Comments of the California Energy Storage Alliance (CESA)
on CAISO ESDER 4
June 27 Working Group Meeting

Submitted by	Company	Date Submitted
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CESA appreciates the opportunity to comment on the Energy Storage and Distributed Energy Resources (ESDER) Phase 4 Working Group meeting on June 27, 2019 and related materials and presentations.[1]

CESA salutes and thanks the CAISO for hosting this informative and useful working group. The type of technical discussion that occurred at the working group is essential for working through key specifics of market design ideas. CESA appreciates both the CAISO's and others' efforts to develop useful ideas, approaches, and technical specifications.

To respond usefully to the Working Group meeting, CESA provides responses to the template questions below. CESA also offers high level feedback.

I. High-Level Feedback:

- CESA supports the proposed improvements to the NGR model, including the "range concept" but wants biddable parameters to be voluntary where applicable.
- Market Power Mitigation approaches should start simply with large buffers or adders to account for costs which may not hard to quantify accurately, and CESA suggests the CAISO only mitigate generation side bids with simple methods. Solutions to ensure mitigated bid-curves are monotonically increasing should be discussed in a future working group.
- The CAISO should support broader market participation by developing a non-24x7 NGR settlement

[1] http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=7F774DE6-48BD-4592-B895-80B4D4146813

- The CAISO should address minimal modifications to promote dual-participation storage applications, including allowing two resource IDs at the same customer site (ID.)
- The CAISO should authorize and lay out timelines for NGR model participation for solar-plus storage resources and should ensure the ITC can be appropriately 'captured' through scheduling practices. See below for more information.

II. About CESA:

CESA is an industry advocacy association focused on grid-connected energy storage. CESA's mission is to make energy storage a mainstream resource to advance a more affordable, efficient, reliable, safe and sustainable electric power system for all Californians.

We are technology and business model-neutral and are supported solely by the contributions and coordinated activities of our members. CESA is a 501(c)(6) non-profit that represents over 70 member-companies and leaders in the energy storage industry.[2] www.storagealliance.org.

III. CESA Comments in Response to the Questions-Template:

1. Default Energy Bids for Energy Storage

Please provide your organization's feedback on the ISO's presentation on the *default energy bids for energy storage* topic. Please explain your rationale and include examples if applicable.

[2] 8minutenergy Renewables, Able Grid Energy Solutions, Advanced Microgrid Solutions, AltaGas Services, Amber Kinetics, American Honda Motor Company, Inc., Axiom Exergy, Brenmiller Energy, Bright Energy Storage Technologies, Brookfield Renewables, Carbon Solutions Group, Centrica Business Solutions, Consolidated Edison Development, Inc., Customized Energy Solutions, Dimension Renewable Energy, Doosan GridTech, Eagle Crest Energy Company, East Penn Manufacturing Company, Ecoult, EDF Renewable Energy, ElectrIQ Power, eMotorWerks, Inc., Enel, Energport, ENGIE, E.ON Climate & Renewables North America, esVolta, Fluence Energy, GAF, General Electric Company, Greensmith Energy, Ingersoll Rand, Innovation Core SEI, Inc. (A Sumitomo Electric Company), Iteros, Johnson Controls, Lendlease Energy Development, LG Chem Power, Inc., Lockheed Martin Advanced Energy Storage LLC, LS Power Development, LLC, Magnum CAES, Mercedes-Benz Energy, NantEnergy, National Grid, NEC Energy Solutions, Inc., NextEra Energy Resources, NEXTracker, NGK Insulators, Ltd., NRG Energy, Inc., Parker Hannifin Corporation, Pintail Power, Primus Power, Range Energy Storage Systems, Recurrent Energy, Renewable Energy Systems (RES), Sempra Renewables, Sharp Electronics Corporation, SNC Lavalin, Southwest Generation, Sovereign Energy, Stem, STOREME, Inc., Sunrun, Swell Energy, True North Venture Partners, Viridity Energy, VRB Energy,Wellhead Electric, and Younicos. The views expressed in these Comments are those of CESA, and do not necessarily reflect the views of all of the individual CESA member companies. (http://storagealliance.org).

CESA Response:

This was a fun presentation – thank you! The study referenced is useful and forward-thinking insofar as it attempts to include depth-of-discharge and related use as a cost that can inform variable operations and maintenance (VOM) or other default energy bid (DEB) cost-components. CESA supports the concept that discharges are part of some energy storage resources' VOMs.

CESA is supportive of the CAISO developing DEBs and related bid-mitigation for energy storage. CESA is skeptical, however, that a formulaic approach will capture all costs, strategies, and opportunities that storage devices could need to reflect in economic bids.

Instead of seeking a highly accurate formulaic approach, CESA supports a simplified bid-mitigation approach as a 'Phase 1' of establishing DEBs for energy storage. The CAISO should establish and calculate DEBs by simply 1) mitigating *generation* side-bids to a reasonable level and then 2) adding ample adders to reflect the difficulty of approximating or knowing costs. This type of simplified near-term DEB approach could be as simple as using a storage resource's recent average energy cost, and then applying a large adder to the cost, *e.g.* 50%[3], in order to reasonably limit market power while ensuring all costs are covered by the DEB.

This approach is reasonable for several reasons. Energy storage uses are hard to predict and can include difficult to quantify out of market costs. 'Getting it right' will be extremely difficult and likely idiosyncratic to the resource. The CAISO's data shows that much of the only storage to date is used for fast-ramping services, and not energy shifting, even though some DEB calculation methodologies are premised on an energy shifting use-case.[4] CESA expects the amount of mitigation in the next two years on NGRs will be minimal, as the amount of storage operating in the CAISO (excluding pump-hydro), is very small. While supporting market power controls, CESA has also repeatedly requested information on the severity of market power concerns for storage in the near-term years so as to inform efforts on the urgency and types of market power mitigation we might devise. Mitigation only on the generation side bids of storage is

[3] CESA welcomes input on what a reasonable but safely sufficient adder should be.

[4] See slides 9-10, compared with the approaches considered by DMM or SCE:
http://www.caiso.com/Documents/Presentation-EnergyStorage-DistributedEnergyResourcesPhase4WorkingGroup-Jun27-2019.pdf
http://www.caiso.com/Documents/DMMPresentation-EnergyStorage-DistributedEnergyResourcesPhase4-Jun27-2019.pdf
http://www.caiso.com/Documents/SCEPresentation-EnergyStorage-DistributedEnergyResourcesPhase4-Jun27-2019.pdf

appropriate in that it parallels the mitigation of normal generators. Further, the negative $150 bid floor provides a limit on any excessive leveraging of load-side market power, of which CESA expects none near-term.[5]

CESA expects energy storage will operate in distinctly different ways in the CAISO, and the methodologies listed do not reflect these various use-cases. Some storage may provide regulation and fast ramping services, such as we see today. Some storage may address daily energy shifting needs. Some storage may operate to provide local capacity services, and may retain energy to meet contingencies. Each of these three use-cases may have different costs and opportunities. Some of these use-cases may also take the form of multi-use applications. CESA views it as unlikely that DEBs will precisely estimate these costs and opportunities.

In any DEB approach, CESA suggests it is essential that NGRs can develop negotiated DEBs.

CESA remains unclear on the extent to which PDRs are seeking to be mitigated. PDRs may be even more difficult to estimate, so broad leeway in DEBs for PDRs will be needed.

CESA recommends a more specific calculation be explored in several years, where more data and operational experience can inform the calculation. That said, CESA believes the basic categories listed by the CAISO – energy, losses, cycling costs, and opportunity costs – is a good starting list. CESA understands that the "opportunity costs" includes out-of-market opportunities. Such costs are an essential part of bid structures for some multi-use projects.

The depth-of-discharge approach and lists of sub-cost categories is also a good start. Even with studies to inform such approaches, CESA believes it may be very difficult to standardize cost curves for the variety of energy storage projects. Even amongst lithium-ion storage technologies, wear and tear issues can differ widely, and the CAISO flags some factors to this effect on slide 16. These fact again suggests that a simple and relatively high DEB cost is a reasonable step for now.

While CESA supports the CAISO's efforts, CESA also requests the CAISO act prudently with its resources and consider how a simplified DEB approach could free up 'bandwidth' to tackle other important CAISO issues while still achieving the goals associated with the DEBs. Other topics the CAISO should explore include:

[5] That said, CESA continues to support a lower negative bid-floor, as parties have shown the -$150 does not necessarily allow for all costs to be included from some generators, and the asymmetry between the bid floor and the bid cap can create uplift issues. The negative bid floor is also unlikely to promote efficient market uses of energy storage in some cases, e.g. in absorbing high amounts of overgeneration in fewer market intervals.

- Developing a non-24x7 NGR settlement
- Allowing multiple resource IDs at a single customer site (ID)

Please provide your organization's feedback on DMM's presentation on *default energy bids for energy storage*.

CESA Response:

This was a fun presentation – thank you! CESA appreciates the thoughtfulness of DMM and believes the profit-maximization approach to determining DEBs is intriguing but potentially difficult to standardize at this time. CESA is also unclear on how DEBs that mitigatate and replace both the charging and discharging range of bids would be used in the ever-rolling forward basis in the Real-Time Market (RTM), versus in the more static 24-interval Day-Ahead Market (DAM) optimization (where such an approach might be more easy to implement and more accurate). CESA also understands that computational requirements and timelines are an ongoing challenge for CAISO at this time in some market solution periods, and the DMM approach seems computationally intense, even if all components are accurate. All of this said, the accuracy of the assumptions seems the trickiest part of this approach, and CESA is very hesitant to support any approach which could inadvertently underestimate the costs and opportunities of energy storage solutions, in turn leading to an undercollection of costs.

While CESA looks forward to working with DMM to further develop useful DEBs for NGRs, CESA requests that DMM also evaluate the risks and benefits of a near-term simple DEB approach, as proposed above. Through DMM's assessments of future market power occurrences and of their consequences, *e.g.* of likely costs and frequencies of any charging-side market power, DMM could aid the CAISO in evaluating how much perfection is needed, near-term, on NGR DEBs. DMM analysis on the risks of undercollection of costs due to inaccurate DEBs should also be considered, *e.g.* how inaccurate is a basic mitigation (with adders) compared to a complex and specified approach?

If a simple 'generation-side only' mitigation is used, DMM should help in considering how to address issues that may arise wherein a mitigated bid-curve might no-longer be monotonically increasing from charging to discharging.

Finally, CESA believes the use-case contemplated in the DMM approach and referenced study may inaccurately reflect actual use cases, and thus may not truly assess costs and opportunities. To the extent that the methodology is inaccurate, it should not be pursued at this time.

Please provide your organization's feedback on SCE's presentation on *resource availability.*

CESA Response:

This was another fun presentation – thank you! CESA appreciates the thoughtfulness of SCE in this regard.

CESA believes the use-case contemplated in the SCE approach may reflect only some use cases, and thus may not truly assess costs and opportunities for other resources, e.g. regulation focused storage units. To the extent that the methodology is not applicable for all storage, it should not be pursued at this time. Instead, CESA would welcome SCE's input on how to pursue a more basic DEB that includes adders, such as mentioned above.

SCE's approach highlights how spread-based bid approaches can be useful in terms of optimally managing storage resources. CESA has suggested that the CAISO explore how spread-bids could be used or useful. CESA continues to suggest this as a topic for ESDER.

2. **NGR State-of-charge parameter**

Please provide your organization's feedback on the ISO's presentation on *the NGR State-of-charge* topic. Please explain your rationale and include examples if applicable.

CESA Response: CESA is generally supportive of tools that can help manage state of charge (SOC) for NGRs or energy storage resources. CESA also understands that an input SOC, which then leads to under-recovery of bid-costs should not be eligible for bid-cost recovery (BCR) in some circumstances.

CESA is still evaluating the two approaches laid out for compliance with biddable SOC, and related BCR outcomes, but is leaning towards Approach 2 as more prudent at this

time. The risks of false positives as shown in Approach 1[6] is concerning to CESA because storage resources should not be deprived of reasonably deserved BCR. This leads CESA to generally focus more on Approach 2 as a starting approach. CESA will work with its members to further evaluate these approaches and to provide recommendations to the CAISO.

CESA believes the 'range approach', as laid out in the WPTF presentation, is a useful addition to this topic insofar as it can limit cases where the SOC creates major under-recovery of bid-costs due to a biddable parameter.

Please provide your organization's feedback on WPTF's presentation on *the NGR State-of-charge* topic.

CESA Response: CESA supports the 'range' state of charge approach. This approach not only helps address the CAISO's goal of having specific SOCs at the end of an interval in order to support MUAs, but also provides more helpful bidding options for energy storage NGRs. This is prudent and useful.

CESA also recommends that biddable parameters be optional. Thus, if the biddable parameter 'field' in a bid template were not populated, the CAISO should clarify what a default setting or outcome would be in terms of interval-ending SOC.

3. Variable Output Demand Response

Please provide your organization's feedback on the ISO's presentation on *the variable output demand response* topic. Please explain your rationale and include examples if applicable.

CESA Response:

CESA generally supports proper counting and alignment with must-offer obligations. That said, CESA understands that some of this matter is being discussed in other forums. In ESDER, DR baselines seem like relevant topics, and CESA offers no position on developing capacity counting approaches in ESDER for DR.

CESA requests the CAISO be mindful of any potential differences between storage-backed DR versus other DR. For storage-backed DR, the limits on availability may link more to non-export provisions than to any actual inability of the storage resource to respond and provide energy. This may indicate that non-export provisions can strand

[6] CAISO Slide 26

capacity. For instance, a storage device may have full capability to deliver even when loads are low. While interconnection structures such as WDATs can work around this, some resources can export without WDATs. CESA suggests WDAT-lites or other approaches be used if non-export restrictions are binding infrequently or if other factors apply. This in turn may be a result of the type of customer load, bidding strategies, or other factors.

CESA believes any transition from current approaches to different ones should be explored carefully. It may help if a study is used to inform on the scale of capacity changes being contemplated, as CESA understands it. Capacity rules allow for storage to be coupled with traditional DR to augment capacity counts. The addition of storage could be a tool for keeping capacity counts high for customers who might otherwise face lower counts under an ELCC methodology and without any storage additions.

4. Maximum Run Time Parameter for DR

Please provide your organization's feedback on the ISO's presentation on *the maximum run time parameter for DR* topic. Please explain your rationale and include examples if applicable.

CESA Response: no comment on this matter at this time.

Additional comments

Please offer any other feedback your organization would like to provide on the topics discussed during the workshop.

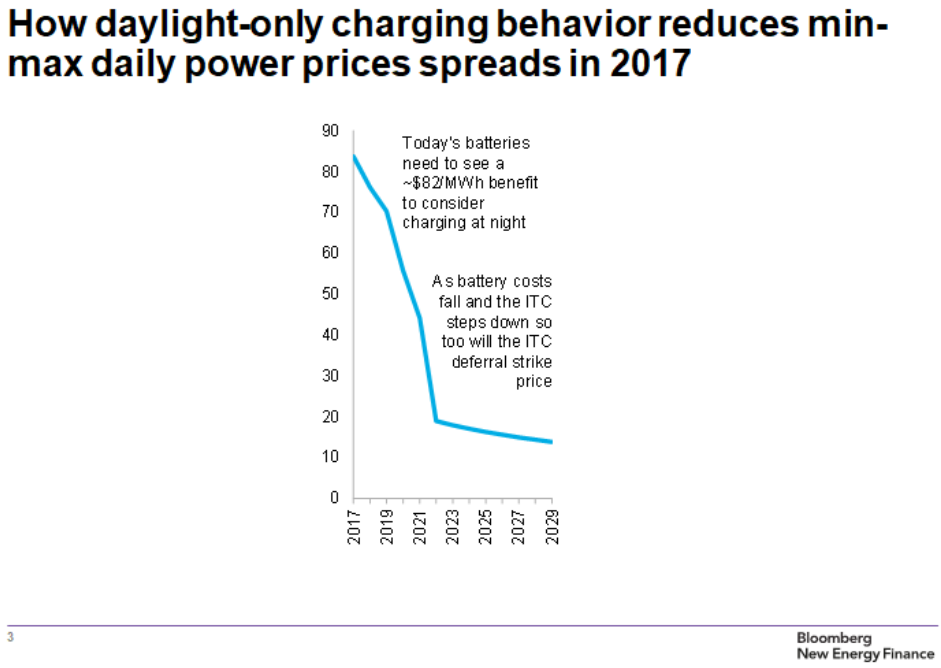
CESA Comments: CESA is again concerned that the CAISO is not making progress on multiple enhancements which should fit with ESDER 4.

- Developing a non-24x7 NGR settlement
- Allowing multiple resource IDs at a single customer site (ID)

- Complying with FERC Order 841 by allowing behind-the-meter resources to avoid double-paying for transmission charges.
- Modifying NGR to be used by solar-plus storage resources wherein the bidder can represent their costs for capturing the solar investment tax credit (ITC)

CESA believes the CAISO can readily address the above issues and should do so as part of ESDER 4.

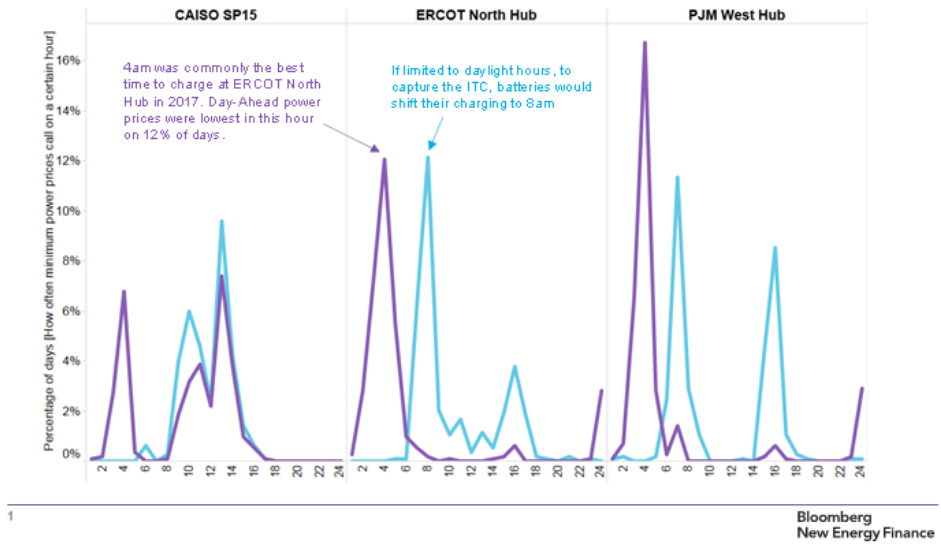
Scheduling pathways for solar plus storage should be available at the CAISO and should recognize a resource's operational plans to maximize solar-based charging. The concepts discussed in this section apply to both the DEB calculation and to the consideration of SOC parameters. This chart from Bloomberg New Energy Finance highlights how storage resources have opportunity costs linked to the ITC for some years, but not for years in which an ITC may no longer apply, i.e. if the ITC is not extended. The ITC opportunity costs is referred to as a 'strike price' in this chart.



Source: "When Should U.S. Solar Storage Systems Charge at Night: Exploring optimal charging patterns at U.S. hubs" Bloomberg New Energy Finance, W. Nelson, August 30, 2018, slide 3

Further, the Bloomberg evaluation highlights that ITC capture directs some storage resources to charge in the day when such resources might otherwise charge at night.

Ideal charging times for batteries – with and without ITC considerations



Source: "When Should U.S. Solar Storage Systems Charge at Night: Exploring optimal charging patterns at U.S. hubs" Bloomberg New Energy Finance, W. Nelson, August 30, 2018, slide 1. The purple line is the unconstrained (No ITC) charging optimal schedule, while the blue line is the ITC-charging constrained value.

How to factor this concept in? CESA recommends the CAISO consider several solutions to address storage ITC charging. First, hybrid resources should be able to schedule and participate using the NGR model. The NGR model, while still having some limitations (such as lacking a field for commitment costs), is a useful model for many resources especially ones with a negative p-min capability. Such capability may be found on all stand-alone storage and on some hybrid storage solutions. Second, the ITC opportunity costs or 'strike price' should be factored into any calculations of opportunity costs and default energy bids. Third, the SOC parameters should be developed with the capability to 'honor' or 'consider' the ITC. For instance, the Day-Ahead Market may not realize a solar plus storage resource only seeks to charge during the day, perhaps under contractual obligations that cannot be readily reflected in energy bids.

With respect to safe-guarding the ITC capture for solar plus storage, CESA, along with its members, have explored how an adjustment to the Pmin could address this challenge. Specifically, CESA believe the p-min could be adjusted to guarantee the resource is charging with co-located solar energy. This p-min adjustment could then inform the optimization in a way where the storage resource is guaranteed to absorb the solar for ITC capture purposes. Further, CESA believes it may be vaible to link the adjusting P-min to renewable resource forecasts. This latter step then helps integrate and leverage the CAISO's VER-forecasting tools.

Conclusion:

CESA appreciates the opportunity to comment on these important issues and looks forward to further work with the CAISO and stakeholders to develop or improve energy storage participation paths.