Energy Storage and Distributed Energy Resources (ESDER) Stakeholder Initiative

Issue Paper and Straw Proposal

July 30, 2015

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1 Introduction

Enhancing the market participation of grid-connected storage and the many examples of distribution-connected resources is the central focus of the ISO's energy storage and distributed energy resources (ESDER) stakeholder initiative.

In this paper the ISO presents its issues discussion and straw proposals on the 2015 scope for the ESDER. The 2015 scope consists of three items: a limited set of enhancements to the ISO non-generator resources model, consideration of alternative baseline methodologies for demand response resources, and addressing questions associated with some non-resource adequacy multiple use applications. A more extensive set of issues will be addressed in the second phase of the ESDER in 2016.

2 Background

Energy storage connected directly to the ISO grid and resources connected directly to the distribution grid (distributed energy resources or "DER") are growing and will

represent an increasingly important part of the future resource mix.[1] Integrating these resources will help lower carbon emissions and can offer operational benefits.

California is taking a number of steps to facilitate market participation of storage and aggregated distributed energy resources. In 2013, the CPUC established an energy storage procurement target of 1,325 MW by 2020. Energy storage developers responded by submitting a significant number of requests to interconnect to the ISO grid. For example, the ISO generator interconnection requests received in 2014 currently include approximately 780 MW of energy storage (13 projects), while the 2015 interconnection requests included approximately 7,300 MW of energy storage (66 projects), a jump of nearly 1000%.[2]

In 2013 the ISO conducted an effort to clarify interconnection rules for storage. This effort concluded as a stakeholder initiative in 2014 and found that existing interconnection rules accommodate the interconnection of storage to the ISO controlled grid.[3] However, the initiative identified non-interconnection related issues that should be addressed. To address this spectrum of issues, the ISO collaborated with the CPUC and CEC to publish the California Energy Storage Roadmap in late 2014.[4]

The 2014 roadmap identified a broad array of challenges and barriers confronting energy storage and aggregated distributed energy resources. The roadmap also identified needed actions to address these challenges, including several high priority action items assigned to the ISO. These are listed below:

- Rate treatment: Clarify wholesale rate treatment and ensure that the ISO tariff and applicable BPMs and other documentation provide sufficient information.

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[1] Distributed energy resources are those resources on the distribution system such as rooftop solar, energy storage, plug-in electric vehicles, and demand response.

[2] Queue clusters 7 and 8 include interconnection requests received in April 2014 and April 2015, respectively. The ISO generator interconnection queue as of July 17, 2015 is available on the ISO website at http://www.caiso.com/participate/Pages/Generation/Default.aspx.

[3] http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorageInterconnection.aspx

[4] http://www.caiso.com/informed/Pages/CleanGrid/EnergyStorageRoadmap.aspx

- Market participation:
  - Clarify existing ISO requirements, rules and market products for energy storage to participate in the ISO market.
  - Identify gaps and potential changes or additions to existing ISO requirements, rules, market products and models.
  - Where appropriate, expand options to current ISO requirements and rules for aggregations of distributed storage resources.

The ISO action plan for carrying out these items is comprised of two parts. The first part is to educate stakeholders on existing ISO requirements, rules, market products and models for energy storage and aggregated DER. The ISO accomplished this first part by developing a special purpose education forum and hosting it on two dates – April 16 and 23, 2015. The forums were a success: Over 200 stakeholders attended and the feedback received was positive.

The second part of the action plan is to conduct a stakeholder initiative to identify and consider potential enhancements to existing requirements, rules, market products and models for energy storage and DER market participation. The ESDER is that initiative. As an initial step, the ISO worked with stakeholders to develop a scope of issues to be addressed in the ESDER initiative and a schedule for resolving them. The scope and schedule includes one set of issues to be addressed in 2015 and a second set of issues to be addressed in 2016 and beyond. In this paper, the ISO focuses on the issues in the 2015 scope.

3 Stakeholder process

The ISO published an initial proposed scope and schedule for the ESDER initiative on May 13, 2015. This identified the candidate issues and divided them into two groups – a proposed scope of issues for potential policy resolution in 2015 and a proposed scope of issues for potential policy resolution in 2016 and beyond. A stakeholder web conference was held on May 21 and written stakeholder comments were received on or about May 29.

Based on a consideration of the stakeholder comments received, the ISO developed the revised scope and schedule and posted that on July 25.[5] The ISO considered the July 25 scope and schedule final and used it as the work plan on which to draft this paper.

Although the ISO did not hold a stakeholder web conference on the revised scope and schedule, the ISO did provide another comment opportunity on the ESDER scope and schedule and invited interested stakeholders to submit written comments no later than July 2. On or around this date, the ISO received written comments from six stakeholders – PacifiCorp, Southern California Edison (SCE), Pacific Gas & Electric (PG&E), NRG Energy (NRG), California Department of Water Resources State Water Project (SWP), and Advanced Rail Energy Storage (ARES). The comments received were principally focused on issues more relevant to the 2016 scope rather than on issues in this year's scope. For example, PacifiCorp urged the ISO to explore increased utilization of dispatchable demand resources, SCE sought to verify that two issues would be added to the 2016 scope (inclusion of additional resource characteristics in the NGR model and multiple issues pertaining to demand response), PG&E expressed interest in multiple issues in the 2016 scope and offered some perspectives on these, SWP urged that work begin on the NGR enhancements in the 2016 scope as soon as possible and also expressed interest in the 2016-scoped topic of the distinction between wholesale charging energy and station power, and ARES urged that regulation market rules for fast-response storage resources be included in the 2016 scope. As a general response, the ISO points out that the issues raised in these stakeholder comments are either already in the 2016 scope or that the ISO has already indicated that it is appropriate to consider them as part of the 2016 scope. Moreover, the ISO anticipates that in early 2016 it will likely provide stakeholders with another opportunity to express their perspectives on the 2016 scope and the relative priority of the issues therein as the stakeholder process on those issues gets underway (although phase 2 of the ESDER is less than six months away, it is still possible that stakeholders' views on the relative priority of the 2016 scope of issues may have changed somewhat). In response to SWP, the ISO reiterates that it will begin internal work on the 2016-scoped NGR enhancements in late 2015 so that stakeholder process work on these issues can begin in earnest in early 2016. NRG

[5] All documents for the ESDER initiative are available on the ISO's website at: http://www.caiso.com/Documents/RevisedScopeSchedule-EnergyStorageDistributedEnergyResources.pdf

expressed concern that the "mixed use" cases to be examined in the 2015 scope will focus solely on non-resource adequacy cases. The ISO discusses this in section 4.3.1 of this paper.

The following table outlines the schedule for the policy development portion of this stakeholder initiative for those issues in the 2015 scope. The next step will be to discuss this paper with stakeholders during a web conference scheduled for August 6 from 9:00 a.m. to 12:00 p.m. Following that, the ISO is inviting stakeholders to submit written comments to InitiativeComments@caiso.com by 5:00 p.m. (Pacific) on August 18.

The objective is to bring proposed resolutions to identified policy issues in the 2015 scope to the Board by December 2015 (i.e., for those proposals requiring tariff changes). This schedule does not include implementation steps including development and filing of tariff amendments, making changes to relevant business process manuals, and making and implementing changes to market system software and models.

Stakeholder Process Schedule (for the scope of issues identified for potential policy resolution in 2015)		
Step	**Date**	**Activity**
Initial proposed scope and schedule	May 13	Post initial proposed scope and schedule (posted in presentation format rather than a paper)
	May 21	Stakeholder web conference
	May 28	Stakeholder comments due
Revised scope and schedule	June 25	Post revised scope and schedule
	July 2	Stakeholder comments due
Issue paper and straw proposal	July 30	Post issue paper and straw proposal
	August 6	Stakeholder web conference
	August 18	Stakeholder comments due
Revised straw proposal	September 17	Post revised straw proposal
	September 29	Stakeholder web conference
	October 9	Stakeholder comments due
Draft final proposal	November 5	Post draft final proposal

Stakeholder Process Schedule (for the scope of issues identified for potential policy resolution in 2015)		
Step	**Date**	**Activity**
	November 12	Stakeholder web conference
	November 20	Stakeholder comments due
Board approval	December 17-18, 2015	ISO Board meeting

Regarding the proposed scope of issues for potential policy resolution in 2016 and beyond, the ISO intends to delay work on these issues until early 2016.[6] Taking this approach will maximize the potential for bringing proposed resolutions to the 2015 scope of issues to the Board by December 2015 (again, for those proposals requiring tariff changes).

4 Issue discussion and straw proposals

The 2015 scope for the ESDER initiative includes the following issues:

1. Non-generator resource (NGR) model enhancements
    a. Update documentation on NGR to capture material and clarifications compiled for the April education forums.
    b. Clarify how the ISO uses state of charge in market optimization.
    c. Evaluate initial state of charge as a submitted parameter in the day-ahead market.
    d. Evaluate option to not provide energy limits or have ISO co-optimize an NGR based on state of charge.

[6] The one exception is the ISO's previously stated intent to begin internal work on the 2016-scoped NGR enhancements in late 2015 so that stakeholder process work on these issues can begin in earnest in early 2016.

2. Proxy Demand Resource (PDR) and Reliability Demand Response Resource (RDRR) enhancements – Evaluate inclusion of baselines that meet the North American Energy Standards Board (NAESB) measurement and validation standards. Clarify how to enable alternative baselines that meet NAESB standards and specify tariff provisions to define alternative baselines in BPMs.
3. Specify tariff provisions needed for the following two multiple use applications
    a. Non-RA DER provides services to the distribution system (operational services and infrastructure deferment) and participates in wholesale market.
    b. Non-RA behind-the-end-use customer meter DER provides services to end-use customer and participates in wholesale market.

In the following sections, the ISO discusses these issues in more detail and presents an initial straw proposal for addressing each issue.

4.1 Non-generator resource (NGR) model enhancements

Under this topic, the ISO will consider limited enhancements to the NGR model.

4.1.1 Background on the NGR model

As early as 2007, the ISO began stakeholder initiatives that began to lay the foundation to allow non-traditional generator resources to participate in the ISO wholesale market. Strictly speaking, the initiatives were for compliance with FERC Order Nos. 719 and 890. FERC Order No. 719 directed the ISO to allow demand response resources to participate in Ancillary Service Markets where the resources could technically provide the ancillary service within response times and other reasonable requirements adopted by the ISO.

FERC Order No. 890, Preventing Undue Discrimination and Preference in Transmission Service, required that non-generation resources such as demand response must be evaluated comparably to services provided by generation resources in the areas of meeting mandatory reliability standards, providing ancillary services, and planning the expansion of the transmission grid.

Because of these initiatives, in 2010, the ISO made the following changes to its tariff for ancillary service wholesale participation:

- Removed resource type restrictions and reduced minimum rated capacity to 500 kW from 1 MW
- Reduced the minimum continuous energy requirement from 2 hours to:
  - Day-Ahead Regulation Up/Down: 60 minutes
  - Real-Time Regulation Up/Down: 30 minutes
  - Spin and Non-Spin: 30 minutes
- Clarified the minimum continuous energy measurement such that continuous energy is measured from the period that the resource reaches the awarded energy output, not at the end of a 10 minute ramp.

In broader context, these initiatives were a catalyst for developing new market opportunities and modeling techniques that recognized that a growing number of participating resources no longer fit the traditional generator or load models. Non-generator resources such as demand response and storage have unique energy use and production characteristics that have spawned the development of new wholesale participation models that recognize the unique attributes of non-generator resources. Thus, in 2012 the ISO introduced the non-generator resource (NGR) model to better accommodate energy constrained resources that can both consume and produce energy.

The NGR model was designed for energy constrained resources where operation could be modeled on the positive generation side, the negative generation side, or from positive to negative generation. The NGR model allowed smaller, energy-constrained resources to be treated on a comparable basis to traditional generation resources in qualifying for day-ahead capacity and continuous energy output when providing regulation services.

The NGR model recognizes that a resource can operate seamlessly between positive and negative generation. For example, battery storage is a resource which can discharge energy in one interval as positive generation and consume energy in the next interval as negative generation. Current battery chemistries and storage control systems have demonstrated these resources can move nearly instantaneously between positive and negative generation, have very fast ramping rates, and can be controlled to a high degree of precision and performance accuracy. While storage technology is an ideal

candidate for the NGR model, the model may also benefit other energy constrained resources such as dispatchable demand response or microgrid configurations that have limited ability to generate or consume energy continuously. The NGR model is also envisioned by the ISO as the model best suited for smaller, distribution connected resources, which when aggregated, demonstrate the ability to operate across negative and positive generation ranges.

4.1.2 ISO initial straw proposal

The ISO's initial straw proposal addresses the following four areas.

1. Enhance NGR documentation

Feedback from the April education forums suggests that the educational forum presentation included material and information that was not previously available about the NGR model and its capabilities. Because the ISO introduced the NGR model almost 3 years ago and because few energy storage projects have yet reached commercial operation, the adoption rate has been slow.[7] However, the adoption rate is likely to increase with the advent of energy storage procurement targets for utilities, storage original equipment manufacturers (OEMs) reducing costs, and developers bringing projects to market. Thus, the timing is right for the ISO to review and enhance NGR documentation in anticipation of more storage participating in the ISO market as NGRs.

To enhance NGR documentation, the ISO proposes to review the ISO Business Practice Manuals (BPMs) and update them with new or revised information to help clarify NGR model functionality and market participation requirements. Content will distinguish differences in requirements between resources participating as NGR from NGR participating under the Regulation Energy Management (REM) option. Multiple BPMs – including but not limited to Market Operations, Market Instruments, Direct Telemetry, Metering, Outage Management, Reliability Requirements, and Settlements and Billing – will be reviewed and updated where appropriate to reflect the most up-to-date information related to NGR requirements and operation.

[7] Although there are many projects under development that could ultimately use the NGR model, they are not yet in commercial operation and thus are not available to participate in the ISO market and utilize the NGR model.

2. Clarify use of state of charge in market optimization

As designed and implemented, the NGR model applies to energy constrained resources. The amount of a resource's available energy is a function of the resource's state of charge (SOC). The SOC is utilized for market resource co-optimization, real time dispatch feasibility, and automatic generation control (AGC) signaling. For the ISO to observe this energy constraint, the resource's SOC must be provided to the ISO through telemetry. This new parameter plays an important role in market optimization of awards, AGC signaling, and market dispatch.

The ISO proposes to clarify how it uses SOC in market optimization and include this information in externally available NGR documentation for stakeholders and market participants.

3. Evaluate initial state of charge as a submitted parameter in the day-ahead market

Under current rules, when an NGR bids into the day-ahead market, the initial SOC value used for that trading day is the ending SOC value from the previous day's day-ahead awards. When there are no previous day's day-ahead awards, the market system assumes that the initial SOC value for the resource is 50% of the maximum energy (MWh) limit defined when the resource is modeled in the ISO network model. As a result, stakeholders have indicated that the day-ahead market award optimization will not be accurate and may create infeasible market dispatches if the actual SOC value is not 50% of the maximum defined energy limit. While the current approach is to begin day-ahead participation at an actual resource SOC of 50%, participants have suggested that another approach would be for the ISO to allow the initial day-ahead SOC value to be supplied as a daily bid component with the day-ahead bid schedule.

In the real-time market, SOC values are passed every 4 seconds through telemetry to the ISO EMS system and then passed to the ISO market system every 1 minute to reflect current SOC values in the real-time market. The passing of the SOC to the ISO market systems helps ensure that the ISO does not create an infeasible dispatch to the resource.

The ISO proposes to evaluate the ability to submit a daily SOC bidding parameter to initialize the ISO day-ahead market system as a potential method to improve resource co-optimization. If approved, this option will include updates to the ISO's scheduling

infrastructure business rules (SIBR)[8] system that would allow scheduling coordinators to submit a daily bid parameter for NGR SOC in both the SIBR user interface and the SIBR application programming interface (API). Appropriate rules must be established in the SIBR application such that the SOC parameter is used only on the first interval of participation for the trading day. Additionally, rules will need to be defined or clarified on how the daily SOC bid value is reconciled with the real-time SOC value passed to the ISO in real-time telemetry for real-time market operation. Day-ahead and real-time settlement rules must also be reviewed and clarified for instances when day-ahead daily bid SOC values differ from real-time operation.

4. Evaluate option to not provide energy limits or have the ISO co-optimize an NGR based on state of charge

Stakeholders have suggested that NGR resources should not be required to provide energy limits or have the ISO co-optimize the resource based on SOC values. This request may be due in part to the lack of wholesale market participation experience with the NGR model and uncertainty of how SOC is used within the ISO co-optimization calculations and market dispatches. While the intent behind requiring the SOC value is to allow the ISO the ability to maximize the value of this resource in the wholesale markets and to ensure that the resource is not given an infeasible dispatch or AGC signal, the ISO also recognizes there may be circumstances or conditions where the benefits of SOC co-optimization by the ISO may not materialize based on multiple use scenarios or where the SOC comprises an aggregation of resources where the SOC becomes variable in nature.

[8] SIBR is an ISO application that provides scheduling coordinators access to the ISO market systems. SIBR functionality includes:

- Accepts bids and trades for energy and energy-related commodities from scheduling coordinators that are certified to interact with the ISO;
- Ensures that those bids and trades are valid and modified bids for correctness when necessary;
- Enters those bids and trades into a database for processing by other components of ISO's management systems; and
- Provides required feedback to scheduling coordinators concerning bids and trades that have been submitted.

The ISO recognizes that in some cases, NGRs may have difficulty providing a SOC value that is based solely on ISO market participation. This may be especially true for sub-resource aggregations which may be composed of multiple types of resources or for resources that are constantly changing based on aggregations where sub-resources may be entering or departing the resource aggregation.

For these cases, the ISO proposes to evaluate an option for NGRs to be modeled similar to a traditional generator, which does not experience the energy constraints of a typical NGR. Under this option, the scheduling coordinator would manage the SOC constraint and actively manage resource bids in the ISO real-time market in line with the resources ability to avoid non-performance conditions. Without SOC or energy limits, the ISO co-optimization process would not use these values when determining awards. If SOC values and energy limits are not provided, the ISO would assume that the NGR did not have these constraints. Resources modeled under NGR REM would not be allowed this option given the need for the ISO to maintain the resources energy state and SOC for continuous energy output.

4.2 Proxy Demand Resource (PDR) and Reliability Demand Response Resource (RDRR) enhancements

Under this topic, the ISO will consider use of alternative baselines for demand response participating in the ISO market as PDR or RDRR.

4.2.1 Background on baseline methodologies for demand response

A baseline calculates a "counter-factual" value, a theoretical measure of how much energy a customer would have consumed had there not been a demand response event. The baseline calculation compares the customer's counter-factual energy use to actual energy use during the demand response event. The difference between the two is the "nega-watts" a demand response (DR) resource delivered during the event. Since only the physical load can be metered and not the demand response quantity, the result

of the baseline calculation serves as the meter data to financially settle the energy delivered (energy not consumed) from a demand response resource.[9]

The North American Energy Standards Board (NAESB), responsible for developing and promoting industry standards, published a standard for DR baseline methodologies.[10] It provided standard terminology and identified five broad types of performance evaluation methodologies:

1) Baseline Type 1: use of historical interval meter data for calculation of a baseline performance;
2) Baseline Type 2: use of statistical sampling to estimate the usage of an aggregated DR where interval metering is not available for all aggregated customers;
3) Maximum Base Load: the ability of DR resource to keep its usage at or below a specific level that typically is determined based on historical peak usage;
4) Meter Before/Meter After: usage during dispatch period is compared to a prescribed period of time before dispatch; and
5) Metering Generator Output: output of generator behind load is metered directly and used as demand reduction.

The ISO tariff currently sanctions for use Baseline Type 1 and Baseline Type 2 of the NAESB approved performance evaluation methodologies. However, this NAESB terminology actually is not found in the ISO tariff. The ISO tariff addresses the equivalent of the NAESB Baseline Type 1 in tariff section 4.13.4 ("Customer Baseline Methodologies for PDRs and RDRRs") and NAESB Baseline Type 2 in tariff section 10.1.7

[9] A baseline calculation is necessary when the load-serving and demand response roles are independent of one another. If load is being scheduled and served by one entity while another entity is taking demand response actions on that load, then a baseline calculation is needed. There is only a meter to record load consumption; there is no meter to record the demand response event. This "pay to not consume" construct is in contrast to price-responsive demand, where, for example, an entity in the wholesale market can procure energy in the day-ahead market and then sell that energy back in real-time, by not consuming that energy, if and when advantageous to do so.

[10] Measurement and Verification of Wholesale Electricity Demand Response – NAESB WEQ-015; July 31, 2012

("Provision of Statistically Derived Meter Data"). For purposes of this discussion, this paper refers to these as "ISO Type I" and "ISO Type 2" respectively to help clarify the relationship.

ISO Type 1 is the most commonly used baseline method for performance measurement of DR resources among ISOs and regional transmission organizations (RTOs). This method uses historical meter data from the facility to calculate the baseline for the DR resource and it allows a day-of event adjustment to minimize baseline errors. The day-of adjustment uses actual load data in the hours preceding the event to adjust the baseline to better reflect the variables that may not be represented in the historical data (e.g. the impact of weather on load). ISO Type I uses the 10-in-10 non-event day methodology as described in section 4.13.4.1 of the tariff. Under this methodology, the ISO examines up to 45 days prior to the trade day to find ten "like" days. The ISO then calculates a simple hourly average of the collected meter data to create a load profile, i.e. the baseline. An adjustment of ± 20 % is allowed to the baseline.

ISO Type 2 uses statistical sampling to estimate an aggregated DR resource that was dispatched. It is best used for large, direct load control aggregations (e.g., residential A/C cycling) that are homogeneous, exhibit similar behavior, and where interval meter data is not readily available within the timeframe that the ISO needs for settlement. ISO Type 2 is described in section 10.1.7 of the tariff which allows the available interval meter data for the aggregated resource to be estimated based on a representative sample of meter data. Some stakeholders believe that there may be some ambiguity as to the precise meaning of "available interval meter data." Although most residential customers currently have meters that are recording hourly reads, participation in the ISO market may require a finer data granularity than what a residential meter provides. Additionally, some stakeholders have indicated that it may be unclear in the ISO tariff or applicable BPMs as to what constitutes a "representative sample," what are the statistical precision or accuracy requirements, or whether or not a control group can be established for purposes of estimating the meter data.

Currently there are no ISO market participants using the ISO Type 2 baseline methodology.

4.2.2 Stakeholder interest in alternative baseline methodologies

Under the umbrella of the California Public Utilities Commission's Demand Response OIR[11], a Supply Integration Working Group (SIWG) was established to 1) identify areas where requirements for the integration of supply resource demand response in the ISO market may be adding cost and complexity, determine whether these requirements can be simplified or changed without creating operational problems, prioritize these possible changes, and resolve them and 2) identify program modifications and operational techniques to make demand response programs more suitable and successful as supply resources.

The SIWG filed a report with the CPUC on June 30, 2015, in which it identified the need for the ISO to expand its support of baselines to include a meter generator output (MGO) baseline for energy and operating reserves, to develop a process for adding "custom baselines," and to address perceived gaps regarding the ISO Type 2 baseline methodology in its BPMs.

The ISO has asked the SIWG members to continue to meet but as an ESDER stakeholder work group to leverage the momentum and expertise among the participants. This ESDER stakeholder work group's efforts will be reflected in the proposals presented within the ESDER initiative in order to receive broader stakeholder input. The work group is open to all stakeholders and meetings will be noticed through the ESDER.

4.2.3 ISO initial straw proposal

Based on a consideration of the SIWG report, the ISO recognizes the need to expand the available approved baseline methodologies to accommodate more demand response use cases.

In developing alternative baseline methodologies, the ISO proposes to apply the following principles:

[11] D.14-12-024.

1) Accuracy – alternate baselines must provide a more accurate estimate of the performance in comparison to existing ISO Type 1 and ISO Type 2 methodologies for the use case in consideration.

2) Auditability – alternate baselines must provide the ability for the ISO to audit fundamental parameters upon which the baseline is established.

3) Ease of Implementation – ISO systems and processes must be able to implement the alternate baseline.

4) Compliance with NAESB standards – alternate baselines must be compliant with NAESB standards and exist within NAESB approved parameters.

Through the ESDER the ISO intends to develop MGO as a new ISO-approved baseline methodology and to develop additional detail regarding the ISO Type 2 baseline methodology and document that in the appropriate BPMs.

This will address two of the three recommendations of the SIWG discussed above. The development of a process for adding "custom baselines" will be deferred until after the ISO's new demand response registration system (DRRS) is deployed in 2016. The business requirement specifications (BRS) for the DRRS have been drafted to allow for variable parameters and the possibility of custom Type 1 baselines. The ISO will reevaluate the topic of custom baselines after gaining sufficient experience with the new DRRS.

4.3 Non-resource adequacy (non-RA) multiple use applications

4.3.1 Background

Multiple use applications are those where an energy resource or facility provides services to and receives compensation from more than one entity. The ISO, CPUC and Energy Commission 2014 Energy Storage Roadmap identified "Define and develop models and rules for multiple-use applications of storage" as a medium-priority action item. Based on stakeholder input the Roadmap identified three broad categories of multiple-use applications of greatest interest: (a) an energy storage facility serving as a

transmission asset and participating in the wholesale market; (b) storage providing reliability services to the distribution grid and services to the wholesale market; and (c) storage providing services such as demand management to an end-use customer while participating in the wholesale market.

Since the release of the Roadmap, the CPUC opened a new energy storage rulemaking (R. 15-03-011), which lists multiple-use applications as an issue for Track 2 of the proceeding; and the ISO launched the ESDER initiative to consider multiple-use applications for aggregated DER in general, including but not limited to energy storage. The ISO's June 25 revised scope and schedule for this initiative stated that in 2015 the ISO would address a limited set of multiple-use applications, specifically, multiple-use applications (b) and (c) above for situations where the resource is not providing resource adequacy (RA) capacity. At that time the ISO indicated that applications involving RA provision would be addressed in the 2016 scope of this initiative.

Some stakeholders raised concerns about the limitation to non-RA cases in 2015. In response the ISO explained that a primary reason for deferring cases involving RA provision is to await significant progress on the ISO's "Reliability Services Initiative – Phase 2" (RSI-2) and "Flexible Resource Adequacy Criteria and Must Offer Obligations – Phase 2" (FRACMOO-2) initiatives. The ISO began both initiatives this summer and expects to complete RSI-2 in the first quarter of 2016. FRACMOO-2 will take somewhat longer: the ISO began working group meetings on FRACMOO-2 in July, will begin the regular stakeholder process in October, and expects to have completed at least two rounds of straw proposals by first quarter 2016 with the intent of completing the initiative by summer 2016. Thus, if the next phase of ESDER begins in first quarter 2016, the ISO will have the benefit of the RSI-2 results and the substantial work done in FRACMOO-2, and can build on these results and ensure consistency across all three initiatives.

Between RSI-2 and FRACMOO-2 the ISO will address several important issues for energy storage and aggregated DER that wish to provide RA capacity. FRACMOO-2 will expand the definition of flexible capacity to address ISO operational concerns that were not addressed in the original definition, and will consider provision of flexible capacity by resources that have not been eligible thus far, such as imports and non-NGR energy storage facilities. RSI-2 will take up, among other things, substitution rules for flexible

RA resources on scheduled or forced outage. Because energy storage and some types of aggregated DER are likely to provide flexible RA capacity, the ISO believes it is necessary to have these initiatives complete or well advanced before the ESDER initiative takes up multiple-use scenarios involving RA.

For purposes of this initiative the ISO proposes to define the distinction between RA and non-RA in temporal terms on a monthly basis, to align with the existing RA structure of monthly showings. At this time the ISO is not considering any more granular temporal RA election. Thus, if a resource is providing RA capacity only in some months of the year, provisions developed here for non-RA multiple use scenarios would be applicable during months when the resource is not providing RA capacity. The ISO does not intend to exclude partial RA scenarios, where a resource provides a portion of its capacity to an LSE as RA capacity; in such scenarios the ISO will consider multiple use applications for the non-RA portion of the resource, subject to existing ISO tariff provisions regarding partial RA resources.

4.3.2 Scenarios and use cases to be considered

The ISO believes the most effective way to begin addressing multiple-use applications is to identify and describe those specific configurations, use-cases, or scenarios that are of most interest to stakeholders. To that end, below is an initial categorization of the scenarios the ISO has identified thus far, with some initial thoughts about the current status of each scenario and whether/how to address it in this 2015 phase of the ESDER initiative. The ISO requests that stakeholders, in their written comments, offer their thoughts on these scenarios, specifically to add details to make the scenarios more concrete and to identify additional scenarios they would like to see included, subject to the general guideline of avoiding the complication of RA offer obligations.

1. DER provide services to the distribution system and participate in the wholesale market

In principle DER could provide two main categories of service to the distribution system:

- Real-time operational services such as voltage support and power quality that help support reliable operation of the distribution system; and
- Deferment of distribution system infrastructure upgrades.

Although there has been broad recognition of the potential for DER to provide real-time operational services to the distribution system, at this time such services have not yet been defined. This subject has been identified in the scope of the CPUC's distribution resources plan (DRP) proceeding (R. 14-08-013), and the ISO understands that ongoing efforts under that proceeding will specify needed distribution-grid services and their associated performance requirements. The same is true for DER selected to substitute for a needed infrastructure upgrade: the effectiveness of DER to offset distribution infrastructure will likely depend on the DER's ability to perform in specific ways under specific grid conditions. Thus, once the needed operational services are formally defined and a distribution utility procures DER to provide them, those DER will be subject to some form of dispatch or direct control by the distribution utility.

Possible conflict arises, then, if a given DER is also bidding into the wholesale market and the real-time needs of the distribution system are not compatible with the ISO dispatch instruction. One possibility in this situation is for the DER to meet the needs of the distribution system and not fully follow the ISO dispatch. Because the ISO has limited this discussion to cases where DER are not providing RA capacity, DER would simply incur an uninstructed deviation in the ISO market and would be settled accordingly.

The scenario just described raises the following question:

Question 1: If a DER is procured by the distribution utility to provide a grid service and bids into the ISO market, how should conflicting real-time needs of the distribution utility and the ISO be managed?

Another possibility is that the ISO's dispatch instruction to the DER aligns with the needs of the distribution system. In such a situation the DER may be paid twice for the same service, once by the ISO for following the dispatch and once by the distribution utility for the service it provided. This scenario raises another question:

Question 2: Is there a concern about double payment to a DER for any market interval in which the DER follows an ISO dispatch instruction that aligns with the service the same DER is providing to the distribution utility? If so, how should the ISO address this concern?

Considering an aggregated DER that crosses multiple pricing nodes or "pnodes," one might suppose that the issues discussed in this section do not apply because service to

the distribution utility would always be local in nature and could not be provided by a multi-pnode DER aggregation. For example, if the distribution utility needs voltage support on a particular feeder, it would not dispatch a resource whose response would be distributed over a much larger electrical area. Alternatively, if a multi-pnode DER aggregation is allowed to provide service to the distribution utility and a local need arises, the utility may want to dispatch a single sub-resource of the DER aggregation to address the local problem. The ISO's initial view is that this would be highly problematic if the same DER aggregation is also bidding into the ISO market during the same interval.

One provision that the ISO included in its DER aggregation proposal that was recently approved by the Board of Governors is that any DER that participates in the ISO market as a sub-resource of a DER aggregation cannot also participate as a separate resource.[12] This provision does not explicitly prohibit a DER that is also a sub-resource of a multi-pnode DER aggregation from providing service to the distribution system, the ISO believes that some limitation is necessary. The reason is that a multi-pnode DER aggregation has an associated set of distribution factors (i.e., weights reflecting the proportion of the total aggregate DER capacity that is located at each pnode) that the ISO uses to model the expected pnode distribution of the DER aggregation's response to a dispatch instruction. If one or more of the sub-resources of the aggregation respond independently to meet the needs of the distribution system, then those distribution factors will no longer predict the pnode distribution of the response to ISO dispatch, and as a result, the response may create congestion or other real-time operational problems for the ISO.

Although the potential to create a congestion problem as just described would not arise in the case of a single-pnode DER aggregation, it is possible that the use of a sub-resource of such an aggregation to provide distribution-level services could alter the performance characteristics of the resource so that its response to an ISO dispatch instruction is very different to what the ISO expected in issuing the dispatch. Therefore

[12] Information about this DER aggregation proposal is available at http://www.caiso.com/informed/Pages/StakeholderProcesses/ExpandingMetering-TelemetryOptions.aspx.

the question about limiting the use of sub-resources of a DER aggregation to provide distribution-level services should be addressed for a single-pnode as well.

The concerns raised above may be captured in the following question:

Question 3: Should there be limitations on the provision of distribution-level services by a multi-pnode DER aggregation or the sub-resources of a single-pnode or multi-pnode DER aggregation that is an ISO market participating resource? If so, what limitations are appropriate?

The ISO believes at this time that the answer to the first part is definitely yes, at least as regards multi-pnode DER aggregations, and requests stakeholders to offer suggestions in their comments on ways to address the identified concerns.

2. DER provide services to end-use customers and participate in the wholesale market

(a) DER are installed behind the end-use customer meter and operate so that there is never a net[13] injection onto the distribution grid across the customer meter.

This scenario is consistent with the ISO's proxy demand response (PDR) model. Because there is no injection of energy from the customer premises onto the distribution system, the resource appears to the ISO as demand response or load modification. Also, because the ESDER initiative considers the adoption of alternative baselines for use with PDR resources, the ISO suggests that this scenario will be sufficiently addressed under the PDR baseline topic (see section 4.2). If any stakeholders disagree with this determination, please explain in your written comments any specific issues related to this scenario you believe need to be addressed that are not covered under the PDR baseline topic.

(b) DER are installed behind the end-use customer meter and may, in the course of their operation, result in a net[14] injection onto the distribution grid across the customer meter.

[13] "Net" in this context means the combined effect of all component facilities behind the customer meter, including the customer load as well as any installed DER, irrespective of whether any of those components also has its own sub-meter.

[14] See previous footnote.

This scenario is consistent with the ISO's non-generator resource (NGR) model: the combined facility consisting of the customer load and the DER will sometimes result in a net injection onto the grid and sometimes a net load or withdrawal. Again, as in the previous scenario, the ISO believes that the NGR topic within the ESDER initiative will adequately address issues related to this scenario, and there is no need for additional treatment as a multiple-use scenario (see section 4.1). If any stakeholders disagree with this determination, please explain in your written comments any specific issues related to this scenario you believe need to be addressed that are not covered under the PDR baseline topic.

(c) DER are installed on the utility side of the distribution system and provide service to end-use customers and also participate in the wholesale market.

This multi-use scenario was identified recently in the CPUC's energy storage OIR (R.15-03-011). While this seems to be a conceptually plausible scenario, the ISO is not aware of any instances that exist today or provisions whereby a DER on the utility side of the meter can provide service directly to end-use customers. Certainly merchant DER can provide wholesale energy to a load-serving entity who then provides retail energy to end-use customers, but this arrangement exists today and does not raise any new issues that need to be addressed in the present initiatives. The ISO therefore believes that this scenario is not relevant at this time.

4.3.3 ISO initial straw proposal

Based on the discussion above, the ISO intends to address questions 1-3 related to topic 1 above, scenarios where DER provide services to the distribution system and also bid into the wholesale market. The ISO does not believe there are issues that need to be addressed at this time related topic 2 above, scenarios where DER provide services to end-use customers and also bid into the wholesale market, beyond those issues that will be addressed under the PDR and NGR topics within the ESDER initiative.