Energy Storage and Distributed Energy Resources (ESDER) Phase 3

Revised Straw Proposal

Comments by Department of Market Monitoring

July 6, 2018

I. Overview

DMM appreciates the opportunity to comment on the ISO's *Energy Storage and Distributed Energy Resources (ESDER) Phase 3 Revised Straw Proposal* and recent working groups.

The ISO's proposed market design changes under ESDER3 include: new bid options for demand response (DR) resources, removing the single load serving entity (LSE) requirement for DR aggregations, developing a load shift product, allowing sub-metering for electric vehicle supply equipment (EVSE) load, and developing a process to define use-limited status for Non Generator Resources (NGRs).

DMM continues to support the ISO's proposed bidding enhancements for demand response (DR) resources. The proposed bid enhancements should provide an effective tool for scheduling coordinators to prevent infeasible 5-minute dispatches for certain DR resources. DMM suggests that the ISO allow other types of resources that cannot respond to five minute dispatch to qualify to use the less flexible bid options being proposed. DMM has confirmed that other types of resources including some wind and solar resources have difficulty responding to 5 minute dispatches as a result of physical limitations.[1] DMM suggests that the ISO develop a registration process for any type of resource to qualify to use the proposed bid options.

DMM also provides feedback on the load shift product design including the proposed baseline calculation for load shift resources (PDR-LSR). Conflicting dispatches under a two resource ID model could arise when intertemporal constraints are honored for the curtailment resource ID, even if the curtailment ID is required to have a 0 MW Pmin.[2] DMM outlines three scenarios that could result in conflicting dispatches between two resources IDs. If a PDR-LSR resource is expected to meet both dispatch instructions in the same interval, the ISO should make stakeholders aware of performance expectations.

DMM also notes that the proposed baseline calculations for PDR-LSR could incent behavior misaligned with system needs on non-event days in order to generate favorable baselines. This

[1] See *2017 Annual Report on Market Issues and Performance*, Department of Market Monitoring, June 2018, p. 107: http://www.caiso.com/Documents/2017AnnualReportonMarketIssuesandPerformance.pdf

[2] See *Energy Storage and Distributed Energy Resources Phase 3*, California ISO, June 25, 2018, p. 11: http://www.caiso.com/Documents/Agenda-EnergyStorageandDistributedEnergyResourcesPhase3-June252018.pdf

type of incentive misalignment exists today for DR under current baseline calculations but becomes more pronounced under the PDR-LSR model that considers both consumption and curtailment. Using historic like-hours or intervals for the baseline calculation also allows resources with a storage device to easily shift charge/discharge between intervals to maintain favorable baselines without providing the system any incremental benefit. DMM suggests that the ISO study alternative baseline approaches which eliminate incentive issues that could be utilized in the future for resources with behind the meter storage.

Lastly, DMM encourages the ISO to continue working with stakeholders to identify limitations of its storage participation models and where costs or constraints faced by storage resources could be more efficiently reflected in these models. Stakeholders have suggested deferring NGR modeling enhancements, currently in the ESDER3 scope, to a future stakeholder process. Some stakeholders mentioned in comments that NGR modeling enhancements could be deferred because energy bids provide room to reflect additional costs as they are not subject to market power mitigation today.[3] This reasoning should not be considered sustainable. Costs that scheduling coordinators reflect in NGR energy bids that are not marginal costs should be reflected explicitly in the market, not conflated with marginal cost offers. DMM also reiterates that outages and hard constraints should not be used to manage resource constraints that are actually economic in nature. DMM notes that enhancements to the ISO's storage participation models may be necessary, given model parameters specified in FERC Order 841. The ISO could use Order 841 compliance as a means to facilitate further discussion on potential storage model enhancements.

The following sections provide more detail on these concepts.

II. Load Shift Product

Two resource ID model

DMM has identified three scenarios in which a PDR-LSR resource under a two resource ID model could receive dual or conflicting dispatches between its resource IDs, even if the curtailment resource ID is required to have a 0 MW Pmin. Because the PDR model accommodates intertemporal constraints, two distinct dispatches between the two resource IDs can result. These scenarios call to question whether PDR-LSR could feasibly follow two separate dispatch instructions. In these examples, the single resource's supply/curtailment ID is called ID1 and the resource's load/consumption ID is called ID2:

1) Scenario 1: ID1 has a minimum run time of 1 hour and is scheduled through HE21. ID1 is economic in the first two intervals of HE 21 (intervals 00 and 15) and scheduled at 5MW,

[3] Comments of the California Energy Storage Alliance (CESA) on CAISO ESDER 3 Revised Straw Proposal, May 21, 2018, p.4: http://www.caiso.com/Documents/CESAComments-EnergyStorage-DistributedEnergyResources-RevisedStrawProposal.pdf

but is ramped down starting in the third interval of HE 21 (interval 30). ID1 is uneconomic in interval 30, but its ramp rate only enables it to ramp to 1MW by interval 30. Meanwhile, ID2 is economically dispatched to consume starting interval 30. The following schedules result:

	HE21, Int 00	**HE21, Int 15**	**HE21, Int 30**	**HE21, Int 45**
LMP	$500	$500	-$50	-$50
ID1 dispatch	5	5	**1**	0
ID2 dispatch	off	off	**-1**	-1

The resource receives conflicting dispatches in HE21 Int 30, when ID1 is ramping down.

To prevent conflicting dispatches in this scenario, the ISO could enforce that ramp rates enable each resource ID to be fully dispatchable between Pmin and Pmax between 15 or 5 minute intervals (depending on whether the resource was designated 15 or 5 minute dispatchable) so that neither ID will incur ramp constraints resulting in separate dispatches on the other ID. However, additional participation restrictions may be unnecessary if PDR-LSR can in fact meet both dispatch instructions. The ISO should seek to confirm that PDR-LSR with facility load and a storage device can meet potentially two separate dispatch instructions. If PDR-LSR can in fact meet two separate dispatch instructions, the requirement that Pmin must equal 0 MW may also be unnecessary.

This example assumed PDR-LSR could incur ramping limitations. However, even if PDR-LSR had infinite ramp, other types of dual or conflicting dispatches can result under the two resource ID model.

2) Scenario 2: ID1 has a start-up time of 1 hour and receives dispatches starting HE18 for 5MW. ID2 is economic during ID1's start-up time. The following schedules result:

	HE17, Int 00	**HE17, Int 15**	**HE17, Int 30**	**HE17, Int 45**	**HE18, Int 00**
LMP	-$50	-$50	-$50	-$20	$500
ID1 dispatch	**start-up time**				5
ID2 dispatch	**-5**	**-5**	**-5**	**-1**	off

ID2 could receive consumption dispatches during HE17 when ID1's start-up time is honored. ID1 requires advanced notice to curtail/generate as specified by its start-up time, but ID2 may be dispatched to increase load leading up to the curtailment.

The ISO should seek input from stakeholders on whether or not this type of schedule is feasible for a PDR-LSR.

3) Scenario 3: Even if ID1 has a 0 MW Pmin and both IDs have infinite ramp, ID1 and ID2 can receive two different dispatch instructions in the same interval. Suppose ID1 is scheduled through HE21 and its minimum run time of 1 hour is honored. However, ID1 is no longer economic starting HE21 interval 30 and is dispatched down, sitting at 0MW through the balance of hour. Meanwhile, ID2 is economically dispatched to consume through the balance of HE21.

   Starting HE22, the system needs additional supply. The market schedules ID1 to ramp up (curtail/supply) and ID2 to reduce consumption.

	HE21, Int 00	**HE21, Int 15**	**HE21, Int 30**	**HE21, Int 45**	**HE22, Int 00**
LMP	$500	$500	-$50	-$20	$300
ID1 dispatch	5	5	0	0	**5**
ID2 dispatch	off	off	-5	-5	**0**

   Starting HE22, ID1 is asked to curtail (supply) 5MW and ID2 is asked to curtail (reduce consumption) 5MW. The market schedules 10 MWs of movement on the single resource between HE21 Int45 and HE22 Int00, not just 5MW of supply on ID1.

   The ISO should inform stakeholders if a single resource is expected to perform to both ID1 and ID2 dispatch instructions. In this example, the resource is expected to provide a total of 10MW to the system in the form of reducing load and/or increasing supply.

   Of note, ID1 and ID2 dispatches do not necessarily move symmetrically starting HE22. Dispatches on each resource ID depend on individual bid costs. It may only be economic to ramp ID1 up, only ID2, or some asymmetric combination of schedules across both IDs.

   Ultimately, like for the other scenarios above, the ISO should understand from stakeholders if this type of dispatch instruction is feasible.

Bid cost recovery (BCR) calculation for PDR-LSR

To the extent that a PDR-LSR can in fact follow two separate dispatch instructions on each resource ID, then treating BCR settlements separate for each resource ID could be appropriate.

Using Scenario 1 above, consider potential settlements in HE21, Int 30. Assume ID1's energy bid cost is $100/MWh. LMP is -$50/MWh. When ID1 is ramping down, ID1 is operating uneconomically and is charged to generate 1MW. ID1 does not recover its marginal costs through market revenues and (-$50/MWh - $100/MWh)*1MWh = ($150) would be eligible for BCR.

Assume ID2's bid cost is -$30/MWh. In the same interval, ID2 is inframarginal and earns profits equal to (-$50/MWh - (-$30/MWh))*-1MWh = $20.

Assuming this interval represents a whole day, if settlements are calculated separately for each resource ID, ID1 would receive $150 in BCR and ID2 would earn $20 in market profits. If calculations were netted across resource IDs, ID2's profits would offset BCR eligible to ID1. The PDR LSR resource would receive $130 in BCR total.

If a PDR-LSR can actually operate as two distinct resources and follow both resource ID dispatch instructions, the scheduling coordinator would have the incentive to split participation of its resource into two resource IDs that could be settled separately.

DMM believes it may be appropriate to settle PDR-LSR BCR separately for each resource ID if the resource can respond to both resource ID dispatch instructions. However, potential gaming opportunities should be further evaluated.

Baseline calculation for PDR-LSR

While some incentives to perform inefficiently exist today for traditional DR resources whose baselines are calculated from meter data, DMM believes incentive issues will be more pronounced when a similar methodology is used to calculate baselines for PDR-LSR resources.

The current PDR baseline approach creates an incentive for resources to increase load in high load hours on non-event days (hours where the DR resource is most likely to be called) in order to generate a more favorable baseline. The resource can maximize the baseline from which its load reduction is measured, maximizing its wholesale performance and compensation when scheduled by the ISO.

A PDR-LSR baseline under the ISO's proposal will be based on historical meter data for both the curtailment *and* consumption sides of the resource. The curtailment baseline introduces the same incentive issue that exists for traditional DR resources. An equivalent consumption baseline would also incent a resource to charge in intervals outside of expected oversupply

intervals. The storage resource could maximize its baseline in expected oversupply hours (maximum baseline for the consumption resource is 0), maximizing its wholesale performance and compensation when scheduled by the ISO. Assuming the storage resource was previously indifferent to when it charged, the prospect of wholesale compensation would incent the scheduling coordinator to shift charging outside of midday hours where negative prices are expected.

Using historic like-hours or intervals for PDR-LSR baseline calculations also allows resources with a storage device to easily shift charging and discharging between intervals to maintain favorable baselines without providing the system any incremental benefit (potentially even incenting the resource to operate contrary to system needs on non-event days). For example, suppose a storage resource's HE12 baseline was -1MWh. In subsequent HE12's, the storage resource could simply shift its charging activities to other hours or even discharge in subsequent HE12's to move its consumption baseline back to zero. Absent wholesale incentives, the scheduling coordinator would not have altered its consumption patterns.

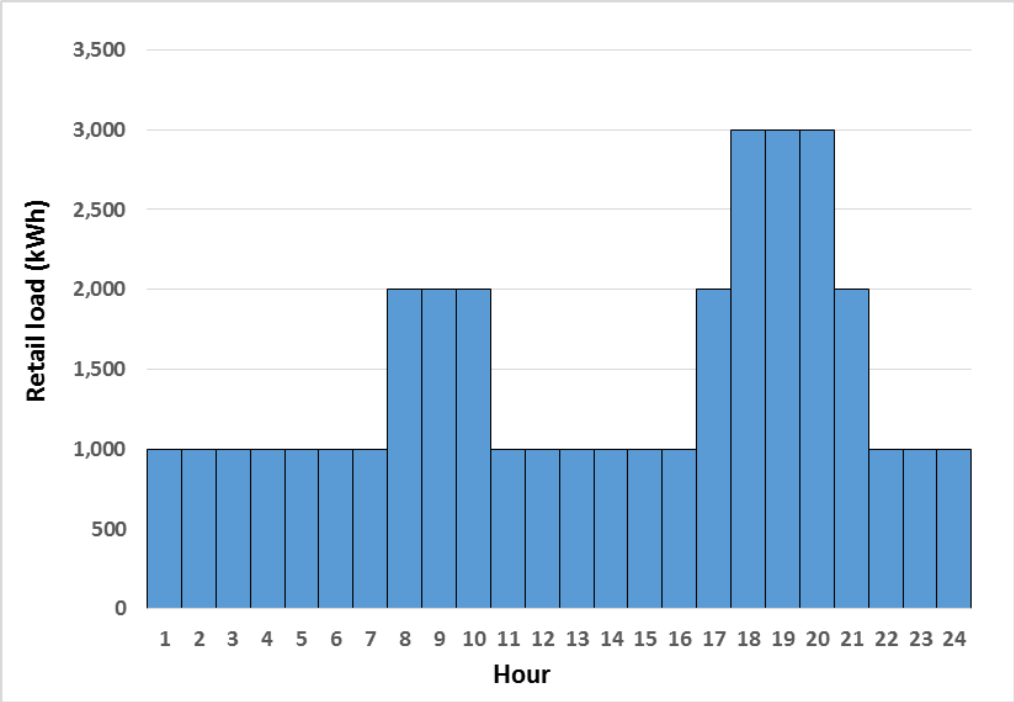
DMM believes the incentive impacts of a 10-in-10 baseline could be more pronounced for PDR-LSR than traditional DR. Assuming traditional DR and PDR-LSR have the same facility load profile:

- For traditional DR to increase its baseline, it must increase load above its typical profile and incur additional retail charges; For PDR-LSR to alter its baseline, the storage component of a PDR-LSR could simply shift charging to other intervals that it would have performed regardless without impacting its retail settlement.
- A storage asset can also act independently of its host load and serve part of its load with stored energy, charging at retail and offsetting retail demand in other intervals. So PDR-LSR can meet the same load profile as a traditional DR asset at the same retail cost, but operate in a way that also optimizes its baseline.

This second issue is illustrated by the example in the following figures. In this example, assume a flat retail rate of $0.15/kWh. As shown in the following example, with storage, the PDR-LSR facility load can still be met at the same retail cost, but the storage device can effectuate a favorable consumption baseline in midday hours in the process.

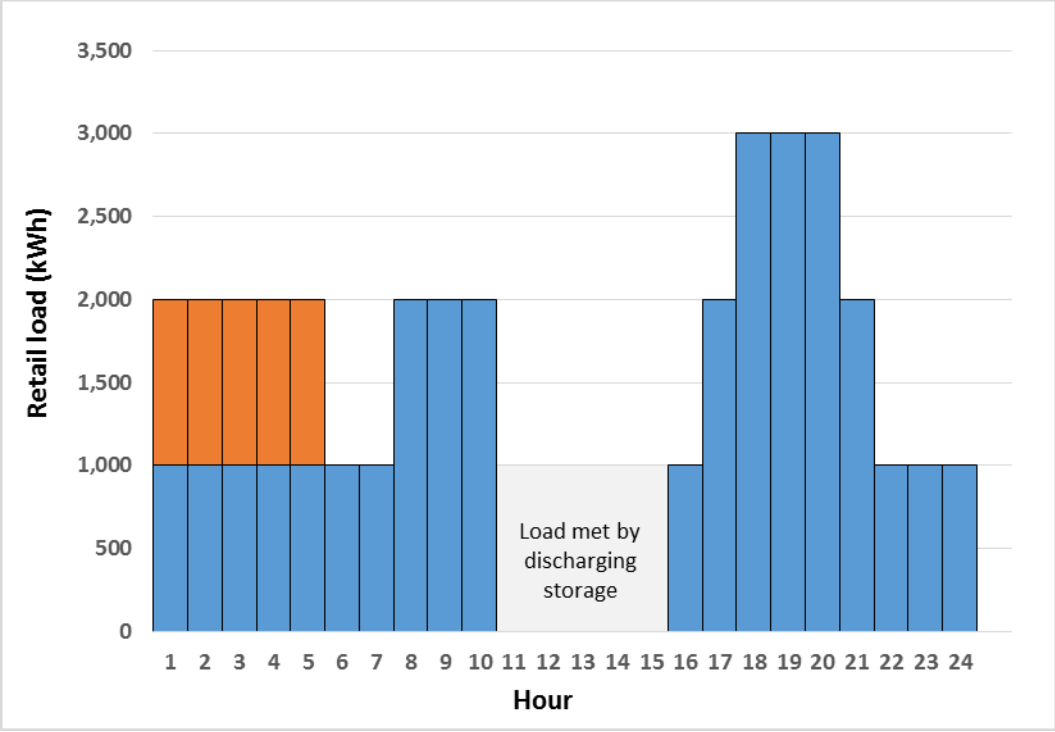
DMM appreciates the complexity and challenges in designing effective baselines for behind the meter resources that participate in the wholesale market. DMM suggests that the ISO continue to study alternative baseline approaches that eliminate incentive issues, which could be utilized in the future for resources with behind the meter storage.

1) Facility load profile:



Total retail cost = $5,250

2) Facility load with storage – storage device (orange) charges at retail in HE1-5 and discharges to offset load in HE11-15:



Total retail cost = $5,250

III. Additional bid options for DR resources

DMM continues to support the ISO's proposal to allow certain DR resources to use bid functionality currently available for intertie transactions. These options – hourly block and 15 minute dispatchable should help DR resources better manage their schedules, supporting feasible market awards and efficient market outcomes. DMM suggests that the ISO also allow other types of resources that cannot respond to five minute dispatch to qualify to use the less flexible bid options being proposed. DMM has confirmed that other types of resources including some wind and solar resources have difficulty responding to 5 minute dispatches as a result of physical limitations.[4] DMM suggests that the ISO develop a process by which any type of resource could become eligible to use the proposed bid options.

DMM notes that allowing DR to use the hourly block bid functionality available for intertie transactions may require additional modeling features or bid provisions to accommodate intertemporal constraints. Because HASP optimizes schedules over one hour, if a DR resource's start-up time plus minimum run time exceeds one hour, can the resource be effectively evaluated in the HASP?

IV. Storage modeling enhancements

DMM encourages the ISO to continue working with stakeholders to identify limitations of its storage participation models and where costs or constraints faced by storage resources can be more efficiently reflected in these models. Stakeholders have suggested deferring NGR modeling enhancements, currently in the ESDER3 scope, to a future stakeholder process. Some stakeholders mentioned in comments that NGR modeling enhancements could be deferred because energy bids provide room to reflect additional costs as they are not subject to market power mitigation today.[5] This reasoning should not be considered sustainable. Costs that scheduling coordinators reflect in NGR energy bids that are not marginal costs should be reflected explicitly in the market, not conflated with marginal cost offers.

DMM reiterates that outages and hard constraints should not be used to manage resource constraints that are actually economic in nature.

DMM also notes that certain enhancements to the ISO's storage participation models may be necessary, given model parameters specified in FERC Order 841. The ISO could use Order 841 compliance as a means to facilitate further discussion on potential storage model enhancements.

[4] *2017 Annual Report on Market Issues and Performance*, Department of Market Monitoring, June 2018, p. 107.
[5] Comments of the California Energy Storage Alliance (CESA) on CAISO ESDER 3 Revised Straw Proposal, May 21, 2018, p.4