California ISO

Energy Storage and Distributed Energy Resources (ESDER) Stakeholder Initiative

Phase 2

Issue Paper

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1 Introduction

The central focus of the ISO's ESDER initiative is to lower barriers and enhance the ability of transmission grid-connected energy storage and the many examples of distribution-connected resources (i.e., distributed energy resources or "DER") [1] to participate in the ISO market. The number and diversity of these resources are growing and they represent an increasingly important part of the resource mix. Integrating these resources is expected to help lower carbon emissions and add operational flexibility.

In this issue paper, the ISO proposes a scope of issues for the second phase of the ESDER initiative ("ESDER Phase 2").

[1] Distributed energy resources are those resources on the distribution system on either the utility side or the customer side of the end-use customer meter, including rooftop solar, energy storage, plug-in electric vehicles, and demand response.

The ISO proposes that ESDER Phase 2 comprise the following topic areas:

1. Consider the following enhancements to the NGR model:
    a. Represent use limitations in the NGR model.
    b. Represent multiple configurations in the NGR model.
2. Consider the following demand response enhancements. The ISO is recommending that proposals on both topics be developed through stakeholder led working groups.
    a. Ability for PDR to be dispatched to both curtail and increase load and provide regulation service.
    b. Alternative baselines to evaluate PDR performance.
3. Multiple-use applications. To avoid redundant efforts on this topic, the ISO is initially proposing to work with stakeholders on this topic through its participation in Track 2 of the CPUC's energy storage proceeding[2] rather than initially in ESDER Phase 2.
4. Resolve the distinction between wholesale charging energy and station power. Although this is also a topic in Track 2 of the CPUC's energy storage proceeding, station power is specifically addressed in the ISO tariff and the ISO will address this issue in ESDER Phase 2. However, because coordination on this topic is important, the ISO intends to also contribute to this topic in Track 2 of the CPUC's energy storage proceeding as necessary.
5. Review the allocation of transmission access charge to load served by DER. This topic was initially raised in the ISO's transmission access charge options stakeholder initiative. The ISO has determined this topic is more appropriately addressed in the ESDER Phase 2 initiative.

[2] CPUC Rulemaking 15-03-011.

2 Background

The ISO launched the first phase of the ESDER stakeholder initiative (ESDER Phase 1) in June 2015 to identify and consider potential enhancements to existing requirements, rules, market products and models for energy storage and DER market participation. The initiative began with identification of a scope of issues and after consulting with stakeholders ESDER Phase 1 ultimately comprised three topic areas:

1. Enhancements to the ISO non-generator resources (NGR) model;
2. Enhancements to demand response performance measures and statistical sampling for the ISO proxy demand resource (PDR) and reliability demand response resource (RDRR) market participation models; and,
3. Clarifications to rules for non-resource adequacy multiple-use applications.

Following determination of the scope, the ISO worked with stakeholders to develop policy proposals, and those triggering the need for tariff change (i.e., topic areas 1 and 2 above) were approved by the ISO Board of Governors at its February 3-4, 2016 meeting.[3] The ensuing stakeholder process to develop tariff amendments to implement these proposals is getting underway.

The mid-2015 scoping effort also produced a list of issues for possible consideration in ESDER Phase 2. The mid-2015 list:

1. Additional NGR enhancements
    a. Consider a single participation agreement, rather than the current requirement that an NGR execute both a participating generator agreement (PGA) and a participating load agreement (PLA).
    b. Evaluate interconnection requirements for non-exporting NGR.

[3] More information about the first phase of the ESDER initiative may be found at: http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorage_DistributedEnergyResourcesphase1.aspx.

c. Explore multiple configurations for a single NGR where each configuration is allowed different operating characteristics and economic bid curves based on physical constraints of the resource.

d. Evaluate expanding bid cost recovery for NGR to potentially cover additional resource types and configurations.

e. Enhance load management capability and participation under the NGR model (i.e., both increasing and decreasing consumption).

2. Additional PDR/RDRR enhancements – Explore dispatching DR to increase consumption.
3. Address remaining policy issues from the DERP initiative.
4. Evaluate the distinction between wholesale charging energy and station power.
5. Consider additional multiple use applications.
6. Examine alignment between distribution level interconnection and the ISO NRI process.
7. Consider open policy issues from CPUC demand response working groups.

Following publication of this potential list of topics in mid-2015, some stakeholders provided comments addressing the proposed 2016 scope. PacifiCorp urged the ISO to explore increased utilization of dispatchable demand resources. Southern California Edison (SCE) sought to verify that two issues would be added to the 2016 scope: defining how an NGR with multiple configurations will bid into the market and modeling of use limitations in the NGR model. Pacific Gas & Electric (PG&E) also asked about modeling use limitations in the NGR model as a topic for 2016 (PG&E again reiterated this interest in comments submitted toward the conclusion of ESDER Phase 1). California Department of Water Resources State Water Project (SWP) expressed its support for including the topic of modeling multiple configurations in the NGR model in the 2016 scope. Advanced Rail Energy Storage (ARES) urged that regulation market rules for fast-response storage resources be included in the 2016 scope.

The ISO acknowledged these interests and indicated that in early 2016 it would provide stakeholders with another opportunity to express their perspectives on the 2016 scope (i.e., phase 2) of the ESDER initiative. This paper is that opportunity. It is through this

paper and subsequent comment opportunity that the ISO is providing stakeholders with a renewed opportunity to express their perspectives on ESDER Phase 2.

To develop the scope of issues proposed in this paper, the ISO used the mid-2015 list of topics and associated stakeholder comments as a starting point. The ISO expanded that list to include topics that stakeholders have suggested more recently (e.g., review the allocation of transmission access charge to load served by DER). Then the ISO pared this list down to a feasible scope of issues for potential policy development in 2016. The CAISO considered several factors including the perceived priority of each topic, the need to allocate ISO staff resources to Track 2 of the CPUC's energy storage proceeding, and the need to balance development of new storage and DER enhancements against implementation of enhancements previously developed in the ESDER Phase 1 and Expanding Metering and Telemetry Options stakeholder initiatives.

Topics proposed for inclusion in the ESDER Phase 2 scope are discussed in section 3. A stakeholder process schedule is provided in section 4. Topics not selected for this phase are discussed in section 5.

3 Proposed Scope of Issues

The ISO proposes that ESDER Phase 2 comprise the following five topic areas.

3.1 NGR enhancements

The ISO is proposing to explore two possible areas of NGR enhancement: (1) representing use limitations in the NGR model, and (2) representing multiple configurations in the NGR model.

3.1.1 Represent use limitations in the NGR model

In comments submitted during ESDER Phase 1, both SCE and PG&E suggested that use limitations in the NGR model be a high priority issue for the ESDER Phase 2 scope. PG&E submits that characteristics of energy storage such as throughput limitations (e.g., maximum annual discharge limitation) and transition limitations (i.e., a limit over time on the number of transitions reversing the direction of energy flow) should be included in the NGR model. PG&E believes that by modeling such limitations and including such

characteristics in the master file for NGRs, market participants could offer more accurate bids and allow ISO to improve dispatch efficiency. SCE stressed the importance of addressing this topic early so this enhancement could inform future energy storage procurement. In recent comments, PG&E strongly recommends that the ISO address throughput limitations as a parameter in the NGR model. PG&E adds that managing throughput limitations is critical to honor resource warranties and to maximize the useful life of these resources.

To better understand the physical use limitations storage resources may have that could be considered as a potential parameter in the NGR model, the ISO invites stakeholders to provide examples of physical use limitations associated with use cases and/or technologies.

The ISO believes that incorporating energy storage use limitations in the NGR model is appropriate and consistent with the treatment and revised definition of use-limited resources in the Commitment Cost Enhancements Phase 3 (CCE3) stakeholder initiative.[4] Historically, use-limited status has been a "catch-all" category for resources not available twenty-four seven, and it was primarily used to exempt resource adequacy resources from bid insertion. In CCE3, the ISO is proposing to narrow the definition of what is classified as a use-limited resource to those resources that can be optimized with an opportunity cost based on eligible limits. Going forward, designating a resource as use-limited means the resource can reflect its opportunity cost in its commitment cost bids (e.g. minimum load and start-up costs) per the revised definition of use-limited in the CCE3 policy. To date, storage resources have not had commitment costs in the market, nor has there been sufficient discussion around what cost components comprise a commitment cost (minimum load and startup cost) for storage resources.

3.1.2 Represent multiple configurations in the NGR model

The intent of this topic is to add functionality to the NGR model that would allow resources to define their operating characteristics in a way that better matches their

[4] More information on the CCE3 initiative may be found at: http://www.ISO.com/informed/Pages/StakeholderProcesses/CommitmentCostEnhancementsPhase3.aspx

physical constraints and their physical allowances, similar to the multi-stage capability for generators. Today's NGR model assumes that a resource behaves consistently within their discharge and charge operating regions. The ISO understands this is not always an accurate assumption for resources comprising certain chemical storage technologies or aggregations of various types of resources. The ISO recognizes that the current NGR model can be improved to further optimize dispatch solutions that consider the resource's changing capabilities within positive and negative generation operating regions.

Under this topic, the ISO will explore multiple configurations for a single NGR where each configuration is allowed different operating characteristics and economic bid curves based on physical constraints of the resource. Both SCE and SWP have suggested that defining how an NGR with multiple configurations could bid into the market is a high priority issue that should be addressed in the ESDER Phase 2 scope.

3.2 Demand response enhancements

The ISO is proposing to explore two possible areas of demand response enhancement: (1) Exploring the ability for PDR to be dispatched to both curtail and increase load, and provide regulation service; and (2) developing alternative baselines to assess the performance of PDR and RDRR.

The ISO believes that both will require a thorough vetting from stakeholders with special end-use customer and retail ratemaking expertise. The ISO recommends that proposals on both topics are best developed through stakeholder led working groups that develop and submit straw proposals into the ESDER Phase 2 stakeholder initiative. Stakeholders interested in these two topics should form these working groups and, as necessary, leverage additional expertise, such as the Demand Analysis Working Group, for input and assistance.

3.2.1 Ability for PDR to both curtail and consume load, and provide regulation service

In prior roadmap efforts and ISO stakeholder initiatives catalog processes that preceded ESDER, stakeholders asked about combining features of the PDR and NGR models to enable a demand response resource to provide an expanded set of services beyond load

curtailment – i.e., provide all ISO products including energy, spinning reserve, non-spinning, and regulation service. Stakeholders continue to express interest in this topic.

The ISO recommends that interested stakeholders form a Load Consumption Working Group (LCWG) to resolve the unique issues associated with demand resources responding to wholesale market signals yet consuming energy under retail rates. This stakeholder led working group must address, for instance,

- How would financial settlements work given wholesale bid that causes an increase in retail consumption?
- What retail rate impacts would need to be resolved if a customer responds to a wholesale load consumption signal, such as demand charge impacts, or pushing energy consumption into higher tiers?
- How would the ISO assess the performance of a resource that consumes energy, i.e. what would the consumption energy have been but for the signal to consume energy? Above what threshold or baseline is a load consuming?
- What happens and what are the consequences if a resource over or under performs, both at the wholesale and retail settlement level?
- What are the retail rate impacts of PDR providing regulation service?
- What Grid Management Charges are appropriate for the ISO offering load consumption services and capabilities?

The ISO believes "load consumption" issues requires vetting and resolving complex customer, regulatory, technical, and ratemaking issues before a consensus proposal on ISO directed load consumption can be presented for ISO adoption, refinement, and FERC approval.[5]

The ISO anticipates the LCWG developing a consensus-driven straw proposal and submitting that proposal into the ESDER stakeholder initiative for broader consideration, refinement and possible adoption by stakeholders and the ISO.

[5] Any state energy policies that have to be amended or created must likewise be identified as part of the working group process, and whether such policies would pre-empt ISO adoption until resolved or approved by the appropriate local regulatory authority.

3.2.2 Alternative baselines to assess PDR performance

For this topic, the ISO recommends that interested stakeholders form a Baseline Analysis Working Group (BAWG) to vet baseline performance methodologies and their application by customer type, end-uses, and load profiles. Any BAWG proposed baselines must provide quantitative analysis on the accuracy, bias, and variability of any proposed baselines, and how application of a new baseline will significantly improve accuracy, and reduce bias and variability over the current 10-in-10 baseline method for a particular customer, customer class or end-use technology. The BAWG must discuss the feasibility of the ISO administrating the proposed baseline performance methods, and what those administrative duties might entail, e.g. what tools and capabilities would the ISO need to assess that a certain customer, customer class or technology is a good fit under a proposed baseline methodology.

The ISO anticipates that the BAWG would develop a consensus-driven straw proposal and submit their proposal into the ESDER stakeholder initiative for consideration, refinement and possible adoption.

3.3 Multiple-use applications

Multiple-use applications are those where an energy resource or facility provides services to and receives compensation from more than one entity. DER could potentially provide and be compensated for many services to customers, the distribution system and the wholesale markets as new markets and services evolve across the energy supply chain.

3.3.1 Progress made in ESDER Phase 1

In ESDER Phase 1, the ISO addressed two broad categories or types of multiple-use applications: (1) DER providing reliability services to the distribution grid and services to the wholesale market; and (2) DER providing services such as demand management to end-use customers while participating in the wholesale market. ESDER Phase 1 limited its treatment of these multiple-use applications to circumstances where the resource either is not providing resource adequacy (RA) capacity or can set aside a portion of its installed capacity not providing RA capacity. The criterion “not providing RA capacity” was defined to apply on a monthly basis for purposes of the initiative; i.e., the capacity

in question should not be included in a load-serving entity's RA plan for the given month.

In the case of DER providing services to the distribution system and participating in the wholesale market (the first category of multiple use applications examined in ESDER Phase 1), the ISO posed three questions and developed a proposed approach to each.

First, if 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? The ISO proposed that it would settle a DER dispatch as other generating resources are settled – i.e., that if the DER deviates from an ISO dispatch instruction to provide service to the distribution system or for another reason, its deviation will be settled as uninstructed imbalance energy.Rather than establish a priority among conflicting needs, the ISO proposed to leave it to the resource owner or operator to decide how to respond in light of the settlement consequences for deviating from an ISO dispatch instruction.

Second, 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, is there a double payment concern that must be addressed? The ISO proposed not to implement any provisions to address potential double payment situations where a DER is compensated by the distribution utility and is also settled through the ISO market for responding to an ISO dispatch. Instead, the ISO indicated that although it may reconsider this position, it did not believe the issue is ripe for resolution because distribution-level services have not yet been defined. The ISO's position is that double payment concerns from both the distribution utility for distribution-level services and the ISO for wholesale market participation must be based on an understanding of the specific distribution-level services involved and how they are procured, utilized and compensated by the distribution utility. These questions are being considered in CPUC proceedings[6] and may or may not be ripe for consideration by the ISO in ESDER Phase 2.

Third, the ISO considered whether there should be limitations on the provision of distribution-level services by a multi-pricing node DER aggregation or the sub-resources

[6] See in particular the CPUC Distribution Resources Plan (DRP) proceeding (R.14-08-013) and the Integration of Distributed Energy Resources (IDER) proceeding (R.14-10-003).

of a single-pricing node or multi-pricing node DER aggregation that is an ISO market participating resource? If so, what limitations are appropriate? The ISO proposed not to impose any such limitations. This is because under the ISO's proposed DER aggregation framework[7], the ISO will require no specific performance by sub-resources that comprise either a multi-pricing node or single-pricing node DER aggregation. The ISO's requirement is that when the ISO issues a dispatch instruction to a DER aggregation, the net response at each constituent pricing node be in the direction of the dispatch and the net response across constituent pricing nodes be in proportion to the DER aggregation's distribution factors. As long as the DER aggregation complies with this requirement, the operational behavior of individual sub-resources will not be subject to ISO requirements. An individual sub-resource could respond to the needs of the distribution system as long as the DER provider who operates the DER aggregation delivers the net response at the associated pricing node that is in the same direction as the dispatch instruction and aligns with the distribution factors for the DER aggregation.

With DER that provide services to end-use customers and participate in the wholesale market (the second category of multiple use applications examined in ESDER Phase 1), the ISO determined that no additional new provisions were needed beyond the provisions developed in ESDER Phase 1 for PDR/RDRR involving behind-the-meter generation devices. To accommodate the proliferation of behind-the-meter generation devices involved in demand response, the ISO developed 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 demand response performance is the demand reduction resulting from the output of the behind-the-meter generation device for the dispatch interval. Under the ISO's proposal, the resource's response is 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 appropriately removes 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

[7] See the ISO's filing with the Federal Energy Regulatory Commission at this link: http://www.caiso.com/Documents/Mar4_2016_TariffAmendment_DistributedEnergyResourceProvider_ER16-1085.pdf

ISO dispatch. The adjustment is intended to mitigate issues of wholesale and retail service overlap and the potential for double compensation present in this multiple use application scenario. The adjustment is calculated by taking an average of the energy delivered by the generation device during a prescribed number of prior non-event hours. This proposed solution to address this PDR-related multiple-use application scenario was approved by the ISO Board of Governors during its February 3-4, 2016 meeting.

3.3.2 Proposed effort in ESDER Phase 2

In ESDER Phase 2 the ISO initially plans to continue its efforts to address multiple-use applications through its participation in the CPUC's energy storage proceeding.[8] This approach is necessary to avoid redundant and potentially divergent efforts between the storage proceeding and the ISO initiative. If the storage proceeding identifies issues that require treatment in an ISO initiative or develops proposals appropriate for ISO consideration, refinement and possible adoption, the ISO can open an initiative or expand ESDER Phase 2.

The subject of multiple-use applications will receive significant attention in Track 2 of the CPUC's energy storage proceeding. Track 2 will delve into many aspects of multiple-use applications including identification of use cases that provide multiple services and participate in the ISO market, and cost-recovery issues such as double payments, overlapping value streams, and redundant compensation.

The viable revenue streams available to energy storage resources will drive the number and variety of energy storage use-cases and configurations that will appear in the evolving DER marketplace. Revenue or "value streams" reflect the energy and capacity services energy storage resources can or will be able to provide and be compensated for as new markets and energy services evolve across the energy supply chain.

Rocky Mountain Institute ("RMI") published a study on the economics of battery storage to address what services exist or may exist that will drive multi-use applications and the value proposition for energy storage. The study identified 13 services that energy

[8] CPUC Rulemaking 15-03-011.

storage can provide to three distinct stakeholder segments or areas of the supply chain, summarized in the table below.[9]

STAKEHOLDER GROUPS	SERVICES
ISO/RTO SERVICES	• Energy Arbitrage • Frequency Regulation • Spin / Non-Spin Reserves • Voltage Support • Black Start
UTILITY SERVICES	• Resource Adequacy • Distribution Deferral • Transmission Congestion Relief • Transmission Deferral
CUSTOMER SERVICES	• Time-of-Use Bill Management • Increased PV Self-Consumption • Demand Charge Reduction • Back-up Power

The list can be augmented in the future by distribution-level operational services being considered in the Commission's Distribution Resources Plan proceeding, services such as local voltage support and power quality that would be additional utility services in the above table. Definition of distribution-level services that can be provided by storage and other DER is also being considered in the More Than Smart working group, which is an ongoing venue for stakeholders interested in the growth of DER and their impacts to discuss related planning and implementation issues.

Although some are not yet fully specified and ready to be turned into revenue streams, the list reflects existing and potential future revenue opportunities storage and other DERs can participate in if they have the right characteristics and, importantly, are

[9] Rocky Mountain Institute Economics of Battery Storage study may be found here: http://www.rmi.org/Electricity

interconnected where needed. In particular, a key insight of the RMI study is that it matters where the resource is interconnected, because it affects services and value streams the device can provide across the energy supply chain.

RMI points out that if a resource is interconnected to the ISO/RTO operated transmission system, it can offer only the ISO/RTO services, i.e., five of the thirteen services. However, if interconnected on the distribution system, in front of the customer meter, it can offer all four utility services, plus all five ISO/RTO services. Finally, a resource located behind the customer meter can offer all 13 services, four customer services and the other nine utility and ISO/RTO services. A resource's potential value and service offerings increase when it interconnects further out at the edge of the grid. This means we should expect to see use cases and configurations involving storage devices behind the customer meter designed to provide services directly to the customers where they are located and to the distribution and transmission systems. Because most of the distribution-level services identified in concept have not yet been specified in sufficient detail for implementation, we should expect configurations that serve end-use customers and participate in the ISO/RTO markets to dominate the multi-use arena in the near term.

Multi-use scenarios reflect distributed energy resource owners offering combinations of these thirteen (or perhaps more) services to the three identified stakeholders: the ISO, UDC, and end-use customer. As an industry, we need to define each service, its rules, performance requirements, measurement, etc., so the incremental value each service provides is fairly paid to each resource that provides the service while safeguarding against fraud, manipulation, and unearned revenue.

For instance, interconnecting a device at the edge of the grid enables the resource owner to capture multiple value streams, between the customer and ISO/RTO. Two problematic multi-use scenarios emerge, including variations on these scenarios, which include offering services mutually exclusive, and selling the same energy or capacity twice without adding incremental value.

Mutually Exclusive Capacity and Energy

The offering of capacity and energy services can be mutually exclusive. An example from the ISO market is that a successful bidder in the ancillary services market cannot resell the energy behind the ancillary services capacity award. For a spinning or non-

spinning reserve award, the energy must be bid into the ISO market and must remain available so the ISO can dispatch it if and when needed in a contingency. The ISO has a means to monitor such activity and employs a no-pay settlement rule to subtract the ancillary services capacity payment if it finds that the energy behind an ancillary services capacity award was unavailable.

Another example of this mutual exclusivity between energy and capacity is when the capacity of a storage resource located behind a customer's meter is sold as resource adequacy capacity to an LSE, making that resource's capacity subject to a must-offer obligation. Because a storage resource has limited energy production capability, conflict can raise if the same capacity is also used to manage its host customer's demand charges and perform retail rate arbitrage. Because resource adequacy capacity comes with a must offer obligation, the energy is dedicated to the ISO, but if the resource exhausts its charge before the ISO needs to dispatch it, it will have violated its resource adequacy obligation to the ISO.

Selling the Same Energy Twice

The sale and export of energy sourced in the distribution system and sold into the bulk power system via a Wholesale Distribution Access Tariff ("WDAT") is an approved and acceptable means of providing energy services. The WDAT enables the safe and reliable interconnection of a distribution connected resource to sell its energy into the wholesale market. Other scenarios may exist that require no WDAT, but still allow resources behind the meter to export energy onto the grid, such as with Net Energy Metering ("NEM"). What must be avoided is a resource getting paid two or more times for the same energy delivered, capturing unearned value by simultaneously selling and banking the same energy.

Suppose a resource owner sells energy to the ISO/RTO from a large solar resource behind its facility meter, while the facility is enrolled under a utility's NEM tariff. The owner of the resource sets the resource up for participation in the ISO market and bids the excess energy from the resource into the wholesale market. Simultaneously, the owner "banks" the excess energy from the resource under the NEM tariff to be withdrawn and consumed by the facility at a different time. In this simple example, the resource owner would receive a double value or compensation: paid once by the ISO for

wholesale energy and a second time for the value of energy withdrawn and consumed at a later time via the NEM tariff, receiving two value streams for the same energy.

In its opening comments in Track 2 of the energy storage proceeding, the ISO recommended the following to the CPUC:

1. Refine and assess the list of energy and capacity services: Start with the 13 services identified by RMI and the distribution-level services being considered in the DRP proceeding, and then refine the list in ways meaningful to the CPUC and the market structures in California. Each service type can then be evaluated against different use-cases to test for new rules, incompatibilities, and requirements, ensuring every identified service delivers incremental value when bundled with other energy and capacity services under a multi-use scenario.
2. Identify energy and capacity services already compensated: The CPUC should identify what incentives, tariffs, and rates exist that already compensate for certain energy and capacity services as identified in the RMI study and refined in this proceeding. If a multi-use scenario emerges where one or more of these services are already compensated, then such multi-use applications should be modified or rejected to account for the services already compensated.
3. Establish guiding principles: The ISO recommends CPUC staff work with interested parties to develop a set of principles that can test the validity of different multi-use scenarios. Does each service in a multi-use scenario provide incremental value, or is the same energy or capacity service being sold twice with no added benefit. Questions like these can be turned into guiding principles and are instructive for evaluating myriad different multi-use scenarios that will emerge.

In the near term, the ISO anticipates that it may hold one or more joint workshops with the CPUC on this important topic area.

3.4 Distinction between charging energy and station power

Under this topic the ISO intends to resolve the distinction between wholesale charging energy and station power. Although this is also a topic in Track 2 of the CPUC's energy storage proceeding, station power is specifically addressed in the ISO tariff and the ISO

will primarily address this issue in ESDER Phase 2. However, because the question of station power is inherently jurisdictional, the ISO intends to also contribute to this topic in Track 2 of the CPUC's energy storage proceeding as may be necessary. In doing so the ISO will seek to economize its staffing resources where possible and avoid redundant efforts, and will also seek to avoid the conflicts that have arisen in the past over the wholesale/retail line.

The ISO tariff defines station power as "energy for operating electric equipment, or portions thereof, located on the Generating Unit site owned by the same entity that owns the Generating Unit, which electrical equipment is used exclusively for the production of Energy and any useful thermal energy associated with the production of Energy by the Generating Unit; and for the incidental heating, lighting, air conditioning and office equipment needs of buildings, or portions thereof, that are owned by the same entity that owns the Generating Unit; located on the Generating Unit site; and used exclusively in connection with the production of Energy and any useful thermal energy associated with the production of Energy by the Generating Unit."[10]

The ISO tariff explicitly states that station power includes, for example, the energy associated with motoring a hydroelectric generating unit to keep the unit synchronized at zero real power output to provide regulation or spinning reserve.[11] Importantly, because the ISO tariff allows for netting of consumption against output within a five-minute interval, station power under the ISO tariff is only measured as the amount of consumption that exceeds output within a five-minute interval.[12]

As part of the ISO's new resource implementation process, the ISO verifies that new resources have a load serving entity in place to meet station power needs prior to commercial operation. Similarly, an energy storage facility owner should consult with

[10] Appendix A to the ISO tariff.

[11] Station power does not include any energy used to power synchronous condensers; used for pumping at a pumped storage facility; provided during a black start procedure; or to serve loads outside the ISO BAA.

[12] See Sections 10.1.3, 10.2.9.2, and 10.3.2.2 of the ISO tariff.

its load serving entity to determine how retail charges may apply to its station power consumption.

The ISO recognizes the need to further evaluate methods to distinguish between wholesale charging energy and station power and address such issues as the merits and drawbacks of treating battery temperature regulation as wholesale charging or station power; possible metering and battery configurations that would enable distinguishing among traditional station power uses, charging, and battery regulation; and any other areas where additional clarifications or enhancements to ISO rules are warranted. Revising the definition of station power to allow for energy consumed to regulate battery temperature could require revision to the ISO tariff's definition of station power, which would require FERC approval. The Federal Power Act requires equal treatment of similarly situated customers, so there would have to be a compelling difference between, for example, energy consumed to regulate battery temperature and energy consumed to start a combustion generator in order to consider one wholesale and the other retail.

The ISO also recognizes that its efforts in re-defining station power from a wholesale perspective could be unproductive if a different determination is made from the retail perspective by the CPUC.[13] The same energy could incur both wholesale and retail charges, resuscitating the years of litigation that preceded the current station power framework.[14] The ISO recognizes that its determinations regarding station power should be consistent with the CPUC's, and vice versa.

In the near term, the ISO anticipates that it may hold one or more joint workshops with the CPUC on this important topic area.

[13] See, e.g., *Southern California Edison Co. v. FERC*, 603 F.3d 996, 1002 (D.C. Cir. 2010)

[14] See, e.g., *id.*; *Calpine Corp. v. FERC*, 702 F.3d 41 (2012); *Duke Energy Moss Landing LLC v. CAISO*, 134 FERC ¶ 61,151 (2011).

3.5 Review allocation of transmission access charge to load served by DER

The ISO is proposing to review the rules for determining load subject to the transmission access charge (TAC) to reflect the effects of utility-side distributed generation. The TAC is the ISO's mechanism for collecting revenues to compensate participating transmission owners (PTOs) for the costs of owning, operating and maintaining the transmission assets they have placed under ISO operational control. The ISO charges the TAC to each MWh of internal load and exports, where internal load is determined by aggregating end-use customer meters and therefore is net of any behind-the-meter generation such as rooftop solar PV.

In 2015 the ISO began an initiative to consider transmission access charge (TAC) options for integrating additional transmission-owning utilities with load-service territories into an expanded balancing authority area ("BAA").[15] In that initiative, Clean Coalition submitted comments arguing that the allocation of TAC to gross load on the system should be reconsidered to reflect the growth of distributed generation that serves some of the load locally with less reliance on the transmission system. In the February 10 straw proposal in that initiative, the ISO indicated its intention to include this topic in ESDER Phase 2.

The ISO believes that Clean Coalition raises an important question and proposes to consider it in ESDER Phase 2. The issue is not simple, however; there are at least three concerns that must be considered.

First is that transmission infrastructure investment is driven mainly by peak load conditions. Adding DER in the form of utility-connected distributed solar generation may offset some of the total energy that would otherwise come from the transmission grid, but may not reduce the peak load on the grid at all. Recent analysis of the impact of high penetration of solar PV indicates that the actual summer peak load on the ISO system tends to occur in the early evening after solar generation has declined for the day. This means that the distributed generation does not reduce the system peak load,

[15] More information on this initiative may be found at: http://www.ISO.com/informed/Pages/StakeholderProcesses/TransmissionAccessChargeOptions.aspx

in which case it would not be appropriate to collect TAC based only on net energy at the transmission-distribution interface as Clean Coalition suggests.

Second, current TAC rates reflect transmission that has been planned, approved, built and placed in service to serve the load that existed or was forecasted at the time these decisions were made. The installation at a later time of distributed generation to serve some of the load does not alter that the transmission facilities were intended to serve that load.

Third, using DER to serve load locally does not reduce the money that must be collected via TAC, which reflects the actual capital, maintenance and operating costs of the transmission assets. If the load associated with local distributed generation were removed from the denominator in calculating the TAC rate, the rate would increase for everyone else.

4 Stakeholder process schedule

The following table outlines the schedule for the policy development portion of ESDER Phase 2. As a next step, the ISO will discuss this proposed scope of issues with stakeholders and solicit stakeholder written comments. After considering the feedback received, the ISO will make any necessary adjustments to the scope and then develop a straw proposal on each topic for posting in May.

The objective is to bring proposed resolutions to the issues in the ESDER Phase 2 scope to the Board in October of this year. This schedule does not include implementation steps including development and filing of tariff amendments, changing relevant business process manuals, and making and implementing changes to market system software and models.

Stakeholder Process Schedule		
Step	**Date**	**Activity**
Issue Paper	March 22	Post issue paper
	April 4 (1-4pm)	Stakeholder web conference
	April 18	Stakeholder comments due

Stakeholder Process Schedule		
Step	**Date**	**Activity**
Straw Proposal	May 19	Post straw proposal
	May 26	Stakeholder web conference
	June 9	Stakeholder comments due
Revised Straw Proposal	July 12	Post revised straw proposal
	July 19	Stakeholder web conference
	August 2	Stakeholder comments due
Draft final proposal	September 8	Post draft final proposal
	September 15	Stakeholder web conference
	September 29	Stakeholder comments due
Board approval	October 26-27	ISO Board meeting

5 Topics not selected for ESDER Phase 2

As previously discussed in section 2, the ISO found it had to pare down the list of potential topics to a feasible set of issues for potential policy development in 2016. The ISO considered several factors including the perceived priority of each topic, the need to allocate ISO staff resources to Track 2 of the CPUC's energy storage proceeding, and the need to balance development of new storage and DER enhancements against implementation of enhancements previously developed in the ESDER Phase 1 and Expanding Metering and Telemetry Options stakeholder initiatives. As an outcome of weighing these factors, the following issues were not selected for the ESDER Phase 2 scope.

In the mid-2015 scoping exercise, the topic area "open issues from CPUC demand response working group" was identified for possible consideration in 2016. As discussed in section 3.2.2, one of these—development of alternative baselines—is proposed for inclusion in ESDER Phase 2. An "open issue" not selected is discrete dispatch. In comments submitted during ESDER Phase 1, SCE suggested that discrete dispatch for demand response resources is one such "open issue" and stated that due to current ISO

rules, demand response resources have the possibility of being partially dispatched (either due to being a marginal resource or for other factors). SCE expressed that partial dispatch may not be feasible for many demand response resources and options should exist to avoid this conflict. SCE suggested that allowing discrete dispatch of demand response resources—to dispatch fully or not dispatch at all—should be added to the scope of issues.

Another topic discussed in the mid-2015 scoping exercise was related to compensation of resources in the regulation market. Advanced Rail Energy Storage (ARES) suggested this topic for consideration. The ISO noted at the time that it is not experiencing reliability issues as a result of the current performance of its fleet of resources providing regulation service, and stated in filing its tariff revisions for its frequency regulation market design, which it filed with the Federal Energy Regulatory Agency (FERC) on December 2, 2014. In its filing the ISO offered to evaluate the performance of new technologies expected to join its regulation fleet over the next few years. In its order issued January 30, 2015, the FERC found the ISO's proposal to reduce the minimum performance threshold from 50 percent to 25 percent just and reasonable. The FERC order directs the ISO to file an informational report to review the minimum performance threshold no later than 18 months from January 1, 2015. The FERC order further notes that because data collected for this initial informational report may not be ripe in considering emerging technologies, the FERC also directs the ISO to file a second subsequent informational report no later than 36 months from January 1, 2015. This second informational report is to include an analysis of how the entrance of new and faster-responding technologies potentially influenced overall resource accuracy measurements in the ISO's regulation market. Given this timeline takes this analysis out to late 2017 the ISO believes it would be premature to add this issue to the ESDER initiative.

Last, another topic raised during ESDER Phase 1 but not selected for ESDER Phase 2 is consideration of the question of twenty four seven participation by DER aggregations participating in the ISO market as NGRs. Under the topic of multiple-use applications, the ISO clarified in ESDER Phase 1 it will require settlement quality meter data (SQMD) from the scheduling coordinator for a DER aggregation be submitted daily according to ISO submittal timelines, and that the ISO will settle the DER aggregation based on that

SQMD for all market intervals not just those intervals in which the DER aggregation was issued an ISO schedule or dispatch instruction. This is an existing requirement for all resources participating in the ISO market.[16] The ISO is not proposing to consider this topic in ESDER Phase 2.

[16] The only exception is in the case of demand response participating as PDR and RDRR. These demand response resources have the ability to provide SQMD and be settled through the ISO market only for intervals in which they were dispatched by the ISO.