

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking to  
Develop an Electricity Integrated  
Resource Planning Framework and to  
Coordinate and Refine Long-Term  
Procurement Planning Requirements

Rulemaking 16-02-007  
(Filed February 11, 2016)

**REPLY COMMENTS OF THE DEPARTMENT OF MARKET MONITORING OF  
THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION**

The Department of Market Monitoring (“DMM”) of the California Independent System Operator Corporation (“CAISO”) submits these reply comments on the *Assigned Commissioner and Administrative Law Judge’s Ruling Initiating Procurement Track and Seeking Comment on Potential Reliability Issues*, issued June 20, 2019 (“Ruling”).

**Increased reliance on energy-limited and availability-limited resources**

DMM shares concerns expressed by other parties about increased reliance on energy-limited or availability-limited resources to meet resource adequacy (RA) requirements in the coming years, as a significant amount of gas and nuclear capacity now providing RA capacity is retired.<sup>1</sup> These energy-limited or availability-limited resources include renewables, import capacity, demand-side resources and energy storage. Unlike gas and nuclear capacity, these resource types may have limited availability to meet both peak demand and demand across all multiple hours in an operating day. When available, these resources could also be very expensive to

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<sup>1</sup> CAISO comments on Ruling (pp. 3-6), NRG comments on Ruling (p. 7)

dispatch. If increased reliance is placed on these resources to meet RA requirements, DMM is concerned that the RA fleet could have limited output during hours when net loads – and the potential for uncompetitive supply conditions – are highest. Such energy-limited or availability-limited resources provide limited benefits in terms of mitigating potential system market power in CAISO’s markets. Increased reliance on these resources to meet RA requirements is likely to increase the potential for market power in CAISO markets and uncompetitive system market conditions could become more frequent.

The Energy Division’s analysis of the system RA composition in forward years shows a projected increase in import and battery capacity (LESR) as gas and nuclear generation retires.<sup>2</sup> While renewable capacity is expected to increase, new ELCC factors will limit these resources’ contribution to meeting RA requirements. The Ruling indicates that new solar and wind resources are expected to be added to meet RPS requirements (about 2,200 MW of nameplate capacity during 2020 and 2021), but after new ELCC factors are applied this would amount to just a 300 MW increase in available system RA.<sup>3</sup>

SCE adds that system peak is projected to shift later in the year and later in the day, further decreasing solar resources’ contribution to meeting peak load.<sup>4</sup> SCE’s analysis shows that solar is expected to provide little to no contribution to peak demand in forward years.<sup>5</sup> DMM agrees with SCE’s conclusion that 2020 ELCC values would

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<sup>2</sup> Ruling, p. 12

<sup>3</sup> Ruling, p. 14.

<sup>4</sup> SCE comments on Ruling, p. 11

<sup>5</sup> SCE comments on Ruling, Table 6, p. 24

likely still overstate the contribution of solar resources to meeting demand in peak net load hours in the coming years.

In opening comments, the CAISO also analyzed the capability of the projected RA fleet to serve load over multiple hours, showing that the availability of the RA fleet is expected to decrease approaching the gross peak, potentially falling below capacity requirements in evening hours.<sup>6</sup> The anticipated shortfalls are primarily due to solar generation dropping off in evening hours.

The Commission's Ruling describes other potential options to address short-term reliability needs which include new storage and/or demand response procurement.<sup>7</sup> In response to the Commission's proposed solutions, various parties have encouraged the Commission to consider authorized procurement of "preferred" technology types such as storage, hybrid resources, and demand response.<sup>8</sup> While the analyses provided by CAISO and SCE show potential capacity shortfalls attributed to drops in solar production, the analyses by the CAISO and SCE both assume that RA imports, demand response, and battery storage capacity will be available at levels equal to these resources' NQC values.

While energy-limited resources may be counted towards meeting RA requirements, relying on these types of resources to meet an increased share of energy needs during ramping hours could result in increased market power and high market prices when high cost RA capacity is called upon. Going forward, it will be important for the Commission, CAISO, and stakeholders to consider rules governing contracting

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<sup>6</sup> CAISO comments on Ruling, pp. 3-6

<sup>7</sup> Ruling, p. 14.

<sup>8</sup> Comments on Ruling of: CESA (p. 18), Environmental Defense Fund (p. 3), C Power and Enel X North American comments (p. 4)

practices and market participation in order to ensure the future RA fleet will be available at reasonable cost during critical system and market conditions.

### **Analysis of energy and availability-limited resources in CAISO markets**

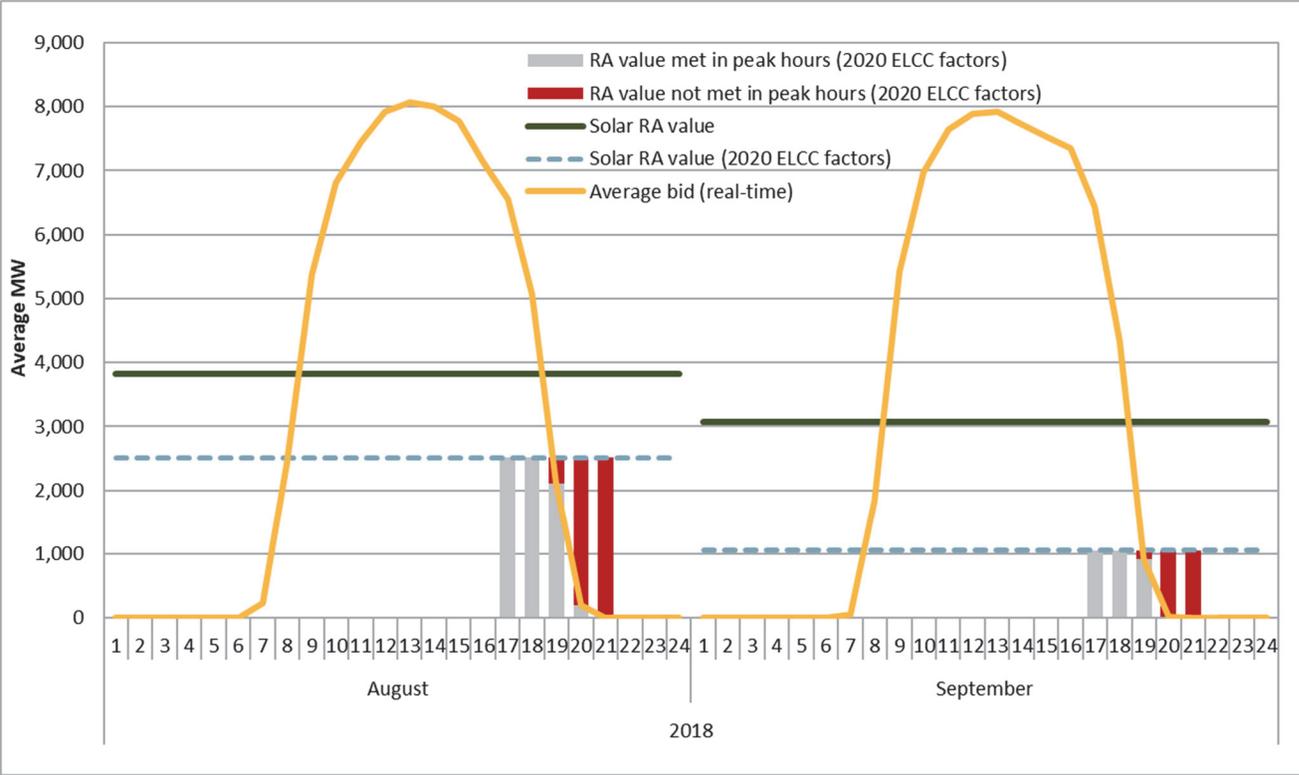
In these reply comments, DMM provides additional analyses on the actual availability of energy-limited (or availability-limited) resources such as solar, imports, demand response, and battery capacity in peak net load hours. DMM's analyses of market participation by these resources focuses on summer months of 2018 during CAISO Availability Assessment Hours (hours ending 17 through 21 on non-holiday weekdays). The CAISO has identified these hours as coinciding with highest net load and are hours in which the CAISO's Resource Adequacy Availability Incentive Mechanism (RAAIM) is applied to RA capacity.

DMM's analysis in these comments shows that these resource types have generally had limited availability during peak net load hours when the CAISO would count on resource adequacy capacity to be available the most. In addition, when import, demand response, and battery capacity is available, this capacity is relatively expensive to dispatch during high net load periods. DMM believes the costs and actual operation of these types of resources in CAISO markets to meet both peak demand and energy needs will be important to consider in procurement directives, particularly if these resources will comprise an increasing share of the RA fleet going forward.

**Solar Resources**

Figure 1 shows average hourly solar RA availability based on real-time bids in August and September 2018, compared to solar RA values. The dashed line represents RA values adjusted for 2020 ELCC factors adopted by the Commission.<sup>9</sup> As reflected in Figure 1, during August 2018, solar capacity’s contribution to meeting RA requirements was overstated in hours 19-21. Under updated 2020 ELCC factors, RA values for these solar resources would still have been overstated in hours 19-21. In September 2018, the actual availability of solar compared to RA values based on 2020 ELCC factors averaged 87% of RA value in hour 19, 1.2% of RA value in hour 20, and <1% of RA value in hour 21.

**Figure 1. Average hourly solar availability v. RA values**



<sup>9</sup> 2020 ELCC values for solar resources are 27% in August and 14% in September

## ***RA Imports***

DMM has longstanding concerns that RA imports may have limited availability and value during critical system and market conditions. Some parties have pointed to a recent CAISO analysis on the real-time performance of RA imports<sup>10</sup> to suggest that concerns about speculative import supply may be overstated.<sup>11</sup> However, DMM's concerns about the availability RA imports extends beyond the real-time market. Import capacity has no further bid obligation in real-time if not scheduled in the day-ahead market or residual unit commitment process ("RUC"). Additionally the bid obligation for import RA into RUC is limited to CAISO Availability Assessment Hours. DMM is concerned that import resource adequacy providers could simply price their capacity out of the day-ahead market with no further obligation to be available in real-time.

Figure 2 shows the average hourly volume of import RA capacity cleared in the day-ahead market in 2018. In summer months over CAISO assessment hours, 75% of import RA capacity cleared the day-ahead market on average.

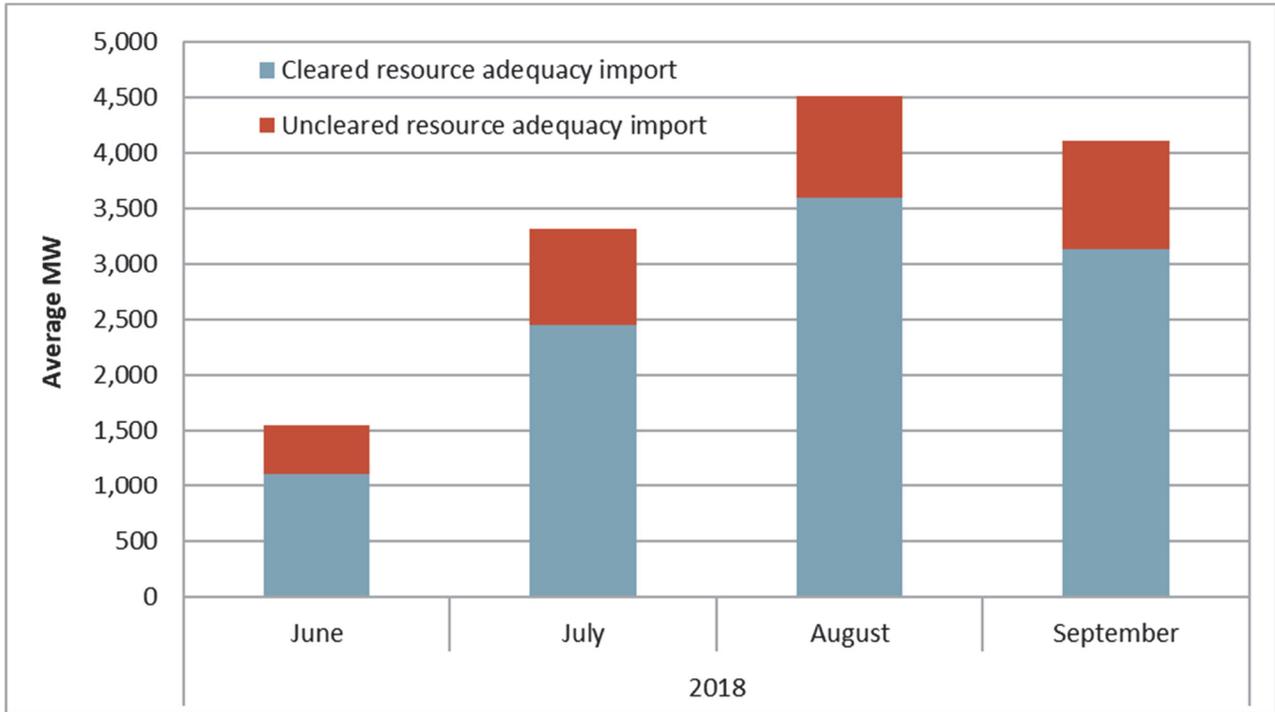
Figure 3 summarizes energy bid prices of RA imports in the day-ahead market in August 2018. On average, import RA capacity that did not clear the day-ahead market during CAISO availability assessment was offered at prices that exceeded \$250/MWh. About 437 MW, or 12% of total import RA capacity, was offered into the day-ahead market at prices \$750 or higher in August assessment hours.

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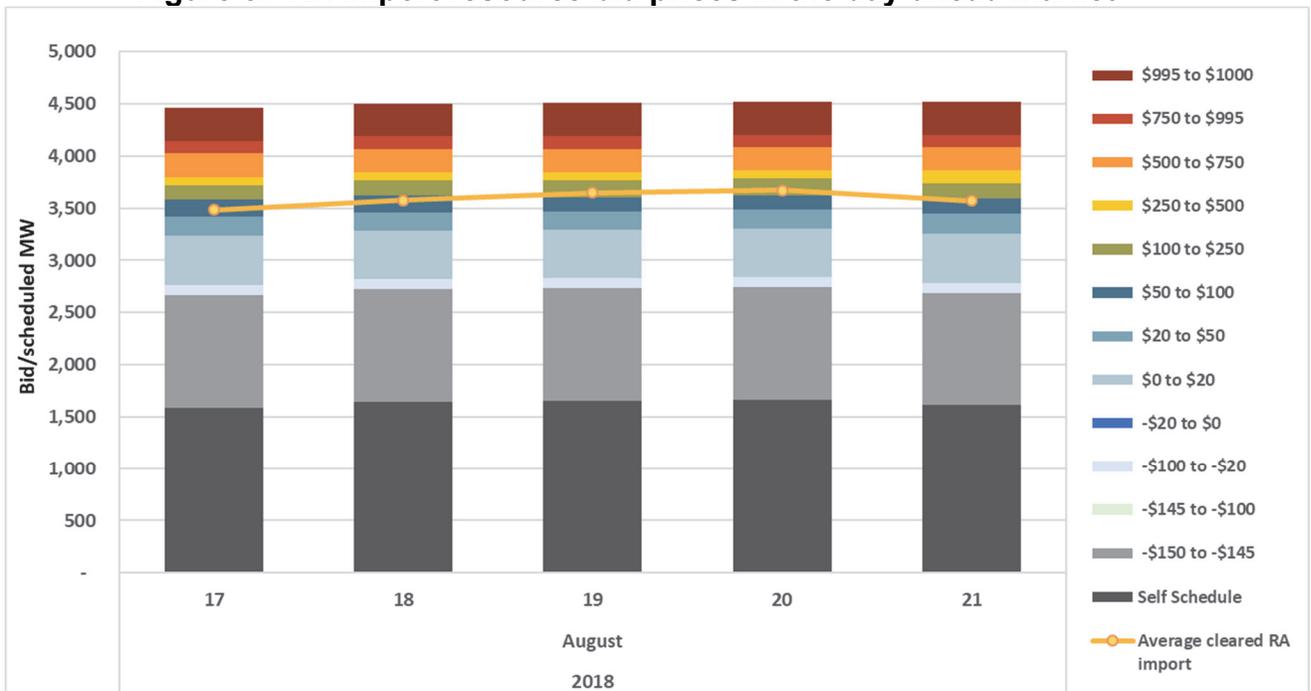
<sup>10</sup> *Resource Adequacy Enhancements Revised Straw Proposal*, California ISO, July 1, 2019, p. 43.

<sup>11</sup> CalCCA comments on Ruling (pp. 14-15)

**Figure 2. Average hourly RA import capacity offered/cleared in the day-ahead market during RA Availability Assessment Hours**



**Figure 3. RA import resource bid prices in the day-ahead market**



The Commission's Ruling proposes to discount the amount of import RA that can count towards meeting the proposed peak capacity requirement by 1/3 to address concerns about increased reliance on import capacity.<sup>12</sup> DMM agrees with other parties that applying a limit on potential import RA capacity may artificially constrain the supply of import RA, particularly import capacity that has been available and reliable.<sup>13</sup> Instead, DMM supports re-evaluating CAISO and CPUC rules governing requirements for imports to provide resource adequacy and participate in the energy market.

DMM supports options to improve the reliability and deliverability of import capacity such as those being discussed under R.17-09-020<sup>14</sup>. Potential solutions discussed under the ruling include considering negotiated strike prices or offer caps within import RA contracts, or fixed-for-float contract options overseen by the CPUC. DMM has also recommended that the CAISO consider a form of real-time availability or bidding requirement for RA imports.<sup>15</sup>

### ***Demand response***

Demand response can count towards meeting RA requirements under Commission rules in two different ways. Utility demand response programs can contribute toward reducing the overall system RA requirement. Alternatively, demand response resources can be shown directly on RA supply plans as supply-side resources. Resources on supply plans are subject to the same CAISO must offer and

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<sup>12</sup> *Ruling*, p. 15

<sup>13</sup> Powerex comments on Ruling (pp. 6-8), SDG&E comments on Ruling (pp. 8-9)

<sup>14</sup> *Assigned Commissioner's Ruling Seeking Comment on Clarification to Resource Adequacy Import Rules*, R.17-09-020, July 3, 2019

<sup>15</sup> *Comments on Resource Adequacy Enhancements Revised Straw Proposal*, DMM, July 24, 2019, p. 5

market participation rules as other RA resources, while demand response used to reduce RA requirements is not.

DMM agrees with Enel X and C Power that utility programs are not subject to the same level scrutiny as DR capacity shown as supply-side resources in terms of what is bid into the market and how well those resources perform.<sup>16</sup> If the Commission and CAISO plan to count on both types of DR capacity to be available to meet RA requirements, utility demand response and supply-side demand response capacity should both be accurately accounted for and rules should be in place to incentivize resource availability and performance from all DR resources.

Figure 4 compares the amount of utility demand response bid into the CAISO market during Availability Assessment Hours with the total amount of system RA credit attributed to these utility demand response programs.

- The blue line in Figure 4 shows the monthly demand response RA credit used to reduce the system RA requirement.
- The yellow bars show the average utility proxy demand response (“PDR”) capacity bid into the day-ahead market.
- The blue bars show the average utility reliability demand response (“RDRR”) bid into the real-time market. Only about ~140 MW of RDRR capacity is offered into the day-ahead market on average. RDRR capacity not bid or scheduled in the day-ahead market can only be offered in the real-time market at prices between \$950 and \$1,000/MWh.<sup>17</sup>

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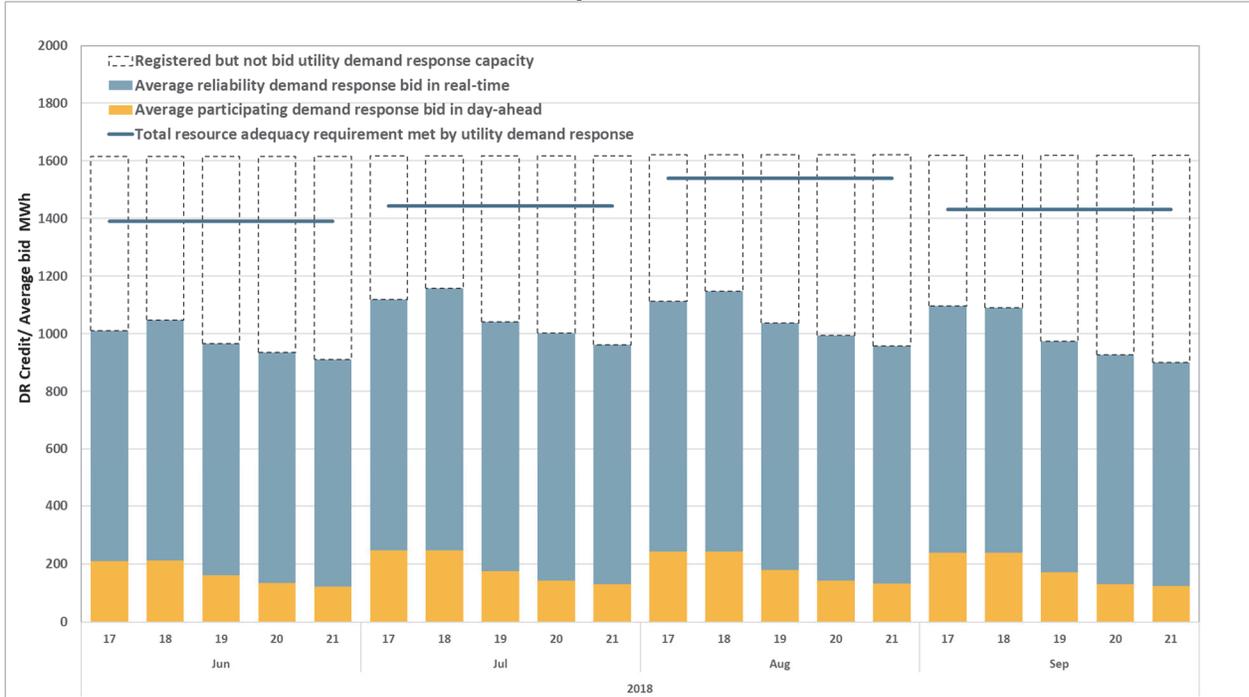
<sup>16</sup> C Power and Enel X comments on Ruling, p. 10

<sup>17</sup> Utility PDR is generally bid into the day-ahead market and not bid in real-time if not scheduled day-ahead. Conversely, only a small percentage of utility RDRR is bid into the day-ahead market.

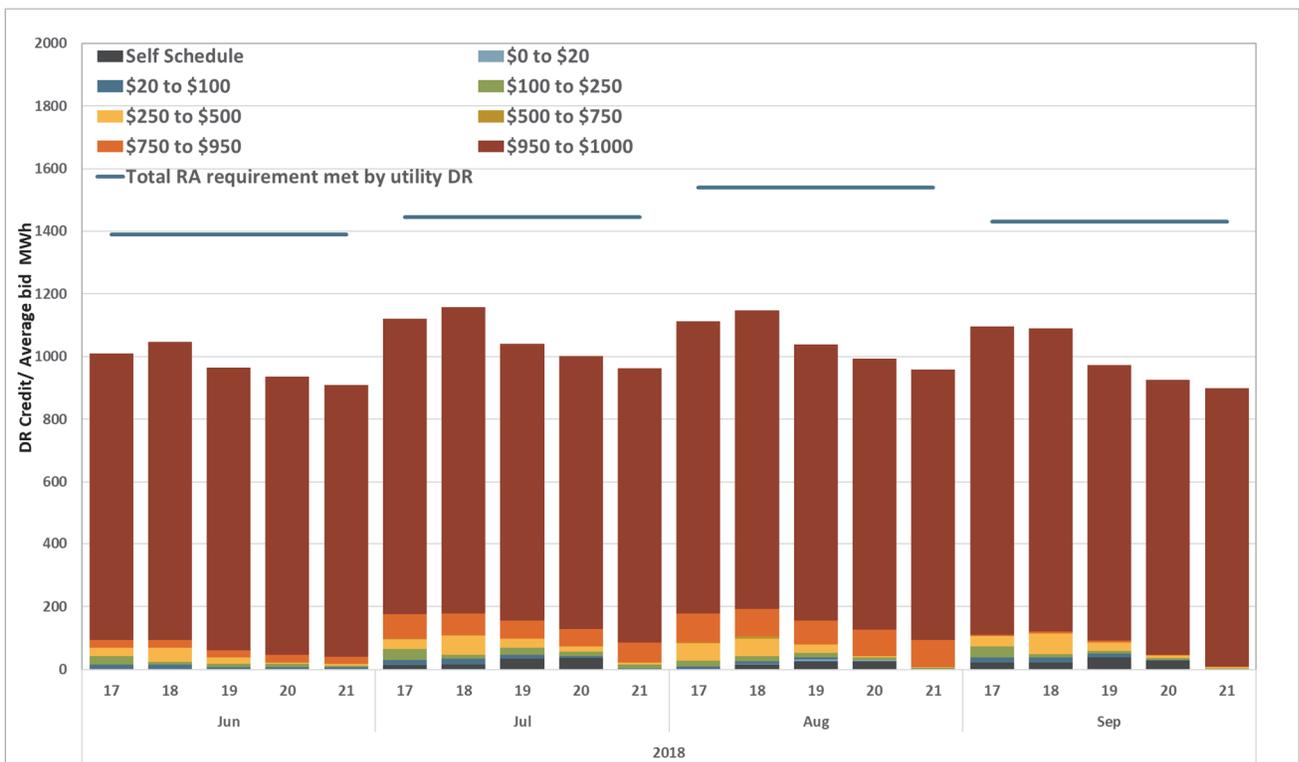
As shown in Figure 4 (and after accounting for ~140 MW of utility RDRR offered into the day-ahead market each hour), the total amount of utility demand response bid into the day-ahead market is about 1,000 to 1,400 MW below the amount by which RA requirements are reduced or allowed to be met by utility demand response resources in peak demand hours. After including RDRR resources bid into the real-time market (at very high prices), the total amount of utility demand response actually offered in the CAISO markets was about 300 to 600 MW below the amount by which RA requirements are reduced or met by utility demand response resources.

DMM understands that some utility demand response programs may still have not been fully integrated into the CAISO market in 2018. However, Figure 4 shows that utility DR capacity being offered in the CAISO market falls well below the total registered capacity (registered Pmax) by a very significant margin in both the day-ahead and real-time markets. Additionally, as shown in Figure 5, when utility DR capacity was made available to the CAISO, this capacity was generally offered at very high prices at or near the \$1,000/MWh offer cap.

**Figure 4. Availability of utility DR vs. DR credit applied to reduce system RA requirement**



**Figure 5. Hourly bid prices of utility PDR (in day-ahead) and RDRR (in real-time)**



## **Battery Storage Resources**

Under Commission rules, a resource must be able to operate for four consecutive hours at its RA value to be able to sell that capacity as resource adequacy. In the CAISO market, batteries participate under the Non-Generator Resource (“NGR”) model. An NGR resource can reflect (bid) its full RA value in all hours, but the resource’s potential output is ultimately constrained by its state-of-charge.

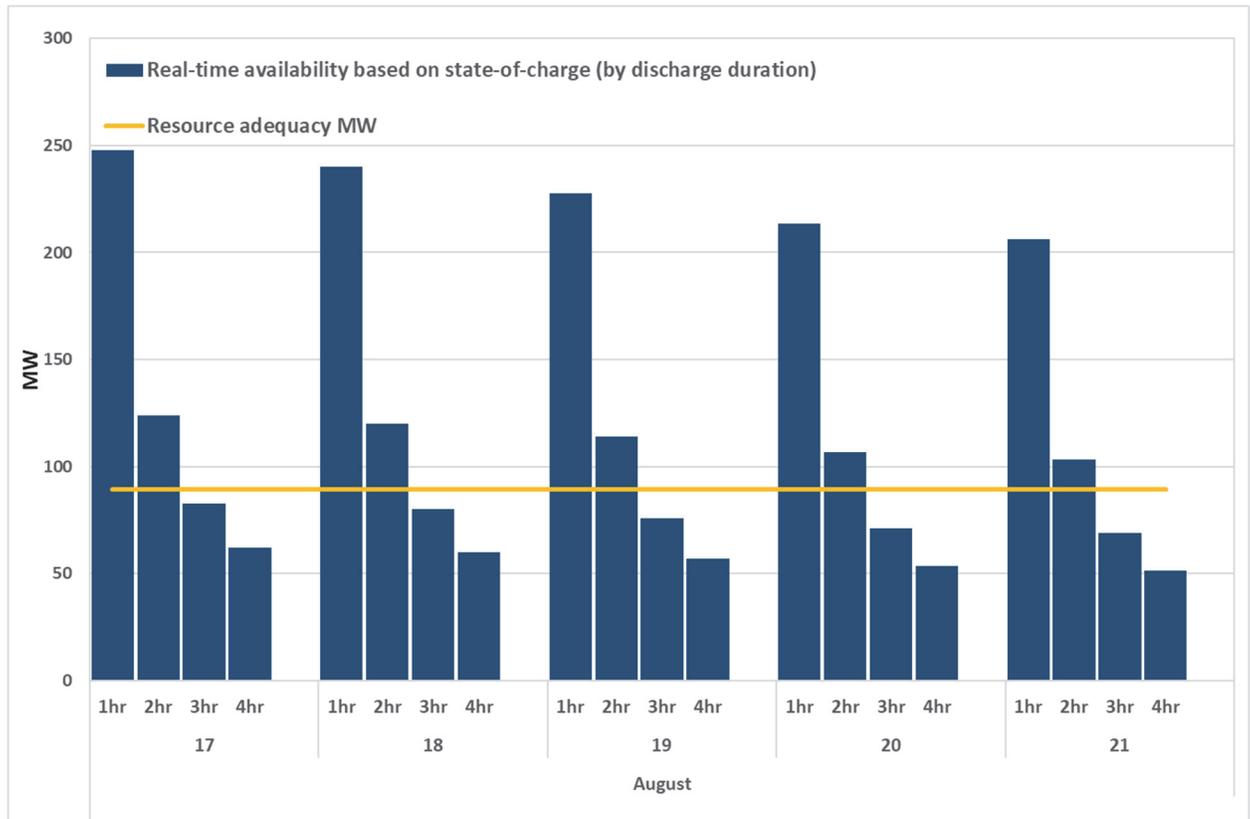
Figure 6 compares the total RA capacity of battery resources in August 2018 to the fleet’s average availability during CAISO assessment hours based on resources’ real-time state-of-charge.<sup>18</sup> The yellow line reflects the total RA capacity of battery storage resources in August 2018 based on current RA rules. The blue bars depict the battery fleet’s average hourly available discharge for one to four hours duration. For example, the 4-hour bar under hour 17 shows that on average, based on average state-of-charge of the battery RA fleet in hour 17, these resource could provide 62 MW for four consecutive hours starting hour 17. This availability falls under the expected capability of the battery RA fleet, which would be to be able to provide 89.5 MW for four consecutive hours.

As shown in Figure 6, on average, RA batteries were unable to provide total RA values for three and four consecutive hours across CAISO assessment hours in August 2018.

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<sup>18</sup> Only August 2018 results are depicted this section but June – September 2018 showed very similar trends.

**Figure 6. Battery RA resource availability in August 2018 by discharge duration**



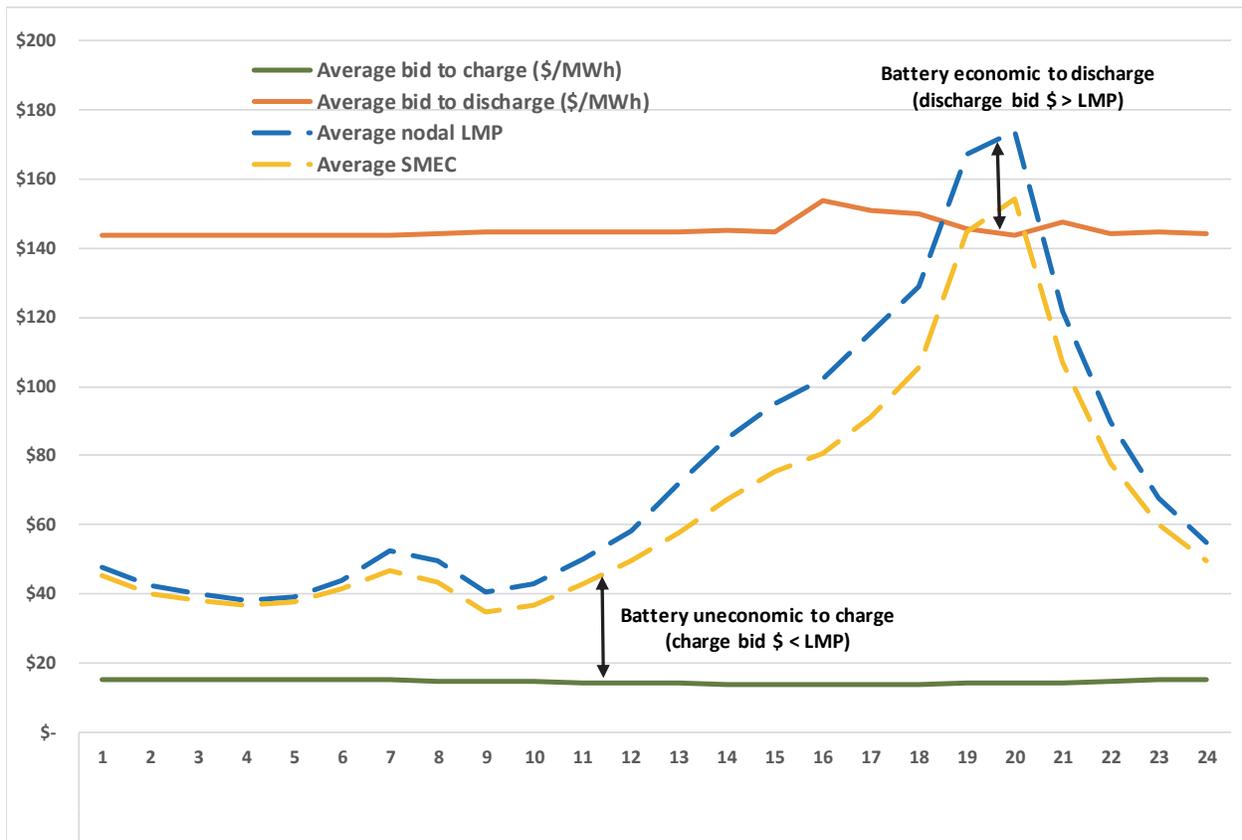
The state-of-charge of NGR resources (batteries) in peak net load hours is directly impacted by a resource’s operation in preceding intervals. For example, if a NGR resource does not charge earlier in the day, it may have limited ability to operate for consecutive hours at its RA value during ramping and peak net load hours.

To illustrate and assess this issue, DMM performed further analysis of the day-ahead bids of batteries providing RA capacity compared to nodal prices during August 2018. As highlighted in Figure 7, this analysis shows that energy from batteries was bid at prices that would be dispatched to discharge only in hours 19 and 20.<sup>19</sup> However, these resources’ bids to be charged were generally to lower than market prices in the

<sup>19</sup> Resources’ bids are weighted by MWs in each bid segment. Nodal LMPs are weighted by total capacity bid at each resource node.

other hours of the day. Therefore, even though battery resources were economic to discharge in net peak load hours, bid prices submitted to charge in prior hours limited these battery resources' state-of-charge, thereby constraining these resources' ability to discharge up to RA values in peak hours.

**Figure 7. Average bid prices to charge and discharge vs. nodal LMPs and SMEC of RA battery resources (August 2018)**



Battery owners have indicated that that cycling and cell augmentation costs comprise a significant component of overall costs that battery resource owners face. Under the CAISO's current NGR model, a resource owner might reflect these costs within charge or discharge bid ranges, further increasing the spread between willingness to charge and discharge. However, the availability of batteries or price at

which suppliers offer battery capacity in the market could be further constrained by contractual limitations, warranties, or performance guarantees.

To ensure battery resources' bid prices reflect short run marginal costs and to potentially improve the availability of battery capacity, DMM supports the CAISO's efforts to subject energy storage resources to local market power mitigation in its Energy Storage and Distributed Energy Resources Phase 4 ("ESDER 4") initiative. DMM has recommended that the CAISO evaluate costs that battery resources incur in order to develop accurate default energy bids.

DMM also understands that the CAISO's current structures for modeling batteries may not accurately reflect the ways in which operating a battery accelerates the need for the owner to incur significant, lumpy maintenance costs such as augmenting battery cells. Therefore, DMM has also supported considering enhancements to the NGR model to accommodate costs that suppliers perhaps today, cannot reflect efficiently in the current participation model.<sup>20</sup> Accurately modeling the actual causes of battery costs within a market participation model should allow market participants to efficiently limit the kinds of battery operations that cause significant maintenance costs and allow resources to recover these costs through market revenues.

Finally, DMM suggests that the Commission could ensure that procurement of batteries does not include contractual provisions that may limit resources' actual use in ramping hours when the CAISO expects to need these resources the most.

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<sup>20</sup> *Energy Storage and Distributed Energy Resources Phase 4 Straw Proposal Comments*, DMM, May 21, 2019: [http://www.caiso.com/Documents/DMM\\_Comments-EnergyStorageandDistributedEnergyResoucesPhase4-StrawProposal.pdf](http://www.caiso.com/Documents/DMM_Comments-EnergyStorageandDistributedEnergyResoucesPhase4-StrawProposal.pdf)

## **CPUC and CAISO Policy Options**

DMM believes that potential changes to CAISO or CPUC rules could alleviate some concerns about RA resource availability and should be considered in any procurement directives. DMM has suggested potential changes to CPUC and CAISO rules that could help mitigate availability concerns related to import and battery resources. These recommendations include considering a form of real-time must-offer for RA import capacity,<sup>21</sup> and developing default energy bids and subjecting battery resources participating under the CAISO's Non-Generator Resource ("NGR") model to local market power mitigation.<sup>22</sup>

The CAISO is also considering alternative RA counting methodologies for demand response resources<sup>23</sup> and is proposing to apply forced outage rates to resources' NQC values to better reflect the actual dependable capacity of RA resources.<sup>24</sup> DMM supports each of these efforts, which could better capture these resources' actual capability to meet RA requirements and help ensure this capacity is available in the market. However, further discussion of these and other potential rules governing participation of availability-limited resources in the CAISO market will be

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<sup>21</sup> *Comments on Resource Adequacy Enhancements Revised Straw Proposal*, DMM, July 24, 2019, p. 5  
<http://www.caiso.com/Documents/DMMComments-ResourceAdequacyEnhancements-RevisedStrawProposal.pdf>

<sup>22</sup> *2018 Annual Report on Market Issues and Performance*, DMM, May 2019, p. 24:  
<http://www.caiso.com/Documents/2018AnnualReportonMarketIssuesandPerformance.pdf>

<sup>23</sup> *Energy Storage and Distributed Energy Resources Phase 4*, California ISO, April 26, 2019:  
<http://www.caiso.com/Documents/StrawProposal-EnergyStorageandDistributedEnergyResourcesPhase4.pdf>

<sup>24</sup> *Resource Adequacy Enhancements Revised Straw Proposal*, California ISO, July 1, 2019:  
<http://www.caiso.com/Documents/RevisedStrawProposal-ResourceAdequacyEnhancements.pdf>

important to ensure RA capacity can be available to the CAISO during critical system and market conditions at reasonable cost.

### **Local RA needs**

The Commission asks parties in its Ruling whether it should also be concerned about local resource adequacy needs, in addition to the system needs discussed in the Ruling. DMM agrees with other parties that local RA needs should also be considered in any forward procurement decisions within the IRP proceeding.<sup>25</sup> CAISO backstop procurement has primarily been used to address local or sub-local reliability issues. Additionally, OTC retirements could further constrain supply in local areas capacity and increase potential local market power. DMM has consistently found that many local capacity areas are non-competitive with one or two entities owning most of the generation needed to meet local capacity requirements.<sup>26</sup> Furthermore, gas resource retirements could exacerbate non-competitive conditions in these local areas and sub-areas. When determining what resources could optimally address both system and local forward capacity needs, the Commission should consider resources that could be effective to address both system and local constraints.

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<sup>25</sup> CESA p.14, Public Advocates Office pp. 6-7

<sup>26</sup> *2018 Annual Report on Market Issues and Performance*, DMM, May 2019, pp. 161-162.  
*2017 Annual Report on Market Issues and Performance*, DMM, June 2018, pp. 154-155.

Respectfully submitted,

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