

The ISO received comments on the topics discussed at the October 31, 2024 stakeholder call from the following:

1. Form Energy, Inc.

Copies of the comments submitted are located on the Local Capacity Requirements Process Page at:
<https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses/Local-capacity-requirements-process-2026>.

The following are the ISO's responses to the comments.



No	Comment Submitted	CAISO Response
1	Form Energy, Inc. Submitted by: Mark Thompson	
1a	<p>1. Please provide a summary of your organization’s comments on the 2026 Local Capacity Requirements, Methodology, and Assumption.</p> <p>The proposed methodology for the 2026 Local Capacity Reliability (LCR) studies largely maintains the same study scenarios and contingencies as the 2025 LCR studies. Form Energy is concerned that maintaining the current study parameters does not fully account for the impact of multi-day events of grid stress, such as heat waves, periods of renewable lulls in winter, fuel shortages, and major outages. As a result, the study is unlikely to accurately assess reliability during such events or provide investment signals to the CPUC and developers about the types of resources and minimum resource performance needed to maintain local reliability during contingencies.</p> <p>Rather than looking at multi-day grid stress events, the existing methodology only evaluates whether reliability can be maintained within a single-day peak event. This narrow scope is not sufficient to guide near and long-term local reliability given the increased frequency and duration of multi-day events that cause reliability risks, as observed in the 2022 heat wave and more recent wildfire-related transmission emergencies, and as reflected in various CEC and CPUC-funded studies of long-term resource adequacy under SB 100 scenarios. It is essential for CAISO to begin planning to ensure both capacity and energy sufficiency during multi-day periods of reliability risk to ensure that CAISO’s assessments of resource needs align with California’s evolving energy landscape and create appropriate investment signals.</p> <p>Multi-day periods of grid stress, and resources such as multi-day energy storage that are designed to address these events, will not be fully studied under CAISO’s proposed 2026 LCR methodology, despite the fact that reliability risks are increasingly lasting multiple days. As these events become more common, it will be more important for CAISO to consider how to maintain reliability during these events. Without this planning, CAISO may be unprepared if thermal resources announce their intention to retire and suitable alternatives have not been developed.</p> <p>For these reasons, Form Energy makes the following recommendations for the 2026 LCR studies:</p>	<p>Thank you for your comments, concerns and suggestions.</p> <p>CAISO disagrees with this statement and believes its LCR studies accurately assess reliability during events required by current standards and provides investment signals to the CPUC and developers about the types of resources and minimum resource performance needed to maintain local reliability vis-à-vis the existing market mechanisms.</p>



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	<ul style="list-style-type: none"> • CAISO should evaluate multi-day periods of grid stress in LCR areas to ensure these areas have sufficient capacity and energy; • CAISO should evaluate multi-day energy storage, and more diverse energy storage resource performance, in LCR studies, when it considers storage charging feasibility and limitations; and • CAISO should consider scenarios that reflect high thermal resource retirements and longer-term scenarios. 	
1b	<p>2. Please provide your organization’s comments on the 2026 Local Capacity Requirements Study Criteria, Methodology, and Assumptions and October 31 stakeholder call discussion. Form Energy provides comments on the 2026 LCR study methodology below.</p> <p>Multi-day Periods of Grid Stress in LCR Areas Should Be Considered CAISO proposes to utilize the same fundamental LCR methodology as it has in the past, studying the ability to maintain energy sufficiency during a single-day event under 1-in-10 managed peak load and a range of contingency scenarios. CAISO then considers whether reliability can be maintained using existing resources or if there are deficiencies that will require new resources to be procured for Local RA purposes. CAISO’s current approach of assessing reliability needs based on single-day 1-in-10 peak load conditions is insufficient to address the challenges posed by multi-day reliability events. In California, grid stress at both the system and local level is increasingly driven by extended periods of low renewable generation and extreme weather lasting multiple days. None of the proposed study scenarios consider the true impact of a multi-day reliability event, how to optimize the local portfolio to meet these multi-day needs, or how to utilize multi-day storage resources to meet these needs. CAISO should consider extreme events lasting for sequential day periods from both a load and generation perspective. Currently, it is assumed that increased load drives reliability needs. For this reason, LCR studies are done during 1-in-10 load peaks with the assumption that “if reliability can be maintained for the 1/10 local peak day, then reliability will also be maintained for any day with load</p>	<p>The current LCR studies assure that if reliability can be maintained for the 1/10 local peak day then reliability will also be maintained for any day with load less than 1/10, including multi-day events where load is at or below 1/10.</p> <p>If storage can be optimized across the 1/10 peak day then it can also be optimized for multi-days with load at or less than 1/10 peak day.</p>

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	<p>less than 1/10.”¹ However, it may not be increased load that drives electric reliability risk. In general discussions, California has already turned away from a focus on serving electric gross peak to focusing on the net peak load when renewable energy output is low.</p> <p>Aside from the daily “duck curve,” California is also at risk of extended periods of low renewable generation. CAISO’s true reliability challenge looks more like a series of waves: a risk of energy shortfalls during several connected days with high net load. For example, Form Energy’s analysis has shown that renewable energy output can fall more than 25% below the 35-year average on a periodic basis, with 100-hour events occurring once every ten years and 50-hour events occurring more than once every two years.² These lulls can be due to weather patterns that are not necessarily considered to be extreme for other purposes, such as an extended period of cloudy weather or low wind, and can occur outside of the current 1-in-10 load peak day that is currently studied. The time periods of grid stress in California are also changing: both the California Energy Commission (CEC) and California Public Utilities Commission (CPUC) have identified that the periods that cause the most grid stress in the long run are likely to shift to the winter, during prolonged winter storms that limit solar output.</p> <p>CAISO is also relying on 4-hour short duration storage to be able to be recharged on a daily basis, which may not be possible. The 2026 LCR Draft Methodology states that for battery energy storage, “the transmission and the other local capacity resources must be sufficient to recharge the batteries in anticipation of the outage continuing into the next day’s peak load period.”³ This assumption is inappropriate for resources like multi-day energy storage, which are designed to be able to discharge at rated capacity for several day periods without needing to recharge. Additionally, while guaranteeing sufficient charging capacity within a day could allow shorter-duration storage to be available multiple days in a row, this is not a guaranteed outcome and cannot be</p>	<p>Multi-day assessment is not necessary in order to find and/or address net peak reliability needs.</p> <p>CAISO continuously assesses availability of resources in any given area at time of peak and across the peak day and modifies its dispatch of such resources accordingly.</p> <p>CAISO continuously assesses the correct peak day for each local area regardless in what season it occurs.</p>

¹ CAISO, ISO Responses to Comments – Draft 2025 and 2029 Local Capacity Requirement Study Results, April 3, 2024, at p.4. Available at:

https://stakeholdercenter.caiso.com/InitiativeDocuments/ISOResponsesToComments_Draft2025and2029LocalCapacityRequirementStudyResults.pdf

² Form Energy, Opening Comments of Form Energy, Inc. on Administrative Law Judge’s Ruling Seeking Feedback on Mid-Term Reliability Analysis and Proposed Procurement Requirements submitted to CPUC Rulemaking 20-05-003, March 26, 2021, at p.3-7. Available at:

<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M376/K501/376501686.PDF>

³ CAISO, Draft Study Manual - 2026 Local Capacity Requirements, October 15, 2024, at p.13. Available at:

<https://stakeholdercenter.caiso.com/InitiativeDocuments/DraftStudyManual-2026LocalCapacityRequirements.pdf>



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	<p>assumed. As stated by CAISO, “The study assumes the ability to provide perfect dispatch and the ability to enforce charging requirements for multiple contingency conditions (like N-1-1) in the day-ahead time frame while the system is under normal (no contingency) conditions. CAISO software improvements and/or augmentations are required in order to achieve this goal.”⁴ Modeling will always simplify real-world scenarios, but CAISO’s methodology makes simplifying assumptions that fail to address known weather-driven risks over sequential days that have caused many recent reliability challenges. Consequently, CAISO’s LCR studies do not give the CPUC adequate information on which to direct future resource development that marries California’s reliability, clean energy, and energy affordability goals.</p> <p>Uncertainties around renewable generation and storage output and availability mean that CAISO’s assumption that “if reliability can be maintained for the 1/10 local peak day, then reliability will also be maintained for any day with load less than 1/10” is flawed. In this 2026 LCR Study, CAISO should consider both high-load and low-renewable generation multi-day events and how they could impact local reliability needs.</p> <p>CAISO Should Consider How to Utilize Multi-Day Energy Storage in LCR Studies</p> <p>As CAISO considers multi-day reliability events, energy storage resources like multi-day storage that can respond for multiple days to these events without recharging should be more specifically studied and considered. The current approach that focuses on single-day reliability risks and a storage fleet that can recharge every day overlooks the capabilities of newly commercial multi-day energy storage resources. For example, Form Energy’s 100-hour multi-day energy storage system will be operational in the CAISO market as soon as 2025. Other multi-day storage technologies and hydrogen solutions are also coming to market.</p> <p>CAISO has already acknowledged that short-duration storage resources may not provide the needed reliability value of existing gas or other firm generation resources. In the 2026 LCR Study, CAISO plans to assume that most batteries are 4-hours in duration and will include analysis of the maximum MW quantity of</p>	<p>The challenges described in this paragraph are the same for short-term batteries as well as multi-day batteries.</p> <p>CAISO disagrees with this statement and believes its LCR studies give a reasonable direction for local resource procurement in line with capabilities of the system and the existing market mechanisms.</p> <p>Local areas and sub-areas are by definition load constrained as such any battery (daily or multi-day) should be able to charge and discharge under contingency conditions due to the unknown duration of the outage. The charging need for the multi-day battery cannot be ignored.</p> <p>Using the single 1/10 peak load day when determining the LCR needs and target battery characteristics is considered by the CAISO to be more conservative than a multi-day approach because battery charging is the most restrictive on that day vs other days with load less than 1/10 peak. Currently the NERC/WECC/CAISO standards do not plan to maintain the same level of reliability when load exceeds 1/10 local load forecast.</p>

⁴ Ibid at p.14.



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	<p>4-hour batteries that can act as a 1-for-1 replacement for existing local resources.⁵ The addition of additional 4-hour batteries beyond the maximum quantity is unlikely to provide the same reliability benefit and will not reduce the need for other local resources. Additionally, since CAISO assumes that storage has to be recharged in a single-day period before the next day's net peak, CAISO assumes that storage must have enough time to charge and cannot discharge at all hours of the day. This may be appropriate for 4-hour storage, but it is not appropriate for multi-day storage. In the 2025 LCR study, CAISO found that some LCR areas, such as the Eastern LA Basin and areas of the Sierra LCR, were able to discharge storage for less than 8 hours a day due to charging constraints.⁶</p> <p>Multi-day energy storage, such as Form Energy's 100-hour system and other technologies, provides flexibility to cover reliability needs across consecutive days without recharging. This capability is critical for responding to multi-day periods of grid stress where renewable generation may remain low and transmission imports may be limited. By integrating multi-day storage into the LCR studies, CAISO can ensure a diversified portfolio that addresses both single-day and multi-day reliability risks effectively, minimizing the need for aging thermal power plants that are at risk of retirement to serve prolonged stress events. This capability provides grid operators with a new means to shift excess energy over longer periods and meet local reliability needs across sequential days despite limited local generation. Unlocking both of these traits will provide California with an optimal portfolio that provides cost savings to ratepayers.</p> <p>In the 2026 LCR study and assessments of energy storage needs, we encourage CAISO to: 1) Model multi-day weather events and atypical periods less frequent than 1-in-10 years, 2) Consider the optimal portfolio to address these multi-day needs, including the potential for longer-duration storage resources to provide additional reliability benefits, and 3) Generally consider a multi-day storage class that is not bound by single-day charging constraints in the same way that short-duration storage resources are.</p>	<p>While multi-day discharging has its appeal in local areas and sub-areas, the multi-day charging has totally the opposite effect.</p> <p>All batteries participate in the day ahead and real-time energy markets and use energy arbitrage to charge and discharge. The current energy markets (day-ahead and real-time) challenges regarding the "assurance" that the battery is charged in order to mitigate local area and/or sub-area need is the same for daily or multi-day batteries.</p> <p>Furthermore, the energy markets do not run a multi-day (weekly etc.) markets and therefore multi-day batteries will not get enough advance charging notice for the simple fact that such energy markets do not exist.</p> <p>In summary, CAISO current methodology regarding the single 1/10 peak day needs is more conservative than multi-day methodology and in-line with the current energy market structure.</p>

⁵ CAISO, Presentation - 2026 Local Capacity Technical Study Criteria Methodology and Assumptions - Oct 31, 2024, presented October 31, 2024, at slide 40. Available at: <https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-2026LocalCapacityTechnicalStudyCriteriaMethodologyandAssumptions-Oct31-2024.pdf>

⁶ CAISO, Final 2025 Local Capacity Technical Report, April 30, 2024, at p.28-29. Available at: <https://stakeholdercenter.caiso.com/InitiativeDocuments/Final2025LocalCapacityTechnicalReport.pdf>

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	<p>Specific Gas Retirement and Longer-Term Scenarios Should Be Considered by CAISO</p> <p>In response to previous comments from Form Energy and other parties on coordinating LCR studies and local planning with work being done by the CPUC in the Integrated Resource Planning (IRP) process, CAISO has pointed parties to work that is currently being done in the 2024-2025 Transmission Planning Process (TPP) on long-term LCR planning. Form Energy looks forward to engaging in the TPP on this issue, but we encourage CAISO to more regularly consider long-term local reliability planning and how resources such as multi-day storage can substitute for aging thermal resources that may be at risk of retirement.</p> <p>CAISO should not only consider scenarios of gas retirements in the TPP but should also consider the impact of gas retirements on local capacity needs and the attributes of storage and other firm zero-carbon resources that can meet loads in the event of retirements. In particular, CAISO can play a unique role in helping the CPUC determine where it may be most cost-effective to develop new firm zero carbon resources in LCR areas to address both local and system reliability needs and save ratepayers money. For example, in 2017, CAISO released the Moorpark Sub-Area Local Capacity Alternative Study, which showed that energy storage could provide an alternative to building a new natural gas plant.⁷ This study was conducted on a one-time basis in response to a specific request from the CEC. However, this study showed a concrete path forward for the replacement of gas, which the CPUC could then act on through procurement orders.</p> <p>The CEC also recently sponsored a study that evaluated which portfolio of energy storage resources could substitute for fossil fueled power plants that are located within disadvantaged communities in the Los Angeles Basin. The study showed that 2 GW of long-duration storage and 1.3 GW of 4-hour lithium-ion storage could cost-effectively substitute for such resources, lowering system costs by 3% while maintaining reliability during periods of transmission</p>	<p>Based on the alignment of the CAISO Transmission Planning Process (TPP) with the CEC Integrated Energy Policy Report (IEPR) demand forecast and the CPUC Integrated Resource Plan (IRP), the Long-Term LCR assessment is to be evaluated every two years.</p> <p>The CAISO will conduct a new set of long-term LCR studies as part of this TPP cycle, please see the final TPP study plan. Draft results will be presented at the December 9, 2024 stakeholder call.</p> <p>The CPUC provided gas retirement and high gas retirements scenarios are included in the long-term LCR studies.</p>

⁷ CAISO, Moorpark Sub-Area Local Capacity Alternative Study, August 16, 2017. Available at: https://www.caiso.com/Documents/Aug16_2017_MoorparkSub-AreaLocalCapacityRequirementStudy-PuentePowerProject_15-AFC-01.pdf



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	<p>constraints.⁸ This study can serve as a blueprint for how other local reliability areas can be studied in the future.</p> <p>As California moves towards decreasing reliance on gas, the CAISO should look to provide additional information on resource performance needed to maintain local reliability so the CPUC can examine opportunities to decrease costs in LCR areas in the long run. CAISO has the opportunity to lead in optimizing a long-term local reliability portfolio that is clean, cost-effective, and resilient. Multi-day energy storage becomes increasingly essential to provide firm, dispatchable power during extended periods of grid stress. Prioritizing multi-day storage in the LCR study can demonstrate a viable path to address California’s clean energy goals while maintaining local reliability and lowering system-wide costs.</p> <p>It will be particularly important to consider multi-day reliability events and optimize for a multi-day portfolio of resources that can most cost-effectively maintain reliability during these events. This could be conducted in the main LCR study process or could be directed in another workstream to provide additional time for study and stakeholder engagement.</p>	<p>CAISO reminds stakeholders that it already conducted studies for alternatives to reduce or eliminate conventional gas generation during 2018-2019, 2019-2020 and 2020-2021 TPP assessment cycles. See details under each area and sub-area sections of the 10-year out LCR reports:</p> <p>http://www.caiso.com/Documents/AppendixG-BoardApproved2020-2021TransmissionPlan.pdf</p> <p>http://www.caiso.com/Documents/AppendixG-BoardApproved2019-2020TransmissionPlan.pdf</p> <p>http://www.caiso.com/Documents/AppendixG-BoardApproved2018-2019TransmissionPlan.pdf</p>

⁸ Assessing the Value of Long-Duration Energy Storage in California prepared by Energy and Environmental Economics (E3), Form Energy, and the University of California San Diego (UCSD), December 2023. Available at: <https://www.energy.ca.gov/publications/2024/assessing-value-long-duration-energy-storage-california>