Memorandum

To: ISO Board of Governors

From: Keith Casey, Vice President, Market & Infrastructure Development

Date: August 29, 2018

Re: **Decision on the Energy Storage and Distributed Energy Resource phase 3 (ESDER 3) proposal**

This memorandum requires Board action.

EXECUTIVE SUMMARY

Management continues its efforts to lower barriers and enhance the ability of energy storage and distributed energy resources, including demand response, to participate in the ISO market through the energy storage and distributed energy resources phase 3 (ESDER 3) initiative. ESDER is an on-going stakeholder initiative to address market participation issues unique to demand response, non-generator resources, and distributed energy resource (DER) multi-use applications. This third phase of the initiative (ESDER 3) contains four elements requiring the Board of Governors' approval:

1) New bidding and real-time dispatch options for demand response
2) Removal of the single load serving entity aggregation requirement and the application of a default load adjustment
3) Load shift product for behind the meter energy storage
4) Performance evaluation methodology for behind the meter electric vehicle supply equipment load curtailment

The first element of the proposal provides demand response resources with additional bidding options to better align with certain resources' dispatch limitations. Stakeholders expressed concerns about the inability for certain demand response resources to respond to ISO dispatches in real-time due to insufficient notification time and recognition of their minimum run-time. To address these concerns, Management proposes to offer two new bidding options for proxy demand resources (PDR) that are modeled off the bidding rules applicable to inter-tie resources. Under the proposed bidding rules, PDRs will have the option to provide real-time market bids as an hourly block or as a 15-minute dispatchable

resource.[1] Choosing to be either an hourly block or 15-minute dispatchable resource provides PDRs with a longer dispatch notification time and a known minimum length of dispatch to respond to real-time dispatches.

The second element under the ESDER 3 proposal is a simplification of the registration rules and settlement mechanisms for aggregated demand response resources. The ISO currently requires demand response resource aggregations to be contained within a single load serving entity (LSE), represented by one demand response provider, and within a single sub-load aggregation point (sub-LAP).[2] The single LSE requirement stemmed from the ISO's application of a default load adjustment, which is a settlement mechanism to prevent a double payment for the load reduction of a demand response resource when it was provided during times found not to be net beneficial to the market. Stakeholders have expressed difficulty meeting or maintaining the minimum 100 kW threshold for demand response aggregations due to the migration of customers to new LSEs such as Community Choice Aggregators. Management proposes to remove the single LSE requirement for demand response aggregations, eliminate the need for a default load adjustment settlement mechanism, and institute a new bidding rule to ensure demand response resources bids are net beneficial to the system.

The third element of the proposal is a new product that will provide an opportunity for a behind the meter battery storage resources to consume energy during oversupply conditions and return that energy to the system during times of need. The new product, called the proxy demand resource – load shift resource (PDR-LSR), will enable such resources to bid and be dispatched for both load consumption (charging, negative generation) and load curtailment (discharging, generation) when the demand response resource is supported by a behind the meter battery storage device.

Finally, the fourth element of the proposal provides for separate load curtailment performance measurement of electric vehicle charge management through sub-metered electric vehicle supply equipment (EVSE). Stakeholders requested the ISO provide the means to recognize the distinct nature and performance of a sub-metered EVSE separate from the host facility's performance evaluation. Management proposes to leverage policy developed in ESDER 1, the metered generator output methodology, to develop a performance evaluation methodology for EVSEs.

Management proposes the following motion:

Moved, that the ISO Board of Governors approves the Energy Storage and Distributed Energy Resource phase 3 proposal, as described in the memorandum dated August 29, 2018; and

[1] PDRs will still have the ability to respond to 5-minute real-time dispatches as they do today if those PDRs prefer to stay with existing bidding and dispatch rules and not elect to participate under these new bidding options.

2 A sub-LAP is a sub-region of pricing nodes grouped by similar grid conditions within a default load aggregation point.

Moved, that the ISO Board of Governors authorizes Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the proposal, including any filings that implement the overarching initiative policy but contain discrete revisions to incorporate Commission guidance in any initial ruling on the proposed tariff amendment.

DISCUSSION AND ANALYSIS

1) New bidding and real-time dispatch options for demand response

Management has recognized and worked towards resolving potential infeasible dispatch issues resulting from how the ISO's market optimization manages a demand response resource with a minimum operating level (Pmin) of 0 MW. Today, the ISO's market systems will issue a start-up instruction to a demand response resource to their Pmin, often 0 MW, well in advance of the commitment hour in the real-time market. This commitment ensures both start-up and minimum runtime constraints are met. Once these constraints are met, the optimization sees the resource as available for dispatch whenever the resource's energy bid is economic. This can result in 5-minute dispatch instructions with only a 2.5-minute notification time. Certain affected stakeholders have explained that this notification time is infeasible for many PDRs. In response, Management proposes to offer bidding options for PDRs that will provide longer notification times and extended real-time dispatch intervals, similar to what the ISO currently offers to intertie resources.

The two additional bidding options are:

Hourly block – The scheduling coordinator submits an hourly real-time market bid 75 minutes prior to the operating hour. If determined to be economic over the hour, the resource will be scheduled via the hour ahead scheduling process but will be settled at 15-minute market prices over the operating hour. The binding schedule is communicated to the scheduling coordinator at 52.5 minutes before the flow of energy. Because the resource is scheduled for the full hour, it will settle at the 15-minute market in real time making it a "price-taker" for the full hour.

15-minute dispatchable – The scheduling coordinator (SC) submits an hourly real-time market bid 75 minutes prior to the operating hour. If the 15-minute bid is economic, it will be dispatched and receive a binding schedule at the 15-minute market price. The dispatch notification is communicated 22.5 minutes before the flow of energy is expected.

Management believes that providing PDRs with the hourly and 15-minute economic bidding options currently available to interties will allow certain PDRs that cannot respond to 5-minute dispatches to viably participate in the real-time market and increase resource performance. The new bidding options will also provide opportunities for participation from new demand response resources that were previously unable to align their resource performance with the current real-time bidding requirements.

2) Removal of the single load serving entity aggregation requirement and the application of a default load adjustment.

The ISO currently requires demand response resource aggregations be contained within a single load-serving entity (LSE), represented by one demand response provider, and within a single sub-LAP. The ISO originally established the single LSE requirement in its PDR policy, later replicated in the reliability demand response resource (RDRR) policy, to facilitate the settlement application of an LSE-specific default load adjustment. The default load adjustment mechanism eliminates a double payment for a demand response resource when it is not net beneficial to all energy purchasers in terms of a wholesale market price reduction based on the demand response net benefits test, which was a test instituted by the Federal Energy Regulatory Commission.[3] The double payment occurs when the LSE gets credit for the load that does not show up in real-time in addition to the payment to the demand response provider. This double payment was determined by FERC to not be beneficial to the market if the demand response is dispatched at a bid price that does not have a significant impact on market clearing prices. At higher bid levels, demand response resources can have a greater impact on market clearing prices due to the shape of the resource supply curve. FERC defined that level at which demand response bids become net beneficial to the market, without the need for the default load adjustment, as the net benefits test threshold price.

The default load adjustment design feature required segmenting a demand response program into different aggregations by LSEs within a single sub-LAP. Demand response market participants raised concerns that this segmentation could potentially strand willing customer participants and affect the ability for some aggregators to meet the minimum market participation size requirement of 100 kW. In more specific cases, demand response providers establishing new resource aggregations expressed difficulty meeting, or maintaining, the 100 kW minimum participation requirement as customers are defaulted or moved to new LSEs, such as to a Community Choice Aggregator (CCA). Therefore, Management proposes to remove the single LSE requirement for demand response aggregations as well as remove the application of the default load adjustment settlement mechanism and institute a bidding rule that requires proxy demand resources bid at or above the net benefits test price threshold.

Management believes removing the default load adjustment settlement mechanism is necessary because the allocation of costs becomes too complex to implement and manage across multiple LSEs under a single demand response aggregation. In support of removing the default load adjustment, data analysis shows that the settlement implications have historically been de minimis relative to the benefits achieved by eliminating the one LSE per demand response aggregation requirement. To ensure that demand response resources are bidding beneficially to the market, Management proposes to utilize the net benefits test threshold price to screen submitted demand response bids to ensure they are at or above

3 http://www.caiso.com/informed/Pages/StakeholderProcesses/CompletedClosedStakeholderInitiatives/DemandResponseNetBenefitsTest.aspx

the threshold price in compliance with FERC Order No. 745. The bidding requirement will ensure demand response resources are net beneficial to the system when submitting bids to the ISO rather than an after-the-fact assessment in the settlement system currently conducted through the default load adjustment. The ISO will use the existing monthly calculation of the net benefits test and its resulting on-peak and off-peak threshold prices to validate bid submissions in the day-ahead and real-time markets to ensure all energy bids from proxy demand resources are at or above the net benefits threshold price.

3) Load shift product for behind the meter energy storage

Management proposes to develop a load shift product for behind the meter storage devices under the PDR demand response participation model. The load shift product will fall under existing PDR policy provisions with new functionalities to enable the resource to bid and be dispatched for both load consumption (charging, negative generation) and load curtailment (discharging, generation) from a behind the meter battery storage resource. The initial product will allow a PDR to access day-ahead and real-time energy markets for both load curtailment and load consumption through the use of two separate resource IDs. The proposal will facilitate the provision of "shift" services while maintaining a demand response policy that injection or export of behind the meter energy storage beyond the retail meter is not eligible for wholesale market compensation, nor is energy associated with typical use for non-ISO purposes, such as customer demand and energy management.

The PDR-LSR will be designed as two discrete resource IDs utilizing specific bidding rules and parameters to prevent scenarios where both resource IDs are given conflicting dispatches. The resource ID for curtailment (discharging, generation) will be allowed to bid from the net benefits test price up to the ISO bid cap and the resource ID for consumption (charging, negative generation) will be allowed to bid from less than $0 down to the bid floor (currently at -$150). In addition to specific bidding rules, the resource ID for curtailment must register with a Pmin of 0 MW and the ISO will enforce ramping capabilities for each resource ID.

The PDR-LSR will be settled using the meter on the storage device, subtracting off any typical use (i.e., for non-ISO purposes) such as customer energy and demand management. This subtraction of typical use ensures the ISO is not compensating for services provided for other purposes, under a multiple use application. The typical use is calculated using a 10-in-10 customer load baseline methodology. The 10-in-10 methodology estimates what electricity use would typically have been during the relevant settlement intervals but for an ISO dispatch instruction. The subtraction of typical use is an existing and FERC-approved settlement construct that is applied today to proxy demand resources that elect the meter generator output performance evaluation methodology. Specific to PDR-LSRs, Management proposes to modify the existing 10-in-10 "typical use" baseline methodology to account for both charge and discharge values when establishing the typical use value. Specifically, when the simple average of typical energy use is opposite to the ISO dispatch, the value is adjusted to zero. In other words, if the device is typically charging when the ISO

instructs the resource to discharge, the ISO will set the typical use to zero, expecting energy to be delivered equal to the ISO dispatch instruction.

4) Performance evaluation methodology for behind the meter electric vehicle supply equipment load curtailment

In ESDER phase 1, Management proposed the meter generator output (MGO) performance measurement, which uniquely recognizes a sub-metered storage device's contribution to a facility's overall load curtailment during an ISO dispatch event. Certain stakeholders requested that the ISO extend the MGO concept to sub-metered electric vehicle service equipment (EVSE) load curtailment.

Management proposes to enable EVSE sub-metering and extend the MGO performance method for EVSE market participation independent of, or in combination with, its host customer. Currently, EVSEs or any sub-metered device can already participate using the MGO provisions, but the ISO currently cannot accommodate a sub-metered resource with a different performance evaluation methodology than its host facility load, which many desire for EVSEs. Sub-metering resolves many issues including the lack of fifteen-minute interval metering at the host facility for measurement of curtailment in five-minute intervals, enabling direct measurement of the actual EV load curtailment achieved, and creating a more tailored market participation model for EVSEs. The proposal includes implementing two additional day-matching customer load baselines to accommodate for EVSEs in the residential and non-residential sector.

POSITIONS OF THE PARTIES

Stakeholder comments were generally supportive of ESDER 3's proposal with the exception of one stakeholder opposing the EVSE element of the proposal.

Under the proposal for a load shift product for behind the meter energy storage, a majority of stakeholders support the calculation of a typical use as an important and reasonable settlement construct. One stakeholder, Stem, representing storage resource interests, does not support the proposed treatment of typical use under the PDR-LSR option.

Stem believes that if their storage device is typically charging when the ISO dispatches the device to discharge, then it should be credited for its typical use. In other words, if the ISO dispatched Stem's storage device to discharge 25 kW, and the typical use calculation shows the device typically charges at 25 kW of energy in this same interval, then Stem should have no obligation to deliver actual energy; they simply must stop charging the battery to fulfill the ISO's dispatch instruction.

Stem's proposal is problematic for several reasons. Currently, there is a fundamental misalignment between retail rates and the needs of the bulk grid, which creates perverse

incentives and outcomes that are not rational from an overall system perspective. Most LSE retail time of use (TOU) rates continue to identify 12 noon to 6 PM as a peak period, meaning customers are incented to conserve during periods of over supply when the bulk system needs consumption. Retail partial peak periods occur after 6 PM, just when the ISO is experiencing the net peak demand, i.e. from 4 PM to 9 PM. From 4 PM to 9 PM, the ISO generally needs conservation and wants storage devices to discharge. The PDR-LSR option is designed to help the ISO address over-supply and store negatively priced energy during over-supply conditions, and preferably, deliver that energy back to the system in times of need. Unfortunately, current TOU rates provide storage a very strong retail incentive to do the opposite of the what the bulk power system needs — to discharge the storage device to manage a customer's peak demand during peak solar output periods (belly of the duck) and to charge during the evening net load ramp period when solar output tails off and loads continue to be high (neck of the duck) — the opposite of what is needed for reliability. The misalignment of retail TOU rate periods and ISO bulk system needs creates opportunities where it is both advantageous to charge and at the same time be paid by the ISO to stop charging, since the charging exacerbates the net load ramp in the first instance. This is a perverse incentive that should not be supported as an ISO performance evaluation method. To address this, Management's proposal sets any typical consumption of a PDR-LSR to zero when settling the battery for its discharged energy. This prevents the gaming opportunity described above, and ensures actual energy is delivered in response to an ISO dispatch instruction.

Second, Stem argues this is discriminatory treatment of PDR-LSRs since traditional demand response is credited for its typical use. However, behind the meter energy storage device is different from traditional demand response because it is able to shift and store energy dynamically. Traditional demand response must curtail load, i.e., it must turn off actual load in response to an ISO dispatch instruction, thus reducing production, service, or comfort in exchange for a wholesale payment. In other words, traditional demand response cannot sit idle in response to a dispatch instruction and get credit for its typical use. Services must be curtailed and actions must be taken to intentionally reduce load below the customer's typical use baseline.

Third, the incentives for storage to charge when the system needs it to discharge, and vice versa will be mitigated when retail rates and the needs of the bulk power system are more closely aligned. With retail rate alignment, there should be limited instances and incentives for a battery's typical use to be in the opposite direction of the bulk power system's needs. Therefore, Management's typical use baseline applied to the proposed PDR-LSR option is appropriate and helps prevent these gaming opportunities under the current retail rate construct.

Management's concerns and justifications in response to Stem's position is generally supported by stakeholders and by the Department of Market monitoring.

Under the proposal for a performance evaluation methodology for a sub-metered EVSE, a majority of stakeholders have given general support for the proposal with the exception of

Southern California Edison (SCE). SCE opposes the proposal based on its concerns with a potential scenario where an EVSE participating in the wholesale market would not provide a full load drop because it could potentially disconnect from one EVSE and, in turn, connect to a non-participating EVSE. Management believes that the scenario posed by SCE is a highly unlikely scenario based on several discussions with stakeholders throughout the process. Management does not believe that there is an economic incentive nor a technologically feasible implementation for an EVSE owner to switch electric vehicles to non-participating EVSEs in response to ISO market dispatches. Pacific Gas & Electric requested as a condition to supporting Management's proposal, an attestation be required for EVSE participants when registering and submitting its ISO settlement quality meter data plan that they will provide curtailments of the EVSE consistent with their dispatch. Management has included this requirement in its proposal to disincentivize the practice of not providing full load curtailment by PDRs electing to register under the EVSE option.

Management addresses additional stakeholder comments in Attachment A.

CONCLUSION

Management requests the Board approve its proposal for the provision of two new bidding options for PDRs, eliminating the single LSE requirement and DLA settlement mechanism, the load shift product for behind the meter energy storage devices, and establishing performance evaluation methodologies to recognize an EVSE's load curtailment distinct from its host facility. The proposed enhancements will provide energy storage resources and distributed energy resources more opportunities to efficiently participate in the ISO market.