Memorandum

To: ISO Board of Governors

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

Date: January 27, 2016

Re: **Decision on energy storage and distributed energy resources proposal**

This memorandum requires Board action.

EXECUTIVE SUMMARY

Energy storage connected directly to the ISO grid, and distributed energy resources connected directly to the distribution grid, are growing and will represent an increasingly important part of the future generation resource mix available to the ISO. Integrating these resources into the ISO market will help lower carbon emissions and can offer operational benefits. Enhancing the ability of these resources to participate in the ISO market is the central focus of the ISO's energy storage and distributed energy resources stakeholder initiative.

Through this initiative, Management has developed a proposal to increase the flexibility for these resources to participate in the ISO market. This proposal involves several enhancements to existing market design rules. These include two proposed enhancements to the market participation model for storage and one proposed enhancement to demand response performance measures. The storage-related enhancements for resources participating in the ISO market under the non-generator resources model would (1) allow such a resource the ability to submit a daily state of charge bidding parameter and (2) have the option to self-manage limits and state of charge. The demand response-related enhancement would provide three performance evaluation methods for resources participating in the ISO market as either a proxy demand resource or reliability demand response resource with behind-the-meter generation devices.

Management recommends the following motion:

> **Moved, that the ISO Board of Governors approves the proposal for the non-generator resources model and demand response performance measures, as described in the memorandum dated January 27, 2016; and**
>
> **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 proposed tariff change.**

DISCUSSION AND ANALYSIS

Proposed enhancements to the market participation model for storage

In 2012, the ISO introduced the non-generator resource model to better accommodate energy-constrained resources that can operate seamlessly between positive and negative generation. For example, battery storage is a resource that can discharge energy in one interval as positive generation and consume energy in the next interval as negative generation. The ISO also considers this model as best suited for aggregations of distributed energy resources to participate in the ISO market. Although the ISO introduced the model three years ago, the adoption rate has been slow because few energy storage projects have reached commercial operation. However, the adoption rate is likely to increase dramatically in the near future as the many projects in the development pipeline reach commercial operation. The timing is right to review and enhance the model in anticipation of more storage devices participating in the ISO market as non-generator resources.

Management proposes two enhancements. First, we propose to allow a storage resource participating as a non-generator resource to submit a daily state of charge bidding parameter in the day-ahead market. Under current rules, when a non-generator resource bids into the day-ahead market, the initial state of charge value used for that trading day is the ending state of charge value from the previous day's day-ahead awards. However, when there are no previous day's day-ahead awards, the market system assumes that the initial state of charge value for the resource is fifty percent of the maximum energy limit. As an alternative, stakeholders have requested that the ISO allow the initial day-ahead state of charge value to be provided as a daily bid component with the day-ahead bid schedule.

Second, we propose to provide non-generator resources with the option to self-manage their energy limits and state of charge. Under current rules, state of charge must be provided to the ISO through telemetry to enable the ISO to maximize the value of the resource in the wholesale market, and to ensure that the resource is not given an infeasible dispatch. As an alternative, stakeholders have requested that non-generator resources have the option to self-manage their state of charge rather than be required to provide energy limits or have the ISO co-optimize the resource based on state of

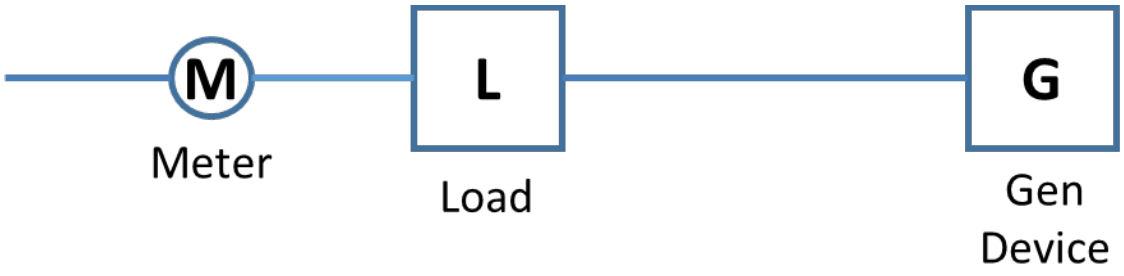
charge values. Under Management's proposal, non-generator resources that do not have state of charge energy limits or prefer to self-manage the state of charge within resource energy limit constraints may choose to not use energy limit constraints and state of charge in co-optimization or dispatch. Non-generator resources choosing this option will self-manage their available energy within any energy limit constraints to avoid uninstructed imbalance energy settlements. Although under this option a non-generator resource would not be required to provide its state of charge to the ISO through telemetry, it would still be required to provide all other telemetry data required by the tariff and as specified in applicable business practice manuals. If the ISO determines that resources under this option are not self-managing their resource within energy limit constraints, the ISO reserves the right to require state of charge telemetry. Non-generator resources modeled as regulation energy management resources are not allowed to utilize this option, given the need for the ISO to maintain the resource's energy state and state of charge for continuous energy output. In this latter case, without real-time telemetered state of charge and energy limit constraints, the ISO could not manage continuous energy requirements.

Proposed enhancements to demand response performance measures

Demand response is a reduction in actual consumption relative to expected consumption. A baseline is an estimate of the expected consumption – that is, the electricity that would have been consumed had there not been a demand response event. Because only physical load can be metered and not the demand response quantity, the result of the baseline calculation compared against the actual load during the ISO dispatch interval serves as the demand response energy measurement used by the ISO to financially settle the energy delivered (that is, energy not consumed) from a demand response resource.

Today, a proxy demand resource or a reliability demand response resource[1] participating in the ISO market comprises a physical meter connected to a load. The load may be a pure load, or it may be offset by "behind-the-meter" generation or other devices as depicted in the following diagram. The presence of such a load-offsetting device is unknown to the ISO under this configuration. With such a meter configuration – that is one lacking a sub-meter separately measuring the performance of the behind-the-meter generation device – there is no way to separate the load from the generation or vice versa.

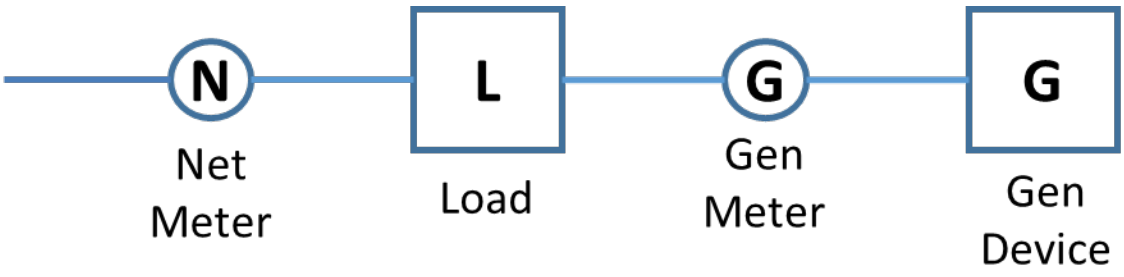
[1] Loads or aggregation of loads capable of measurably and verifiably providing demand response services pursuant to a demand response provider agreement with the ISO.



Under current rules, proxy demand resources and reliability demand response resources participating in the ISO market use a baseline method to estimate expected consumption which is compared to actual consumption to measure performance. The baseline for the demand response resource is calculated using historical meter data from the facility with defined selection rules including a look-back window and exclusion days. The ISO methodology examines up to 45 calendar days prior to the trade day to find a target number of "like" days and calculates an hourly average of the collected meter data to create a load profile, which is the baseline used to assess the event-day load response quantity. This method cannot distinguish the cause of demand response – that is, whether it is actual load reduction versus load consumption offset by the output of a behind-the-meter generation device – because there is no way to separately measure the amount of consumption offset by the output of the generator or device.

To accommodate the proliferation of behind-the-meter generation devices involved in demand response, stakeholders have requested an alternative performance evaluation methodology that directly meters the behind-the-meter generation device to measure the demand response provided by the device separate from the facility load.

The following illustration reflects the addition of a generation meter to the current configuration, enabling the overall demand response at the location to be separated into a pure load (facility) response and a behind-the-meter generation device's response or contribution.



Management proposes three performance evaluation methods to support this meter configuration.

The first method would apply in instances where only the facility load is registered in the proxy demand resource or reliability demand response resource. In this instance, the demand response performance would be calculated by subtracting the actual demand (represented by the N minus G values for the dispatch interval) from a standard baseline (represented by an average of N minus G values for comparable non-dispatch hours selected in the look-back).

The second method would apply in instances where only the behind-the-meter generation device is registered in the proxy demand resource or reliability demand response resource and not the facility load as in the first method. In this instance, the demand response performance is the demand reduction resulting from the output of the behind-the-meter generation device for the dispatch interval. It would be evaluated based on the physical meter generator output for the dispatch interval and reduced by an estimate of the typical energy output of the device used for retail load-modifying purposes and benefits. This adjustment would appropriately remove an estimated quantity of energy delivered by the device to the facility for its retail load-modifying purposes, i.e., energy not produced in response to an ISO dispatch. The adjustment is intended to mitigate issues of wholesale and retail service overlap and the potential for double compensation. It is calculated by taking an average of the energy delivered by the generation device during a prescribed number of prior non-event hours. To identify non-event hours, Management's proposal originally defined an event hour as any hour when there was an ISO market award or dispatch or outage recorded. In its comments, Southern California Edison proposed a modification to this definition to include as non-event hours those hours in which the generation device received an ISO award/dispatch but had submitted a bid below the applicable ISO net benefits test price threshold published by the ISO on a monthly basis. The ISO net benefits test establishes a price threshold above which demand response resource bids are deemed cost effective. Thus, under SCE's proposed modification, an event hour is any hour when there was an ISO market award or dispatch at or above the demand response net benefits test price threshold or outage recorded. Management has incorporated this modification into its proposal, as it appears reasonable and is supported by stakeholders.

The third method would apply in instances where both the load and the behind-the-meter generation device together are registered in the proxy demand resource or reliability demand response resource. Under this method, the demand response performance would be the combined demand response performance detailed under the previous two methods.

POSITIONS OF THE PARTIES

Stakeholders broadly support Management's proposed enhancements to the market participation model for storage.

On Management's proposed enhancements to demand response performance measures, Southern California Edison proposed a minor modification that affects the

definition of an event hour for purposes of estimating the typical retail behavior of a behind-the-meter generation device. As previously discussed, Management has incorporated the modification into its proposal because it appears to represent a slight improvement and most stakeholders support it.

Management more fully addresses stakeholder's comments in Attachment A.

CONCLUSION

Management recommends that the Board approve the proposed enhancements to the market participation model for storage and demand response performance measures described in this memorandum. Management's proposal will increase the flexibility for these resources to participate in the ISO market.