Expanded Metering and Telemetry Options

Distributed Energy Resource Provider (DERP)

Supplement to the Draft Final Proposal

October 28, 2015

Table of Contents

Expanded Metering and Telemetry Options Phase 2

Distributed Energy Resource Provider (DERP)

Supplement to the Draft Final Proposal

1 Introduction

On July 16, 2015, the ISO Board of Governors (Board) approved a framework for a distributed energy resource provider to offer aggregations of distributed energy resources[1] into the ISO market. The framework recognizes distributed energy resource aggregations (DERA) as a new type of market resource similar to a generating facility, and it recognizes a distributed energy resource provider as a new type of market participant that owns or operates these resources. The distributed energy resource provider would execute a distributed energy resource provider agreement to accept and abide by the terms of the ISO tariff. Under the framework, a distributed energy resource provider, the aggregated resources it operates and the distributed energy resources that comprise such aggregated resources must comply with applicable utility

[1] The ISO defines a distributed energy resource as any distribution-connected resource, regardless of size or whether it is connected behind or in front of the end-use customer meter. Distribution-connected means connected to distribution facilities controlled by a distribution utility, regardless of voltage level, served by the ISO grid.

distribution company tariffs and any applicable requirements of the local regulatory authority.

The distributed energy resource aggregation would participate in the ISO's market through a scheduling coordinator and the ISO would treat the resource as a scheduling coordinator metered entity. As such, the ISO will not need to directly meter the individual distributed energy resources that comprise the aggregation. Instead, these resources may rely, subject to audit, on revenue quality meters that meet the metering standards of the applicable local regulatory authority. Scheduling coordinators must, however, submit settlement quality meter data to the ISO for each settlement period in an operating day to permit the ISO to settle instructed and uninstructed imbalance energy.

The ISO intends for the distributed energy resource aggregation framework to accommodate different business and/or regulatory models, including potentially a utility distribution system operator model as well as a non-utility aggregator seeking to develop distributed energy resource aggregations for participation in the ISO market. Under the framework, aggregations of distributed energy resources may operate at a single pricing node or across multiple pricing nodes within a single sub-load aggregation point. The Board-approved framework imposed certain limitations on aggregations across multiple pricing nodes which the ISO is now proposing to relax, as discussed further below.

Consistent with the Board's direction from its July 16, 2015 meeting, the ISO is developing tariff revisions that enable the participation of distributed energy resource aggregations in the ISO market. Over the course of the stakeholder tariff-review process, the ISO reconsidered certain limitations the Board-approved proposal imposed on multiple pricing node distributed energy resource aggregations, which the ISO believed were necessary. Specifically, ISO Management believed that in order to prevent adverse congestion management impacts, distributed energy resource aggregations that span multiple pricing nodes must be comprised of a single sub-resource type and all sub-resources must move in the same direction in response to an ISO dispatch instruction. Upon further review, ISO Management now believes that this limitation is overly restrictive, and intends to replace it with a less restrictive provision, discussed in this paper, that will still achieve the same objective of preventing adverse congestion management impacts. Although the ISO has discussed this revision with

stakeholders through its tariff development stakeholder process, the ISO finds it prudent to publish this supplemental information to formally convey and clarify the specific proposed market design change.

The ISO has scheduled a stakeholder call on November 10 to discuss the ISO's proposed enhancement to the Board-approved policy and is inviting stakeholders to submit written comments by November 17. Because the original limitations were included in the proposal the Board approved in July, the ISO is planning to request that the Board authorize elimination of the original limitations and adoption of the market design enhancement the ISO is proposing in this paper. The ISO plans to make this request at the Board's December meeting.

2 Revisions to the draft final proposal

2.1 Background

Under the Board approved market design framework, aggregations of distributed energy resources may operate at a single pricing node or across multiple pricing nodes, but must be within a single sub-load aggregation point. The Board approved framework allows heterogeneous sub-resources in aggregations at one pricing node. Also, for aggregations limited to one pricing node, all of the sub-resources do not need to move in the same direction as the ISO dispatch instruction; rather, it is only necessary that the net response at the pricing node is consistent with the ISO dispatch instruction. However, for aggregations across multiple pricing nodes, the Board approved framework requires that all sub-resources that comprise a distributed energy resource aggregation must be of a single resource type (i.e., homogenous), must all move in the same direction as the ISO dispatch instruction, and the total capacity of the aggregation must be no larger than 20 MW. In addition, for aggregations of energy storage, all sub-resources must operate in the same mode (that is, charging or discharging, but not a mix of the two) in response to an ISO dispatch instruction.

2.2 Single pricing node aggregations

The ISO is proposing no changes to the Board approved framework relative to aggregations of distributed energy resources at a single pricing node.

2.3 Multiple pricing node aggregations

As part of its initial implementation efforts, the ISO has reassessed the limitations described above in section 2.1 that would apply to aggregations across multiple pricing nodes and believes that these limitations can be relaxed without adverse impacts on the ISO's ability to manage congestion accurately, provided the aggregated resource perform in accordance with a less restrictive alternative requirement. Specifically, the aggregated resource must provide a net response at each constituent pricing node that is consistent with the ISO dispatch instruction, and the distribution of the resource's response across constituent pricing nodes must be consistent with applicable distribution factors that the aggregation submits with its bid.[2] With this requirement, it is not necessary to require that multi-pricing node aggregations consist of homogenous sub-resources or that all sub-resources move in the same direction as an ISO dispatch instruction. The ISO will, however, continue to maintain the 20 MW maximum size limit for distributed energy resource aggregations across multiple pricing nodes.[3]

The following examples illustrate the requirements described above. In all of these examples, the distributed energy resource aggregation is comprised of sub-resources at three pricing nodes designated as P2, P6, and P8, all of which are within a single sub-LAP. Although in these examples there is only one sub-resource shown at each pricing

[2] The scheduling coordinator for the aggregation of distributed energy resources may bid generation distribution factors for each hour, or rely on default distribution factors registered in Master File.

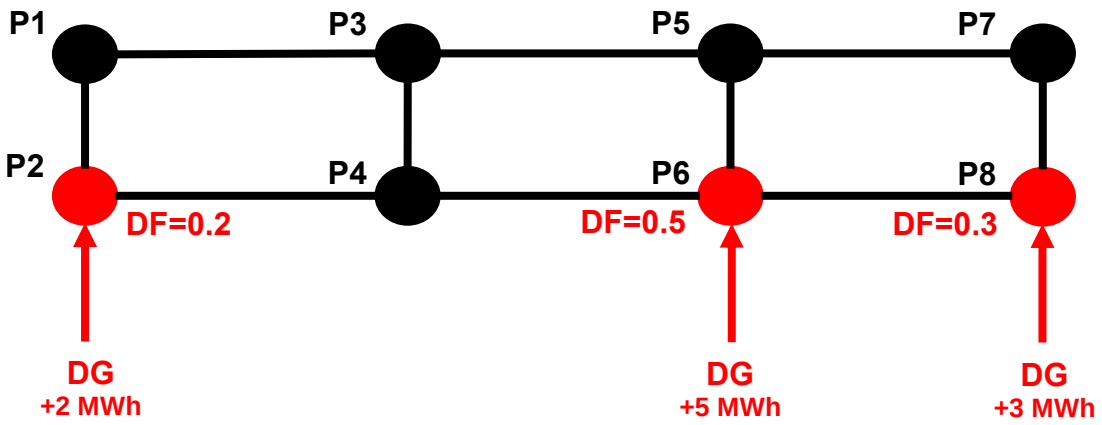
[3] The ISO is proposing to reevaluate the need for the 20 MW limitation after gaining a full 12 months of operational experience with several DERP aggregations of sufficient size (i.e. between 10 and 20 MW) across multiple PNodes. Until such time as the ISO has gained this experience, the ISO believes it is prudent to place an initial limit on their size and believes that 20 MW represents a reasonable starting place.

node, the ISO has proposed no limit on the number of sub-resources at each pricing node in a distributed energy resource aggregation.

Example 1 (see figure 1 below). In this first example, the distributed energy resource aggregation consists solely of sub-resources that are distributed generators ("DG"). The distribution factors ("DF") at P2, P6, and P8 are 0.2, 0.5, and 0.3, respectively. If this aggregation gets a dispatch instruction to increase output by 10 MWh, then for the aggregated response to be consistent with the ISO dispatch instruction and the applicable set of distribution factors the net response of all the sub-resources at P2 must be +2 MWh, the net response at P6 must be +5 MWh, and the net response at P8 must be +3 MWh.

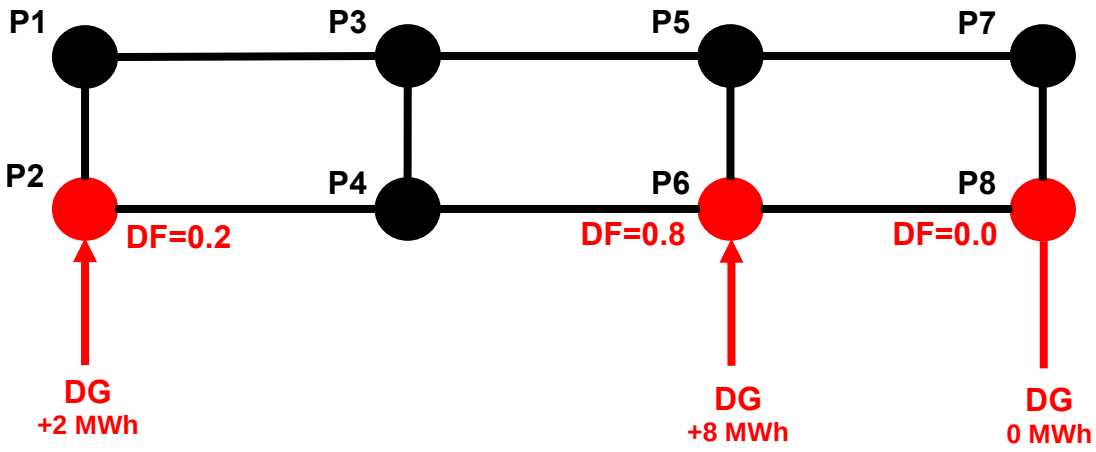
By the aggregate resource providing a net response at its pricing nodes that is consistent with the ISO dispatch instruction and applicable generation distribution factors, the ISO market software is able to manage congestion accurately and ensure that the dispatch will not exacerbate congestion. The market optimization assumes that the response at each pricing node in the aggregation (i.e., P2, P6, and P8) will be in accordance with the distribution factors specified for the aggregation. If in practice the actual response across the pricing nodes differed from the bid-in distribution factors, then the software's assessment of congestion would not be accurate and the ISO could have to address unexpected congestion in real time. By limiting the rated capacity of distributed energy resource aggregations across multiple pricing nodes to 20 MW, the ISO can minimize potential negative effects of such deviations. However, the ISO will not rely solely on this limitation, but will have the authority to investigate resources that are not responding in proportion to their applicable distribution factors, based on an audit of sub-resource meter data.

Figure 1
(Energy Output)
10 MWh DERA dispatch instruction



Example 2 (see figure 2 below). In this example the distributed energy resource aggregation is the same as depicted in example 1 above but applying a different set of distribution factors. In this example the distribution factors at P2, P6, and P8 are 0.2, 0.8, and 0.0 respectively. If for this particular interval it gets the same dispatch instruction as the prior example (i.e., increase output by 10 MWh), providing a net response at its pricing nodes that is consistent with the ISO dispatch instruction and applicable generation distribution factors means that the net response of the sub-resources at P2 must be +2 MWh, the net response at P6 must be +8 MWh, and the net response at P8 must be zero MWh.

Figure 2
(Energy Output)
10 MWh DERA dispatch instruction

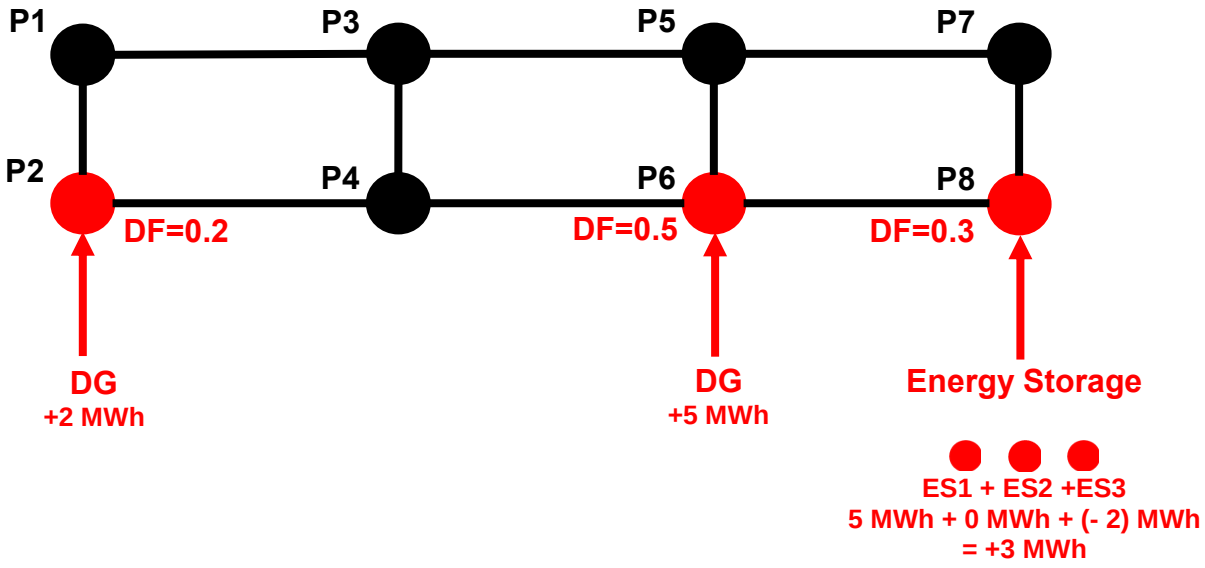


Example 3 (see figure 3 below). Now consider an aggregation at the same three pricing nodes that is comprised of DG at P2 and P6 and only storage devices at P8. In this example, the distribution factors are 0.2 at P2, 0.5 at P6, and 0.3 at P8, associated with a bid to increase energy output from the aggregate resource. If for this particular hour it gets the same dispatch instruction as the example 1 (i.e., output 10 MWh), then providing a net response at its pricing nodes that is consistent with the ISO dispatch instruction and applicable generation distribution factors means that the net response of all sub-resources at P2 must be +2 MWh, the net response at P6 must be +5 MWh, and the net response at P8 must be +3 MWh.

The net response of the storage devices in this example illustrates an important point. Although the storage devices at P8 may physically be capable of charging during this hour, the requirement that the net response at each pricing node must be consistent with the ISO dispatch instruction means that the net response at all three pricing nodes be positive (i.e., a net injection of power), and that the net response of the energy storage at P8 be +3 MWh. At the same time, if there are multiple storage devices at P8, illustrated in figure 3 as ES1-3, the ISO's latest proposal no longer requires that they all

operate in discharging mode and move in the same direction as the dispatch instruction. The latest proposal as described in this paper requires only that the net movement of all the sub-resources at P8 result in +3 MWh of output.

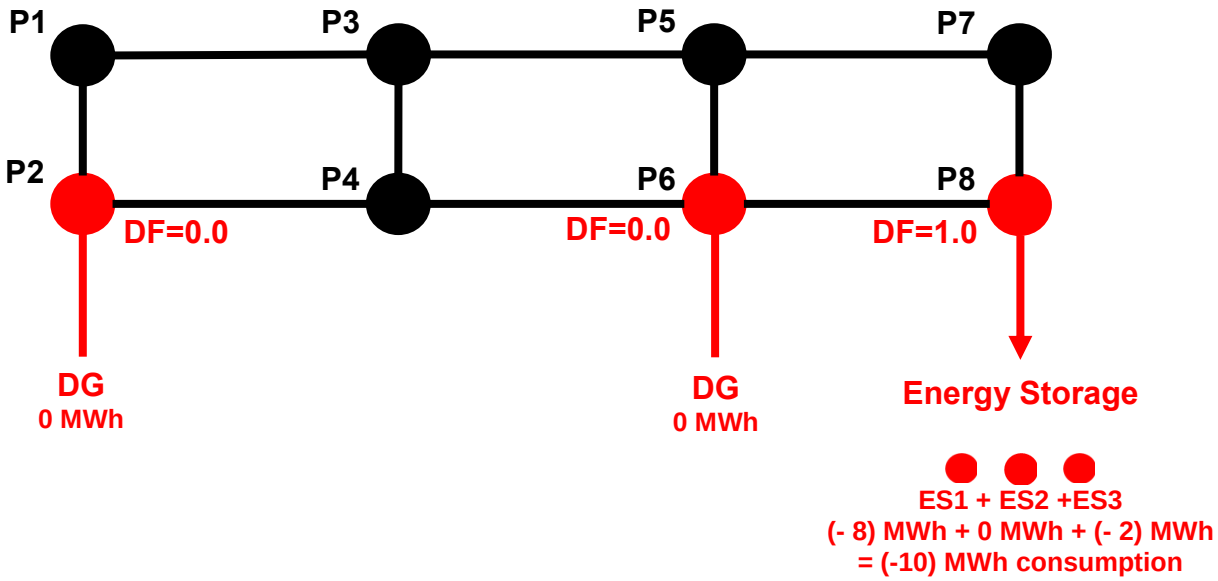
Figure 3
(Energy Output)
10 MWh DERA dispatch instruction



Example 4 (see figure 4 below). In this example, the distributed energy resource aggregation is the same one depicted in example 3 except that it now has a different set of distribution factors. Specifically, the resource is now bidding to consume energy for charging, and therefore the distribution factors at P2, P6, and P8 are 0.0, 0.0 and 1.0 respectively. Assume that the market clears the resource's bid to consume 10 MWh and issues the dispatch instruction. Then to provide a net response at its pricing nodes that is consistent with the ISO dispatch instruction and applicable generation distribution factors means that the net response at P2 and P6 must be zero and the net response at P8 must be -10 MWh. Under the proposal described in this paper, there is no

requirement that the storage sub-resources at P8 all be operating in charging mode, nor that they all be moving in the same direction as the dispatch instruction, as long as the net response of all the storage sub-resources at P8 is -10 MWh.

Figure 4
(Energy Consumption)
- 10 MWh DERA dispatch instruction



3 Coordination with distribution utilities and regulatory authorities

The ISO Board-approved market design framework and the enhancements to that framework outlined in this paper open a pathway for aggregations of distribution-connected resources to participate in the wholesale market. The ISO recognizes that opening this pathway may raise questions regarding whether applicable distribution utility tariffs and local regulatory authority requirements accommodate distributed energy resource aggregations or whether modifications to existing retail tariffs and

requirements will be needed. The ISO further recognizes that a coordinated effort with the distribution utilities and their local regulatory authorities (e.g., SDG&E, SCE, PG&E and the CPUC) is essential to enable the successful integration and operation of distributed energy resources. The ISO looks forward to continuing to work with stakeholders to identify and resolve issues, lower barriers, and refine its market design as appropriate.

4 Stakeholder process

Consistent with the Board's direction from its July 16, 2015 meeting, the ISO is developing tariff revisions to establish a distributed energy resource provider as a new market participant and to integrate distributed energy resource aggregations into the ISO market. Over the course of this effort, the ISO reconsidered certain limitations it had proposed be applied to distributed energy resource aggregations, which it now believes are no longer necessary and can be replaced with less restrictive limitations. Because the Board tacitly adopted the original limitations as part of the proposed market design, the ISO is planning to request that the Board authorize the elimination of these limitations and adoption of the less restrictive alternative described in this paper at the December Board meeting.

The following table outlines the remaining stakeholder schedule for this initiative.

Step	Date	Activity
Board approval	July 16-17, 2015	ISO Board meeting
Draft tariff language	September 21, 2015	Post draft tariff language
	September 29, 2015	Stakeholder comments due
	October 1, 2015	Stakeholder web conference
Revised tariff language	October 13, 2015	Post revised draft tariff language
	October 21, 2015	Stakeholder comments due
	October 29, 2015	Stakeholder web conference
Supplement to	October 28, 2015	Post supplement to the draft final proposal

Step	Date	Activity
draft final proposal	November 10, 2015	Stakeholder web conference
	November 17, 2015	Stakeholder comments due
Board approval	December 17-18, 2015	ISO Board meeting
Tariff submittal	December 2015 - January 2016	Make tariff filing at FERC