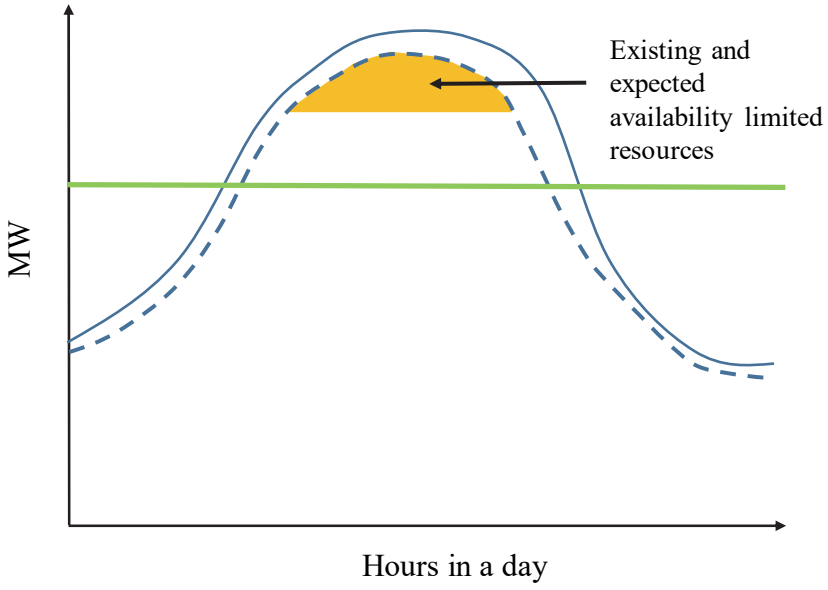
- **Subtract the voltage stability or thermal area load limit (input analysis) to derive the remaining load that may be served by availability-limited resources.** In Figure 3, this area is bounded by the voltage stability or thermal area load limit shown as a green horizontal line and the hourly load net of energy efficiency and solar PV shown as dotted blue line.

Figure 3: Voltage Stability or Thermal Area Load Limit



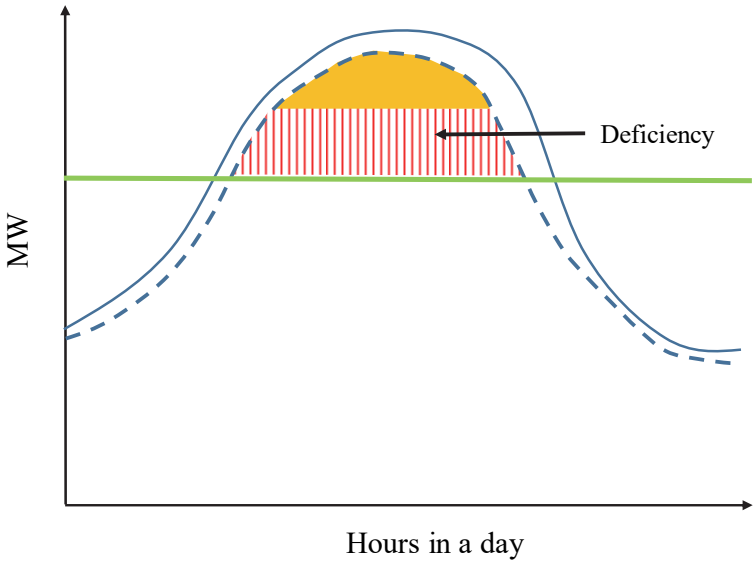
- **Assess whether existing and expected online availability-limited resources can meet the local capacity need.** This part of the assessment assumes availability-limited resources can serve the net load when the net load is greater than the voltage stability area load limit, recognizing all resources must be dispatched at the peak load hour and demand response is to be used last. The CAISO will use the resource parameters provided to the CAISO to appropriately model each resource's ability to meet the local area need such as number of calls or runtime for demand response programs or the need to recharge energy storage resources to be prepared for next day duty. Figure 4 below shows in yellow existing and expected online availability-limited resources' ability to serve load in this illustrative example.

Figure 4: Assessment of Availability Limited Resources



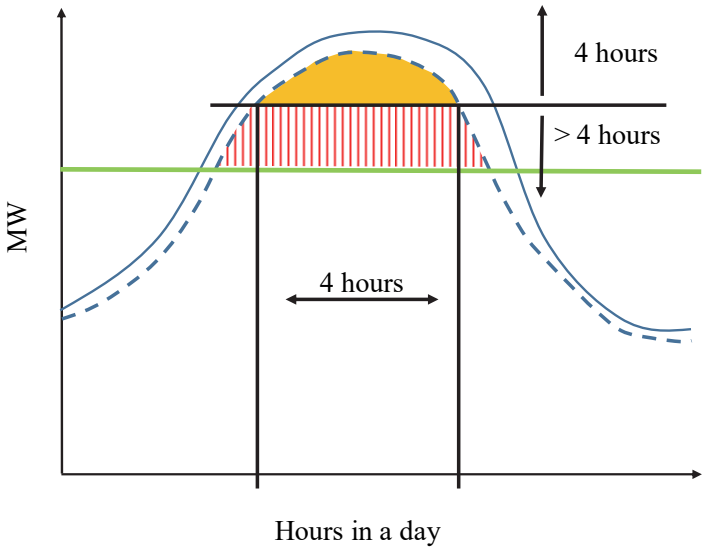
- **Identify any local area deficiencies.** Some local capacity areas or sub-areas may show a deficiency. If this is the case, the CAISO analysis will identify the deficiency on an hourly basis shown as the red striped area in Figure 5.

Figure 5: Identifying Local Area Deficiencies



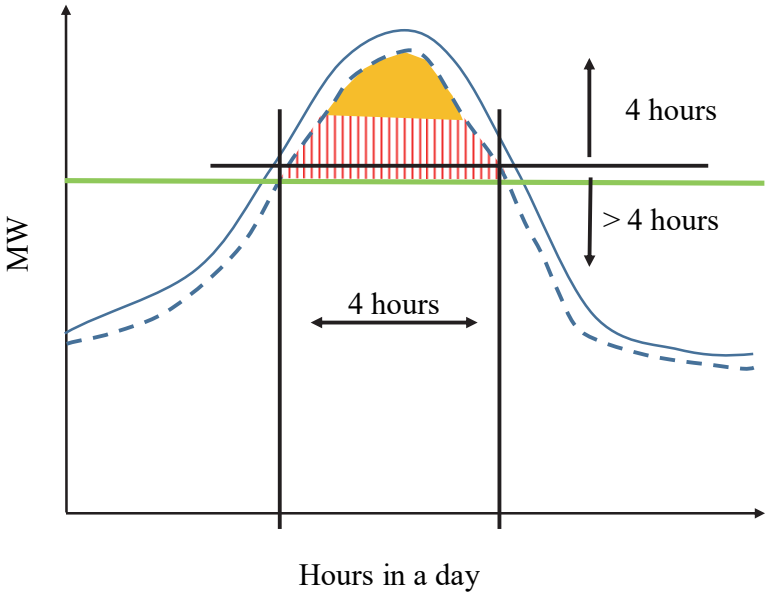
If there is a deficiency, CAISO's analysis will provide critical information to inform the additional procurement of availability-limited resources. The study assumes the Commission continues considering local and system resources as bundled for resource adequacy purposes, and the minimum availability requirement is four hours. In Figure 6 below, the solid vertical black lines reflect a four hour minimum availability threshold that includes the peak hour. Above the solid black horizontal line is the load that can be served with resources that meet this minimum availability. Below the solid black horizontal line is load that will need to be served with resources with greater than four hours of availability. In this example, the area below the line is the local area deficiency. Therefore, the deficiency can be met by both availability-limited and non-limited resources, but the duration of availability-limited resources must exceed four hours and specifically meet the needs of this local area.

Figure 6: Four Hour Minimum Availability Threshold



In comparison, Figure 7 shows another illustrative load profile with a much steeper and narrower peak period. This example shows that the minimum four hour availability threshold has not yet been reached so load serving entities wishing to procure more availability-limited resources can continue to rely on the minimum four-hour requirement up to the threshold. By providing the spreadsheet analysis, load serving entities will have a transparent and straightforward process to evaluate future procurement of necessary capacity.

Figure 7: Illustrative Alternative Load Shape



After load serving entities have followed this guidance, procurement will be validated against the availability needs as discussed in the next section.

IV. The Commission Should Adopt the CAISO's Proposed Process for Incorporating an Hourly Load and Resource Analysis into the Local Capacity Technical Analysis.

The CAISO's proposed hourly load and resource analysis to determine availability limitations requires significant new inputs and analyses. Below, the CAISO proposes a schedule for adopting and implementing the proposal to target implementation by the 2020 resource adequacy compliance year to align with multi-year resource adequacy procurement requirements. The CAISO's proposed implementation timeline is as follows:

Time	Activity
Q4 2018	• In Track 2 decision, Commission adopts CAISO's definition of availability-limited resources and hourly load and resource analysis.
Q1 2019	• Single forecast set is adopted by the CEC. Hourly load data may be available from the CEC or PTOs. • CAISO performs hourly load and resource analysis within the Local Capacity Technical Analysis stakeholder process
Q2 2019	• CAISO submits availability needs assessment into the Commission's resource adequacy proceeding as part of the Local Capacity Technical Analysis to guide resource procurement
Q4 2019	• Validate LSE procurement with power flow modeling

To leave enough time for the rest of the process, the CAISO requests the Commission adopt this proposal no later than in the fourth quarter of 2018. Shortly after, the CAISO must receive hourly load shapes for each local area and sub-area. A potential source for this data is the CEC's 10-year demand forecast adopted as part of its Integrated Energy Policy Report in the first quarter of 2019. The CAISO also expects to work collaboratively with its participating

transmission owners to determine additional load or supply data, especially for local capacity sub-areas. The CAISO will evaluate several years of data to match the multi-year resource adequacy construct ultimately adopted by the Commission. During the rest of this quarter, the CAISO will perform the hourly load and resource analysis within its existing Local Capacity Technical Analysis stakeholder process.

In the second quarter of 2019, the CAISO expects to submit the results of the hourly load and resource analysis into the 2019 resource adequacy proceeding (for the 2020 compliance year) with the Local Capacity Technical Study. The hourly loads and resource analysis can then be used to guide local procurement for the 2020 compliance year.

In the fourth quarter of 2019, after load serving entities procure additional local capacity resources, the CAISO will validate the showings based on power flow modeling. This step is necessary because the spreadsheet load and resource analysis described in the preceding section does not consider reactive power and locational impacts. In this step, the CAISO models the load and resource dispatch for each hour of the 24-hour period obtained from the hourly load and resource analysis in the power flow model as needed to confirm that the dispatch yielded acceptable results. If the dispatch in any hour failed to yield acceptable results, the CAISO will use the existing process to allow load serving entities to cure any deficiencies.

In the first iteration of this process, the CAISO will analyze every local area and sub-area across the multi-year resource adequacy procurement horizon. In subsequent iterations, the CAISO may reduce the frequency and analysis of areas to those that show significant or increasing availability limitations, in order to manage CAISO's workload. Adopting the CAISO's study methodology will provide LSEs information to conduct procurement designed to meet the technical and operational characteristics the CAISO needs to ensure that local capacity requirements are fully met. In turn, this would reduce the need for CAISO backstop procurement.

Appendix A

Statement of Qualifications

John Goodin, Manager, Infrastructure and Regulatory Policy

Statement of Qualifications

John Goodin – Manager, Infrastructure and Regulatory Policy at the California ISO

Mr. Goodin has over 30 years' experience in the electric industry. In 1997, he was a part of the original start-up team for the California ISO (CAISO). Prior to joining the California ISO, Mr. Goodin worked at Pacific Gas & Electric Company for 10 years serving in various roles.

Mr. Goodin's current responsibilities at the California ISO include:

- Managing the Infrastructure and Regulatory Policy Team. This team is responsible for formulating the CAISO's market design and policies related to:
    - Resource adequacy and procurement
    - Transmission Infrastructure
    - Demand Response
    - Distributed Energy Resources

Mr. Goodin holds a Bachelor of Science in Mechanical Engineering from California Polytechnic State University, San Luis Obispo.

Appendix B

Statement of Qualifications

Nebiyu Yimer, Regional Transmission Engineer, Lead, Regional Transmission South

Statement of Qualifications

Nebiyu Yimer – Regional Transmission Engineer, Lead, Regional Transmission South at the California ISO.

Mr. Yimer has over 20 years of Transmission Planning experience in California, Canada and Ethiopia. Mr. Yimer is a licensed Professional Electrical Engineer in the province of Alberta, Canada.

Mr. Yimer's current responsibilities at the California ISO (CAISO) include:

- Planning the CAISO-controlled transmission system in southern California in the most cost effective manner and to ensure compliance with
    - North American Electric Reliability Corporation (NERC) reliability standards,
    - Western Electricity Coordinating Council (WECC) regional criteria, and
    - CAISO Transmission Planning Standards.
- Performed the CAISO local capacity requirements (LCR) technical analysis for the Moorpark sub-area for the 2017 local capacity technical study process.

Mr. Yimer holds a Master of Science in Renewable Energy from the University of Oldenburg, Germany and a Bachelor of Science in Electrical Engineering from Addis Ababa University, Ethiopia.