The ISO received comments on the topics discussed at the October 27, 2021 stakeholder call from the following:

1. California Energy Storage Alliance (CESA)
2. Southern California Edison (SCE)
3. Vistra Corporation

Copies of the comments submitted are located on the Local Capacity Requirements Process Page at: http://www.caiso.com/informed/Pages/StakeholderProcesses/LocalCapacityRequirementsProcess.aspx.

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

No	Comment Submitted	CAISO Response
1	**California Energy Storage Alliance (CESA)** **Submitted by: Alexander Morris**	
1a	**Provide a summary of your organization's comments on the 2023 Local Capacity Requirements Study Criteria, Methodology, and Assumptions:** The California Energy Storage Alliance (CESA) appreciates the ISO's efforts to conduct thorough studies that ensure the reliability of transmission- and/or generation-constrained Local Reliability Areas (LRAs). As California advances towards an increasingly decarbonized grid, the ISO's Local Capacity Technical Studies (LCTS) should provide market participants a robust understanding of the capacity outlook in LRAs, and the type and magnitude of preferred resources that can be accommodated in those load pockets. In this context, CESA's comments can be summarized as follows: • The ISO should revise its energy margin assumption for storage resources since it does not apply to other technologies. • The ISO should assess energy storage under several round-trip efficiency (RTE) assumptions. • The ISO should consider studying an LCTS sensitivity that assesses sufficiency based on the unforced capacity (UCAP) methodology.	Thank you for your comments.
1b	**Provide your organization's comments on the charging for storage used as local RA resources topic, as described in slides 36-40:** ***The ISO should revise its energy margin assumption for storage resources since it does not apply to other technologies*** In the presentation shared by the ISO ahead of the October 27, 2021 stakeholder meeting, Staff describes its methodological approach to represent energy storage and its charging within the LCTS. One of the key assumptions utilized in this approach includes an hourly energy margin of 5% or 10 MW – the larger of the two – that is applied to both the charging and discharging need.[1] The ISO noted that this was incorporated to represent the lack of perfect foresight as well as the fact that storage is seldom dispatched continuously, instead being dispatched in 5 MW increments, for example. CESA finds that the reasoning behind the ISO's assumption does not apply exclusively to energy storage or resources that participate under the non-	CAISO assumes full utilization of hourly energy throughout the day of all other (non-battery) resources required for LCR in that particular area or

[1] CAISO, 2023 ISO LCR Study Criteria, Methodology, and Assumptions, at 39.

No	Comment Submitted	CAISO Response
	generator resource (NGR) pathway. As such, it is unclear why the ISO would only take these incremental steps to represent the bidding/dispatch behavior of these assets when the majority of local capacity requirements (LCRs) are met by conventional thermal generators. Thus, CESA requests that the ISO remove this assumption as it does not seem to be applied fairly across fuel types and participation pathways within the LCTS. ***The ISO should assess energy storage under several round-trip efficiency (RTE) assumptions*** At the stakeholder meeting, staff explained that it will assume a charge/discharge efficiency of 85% in its assessment of energy storage. The ISO argues that this assumption is reasonable as it is "based on the general battery efficiency."[2] CESA understands that, in the last decade, the vast majority of the energy storage assets deployed within the CAISO's footprint have been lithium-ion batteries. CESA thus understands the ISO's decision to use 85% RTE as a starting point for its evaluation of storage assets. While the conclusions derived from these assumptions will provide some insight to market participants, evaluating storage capacity and energy limits under a wide array of RTEs would prove much more valuable, especially considering the growing interest in long duration energy storage (LDES). In the Integrated Resource Planning (IRP) proceeding, the California Public Utilities Commission (CPUC) has directed jurisdictional load-serving entities (LSEs) to collectively procure at least 1 GW of LDES resources by 2026.[3] This requirement is expected to be met by a variety of technologies with different operational characteristics. To this end, the LCTS has the potential to provide substantial insight into how these solutions can be deployed in local areas, thus minimizing ratepayer costs by meeting both IRP and LCTS requirements. Thus, CESA requests the ISO the potential for energy storage energy and capacity by LRA under several RTE assumptions. Based on CESA's collaboration with Strategen Consulting,[4] CESA recommends considering 50%, 65%, and 75% RTEs, in addition to 85% as described during the stakeholder meeting.	sub-area. The assumption used in estimating the maximum energy storage (dispatch at the larger of the hourly energy margin of 5% or 10 MW – that is applied to both the charging and discharging need) is required in order for the results to be more "realistic" else the future generic battery is dispatched in a way that perfectly follows the load curve resulting in a "perfect dispatch" (not available in real life). The CAISO is providing an estimated target of maximum installed battery based on the currently most used type of battery at 85% charge/discharge efficiency. Since the CAISO has also provided the max energy available, stakeholders can make their own translations using other charge/discharge efficiency factors.

[2] Ibid, at 39.
[3] See CPUC, Decision (D.) 21-06-035. LDES is defined as a storage resource capable of discharging at its maximum power output for 8 hours or more.
[4] Strategen Consulting, Long Duration Energy Storage for California's Clean, Reliable Grid, December 2020, 28-33. Available at https://static1.squarespace.com/static/5b96538250a54f9cd7751faa/t/5fcf9815caa95a391e73d053/1607440419530/LDES_CA_12.08.2020.pdf

No	Comment Submitted	CAISO Response
1c	**Additional comments on the on the 2023 Local Capacity Requirements Study Criteria, Methodology, and Assumptions and October 27 stakeholder call discussion:** ***The ISO should consider studying an LCTS sensitivity that assesses sufficiency based on the UCAP methodology*** Within the Resource Adequacy (RA) Enhancements Initiative, the ISO has developed a substantive record for the modification of the capacity counting methodology to one that internalizes the likelihood of forced outages. This approach, UCAP, has been socialized both in said initiative and the CPUC's RA proceeding, where it will be considered in the context of framework reforms for Fall 2023. To calculate UCAP, CAISO proposes assessing availability ex post, looking at the top 20% of hours with the tightest supply conditions.[5] Preliminary data shows that UCAP would represent a significant reduction in capacity contributions for natural gas generators, with weighted seasonal availability factors of about 87.5% during peak months.[6] Since the UCAP framework is actively being considered and could be adopted for the 2024 RA Year, CESA requests the ISO evaluates a sensitivity case in which it counts existing capacity and communicates LCRs in terms of UCAP, not NQC. This is timely as it will provide stakeholders with a clear panorama of the resource deficiency associated with solely relying on existing thermal generation.	As already explained in the CAISO UCAP proposal, the local capacity studies will continue to be done on NQC bases (not UCAP). The CAISO will provide a translation matrix from NQC local requirements into UCAP local requirements and the LSEs obligation will be based on UCAP local requirement. After the LSE showings are in (compliance checked vs. UCAP values), the CAISO will use the NQC values for the procured resources it order to test LCR criteria compliance. As a result no additional UCAP studies are required.

[5] CAISO, Day 1 Presentation of the RA Enhancements Draft Final Proposal and Sixth Revised Straw Proposal, January 2021, at 40. Available at http://www.caiso.com/InitiativeDocuments/Day1Presentation-ResourceAdequacyEnhancements-DraftFinalPropsoal-SixthRevisedStrawProposal.pdf
[6] Ibid, at 84.

No	Comment Submitted	CAISO Response
2	**Southern California Edison (SCE)** **Submitted by: Jonathan Yuen**	
2a	**Provide a summary of your organization's comments on the 2023 Local Capacity Requirements Study Criteria, Methodology, and Assumptions:** For each area and subarea, SCE requests the CAISO clearly specify local transmission serving capabilities and hourly local capacity requirements in terms of numerical values. Furthermore, the portfolio dispatch of available resources assumed within the studies to meet hourly local capacity requirements should be made available to better understand how resources are expected to collectively follow the load curve and meet local reliability needs. Additional details can be found in the response to Question 3.	At this time, the battery charging constraints assessment is being revised and improved on a regular bases and therefore it is not made available to the general public. After the battery charging constraints assessment has reached a final version and has been fully vetted with stakeholders, the CAISO intends to provide the spreadsheets behind the graphs. The spreadsheets includes the remaining data SCE is looking for.
2b	**Provide your organization's comments on the charging for storage used as local RA resources topic, as described in slides 36-40:** ***Hourly Energy Storage Margin Assumption*** On slide 39, it states that for energy storage resources an hourly energy margin of 5% or 10 MW, the larger of the two, is applied to both charging and discharging need. SCE seeks clarification in how this assumption is applied by providing the following example below. For storage charging hours, the study will assume storage can only charge up to 95% (a 5% margin) of the available charging capacity if available charging capacity exceeds 10 MW. Available charging capacity is the absolute value of the negative local capacity (LC) need shown in the table below. If available charging capacity is less than 10 MW, charging in that hour is not assumed. For discharging hours, storage must output the larger of either 10 MW or 105% of the local capacity need. While the below example excludes any local RA non-storage resources, available generation when dispatched can increase the total local load serving capability, reduce the amount of storage discharge required, and increase energy available for storage charging. Therefore, it is expected that the 5% or 10 MW hourly energy storage margins would be applied after transmission and generation load serving capabilities are calculated. Please confirm if this example accurately captures the study assumption.	Based on the methodology, storage discharge need is calculated first. In calculating the total discharge energy need, discharge capacity required for each hour is increased by larger of 10 MW or 5% of the discharge capacity needed for the particular hour. We called this adding margin in the discharge need. For the charging calculation, for each hour where the storage is not discharging, charging capacity is calculated using delta between the net load and load serving capability for that hour. The charging capacity of each hour is then also reduced by larger of 10 MW or 5% of the charging capacity of the particular hour.

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<tr><th>No</th><th>Comment Submitted</th><th>CAISO Response</th></tr>
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<tr><th>Hour</th><th>Load (MW)</th><th>Txn Capability (MW)</th><th>Local Capacity Need (MW)[7]</th><th>Storage Mode</th><th>Charging/Discharging Allowance</th></tr>
<tr><td>10</td><td>650</td><td>790</td><td>-140</td><td>Charging</td><td>Charging up to 133 MW (95% of LC need)</td></tr>
<tr><td>11</td><td>660</td><td>790</td><td>-130</td><td>Charging</td><td>Charging up to 124 MW (95% of LC need)</td></tr>
<tr><td>12</td><td>680</td><td>790</td><td>-110</td><td>Charging</td><td>Charging up to 105 MW (95% of LC need)</td></tr>
<tr><td>13</td><td>725</td><td>790</td><td>-65</td><td>Charging</td><td>Charging up to 62 MW (95% of LC need)</td></tr>
<tr><td>14</td><td>785</td><td>790</td><td>-5</td><td>Charging</td><td>No charging allowed (Available charging capacity < 10 MW)</td></tr>
<tr><td>15</td><td>795</td><td>790</td><td>5</td><td>Discharging</td><td>Discharging of at least 10 MW required</td></tr>
<tr><td>16</td><td>910</td><td>790</td><td>120</td><td>Discharging</td><td>Discharging of at least 126 MW (105% of LC need)</td></tr>
<tr><td>17</td><td>925</td><td>790</td><td>135</td><td>Discharging</td><td>Discharging of at least 142 MW (105% of LC need)</td></tr>
</table>
SCE encourages the assessment of energy charging capacity to also incorporate distribution system constraints, which may be more restrictive than transmission constraints.
Defining Energy Storage Planning Methodology and Assumptions
SCE supports including slides 36-41 and any additional information describing CAISO's energy storage assessment methodology and planning assumptions either in the 2023 LCR Study Manual or a separate whitepaper as mentioned during the stakeholder meeting.
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<td>
The distribution system and its constraints are not modeled in the transmission base cases used for all TPP related studies.
Thank you for your support.
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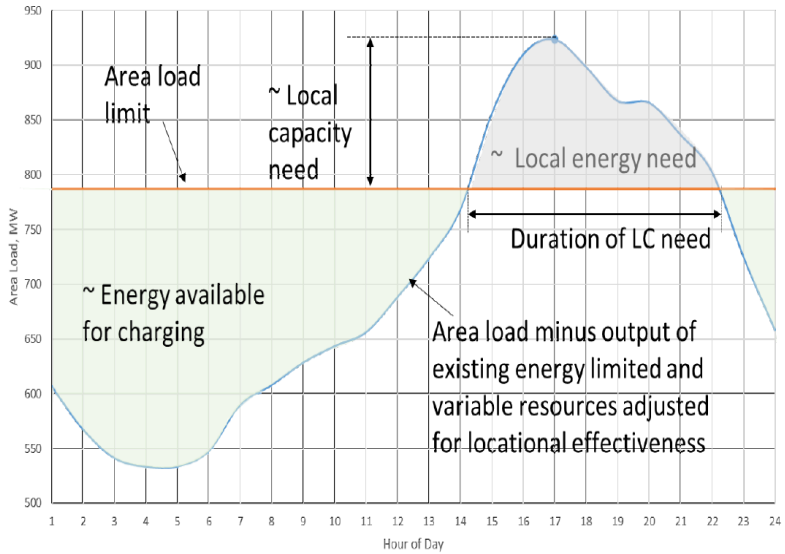
[7] "Local Capacity Need" = "Load" minus "Txn Capability" with negative values representing available capacity to charge storage and positive values representing the need for storage to discharge to meet the need.

No	Comment Submitted	CAISO Response
2c	**Additional comments on the on the 2023 Local Capacity Requirements Study Criteria, Methodology, and Assumptions and October 27 stakeholder call discussion:** ***Specifying Local Transmission and Resource Load Serving Capabilities*** SCE believes clear specification of both transmission and resource capabilities is necessary to define needs and procure resources with the proper attributes, especially in resource-constrained areas and subareas. As stated on slide 38, local load serving capability consists of (1) transmission load serving capability and (2) local generation load serving capability. SCE recommends that CAISO explicitly include the following in the LCR reports: 1. The transmission load serving capability limit(s) under the worst contingency condition without the support of local generation (in MW). While this is available to some extent in prior reports, the capability limit is currently shown as a curve rather than an actual MW value. Without specifying a numerical value, the actual limits are subject to interpretation. 2. The assumed hourly dispatch of the local generation and storage required to serve the load. In other words, the hourly dispatch of existing and upcoming resources assumed in the studies to meet the area under the curve. ***Specifying Hourly Local Capacity Requirements*** In transitioning the local supply fleet to more use-limited resources, hourly capacity requirements should be specified in CAISO's studies to clearly guide the procurement of local resource portfolios with appropriate attributes. From a procurement perspective, it has been challenging to interpret the load shapes included in the LCR reports to determine hourly local capacity requirements. To avoid potential misinterpretation, SCE recommends specifying the hourly capacity requirements at least for the "duration of LC need" as illustrated below from slide 37 for each area and subarea.	See response to 2a above. The "local capacity requirements" are year round requirements, not monthly, daily or hourly requirements. The "expected" hourly dispatch out of each resource for the peak day under the contingency condition can be derived for the spreadsheet requested under 2a above.

No	Comment Submitted	CAISO Response
	 ***Making Study Materials Available*** For all study years, SCE requests that *Appendix A: Physical Resource List Used for the LCR Studies* (in Excel format) be made publicly available. Furthermore, SCE supports CAISO publishing the hourly area and subarea load shapes (in Excel format) when appropriate, including calculated transmission capability and generation dispatch study assumptions. These materials will facilitate any subsequent analysis necessary to review and confirm procured resource portfolios meet identified reliability requirements.	The Appendix A list in excel format) has been posted: https://www.caiso.com/InitiativeDocuments/PhysicalResourceListUsedDuring2022and2026LocalCapacityTechnicalStudies-Basedon2021NetQualifyingCapacity.xls At this time, the battery charging constraints assessment is being revised and improved on a regular bases and therefore it is more appropriate to maintain its description in the LCT reports, in order for the CAISO to be fully transparent about any updates. After the battery charging constraints assessment has reached a final version and has been fully vetted with stakeholders, the CAISO intends to include it in future study manuals.

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<tr><td>3</td><td>Vistra Corporation
Submitted by: Cathleen Colbert</td><td></td></tr>
<tr><td>3a</td><td>Provide a summary of your organization’s comments on the 2023 Local Capacity Requirements Study Criteria, Methodology, and Assumptions:
Vistra Corp. respectfully submits these comments in response to the CAISO’s 2023 Local Capacity Requirements Draft Study Manual posted on October 20, 2021 and discussed at a public stakeholder call on October 27, 2020. We appreciate the CAISO detailing its methodology for the 2022 Local Capacity Requirement (“LCR”) studies. Please see below for specific areas of the draft study manual and presentation that Vistra requests the CAISO provide clarity or confirmation.</td><td>Thank you for your comments.</td></tr>
<tr><td></td><td><table>
<tr><th>Draft Study Quotes</th><th>Vistra Questions</th></tr>
<tr><td>“The ISO will only maintain charge capability, under category P1 system adjustment followed by P7 resulting in voltage collapse or dynamic instability for areas with peak load at or above 250 MW or if the voltage collapse and dynamic instability propagates beyond the area directly affected by the outage, for batteries that have acquired firm charging services from the grid (similar to firm load).”[8]</td><td>Please clarify whether this is intended to provide detail to differentiate between how distributed connected storage assets receive charging energy as either firm or as-available.
Please confirm whether this applies to transmission connected storage and if it is what the CAISO considers “firm charging services”.</td></tr>
<tr><td>“Effective resources shall be dispatch up to the latest available NQC and, where applicable, not to exceed historical (projected for new</td><td>Please provide a reference to the source information being used for the solar output shapes in the final study manual including a link to the location on the CEC website.</td></tr>
</table></td><td>This paragraph was meant to establish that batteries that acquired “firm charge service” (regardless of their interconnection voltage) are treated the same as ”firm load” during the “charging” part of their cycle.

Solar output shapes are calculated from the CEC’s CED Hourly Forecast. Below is the link to CEC’s 2020 California Energy Demand Forecast page:
https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2020-integrated-energy-policy-report-update-0</td></tr>
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[8] 2023 Local Capacity Area Technical Study, Draft, CAISO, October 20, 2021, Page 7, http://www.caiso.com/InitiativeDocuments/2023LocalCapacityRequirementsDraftStudyManual.pdf

No	Comment Submitted		CAISO Response
	resources) output values at the time of the managed peak load in the local area."[9] Using "CEC provided solar output shapes for managed peak hour (ISO to provide solar output shape if not available from CEC)" and "Consistent with TPP assumptions for other resources (Wind, QF)".	Please specify in the final study manual which TPP assumptions for other resources are being adopted so that it is clearer what the historical/projected output values are for these resources.	TPP assumptions only apply to a very small sub-set of resources namely non-energy-only resources that are not on the NQC list. The TPP assumptions can be found in the latest TPP study plan.
	"Maximum storage addition cannot exceed LCR amount."[10]	Please confirm the CAISO is not implying that it believes that within a local capacity area that the storage development should not exceed the Local Capacity Requirement. In practice, there may be a need for additional storage above Local Capacity Requirements in a local area if they are providing a system need. Vistra would appreciate the CAISO confirming whether they share this view and whether this limit to storage additions is to constrain the LCR study to only test for charging needs to support replacement of local RA resources by storage assets.	Correct, this limit to storage additions is to constrain the LCR study to only test for charging needs to support replacement of local RA resources by storage assets.
	"Includes storage charging/discharging efficiency of 85%."[11]	Please provide analysis to market participants on the range of round-trip efficiencies observed in Master File. It's unclear from publicly available data whether 85% round-trip efficiency rate assumption is close to the average observed in the battery fleet or what the	While actual storage devises can have a range of different efficiencies, the scope of the graph is to give an estimate of future potential development. CAISO is using an 85% efficiency rate based on experience and engineering judgement and not Master file data. Since the CAISO has also provided the max energy available, stakeholders can make their own translations using other charge/discharge efficiency factors.

[9] 2023 ISO LCR Study Criteria, Methodology, and Assumptions, CAISO, October 27, 2021, Slide 35, http://www.caiso.com/InitiativeDocuments/Presentation-2023LocalCapacityTechnicalStudyCriteriaMethodologyandAssumptions.pdf
[10] Id at Slide 39.
[11] Id at Slide 39.

No	Comment Submitted		CAISO Response
		basis is. Our expectation is that round-trip efficiencies of existing assets can vary between 80% to 90% and seek additional data transparency to support 85% as a reasonable representation of the storage fleet.	
	"Under worst contingency condition, for battery to have sufficient discharge energy, it is assumed that battery is charged in all hours it is not discharged."[12]	Please confirm whether this is observed in prior modelling results that under worst contingency condition that all hours outside of net peak discharge hours are needed to fully charge storage.	The battery constraint is the "charging mode", in order to be useful in mitigating local constraints a battery must be charged. In order to reach the "charging limit", the CAISO must assume that battery is charged in all hours it is not discharged. It is a required assumption (not an observation) in order to maximize the use of the transmission system.
	"Majority of LSEs are procuring 4 hour batteries (due to current CPUC rules for system RA counting)."[13]	Vistra requests the CAISO confirm that it is not implying that majority of LSEs are procuring single cycle per day batteries. We agree that majority of LSEs are procuring 4:1 MWh to MW ratio of capability from batteries today. We encourage the CAISO to refer to battery characteristics as 4 MWh for every 1 MW battery rather than calling these 4-hour batteries. The hour phrasing is introducing confusion in the market that batteries are duration limited per day instead of energy limited per cycle. We appreciate CAISO leadership in helping to support greater clarity and understanding. We are concerned there is a misunderstanding that the trend has been to procure battery capability for a single cycle per day. Our understanding is that our broader concern does not impact the CAISO's local RA study requirements	Thank you for the clarification.

[12] Id at Slide 39.
[13] Id at Slide 40.

No	Comment Submitted	CAISO Response
	since the CAISO is studying the adjusted peak hour. Please confirm that the number of full cycles that storage can perform per day does not impact the study method or results setting and evaluating the LCR. Please confirm that the number of fully cycles that a storage can perform per day is not restricted to a single cycle per day in the storage charging evaluation and explain how the number of cycles that can be performed may impact the charging analysis.	In over whelming majority of cases a single cycle per day battery is sufficient in local areas and sub-areas. (See provided graphs.) The number of full cycles that a storage can perform per day is not restricted to a single cycle per day in the local storage charging evaluation.
3b	**Provide your organization's comments on the charging for storage used as local RA resources topic, as described in slides 36-40:** See above.	
3c	**Additional comments on the on the 2023 Local Capacity Requirements Study Criteria, Methodology, and Assumptions and October 27 stakeholder call discussion:** None currently.	