

March 11, 2009

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

**Re: California Independent System Operator Corporation
Docket Nos. OA08-12-001, OA08-12-002, and OA08-113-000**

Dear Secretary Bose:

The California Independent System Operator Corporation (“CAISO”) submits this filing in compliance with the requirements of Order No. 890,¹ the Commission’s May 16, 2008 Order Accepting Compliance Filing as Modified,² and the Commission’s February 9, 2009 Order on Compliance Filings.³ As required by the February 9 Order, the CAISO in this filing demonstrates that the tariff revisions proposed in the CAISO’s April 15, 2008 Compliance Filing (“April 15 Compliance Filing”) related to the participation of other non-generation resources in the CAISO’s Ancillary Services⁴ markets, and the CAISO’s compliance demonstration in its June 16, 2008 Compliance Filing (“June 16 Compliance Filing”), satisfy the Commission’s comparability requirement.⁵

The CAISO’s April 15 Compliance Filing amended Section 8.1 of the CAISO’s existing open access transmission tariff (“CAISO Tariff”) to require other non-generation resources to meet the same requirements applicable to other providers of Ancillary Services, as set forth in Sections 8.5 through 8.14 of that tariff. The April 15 Compliance Filing also amended Section 8.1 of the Market Redesign and Technology Upgrade Tariff (“MRTU Tariff”) to incorporate a similar obligation with respect to Sections 8.5 through 8.11 of the MRTU tariff.⁶ CAISO Tariff Sections 8.5 through 8.14, and MRTU Tariff Sections 8.5 through 8.11,

¹ *Preventing Undue Discrimination and Preference in Transmission Service*, Order No. 890, 72 Fed. Reg. 12,266 (March 15, 2007), FERC Stats. & Regs. ¶ 31,241 (2007), *order on reh’g*, Order No. 890-A, 73 Fed. Reg. 2984 (January 16, 2008, FERC Stats. & Regs. ¶ 31,261 (2007)) (“Order No. 890-A”), *order on reh’g*, Order No. 890-B, 123 FERC ¶ 61,299 (2008).

² *California Independent System Operator Corporation*, 123 FERC ¶ 61,180 (2008) (“May 16 Order”).

³ *California Independent System Operator Corporation*, 126 FERC ¶ 61,099 (2009) (“February 9 Order”).

⁴ Capitalized terms not otherwise defined have the same meaning set forth in the MRTU Tariff on file with the Commission.

⁵ February 9 Order at P 22.

⁶ The CAISO Tariff will be replaced by the MRTU Tariff effective with the implementation of MRTU, scheduled for March 31, 2009.

contain general provisions that delineate how a provider participates in the Ancillary Services markets and how payment may be rescinded for Ancillary Services capacity awarded in the markets that is not available during the period of the award. The provisions address generally applicable and basic requirements for participation in the Ancillary Services markets, for example, the timeframe for submitting Ancillary Services bids and schedules, and the process for conducting compliance testing and audits. These are appropriate requirements to apply to all providers of Ancillary Services, including other non-generation resources, in order to maintain an orderly and standard market process and ensure that payment is made for service provided. Further, requiring other non-generation resources to comply with CAISO Tariff Sections 8.5 through 8.14 and MRTU Tariff Sections 8.5 through 8.11 is reasonable as the CAISO both implements and ensures stable operation of MRTU and completes its additional stakeholder activities to consider the extent to which additional tariff revisions under the MRTU platform may be appropriate to further promote the participation of non-generation resources in the CAISO's markets. The CAISO accordingly requests that the Commission accept the revisions to Section 8.1 of the CAISO Tariff and the MRTU Tariff as consistent with the Commission's comparability requirement.

I. BACKGROUND

On February 16, 2007, the Commission issued Order No. 890, in which it adopted a number of changes to the *pro forma* Open Access Transmission Tariff ("OATT"), including a modification to allow certain Ancillary Services to be provided by other non-generation resources, such as demand resources, where appropriate.⁷ The tariff language adopted by the Commission in Order No. 890 provided that non-generation resources can provide each of the specified Ancillary Services -- reactive supply and voltage control, regulation and frequency response, energy imbalance, spinning reserves, supplemental reserves and generator imbalance services -- to the extent they are capable of providing the specific service.⁸

In its April 15 Compliance Filing, the CAISO proposed to revise Section 8.1 in both the CAISO and MRTU Tariffs to provide that: (1) bids for Regulation, Spinning Reserve, Non-Spinning Reserve, and Voltage Support may be submitted by a Scheduling Coordinator for other non-generation resources that are capable of providing the specific service and meet applicable Ancillary Service standards and technical requirements, as set forth in Sections 8.1 through 8.4, and that are certified by the CAISO to provide Ancillary Services;⁹

⁷ Order No. 890 at P 888.

⁸ See Schedules 2, 3, 4, 5, 6, and 9 of the *pro forma* OATT as modified in Order No. 890.

⁹ Energy imbalance service, which is an Ancillary Service under the *pro forma* OATT, is not an Ancillary Service under the CAISO Tariff. Instead, imbalances are resolved through the CAISO's Imbalance Energy markets, and those markets accommodate bids by Participating Loads. Energy imbalance service will also not be an Ancillary Service under MRTU. Under MRTU Tariff Section 11.5, the CAISO will implement an LMP-based Real-Time Market for any positive or negative deviations from Market Participant Day-Ahead Schedules. The MRTU Tariff already

and (2) the provision of Regulation, Spinning Reserve, Non-Spinning Reserve, and Voltage Support by other non-generation resources will be subject to the same basic requirements applicable to other providers of these Ancillary Services, as set forth in Sections 8.5 through 8.14 of the current CAISO Tariff and in Sections 8.5 through 8.11 in the MRTU Tariff. This tariff language is fully consistent with the specific language modifications to the OATT that the Commission adopted in Order No. 890.

In the May 16 Order, the Commission directed the CAISO to modify its MRTU Tariff to include provisions necessary to permit participation by non-generators in the CAISO's Ancillary Services markets. The Commission also acknowledged that the CAISO's April 15 Compliance Filing had already proposed revisions to MRTU Tariff Section 8 and stated that the CAISO should include in its compliance filing to May 16 Order a demonstration why the CAISO believes that its April 15 Compliance Filing sufficiently addresses the concerns expressed by the Commission in that Order.

On June 16, 2008, the CAISO submitted its Compliance Filing for the May 16 Order ("June 16 Compliance Filing") in which it explained that the revisions to Section 8.1 in both tariffs do already permit non-generation resources to provide the specified Ancillary Services, provided that the resources are capable of providing the specific service set forth in the CAISO Tariff and meet the applicable Ancillary Service standards and technical requirements. Specifically, the CAISO explained that its April 15 Compliance Filing proposed to revise Section 8.1 in both tariffs to provide that: (1) bids for Regulation, Spinning Reserve, Non-Spinning Reserve, and Voltage Support may be submitted by a Scheduling Coordinator for other non-generation resources that are capable of providing the specific service and that meet applicable Ancillary Service standards and technical requirements, as set forth in Sections 8.1 through 8.4, and that are certified by the CAISO to provide Ancillary Services; and (2) the provision of Regulation, Spinning Reserve, Non-Spinning Reserve, and Voltage Support by other non-generation resources will be subject to the same basic requirements applicable to other providers of these Ancillary Services, as set forth in Sections 8.5 through 8.14 of the current CAISO Tariff and in Sections 8.5 through 8.11 of the MRTU Tariff.

The June 16 Compliance Filing further explained that Tariff modifications proposed in the April 15 Compliance Filing fully comply with the requirements of Order No. 890, Paragraph 888, by permitting other non-generation resources to provide the specified Ancillary Services and that the comprehensive modifications to the CAISO's MRTU Tariff, operating procedures, and software, as suggested in the comments of Beacon Power Corporation ("Beacon"), far exceed the express requirements of Order No. 890 and would affect a large number of stakeholders. Additionally, the June 16 Compliance Filing discussed the comprehensive stakeholder initiative the CAISO has initiated to develop the technical and operations requirements for integrating energy storage

permits Participating Loads to provide Non-Spinning Reserve, as well as participate in the CAISO's Day-Ahead and Real-Time Markets.

technologies into the grid and consider the extent to which additional tariff modifications, and changes to the CAISO's operating procedures and software, may be appropriate to further promote integration of these resources.

The February 9 Order directed the CAISO to submit the instant compliance demonstration in support of the modifications to Section 8.1 of both tariffs to require that other non-generation resources be subject to the same requirements applicable to other providers of Ancillary Services, as set forth in CAISO Tariff Sections 8.5 through 8.14, and MRTU Tariff Sections 8.5 through 8.11.¹⁰

II. COMPLIANCE DEMONSTRATION

In the February 9 Order, the Commission directed the CAISO to submit a compliance filing that demonstrates "how subjecting generation and non-generation resources 'to the same requirements applicable to other providers of Ancillary Services, as set forth in [CAISO Tariff] Sections 8.5 through 8.14' satisfies [the Commission's] comparability requirement."¹¹ The February 9 Order did not direct the CAISO to provide further support for the modification in Section 8.1 of both tariffs that permit Scheduling Coordinators to submit bids for Regulation, Spinning Reserve, Non-Spinning Reserve, and Voltage Support on behalf of other non-generation resources that are capable of providing the specific service and meet applicable Ancillary Service standards and technical requirements, as set forth in Sections 8.1 through 8.4, and that are certified by the CAISO to provide Ancillary Services. Further, the February 9 Order rejected the comprehensive additional tariff modifications proposed by Beacon that included amendments to permit other non-generation resources to participate in the Residual Unit Commitment Market under MRTU, be eligible for Resource Adequacy, and use netting in relation to station power. The Commission correctly found that Beacon's proposed changes are beyond the scope of this proceeding and that the CAISO's comprehensive stakeholder process is the appropriate vehicle to evaluate additional changes and develop necessary tariff modifications.¹² Accordingly, this compliance demonstration will focus on explaining how requiring other non-generation resources to meet the basic Ancillary Services requirements of CAISO Tariff Sections 8.5 through 8.14 and MRTU Tariff Sections 8.5 through 8.11 satisfies the Commission's comparability requirement.

As articulated by the Commission in Order No. 890-A¹³ and the February 9 Order, the Commission's comparability requirement permits a transmission provider to impose on load resources providing ancillary services technical criteria comparable to the requirements placed on generation resources, but with the caveat that "treating similarly-situated resources on a comparable basis does

¹⁰ February 9 Order at P 22.

¹¹ *Ibid.*

¹² *Id.* at P 23.

¹³ Order No. 890-A at P 216.

not necessarily mean that the resources are treated the same.”¹⁴ The CAISO submits that its requirement that all Ancillary Services providers, including other non-generation resources, comply with CAISO Tariff Sections 8.5 through 8.14 and MRTU Tariff Sections 8.5 through 8.11 is appropriate and consistent with the Commission’s standard for several reasons.

First, the CAISO submits that all providers of Ancillary Services, including other non-generation resources, should be subject to the same basic requirements and processes for participating in the Ancillary Services markets, undergoing periodic compliance testing and audits, and providing the Ancillary Services capacity awarded in order to receive payment. It is these basic requirements that are set forth in CAISO Tariff Sections 8.5 through 8.14, and MRTU Tariff Sections 8.5 through 8.11. Those tariff provisions are process based. They delineate how a provider participates in the Ancillary Services markets and how payment may be rescinded for Ancillary Services capacity awarded in the markets if it is not available during the period of the award. More specifically, the provisions address the timeframe for submitting Ancillary Service bids, the right to self-provide of Ancillary Services and the process for doing so, the scheduling process, and the periodic performance of compliance testing and audits. These are the most basic and necessary requirements for participating in the Ancillary Services markets that should apply to all providers of Ancillary Services, including other non-generation resources, in order to maintain an efficient, orderly market process and ensure that payment is made for service provided.

Second, the CAISO is unaware of any inherent technological limitation on non-generation resources that would preclude their ability to comply with the basic processes established in CAISO Tariff Sections 8.5 through 8.14, and MRTU Tariff Sections 8.5 through 8.11. These provisions do not impose technical standards and are unrelated to the operating characteristics of any resource providing Ancillary Services. Further, no non-generation resource has voiced an objection to these requirements in this proceeding, or in response to the CASIO’s compliance filings in this matter. Accordingly, the CAISO lacks a valid basis to exempt other non-generation resources from these basic process provisions.

Third, the MRTU Tariff already includes Commission-approved provisions that permit Participating Load, which is a form of non-generation resource, to provide Ancillary Services subject to the *same* requirements as other providers of Ancillary Services. In that regard, under MRTU Tariff Section 8.4, all Generating Units, System Units, Participating Loads, and System Resources providing Ancillary Services will be required to comply with the same technical requirements set out in MRTU Tariff Sections 8.4 relating to their operating capabilities, communication capabilities and metering infrastructure.¹⁵ In

¹⁴ February 9 Order at P 22.

¹⁵ MRTU Tariff Section 8.4, Technical Requirements for Providing Ancillary Services, provides as follows: “All Generating Units, System Units, Participating Loads and System Resources providing Ancillary Services shall comply with the technical requirements set out in Sections 8.4.1

addition, for example, Participating Load will be subject to the same requirements as other Ancillary Service providers with respect to the compliance testing and audit process under MRTU Tariff Section 8.9, and the rescission of payments for Ancillary Service capacity that is undispachable, unavailable, or undelivered under MRTU Tariff Section 8.10.8. Because the Commission has already found that Participating Loads, as well as Generation resources, must comply with these provisions following the implementation of MRTU, the CAISO believes that it is comparable treatment to extend the same requirements to other non-generation resources. There is no valid reason why these Commission-approved requirements applicable to Participating Loads should not also apply to other non-generation resources. To do otherwise would result in unduly preferential treatment to other types of non-generation resources. For example, not applying these most basic provisions to other non-generation resources could result in such resources being paid even though they did not actually provide the awarded Ancillary Services capacity, not having to be certified to provide Ancillary Services, or not having metering. Obviously that would not be an appropriate result.

Fourth, requiring other non-generation resources to comply with CAISO Tariff Sections 8.5 through 8.14, as replaced and superseded by MRTU Tariff Sections 8.5 through 8.11 effective with MRTU go-live, is reasonable as the CAISO completes its stakeholder initiative and has the ability to implement any identified changes to CAISO operations and systems that may better accommodate non-generation resource characteristics.

On January 16, 2009, the CAISO issued a new whitepaper that proposed (a) some new technical parameters for limited energy storage resources to be eligible for participation in the MRTU markets and (b) a pilot program, anticipated to commence in the third quarter of 2009, with a small number of limited energy storage resources to test the capabilities and actual performance of these resources when providing Ancillary Services, particularly Regulation. The whitepaper is attached to this compliance filing as Attachment A to provide further information about its status and issues under review. As reflected in the whitepaper, the CAISO's original intent was to propose the final elements of the

to 8.4.3 below relating to their operating capabilities, communication capabilities and metering infrastructure. No Scheduling Coordinator shall be permitted to submit a Bid to the CAISO for the provision of an Ancillary Service from a Generating Unit, System Unit, Participating Load or System Resource, or to provide a Submission to Self-Provide an Ancillary Service from a Generating Unit, System Unit, Participating Load, or Dynamic System Resource, unless the Scheduling Coordinator is in possession of a current certificate issued by the CAISO confirming that the Generating Unit, System Unit, Participating Load or System Resource complies with the CAISO's technical requirements for providing the Ancillary Service concerned. Scheduling Coordinators can apply for Ancillary Services certificates in accordance with the requirements for considering and processing such applications in Appendix K and the CAISO's Operating Procedures. The CAISO shall have the right to inspect Generating Units, Participating Loads or the individual resources comprising System Units and other equipment for the purposes of the issue of a certificate and periodically thereafter to satisfy itself that its technical requirements continue to be met. If at any time the CAISO's technical requirements are not being met, the CAISO may withdraw the certificate for the Generating Unit, System Unit, Participating Load or System Resource concerned."

pilot program by late April 2009, with a target of filing with the Commission by June or July 2009 any necessary market changes for the pilot. However, the CAISO's continued focus on MRTU implementation and effective support after implementation has prompted a reassessment as to the CAISO's ability to allocate the necessary resources to meet the previously proposed schedule. Nevertheless, the CAISO is in the process of facilitating additional understanding of limited energy storage technology by implementing a test plan for a specific device currently interconnected to the distribution system of a Participating Transmission Owner. It is anticipated that this test plan will provide the CAISO with additional information to more efficiently evaluate potential market rule modifications once the CAISO has demonstrated the successful launch of MRTU.

The stakeholder initiation is on-going. Based on the outcome of the initiative, the CAISO will consider the extent to which additional tariff revisions may be appropriate to further enable other non-generation resources to participate in the CAISO's markets. The Commission's acceptance of the CAISO's tariff modifications discussed in this compliance filing will in no way preclude or limit the scope of the changes the CAISO will consider as a result of the stakeholder initiative. The CAISO supports the integration of renewable resources and is taking significant steps to integrate large amounts of renewable resources onto the electric grid, including energy storage facilities. The CAISO will undertake the necessary and proper changes to its tariff, business practice manuals, operating procedures, and software programs in order to better accommodate these resources.

Fifth, to the extent that any energy storage facilities obtain all necessary governmental and regulatory approvals and seek an on-line service date prior to the completion of the pilot program and stakeholder initiative, they will be permitted to participate in the CAISO's Ancillary Services markets under Section 8.1 of the tariff then in effect.

III. COMMUNICATIONS

Communications regarding this filing should be addressed to the following individuals, whose names should be placed on the official service list established by the Secretary with respect to this submittal:

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IV. SERVICE

The CAISO has served copies of this compliance filing, and all attachments, on the official service lists of the above referenced dockets. In addition, the CAISO is posting this compliance filing and all attachments on the CAISO Website.

V. CONCLUSION

For the foregoing reasons, the CAISO requests that the Commission accept the compliance filing as satisfying the Commission's comparability requirement and the CAISO's compliance obligations under the requirements of Order No. 890, the May 16 Order, and the February 9 Order with respect to permitting other non-generation resources to provide the specified Ancillary Services.

Respectfully submitted,

/s/ Beth Ann Burns

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Dated: March 11, 2009

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the entities that are described in that document as receiving service, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, California this 11th day of March, 2009.

/s/ Anna Pascuzzo

Anna Pascuzzo

ATTACHMENT A



California ISO
Your Link to Power

Discussion Paper

Participation of Limited Energy Storage Resources in CAISO Electricity Markets

January 16, 2009

Participation of Limited Energy Storage Resources

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1. Introduction

Small-scale or limited energy storage technology has evolved and matured over the past several years. The technology has now reached the stage where it is being commercially deployed in California and elsewhere. Observers and participants have noted that the expansion and impact of limited storage resources could be further facilitated by permitting providers to directly participate in the organized markets for Ancillary Services (A/S) – regulation and operating reserves – operated by ISOs and RTOs (and possibly by defining new services, such a load-following product or “fast” regulation, that also reward fast ramping capability). In this regard, the Federal Energy Regulatory Commission (FERC) directed the ISO/RTOs to change their tariffs to allow non-generation resources, such as energy storage resources to participate in A/S markets.¹ The CAISO has filed tariff language with FERC in compliance. The next step is to address any barriers and obstacles that could impede limited energy storage and other non-generation resources from actively participating in the A/S markets.

The CAISO posted a White Paper in May 2008 that provided an overview of storage issues.² This paper continues the CAISO’s efforts to identify issues and barriers regarding the participation by energy storage (and demand response where issues are similar), in the A/S markets . The issues and potential solutions will be discussed at a series of stakeholder workshops. Specifically, in this paper the CAISO proposes (a) some new technical parameters for limited energy storage resources to be eligible for participation in the MRTU markets and (b) to conduct a pilot program, anticipated to commence in Q3 of 2009, with a small number of limited energy storage resources to test the capabilities and actual performance of these resources when providing A/S, particularly Regulation. The paper is accompanied by a summary and response to stakeholder comments submitted following a prior CAISO webcast on this topic held in May 2008. The CAISO anticipates that any tariff changes, including those necessary for the pilot program, will be presented to the CAISO Board of Governors in Spring 2009 and subsequently filed with FERC.

This discussion paper is not intended to lay out all relevant modifications to the CAISO’s MRTU market design or the details of the pilot program, but rather to identify the scope of the effort by laying out issues that have been identified as critical components that need resolution. Subsequent papers will examine further needed changes to bring storage resources into the CAISO markets.

The paper begins with a brief review of some key issues raised by stakeholders in the prior phase of the storage project. The proposed timeline for the project follows. The third section provides an initial conception of the pilot project. Finally, the paper includes an appendix summarizing efforts related to limited energy storage technologies in other ISO/RTOs. The CAISO invites comments on whether this discussion paper and the response to comments identify the pertinent issues and adequately describes the factors that must be considered in order to resolve them. Comments are also requested on the concept of a pilot program and its proposed structure. When comments identify additional issues that must be considered, or factors that must be considered to resolve the identified issues, they should be sufficiently detailed to allow the CAISO to formulate its straw proposal for their resolution.

¹ Order No. 890, FERC Stats. & Regs. ¶ 31,241

² CAISO, “Integration of Energy Storage Technology: White Paper – Identification of Issues and proposed Solutions,” May 22, 2008, Available at <http://www.caiso.com/1fd5/1fd56f931140.pdf> .

2. Key Issues with Energy Storage Integration

2.1. Issues Raised by Stakeholders

The stakeholder comments³ received following the first meeting of the CAISO storage project focused on several areas:

- The organization and scope,
- Integration of energy storage technology into the MRTU markets,
- Potential new market products related to energy storage,
- Dispatch control issues,
- Regulatory changes needed, and
- Need to collaborate, cooperate and perform joint studies.

Some issues are examined briefly here. The posted CAISO response to comments provides additional detail.

2.2. Organization and Scope

Several commenters, including SCE and WPTF, questioned whether an independent project and stakeholder process is needed to address energy storage issues, separate from other related CAISO efforts, such as the Integration of Renewable Resources Program (IRRP). Upon review, CAISO has concluded that the CAISO storage project is an initiative that cuts across several areas of market interest, including the development of new A/S products and the general area of alternative technologies. Similar to the demand response initiative, the storage project's objective is both to inform related initiatives, such as renewable integration, and to ensure that any unique attributes of storage technologies are reflected in the evolving market design. Hence, CAISO continues to feel that at least for the remainder of 2009, a separate storage project is appropriate, but is willing to consider future program changes if needed to improve responsiveness to storage or other alternative technologies.

Several commenters had interest in further defining the scope of the storage project. SCE proposed that CAISO focus on storage resources that are interconnected to the transmission network, while SCE (and other utilities) study interconnection of storage at the distribution level. CAISO agrees that the focus of its efforts, such as the pilot program proposed in this paper, will be on integration of storage into CAISO markets and systems. Moreover, CAISO appreciates SCE's interest in research collaboration. However, from the CAISO perspective, as long as there is communication between the device and the CAISO, it can follow dispatch instructions to provide energy or A/S. The major issues will be the potential impact on the distribution facilities and whether the facility is charged wholesale or retail prices for energy. Hence, CAISO will seek further stakeholder input on whether to continue to examine issues associated with such resources.

³ Following the posting of the prior paper, CAISO held a web cast discussion with stakeholders on May 29th, 2008. Stakeholder comments in response to the White Paper and web cast are available at <http://www.caiso.com/1c51/1c51c7946a480.html>.

2.3. Integration of Limited Energy Storage Resources Into MRTU Markets

CAISO's objective in 2009-2010 is to develop the capability to integrate all eligible limited energy storage resources into the MRTU energy and A/S markets as soon as is practical given the pending implementation of the MRTU on March 31, 2009,⁴ and the relative lack of experience heretofore in operating such resources in a market environment. The earliest the CAISO will be ready to interconnect a new resource to the systems under the current MRTU rules is Q3 of 2009. The current timeline for the energy storage pilot project proposed here is therefore Q3 2009. In 2010, CAISO will aim to begin the transition of resources in the pilot, as well as other eligible storage resources, to full participation in the A/S markets.

Limited Energy Storage resources can in principle participate in any of the A/S markets (Regulation Up, Regulation Down, Spinning Reserve, and Non-spinning Reserves) as well as in the Energy market. In response to Order No. 890, all ISOs/RTOs have changed, or are considering how to change, their A/S market rules to remove existing barriers that affect the ability of energy storage resources to provide A/S, such as due to limited energy. The existing CAISO A/S market rules were designed for the operating characteristics of generators.⁵ Under the current rules, resources that bid into the A/S market for Spinning and Non-spinning reserves must be capable of delivering energy for 2 hours.⁶ Limited energy storage devices with less than 1 hour of energy delivery capability could successfully provide regulation services as defined by NERC.⁷ However, if energy storage devices cannot provide 1 hour of sustained energy delivery or demand at the selected capacity level, they may be subject to negative financial consequences under the CAISO's current hourly Regulation market. In practice, storage technologies with limited capacity are best suited to provide Regulation, which as a higher quality product typically clears at higher market prices than operating reserves and also has shorter requirements for duration of energy delivery. At the same time, their ramp rates are typically very high, and they can cycle continuously, features that could result in lowering procurement requirements for Regulation in the aggregate. Figure 1 thus demarcates the initial range of interest for the pilot program for limited energy storage resources proposed in Section 4.

⁴ All CAISO data bases are currently frozen to facilitate the stable implementation of MRTU such that no new resources can, and will be added to the market system or energy management system in the near future.

⁵ See Tariff Section 8.3.3 Certification and Testing Requirements. Each Generating Unit, System Unit, Load, or System Resource that is allowed to bid or self-provide Ancillary Services under this Tariff must comply with the ISO's certification and testing requirements. Each Generating Unit and System Unit used to bid Regulation or used to self-provide Regulation must have been certified and tested by the ISO using the process defined in Part A of Appendix K, Each System Resource used to bid or self-provide Regulation must comply with the Dynamic Scheduling Protocol in Appendix X. Spinning Reserve may be provided only from Generating Units, System Resources from external imports, or System Units, which have been certified and tested by the ISO using the process defined in Appendix K,

⁶ See Tariff Section 8.4.3.a Spinning and Non-Spinning Reserve Capability. Each Generating Unit or external import of a System Resource scheduled to provide Spinning Reserve and each resource providing Non-Spinning Reserve must be capable of converting the full capacity reserved to Energy production within ten minutes after the issue of the Dispatch instruction by the ISO, and of maintaining that output or scheduled interchange for at least two hours.

⁷ NERC Definition of Regulating Reserve - An amount of reserve responsive to Automatic Generation Control, which is sufficient to provide normal regulating margin.

The CAISO will aim to meet the principle of technology neutrality in developing any new market rules. That is, such rules should reflect the technical capabilities and constraints of limited energy storage resources, so as to allow entry in the A/S markets, but in doing so not create barriers to other resources participating in the A/S markets. The CAISO does not intend to distort market-based decisions as to whether to procure storage capability, what particular types of storage devices should be pursued, or whether the A/S potentially provided by storage devices are more cost-effectively provided by other resources. However, there is broad recognition of the potential value of storage due to increased penetration of variable generation renewables and also to future carbon constraints on fossil energy production.

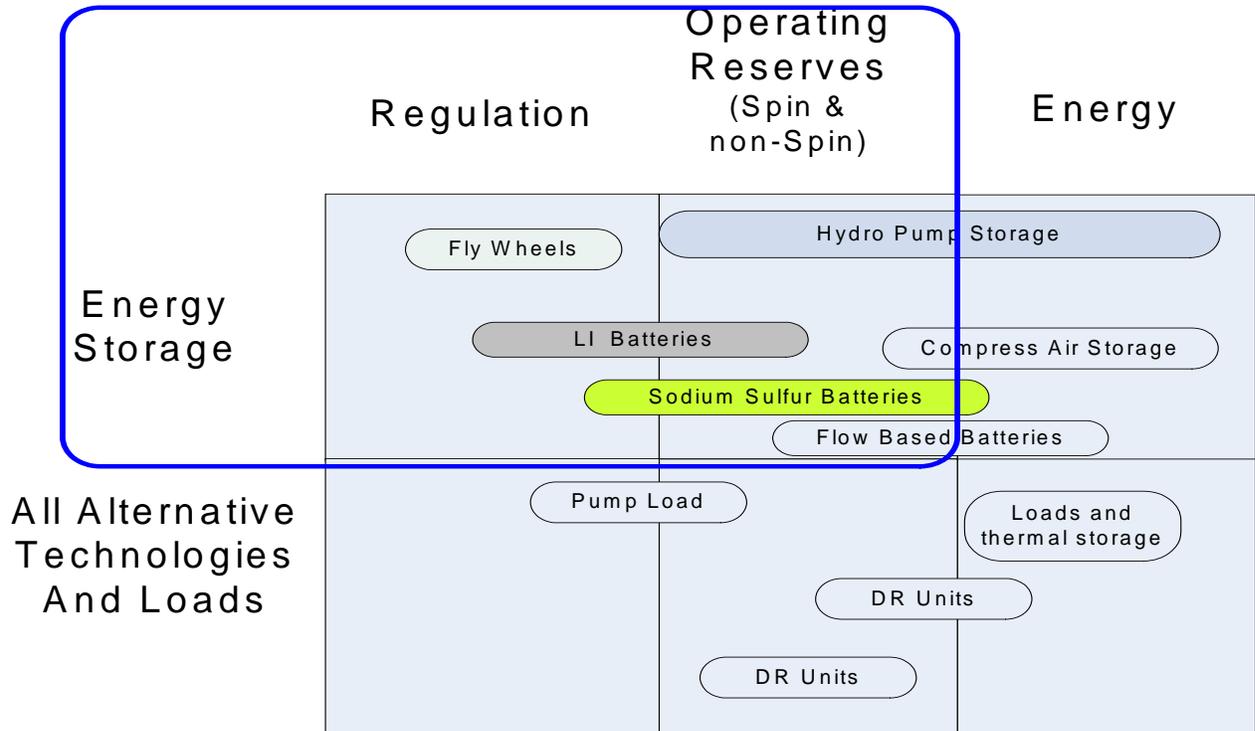


Figure 1

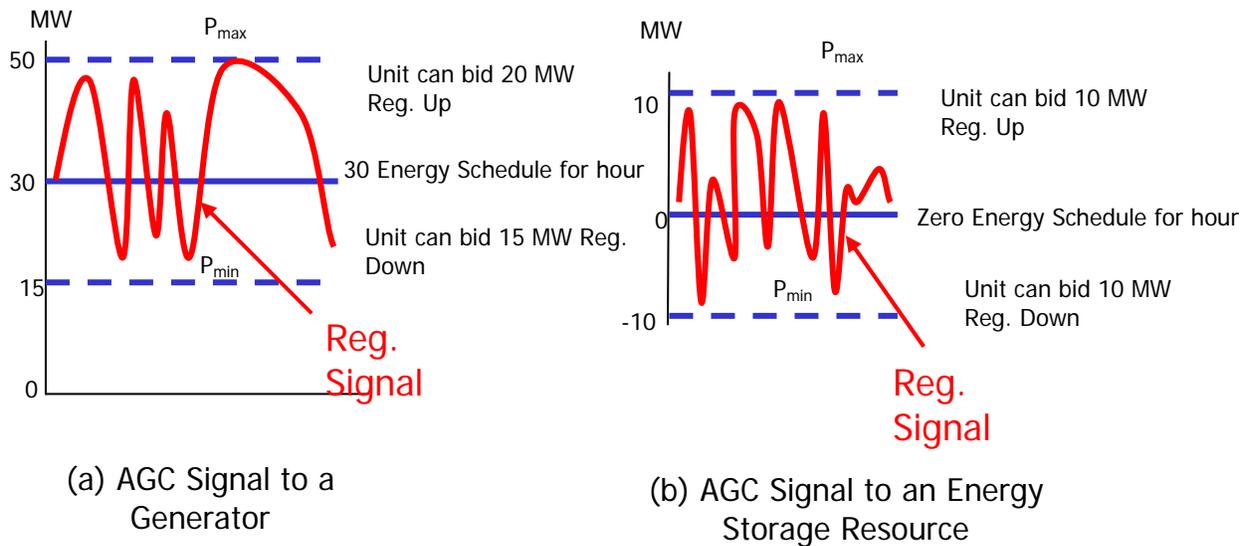


Figure 2

There are some potential changes to the Regulation markets that may better accommodate storage. A generator can offer into either or both Regulation Up and Regulation Down; its accompanying Energy offer will determine where the generator set point is, whether at or above P_{min} , and hence its Regulation capacity payment in either direction. This is shown in Figure 2 (a). In contrast, a limited energy storage resource's regulating range is its MW capacity in both directions, as shown in Figure 2(b). Assuming that a limited energy storage resource would like to bid a zero energy set point and only bid into Regulation with a symmetrical bid for Regulation Up and Regulation Down, a 5 MW energy storage resource would bid 5 MW for Regulation Up and -5 MW for Regulation Down. Unfortunately, the current MRTU design does not make this feasible. A proposed work around strategy is for the energy storage resource to submit a 5 MW Energy Schedule which is offset by a 5 MW load schedule (which makes it neutral in the energy market) and then they can bid 5 MW for Regulation Up and -5 MW for Regulation Down. The resource would have a P_{max} of 10 MW and a P_{min} of zero in the CAISO master file. This temporary strategy would at least allow the resource to be in the system and dispatched by EMS.

A further requirement is that if the energy storage resource is interconnected to the system in the distribution grid, and desires settlement of net energy requirements at the wholesale price, the CAISO would have to determine the wholesale pricing node for energy withdrawal. The CAISO demand response program has developed a methodology for determining the market based price for participating loads in the distribution system. The same pricing model could be used for energy storage resources connected to the distribution system.

The functionality needed for full integration of limited energy storage resources will probably not be available until the second software release for MRTU, which is known as the Markets and Performance (MAP). MAP is currently scheduled for release in early 2010 and it has design features that are compatible with Participating Load Demand Response and could correspond to participating energy storage resources, such as allowing Bids when storage is load.

2.4. Potential New Market Products Related to Energy Storage

A number of commenters, including Beacon and MegaWatt Farms, have expressed interest in defining new market products that would reflect the capabilities of storage technology and potentially provide additional market revenues. These include a load-following product, a “fast regulation” product to complement the existing Regulation Up and Regulation Down products, and Frequency Responsive Reserves (FRR), which are under consideration in the WECC. Given the start-up of MRTU on March 31, 2009, the expectation that the first year of MRTU will be focused on performance of the existing market design, followed by the planned MRTU enhancements under MAP, the CAISO does not expect to introduce any new market products in 2009 or early 2010. However, the proposed pilot could provide information useful for research into pricing formulas that could reflect faster regulation capability. CAISO will continue to evaluate new market products for possible introduction in subsequent years.

2.5. Dispatch Control Issues

The current dispatch control system (EMS) currently can not accommodate a P_{\min} lower than zero. Storage resources would like to have a charge/discharge signal that is both negative and positive. The issue is how should generation, energy storage and load that bid Regulation and/or operating reserves be dispatched by EMS? In the past, the CAISO sent a positive and negative ACE signal to a flywheel storage device, but that is not equivalent to an AGC signal. What would be the optimum dispatch algorithm and what changes should be made to EMS to accommodate non-generation resources, therefore, remain open questions.

2.6. Regulatory Changes Needed

The CAISO plans to conduct a comprehensive review of all CAISO tariff documents, interconnection standards, business practices, and operating procedures to ensure equitable and appropriate treatment of storage resources.

The suggested list of items to review includes:

- Ancillary Services certification, bidding, and procurement rules, to accommodate availability for less than a full hour;
- Interconnection study methodologies for energy storage technology, “behind” and “in front of” the meter;
- Station Power Protocol changes, to add applicability to energy storage resources (see below);
- CAISO-market participant agreement changes (e.g., to the Participating Generator Agreement), to broaden applicability beyond generating and load resources;
- CAISO Master File changes for energy storage (e.g., maximum run time); and
- Modeling & dispatch rules, to accommodate energy storage use in CAISO markets and operations.

2.7. Need For Collaboration, Cooperation And Joint Studies

The New England ISO, New York ISO, Midwest ISO and PJM have tariff changes, changes to market procedures and settlements, and pilot projects underway to accommodate limited energy storage resources in their respective A/S markets. The CAISO is reviewing their tariff filings and their pilot project plans. The CAISO agrees with commenters that there are significant benefits in

learning from the efforts of other ISOs/RTOs (and other countries) and from harmonizing, where possible, the new rules for limited energy storage and other non-generation resources among all the ISO/RTOs. However, it is worth noting that each of the ISO/RTO markets for A/S has different pricing and settlement rules. Nevertheless, common definitions and metrics related to energy storage facilities should be a goal. A short summary of the definitions, technical and market specifications and pilot projects in other ISO/RTOs is contained in the Appendix.

3. Pilot Program for Limited Energy Storage (and other Alternative Resources) providing Regulation and Operating Reserves

Given the CAISO's circumscribed operational experience with limited energy storage resources, as well as the pending MRTU implementation and the current barriers to market participation, the CAISO proposes that, similar to ISO-New England, the initial operational and market performance testing of such resources take place in a pilot project environment. The pilot would be separate from the Energy and A/S markets, but structured to provide operational experience and market-based compensation that closely parallel market participation. The pilot project can also allow for examination of alternative pricing methods. The development of rules and systems to support actual market participation would begin sufficiently prior to the end of the pilot to allow for as seamless a transition as possible.

At the same time, the CAISO will consider stakeholder interest in moving directly to participation in the MRTU A/S markets (rather than conduct a pilot), within rules and parameters determined in this process.

The proposed outline of such a pilot program in this section follows the ISO-New England pilot program to assist comparison, but the CAISO seeks stakeholder input on each aspect of the design. As with the pilots developed in other ISO/RTOs, it focuses initially on participation in the CAISO Regulation Up and Regulation Down markets. Most limited energy resources are expected to provide Regulation; however, they are not prevented from providing Operating Reserves and the CAISO will accommodate any requests to provide a pilot compensation method consistent with participating in those markets.

3.1. Pilot Project Objectives

The objective of the pilot project for energy storage is to identify and eliminate barriers to the participation of limited energy storage in the A/S markets. The additional objectives are to analyze the performance characteristics of the resources and to test the CAISO's ability to

- certify the resources for provision of A/S;
- evaluate market performance without requiring participants to bid into the CAISO markets;
- dispatch the resources for regulation and, if requested, operating reserves;
- measure the services provided and produce a settlements statement, and to
- develop a framework for energy storage that is as consistent where possible with other ISOs/RTOs

3.2. Eligibility and Technical Requirements

- Minimum size of the Energy Storage Resource is 2 MW; and the maximum size is 10 MW capacity
- Minimum energy storage is 25% of nameplate capacity; i.e. a 10 MW facility should be capable of storing at least 2.5 MW-Hrs of energy
- Must have a RIG and be capable of following a regulation signal from the ISO
- (Does it have to be connected to the ISO transmission network or can it be connected to the IOU's subtransmission or distribution system?)
- Operating range of the unit is expected to be symmetrical – i.e. a 2 MW unit must be capable of charging at a 2MW rate and discharging at a 2 MW rate.
- The unit should be design to have at least 2 or more charge/discharge steps – i.e. a 10 MW facility should ideally be able to charge/discharge in 1 MW increments. A 2 MW facility should at least two steps (1 MW each) or more such a 4 steps of 0.5 MW each.
- The unit must be capable of producing and absorbing reactive power (MVARs) and have an operating power factor range of ± 0.95 .
- The ramp rate of the unit must be equal to the certified capacity value in 4 seconds. i.e. a 10 MW unit should be able to charge at a 10 MW rate and be able to switch to a 10 MW discharge rate within 4 seconds and vice versa.
- The resource must meet the requirements of the Small Generator Interconnection Process (SGIP).

Aggregators of distributed storage facilities will be excluded from the initial pilot project for energy storage resources. The first phase will focus on discrete energy storage resources to keep the program simple. After the first phase has been successfully completed, we will address the feasibility of a pilot program to test aggregation of distributed energy storage resources.

3.3. Program Duration

- 18 months is the proposed term of the pilot project. The potential start of the program will be Q3 2009 and run to December 2010. The term of the pilot should be sufficient to implement software changes at the CAISO and verify that all systems are ready for market participation of additional limited energy storage resources in the A/S markets within the finalized market rules. The term of the pilot could be extended if needed for further assessment.
- CAISO will begin consideration of final market rules no later than 6 months prior to the pilot program.

3.4. Program Size

CAISO currently procures approximately 350 MW of Regulation Up and Regulation Down. Based on assessment of the increased Regulation needs associated with integration of variable generation renewables, CAISO has forecast that its Regulation needs could increase to a range of 350-530 MW of Regulation Up and 350-750 MW of Regulation Down, depending on the hour and season (i.e., a dynamically determined procurement).⁸ CAISO proposes the following

⁸ California ISO, "Integration of Renewable Resources: transmission and operating issues and recommendations for integrating renewable resources on the California ISO-controlled grid," November 2007, Available at <http://www.caiso.com/1ca5/1ca5a7a026270.pdf>.

criteria for establishing pilot program size: (1) that the program is of sufficient size to allow participation of several technologies; (2) that the size does not adversely affect functioning of the Regulation markets.

- CAISO proposes that the pilot project is capped at 40 MW of Regulation Up and 40 MW or Regulation Down, which is slightly more than 10% of forecasted regulation market based on the CAISO assessments of future Regulation requirements noted above.
- Size limitations (MW) should be established on each participant and perhaps also by technology type.

3.5. Selection Process

CAISO proposes several criteria for selecting pilot participants: (1) technological diversity, such that ideally 4-5 different technologies – Flywheels, Battery storage, etc. – participate; (2) commercial viability and scalability; and (3) desirability of performance attributes in meeting projected AS and load following requirements. An application process will be established.

3.6. Participant Responsibilities

- The participant will be responsible for all Permits required, signing of a Participating Energy Storage Agreement and Metering Agreement with the CAISO, and operating and maintaining the energy storage facility.
- The participant will provide direct telemetry access from the CAISO network communication facilities and the energy storage facility.
- The participant will provide CAISO with any changes in resource availability and capability.

3.7. Program Design and Management

- CAISO and pilot program participants will work collaboratively to design dispatch parameters that meet program criteria.
- CAISO will analyze the performance of each of the participating resources and produce a monthly progress report.
- CAISO will identify market and operating issues and work with the various CAISO departments to correct and resolve problems.

3.8. Resource Auditing and Performance Monitoring

- CAISO will determine whether audits are needed of resources on Regulation.

3.9. Market Integration and Participant Compensation

CAISO proposes the following criteria for developing the pilot rules for market integration and participant compensation: (1) as noted in 4.5 above, that the size (MW) and design of the pilot does not adversely affect functioning of the Regulation markets during the pilot; (2) the determination of compensation through the pilot should reflect likely compensation through direct participation in the Regulation market; and (3) that the pilot should facilitate a

reasonably rapid transition to participation in the actual AS markets. The following further elements are proposed for consideration:

- At least initially, the MW procured under the Pilot would be over and above the CAISO Regulation requirement procured through the Regulation markets. As the MW registered under the pilot increase, and experience is gained with the Regulation services provided under the pilot, some or all of these MW could be subtracted from the total Regulation MW procured by the CAISO.
- Participants in the pilot program would not be required to submit Bids into the CAISO markets for Energy or Ancillary Services. As such, opportunity costs will not be a component of the compensation formula.
- Payments for Regulation Up and Regulation Down would be through a compensation formula based on the actual real-time Regulation Up and Regulation Down Marginal Prices for the hours in which resources participate in the pilot.
- Additional components of the compensation formula could reflect the actual response of resources to CAISO dispatch instructions. These could include:
 - A measure of availability, such as the capability (MW) of the resources times the minutes that a resource is responding to Regulation instructions;
 - A measure of performance, such as a mileage charge that links compensation to movement in response to Regulation instructions.⁹
- Charges to resources for any net energy requirements and associated uplift charges will be determined on the basis of whether the resource is interconnected and metered as retail load or as a resource interconnected to the CAISO system, in which case it will be settled at LMP.

3.10. Pilot Program Cost Allocation

There are three major categories of pilot program costs to consider how to allocate:

- Costs incurred by pilot participants, such as costs of interconnection and metering;
- Costs to the CAISO of program development and implementation; and
- Payments to pilot participants for provision of Regulation, as per 4.9.

3.11. Expansion of Pilot for Non-Generation Resources in the Regulation Market

CAISO would like to establish as common framework as possible over time for bringing what could be called “alternative technologies” – limited energy storage technologies, demand response, and variable generation renewables – into the MRTU A/S markets. Hence, we propose a phased approach under which for practical reasons, this pilot will focus initially on limited energy storage resources but seek to expand its scope over time to other types of resources that could require testing (as well as coordinate more closely over time with the existing demand response initiatives). This could be developed as follows:

⁹ Such measures have been developed for the ISO-New England Alternative Technologies Regulation Pilot Program, see http://www.iso-ne.com/regulatory/tariff/sect_3/08-10-5%20-v1-mr1_app_i.pdf; see also Appendix C of this document.

3.11.1. Phase 1 – Limited Energy Storage Resources

- The Energy Storage resource must meet the eligibility and technical requirements in 4.2.
- Although the CAISO does not have a bias in favor of any particular energy storage technology, we would like to see a mixture of technologies in the pilot test program.
- Phase 1 pilot project will concentrate on discrete energy storage resources and not distributed storage resources managed by an aggregator.

3.11.2. Phase 2 – Other Non-Generation Resources

- Once the CAISO software has been modified to handle limited energy storage resources, the CAISO will consider expanding the program to include other non-generation resources in the pilot project. This will probably be an opportunity in 2010.

The CAISO Participating Demand Response Program is being developed in parallel with the Limited Energy storage Resource program. The efforts and designs are being coordinated to minimize the amount of software changes and changes to business practices that will be required.

3.12 High Level Timeline

Tentative Date	Milestone
1/16/09	Publish Discussion Paper and CAISO response to comments on 2008 paper on Energy Storage
1/20/2009	Energy Storage Workshop
2/3/09	Due Date for Participants and Stakeholder Comments
2/27/09	Publish response to comments
3/20/09	Publish CAISO revised energy storage paper and Pilot Project Proposals
4/7/2009	Stakeholder Engagement followed by Stakeholder written comments / Joint MSC meeting
4/27/2009	Publish Draft Final CAISO Proposal Paper
4/27/2009	File status report with FERC (Demand Response)
TBD	Stakeholder Engagement followed by Stakeholder written comments
TBD	MSC Opinion Adopted
May 2009	CAISO Board of Governor's Decision on Direct Participation of Energy Storage resources in CAISO Ancillary Services Markets
June 2009	File Tariff Language with FERC to enable the Direct Participation of Energy Storage resources in CAISO Ancillary Services Markets

4. Additional Issues

This section provides review of certain additional issues and requirements associated with limited energy storage resources.

4.1. Specification for Metered Data / Telemetry

The current Metering Protocol and Tariff requirements may be found at the CAISO website at:

<http://www.aiso.com/docs/2005/10/01/200510011606575762.html>

4.1.1. Metering Requirements

Participating limited energy storage resources and their Scheduling Coordinators (SCs) must provide revenue quality metering data to the CAISO. Participating limited energy storage resources and their SCs must ensure that revenue Meter Data is made available

to the CAISO in accordance with the CAISO Tariff and the CAISO Metering Protocol. The specific requirements for CAISO Metered Entities (if applicable) and details regarding the CAISO Certified Meter, including the CAISO's standards for the certification of a "Load-only" meter, can be found in the CAISO Metering section on the CAISO Home Page at <http://www.caiso.com/docs/2005/10/01/2005100114481329995.html>.

For all participating limited energy storage resources, Sections 2.2.3 and 2.3.4 of the Metering Protocol require that revenue Meter Data must be recorded and submitted at 5-minute intervals for purposes of financial settlements. Pursuant to that requirement, ordinarily all limited energy storage resources participating in CAISO markets, including A/S and Energy markets, must have revenue quality metering equipment that records data at intervals no longer than five minutes. For the MRTU Release 1 and thereafter, the 5 minute interval reading may be constructed by dividing a 15-minute interval reading into three equal values.

4.1.2. Telemetry Requirements

Participating limited energy storage resources that provide A/S must provide CAISO EMS Telemetry data. A Data Processing Gateway (DPG) unit serves as the primary means for securing telemetry between the limited energy storage facility and the CAISO EMS as a prerequisite for participation in the CAISO A/S markets. Technical Specifications of a DPG Unit can be found at

<http://www.caiso.com/docs/2000/06/08/2000060813402519477ex.html>.

Figure 3 provides a high level overview of the operational data flows related to energy storage resources, either from an energy storage resource directly communicating with a Remote Intelligent Gateway (RIG) or DPG or from distributed energy storage resources communicating through an Aggregating Energy Storage resources Meter Data Server (AESMDS). A limited energy storage resource that is providing regulation services to the CAISO must have a RIG as the communications interface with the CAISO. Energy storage resources that only participate in the A/S Operating Reserve market – Spinning Reserve and non-Spinning Reserve – must have a DPG.

Referring to the bottom of **Figure 3**, a cluster of small energy storage devices such as electric vehicles or plug-in hybrid electric vehicles could be wirelessly linked to an aggregator that is communicating charge/discharge commands to the distributed energy storage resources. The aggregator is interfaced to a DPG that communicates directly with the CAISO EMS. Although this concept is theoretically possible, it is unlikely that there will be sufficient number of electric vehicles or PHEV that are capable of providing this service within the next five to ten years.

The exact implementation for providing CAISO EMS Telemetry shall be at the discretion of the participating limited energy storage resource provider, subject to approval by the CAISO.

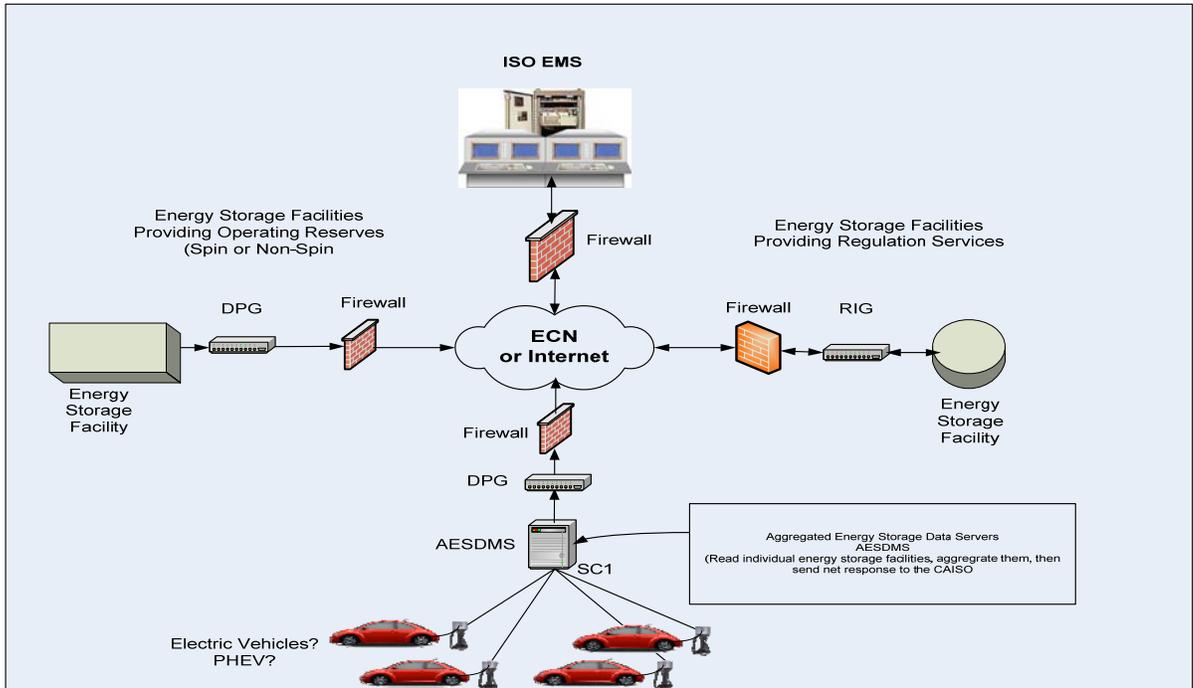


Figure 3 - Participating Energy Storage Resources Operational Data Flow

Acronyms

TLA	Description	TLA	Description
ARC	Aggregator of Retail Customers	M&V	Measurement & Validation
CAISO	California Independent System Operator	MAP	Markets & Performance
CPUC	California Public Utility Commission	MRTU	Market Redesign & Technology Upgrade
CEC	California Energy Commission	NOPR	Notice of Proposed Rulemaking
DAM	Day-Ahead Market	PJM	PJM RTO
DR	Demand Response	RR	Retail Rate
DOE	Department of Energy	RTM	Real-Time Market
ESP	Energy Service Provider	RTMCP	Real-Time Market Clearing Price
FERC	Federal Energy Regulatory Commission	RTO	Regional Transmission Operator
ISO	Independent System Operator	SC	Scheduling Coordinator
ISO NE	Independent System Operator – New England	TAPS	Transmission Access Policy Study Group
LMP	Locational Marginal Price	VEE	Validating, Editing & Estimating
LPPC	Large Public Power Council	MISO	Midwest ISO
LSE	Load Serving Entity	NYISO	New York ISO

Appendix – Summary of other ISO/RTO Energy Storage Markets and Tariffs

1. Midwest ISO

The Midwest ISO specifically is proposing the creation of a new Resource type, to be designated a Stored Energy Resource (also referred to herein as a “SER”). The Stored Energy Resource will be able to offer and supply Regulating Reserve, Spinning Reserve and Supplemental Reserve.

The Midwest ISO has developed the following set of proposed operating parameters that are unique to this new Resource type: Hourly Energy Storage Loss Rate, Hourly Full Charge Energy Withdrawal Rate, Hourly Maximum Energy Charge Rate, Hourly Maximum Energy Discharge Rate and Hourly Maximum Energy Storage Level. Definitions follow at the end of this section.

Because the Stored Energy Resource technology is unique, there are two operational provisions in the Midwest ISO markets that are specific to these Resources. First, the requirements imposed on other Resources to be able to deploy Operating Reserves for a continuous period of 60 minutes or more have been removed for Stored Energy Resources. Eliminating this requirement as it may apply to SERs is necessary in order to allow these Resources to participate in the market and provide Operating Reserves in amounts that can be supported by the physical characteristics of these Resources. In addition, eliminating this requirement for SERs will allow these Resources to adequately contribute to the Midwest ISO’s compliance with applicable ERO reliability standards, including the Control Performance Standards and the Disturbance Control Standards. Stored Energy Resources, however, must continue to meet the Regulation qualification requirement that they be available to supply Regulating Reserve for sixty (60) minutes, subject to energy storage limitations that may be caused by unbalanced Regulating Reserve Deployment within an Hour.

Second, the Midwest ISO is proposing a provision where the maximum amount of Operating Reserve (which includes Regulating Reserve, Spinning Reserve, and Supplemental Reserve) that may be supplied by Stored Energy Resources during a specific hour in the Day- Ahead Energy and Operating Reserve Market, or a specific Dispatch Interval in the Real-Time Energy and Operating Reserve Market, will be limited to a MW level equal to the Regulating Reserve requirement for that Hour. In this regard, it is important to note that the sixty (60) minute requirement regarding the deployment of Contingency Reserve imposed on Resources other than Stored Energy Resources plays a key role in addressing contingencies by ensuring that Energy from reserve capacity can continue to be used to displace capacity lost due to a contingency until it can be restored. If all Operating Reserve were provided by short-term resources, such as Stored Energy Resources, there is no guarantee that sufficient capacity would be available to replace the loss of the largest supply Resource providing Energy to the Midwest ISO. This proposed limitation will, therefore, ensure that an amount of Operating Reserve greater than or equal to the Contingency Reserve requirement will be carried on Resources with the capability to provide reserve deployment for a sustained 60 minute period of time.

Settlement associated with Stored Energy Resources will be performed in same manner as other Resources except that Excessive Energy associated with Stored Energy Resources within an Hour will be settled at applicable Hourly Ex Post LMP. Additionally, Stored Energy Resources will not be subject to the Regulation Deployment Adjustment. The Midwest ISO submits that this

settlement treatment is appropriate because SERs are not participating in the provision of Energy, only Operating Reserve. SERs will be subject to Tolerance Bands, Excessive/Deficient Energy Deployment Charges, Contingency Reserve Deployment Failure Charges, and RSG charges resulting from Excessive Energy and/or Deficient Energy on the same basis as other Resources.

Storage Resources in MISO AS Markets

All Regulation Qualified Resources in the Day-Ahead Energy and Operating Reserve Market must be capable of supplying Regulation for a minimum continuous duration of sixty (60) minutes, except with respect to Stored Energy Resources the Regulating Reserve Deployment shall not exceed the energy storage capabilities of such Resource.

All Spin Qualified Resources in the Day-Ahead Energy and Operating Reserve Market must be capable of deploying one hundred percent (100%) of their cleared Spinning Reserve for a minimum continuous duration of sixty (60) minutes, except for Stored Energy Resources. Stored Energy Resources must be capable of deploying one-hundred percent (100%) of their cleared Spinning Reserve for a minimum continuous duration of five (5) minutes.

All Supplemental Qualified Resources in the Day-Ahead Energy and Operating Reserve Market must be capable of deploying one hundred percent (100%) of their cleared Contingency Reserve for a minimum continuous duration of sixty (60) minutes, except for Stored Energy Resources.

Day-Ahead Energy and Operating Reserves Market

Market Participants that intend to supply Operating Reserve in the Day-Ahead Energy and Operating Reserve Market shall provide the information specified in this Section. Stored Energy Resource Offers shall be submitted in the Day-Ahead Energy and Operating Reserve Market only for registered Stored Energy Resource. Stored Energy Resources Offers will remain in effect for the Day-Ahead Energy and Operating Reserve Market until specifically superseded by subsequent Stored Energy Resource Offers. Each Market Participant may only submit a single Stored Energy Resource Offer for each individual Resource.

MISO Definitions

Hourly Full Charge Energy Withdrawal Rate: The amount of additional energy that can be consumed by a Stored Energy Resource over a period of five minutes when under a full charge.

Hourly Maximum Limit: The maximum MW output of a Stored Energy Resource that may be submitted to override the default value submitted during the asset registration process. This value must be positive.

Hourly Maximum Energy Charge Rate: The maximum rate at which a Stored Energy Resource may be charged, expressed in MWh per Minute, that may be submitted to override the default value submitted during the asset registration process.

Hourly Maximum Energy Discharge Rate: The maximum rate at which a Stored Energy Resource may be discharged, expressed in MWh per Minute, that may be submitted to override the default value submitted during the asset registration process.

Hourly Maximum Energy Storage Level: The maximum amount of energy that may be stored by a Stored Energy Resource on a sustained basis, expressed in MWh, that may be submitted to override the default value submitted during the asset registration process.

Hourly Minimum Limit: The minimum MW output of a Stored Energy Resource that may be submitted to override the default value submitted during the asset registration process. This value may be positive or negative.

Stored Energy Resource: A Resource capable of supplying one or more types of Operating Reserve, but not Energy, through the short-term storage and discharge of electrical Energy in response to Setpoint Instructions.

Stored Energy Resource Offer: A Regulating Reserve Offer (if a Regulation Qualified Resource), Spinning Reserve Offer (if a Spin Qualified Resource) and/or a Supplemental Reserve Offer (if not a Spin Qualified Resource) submitted by a Market Participant within the Midwest ISO Balancing Authority Area for the output of a specified Stored Energy Resource to supply Operating Reserve to the Energy and Operating Reserve Markets.

Operating Reserve Supply Limitation on Stored Energy Resources. The maximum amount of Operating Reserve, including Regulating Reserve, Spinning Reserve and/or Supplemental Reserve, that may be supplied by Stored Energy Resources in the Day-Ahead Energy and Operating Reserve Market in an Hour cannot exceed the Market-Wide Regulating Reserve Requirement for the Hour.

2. New York ISO

Excerpt from John Hickey, “Limited Energy Storage Resource (LESR): Market Integration Update,” Market Issues Working Group, November 3, 2008. Available at www.nyiso.com.

On 07/01/2008 NYISO provided preliminary information on Limited Energy Storage Resources (LESR). The objective is to incorporate LESR technology as a resource capable of providing Regulation Service in the NYISO Markets on a comparable basis with other regulation resources while meeting all reliability criteria.

Current status: On 07/01/2008 presented market rule proposal at 7/1 MIWG and 7/29 SOAS, proposed updates to NPCC, proposed software development and implementation for 2009, developing tariff revisions and proceed through committees.

Reliability Council Update: NPCC is in the review/approval process of changing the A-6 criteria to clarify that sustainability is applicable only to 10 and 30 minute reserves. Each Control Area is required to meet CPS criteria. Change was jointly developed by NYISO and ISO-NE; approval expected in early 2009.

Creation of a “Regulation Only Supplier” that will convert energy but not offer it and energy output is only incidental to the provision of regulation. Scheduling of regulation service will be comparable to other suppliers of regulation service. AGC/RTD functionality will be modified to recognize the LESR capabilities and limitations while managing LESR energy levels. Settlements will generally be consistent with those of other suppliers.

RTD Scheduling: LESR energy level will be managed by RTD to maintain regulation capability to the extent possible by charging/discharging the LESR as necessary. For all intervals with a valid real-time regulation bid, RTD will manage the LESR energy level. During these intervals, the Regulation Capacity offer will be reduced in proportion to the LESR energy level. Energy management will NOT occur when the ISO is experiencing shortage conditions as defined by the regulation demand curve. LESR will be base pointed at zero and will receive a zero regulation schedule. LESRs will be scheduled at zero energy and regulation during any RTD-CAM actions when regulation is also suspended.

AGC Scheduling: AGC will be modified to allocate control error to maximize the capabilities of all regulation resources. Unique characteristics of LESRs will be addressed by AGC.

Settlement: LESRs may offer into both DA and RT markets and will be paid for Regulation Capacity scheduled by ISO in the DAM and RT with payments scaled by its Performance Index (PI). Will be responsible for buying out against DA regulation positions when RTD is scheduling them for energy discharge/recharge. DAMAP is not provided during these periods. LESRs will pay the hourly time-weighted LBMP for their net energy which includes AGC ACE allocations. Provide no bids for energy scheduled either to recharge or discharge. RRA payments and charges (rate Schedule 3) will not apply.

Settlements during shortage conditions as defined by the regulation demand curve will include buying out against DA regulation positions. Replacement regulation costs are provided a DAMAP. The DAMAP will be scaled by any uninstructed energy deviations using the PI.

LESRs will be charged the fixed portion of RS1 as are Generators. The charge will be based on all injected energy from the LESR.

Next Steps: Provide MIWG with updates on requirements that impact MP's such as credit or metering requirement issues. Plan to present Tariff recommendations for MIWG review. Continued development of software requirements for internal NYISO review and approval.

3. ISO New England

Excerpt from "Market Rule 1 Revisions Regarding The Provision Of Regulation By Non-Generating Resources," August 5, 2008, available at www.iso-ne.com

In accordance with the FERC Order of May 7, 2008, ISO New England and New England Power Pool (NEPOOL) Participants Committees submitted the required transmittal letter and tariff sheets revising Market Rule 1 to remove certain barriers in the market rules that prevent non-generating Resources from participating in the Regulation market and providing Regulation. The filing parties also introduce a pilot program that would permit Market Participants with resources incorporating certain new alternative technologies to provide and be paid for Regulation on a trial basis. The intent of the pilot program will be to allow the ISO and participating Market Participants to evaluate the optimal manner in which such alternative technologies are able to provide Regulation and, depending on the results of the program, to implement further revisions to market rules that would allow resources incorporating alternative technologies to participate fully in the Regulation market under terms and conditions comparable to other Market Participants.

The May 7, 2008 Order acknowledged that the ISO had committed to revise Market Rule 1 in accordance with Order 890 to remove barriers in the market rules that prevent non-generating resources from providing Schedule 3 (Regulation and Frequency Response) service and ordered the ISO to submit such modifications within 90 days. The ISO anticipates that it could take up to two (2) years to complete, install and fully test the software changes necessary to implement the Market Rule Changes. The parties also anticipate that the Pilot Program will commence in November 2008 and will continue for approximately 18 months. The ISO will issue quarterly status updates.

The Regulation market in New England is a market-based system for the purchase and sale of the Regulation ancillary service. Owners of Resources submit Resource-specific offers to provide Regulation, and these offers are used in establishing an hourly clearing price for Regulation. Providers of Regulation receive payments for the Regulation they provide, as well as Regulation Opportunity Cost to compensate for the energy a resource would have provided had it been dispatched in economic merit order)

Regulation Rank Prices are calculated on an hourly basis and as needed throughout the Operating Day for each Resource that is eligible to provide Regulation, based on its Regulation

offer parameters and estimated Regulation Opportunity Cost) 8 Resources are then arranged in ascending order based on the Regulation Rank Prices, and this ordering is used by the ISO to assign Regulation to the most economically efficient set of units eligible to meet the Regulation Requirement

The purpose of the Alternative Technologies Regulation Pilot Program is to provide a temporary platform to evaluate resources possessing a wide range of performance characteristics that do not qualify to provide Regulation under the existing market rules, even with the modifications proposed herein. The Pilot Program will allow the ISO to validate the performance claims of these alternative technologies; evaluate the extent to which resources embodying these technologies can provide Regulation that complies with NPCC reliability standards in effect at the time that Alternative Technologies are authorized to provide Regulation service; understand how these resources perform under the existing cost, performance and reliability standards embodied in the existing Regulation market; identify risks that must be protected against; and identify opportunities of which the ISO might take advantage through modifications to the Regulation market design.

The Pilot Program will be limited in size to thirteen megawatts, which represents ten percent of the average hourly weekday regulating requirement. ...Participants will need to meet a number of eligibility and technical requirements. The Response Rate of the resource must be at least one megawatt per minute and the Regulation range must be at least plus or minus 0.1 megawatts and initially no more than plus or minus five megawatts.

To provide Regulation in the Pilot Program, participants will self-schedule their resources to provide Regulation directly in the real-time Regulation market by notifying the ISO when the resource is available, and will be required whenever available to respond to ISO dispatch instructions. the ISO's dispatch software will calculate an AGC set point for each available Pilot Program resource at 4-second intervals based on the New England system's current area control error and the parameter settings established for the Resource. The set point values will then be transmitted electronically to each resource. Software systems will also capture four-second actual performance data for each resource. The dispatch software and the performance monitoring software will operate in parallel with the existing Regulation market software systems.

Participants in the Pilot Program will be paid based on their performance. There will be two compensation components a "mileage payment" that compensates the resource based on movement within its regulating range, and a time-on regulation payment that compensates for the amount of time the resource is online and available to respond to AGC set point signals. These two components correspond very closely to compensation within the existing Regulation market. Resources in the Pilot Program will not receive payments for Regulation Opportunity Costs, because Pilot Program resources will not directly participate in the energy market and as such will not incur lost opportunities in the energy market. Pilot Program participants will be responsible for all costs of interconnection and metering.

The ISO-NE proposed Regulation compensation formula for the pilot program is as follows:

$(RCP * \text{Time-on-Regulation Megawatts}) + (RCP * \text{Capacity-to-Service Ratio} * \text{Regulation Service Megawatts} * (\text{time on in minutes} - \text{fade time in minutes}) / \text{time on in minutes})$, Where RCP = Regulation Clearing Price, Time-on-Regulation Megawatts = Regulation Capability * (time on in minutes - fade time in minutes) / 60 minutes, Capacity-to-Service Ratio, as determined in accordance with Section 111.3.2.2(h) of Market Rule 1, Regulation Service Megawatts = the sum of the absolute value of positive and negative movement that would occur if the Resource responded at its Automatic Response Rate without delay in pursuit of changing AGC setpoints while providing Regulation within the hour, known also as "mileage."