

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

**Order instituting Rulemaking Pursuant to
Assembly Bill 2514 to Consider the Adoption
Of Procurement Targets for Viable and Cost-
Effective Energy Storage Systems.**

**Rulemaking 10-12-007
(Filed December 16, 2010)**

**BEACON POWER CORPORATION
REQUEST TO BECOME A PARTY
AND COMMENTS**

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weigh the associated costs and benefits or such development and deployment and (4) establish how those cost and benefits should be distributed. For the reasons detailed herein, Beacon Power should be allowed full party status in this proceeding.

First, Beacon Power, an energy storage entity that is looking to operate in the California market has a substantial interest in the issues under consideration in this docket and will be significantly affected by the outcome of this proceeding.

Second, Beacon Power has valuable and significant experience with issues under consideration in this docket that will assist the Commission in rendering its decision in this proceeding. Specifically, Beacon Power is actively working with the California Independent System Operator Corporation (“CAISO”) to assist in the development of market rules that would permit fast response Limited Energy Storage Resources (“LESRs”), such as flywheels and batteries, to bid and be paid for Regulation service on a comparable basis with other resources. Most recently, the Company has assisted CAISO with the development of the Regulation Energy Management proposal that will be before CAISO’s Board of Governor’s on February 3, 2011¹. As such, the Company can provide the Commission with pertinent information and insight on the development of California’s energy storage marketplace, the regulatory and economic barriers that could hinder the development of such a market, the benefits of procuring viable and cost-effective energy storage systems, and the allocation of costs and benefits of using energy storage resources to provide regulation. Moreover, the Company has worked with other Independent System Operators, as well as state and federal regulatory agencies to develop the regulation market for limited energy storage resources and has worked with

¹ CAISO’s Regulation Energy Management Draft Final Proposal, January 13, 2011.

utilities that are now evaluating issues similar to those under consideration in this proceeding.

As Beacon Power has a significant interest in the outcome of this proceeding and can provide the Commission with factual and legal contentions pertinent to the issues under consideration in this proceeding, Beacon Power respectfully requests that it be allowed to participate in this rulemaking as a fully party.

I. COMMUNICATIONS

Beacon Power respectfully requests to participate as a party to this proceeding. Communications and correspondence related to this filing should be directed to the Company's representatives:

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II. ABOUT BEACON POWER

A. Introduction

Beacon Power Corporation has developed an innovative, flywheel-based energy storage technology to provide ancillary Regulation Service. Beacon Power's technology

operates by using flywheels to rapidly recycle energy from the grid in order to follow moment-by-moment changes in demand and frequency. When generated power exceeds load, Beacon Power's flywheels store this excess energy. When load increases, Beacon Power's flywheels return the energy to the grid. Using a 25 kWh/100 kW flywheel system, Beacon Power's technology can respond nearly instantaneously to an ISO's control signal. This response is up to one hundred times faster than traditional generation resources. Beacon's flywheel technology has a life-span of 20 years with extremely low maintenance requirements. The ability of Beacon Power's flywheels to quickly and precisely respond to moment-by-moment changes in load and generation make this technology ideally suited to provide Regulation Service.

In ISO/RTO markets that have removed barriers to the participation of LESRs in their Regulation markets, Beacon Power is actively engaged in developing commercial scale 20-megawatt ("MW") flywheel storage facilities. In New York, where the New York Independent System Operator, Inc. ("NYISO") has already implemented tariffs that open the Regulation market to LESRs, Beacon Power's is has commenced operations on its first 20-MW energy storage facility. Similarly, Beacon Power has two 20-MW plants in the interconnection queue in PJM's region where the regulation market is open to LESRs and where tariff revisions have been approved by FERC that ensure comparable treatment for all regulation resources. Beacon Power has been awarded several loans and grants by the DOE and state energy agencies to help fund some of those facilities.

Beacon Power also provides Regulation as a participant in ISO-NE's Alternative Technologies Regulation Pilot Program (the "Pilot Program") since November 2008. ISO-NE is expected to propose imminently, new market rules for FERC's approval that

will allow flywheels to transition from providing Regulation in the Pilot Program to competing in the Regulation market in New England on a comparable basis to generators.

With respect to California, in a 2006 trial sponsored by the California Energy Commission, Beacon Power successfully demonstrated its capability to provide CAISO with regulation service using its flywheel energy storage technology. In a December 26, 2006 letter to Beacon Power, CAISO stated:

“The California ISO is pleased to certify that the 100 KW high speed flywheel technology demonstrated by Beacon Power is an acceptable technology for potential use as a regulation resource for the power grid.... The unit’s high speed response rate and outstanding performance was clearly demonstrated to the California ISO, the CEC and documented in the report provided to the Department of Energy.”

III. BENEFITS OF USING FLYWHEELS FOR FAST REGULATION SERVICE

Beacon Power’s flywheel technology offers many key advantages over the conventional generation resources now used to provide Regulation Service and will provide numerous benefits to CA ratepayers and ensure reliable operation of the CA power grid.

A. Fast Response

As affirmed by CAISO in its January 16, 2009 Discussion paper “Participation of Limited Energy Storage Resources in CAISO Electricity markets”, flywheels, as well as other LESRs (such as batteries, vehicle-to-grid technologies, etc.) are ideally suited to provide Regulation Service given their ability to charge or discharge nearly instantaneously. Specifically, with the addition of more intermittent wind generation to the California Control Area, the grid will benefit from flywheel’s fast response capability to address the control issues created by the frequent and unpredictable changes in wind

output. As the amount of power generated by wind and other intermittent resources increases in order to meet California's Renewable Portfolio Standards, the need for fast regulation will also increase. Fast regulation resources, such as Beacon's flywheels, will assist CAISO in maintaining grid reliability as wind penetration increases. Furthermore, since fast regulation resources are significantly more effective at responding to system imbalances than slower-ramping generation resources, their use on the grid can lower the overall amount of Regulation that needs to be purchased to maintain system reliability.

B. Cost Effective

Deploying Beacon Power's flywheel energy storage for Regulation Service will reduce costs to California's ratepayers by introducing new competition to the market and by displacing relatively high cost regulation deployments by traditional generators. Existing fossil fuel-powered plants displaced by Beacon Power's flywheel-based frequency regulation can be shifted to provide a corresponding amount of added peak generation capacity. In doing so, these plants can run at full capacity, improving their energy efficiency and reducing emissions.

C. Environmentally Friendly

Unlike generators that consume fossil fuel, Beacon Power's flywheel technology recycles existing power, thereby lowering its operating costs to provide regulation and benefiting the environment by producing zero direct CO₂ greenhouse gas, particulates or other air emissions. A study by KEMA concluded that a 20MW Flywheel Energy Storage System emits 56% less CO₂ than a natural gas power plant providing regulation and 26% less emissions than a pumped hydro power plant.² KEMA notes that continued reliance

² KEMA, Emissions Comparison for a 20MW Flywheel-based Frequency Regulation Power Plant, May 18, 2007.

on thermal generating units to meet increased regulation requirements could actually increase emissions of CO₂, NO_x and other pollutants, thereby defeating one of the main benefits of wind generation.

IV. SCOPE OF THIS PROCEEDING

Beacon Power commends the Commission for initiating this first comprehensive proceeding in the nation to initiate policy to establish opportunities for the development and deployment of energy storage technologies throughout California's electricity system. Beacon Power supports the scope as outlined in the OIR and believes this proceeding should serve as an "umbrella" to coordinate development of energy storage policy across the Commission's existing and future proceedings. Beacon Power looks forward to participating actively in all aspects of this rulemaking and in the initial workshop described in the OIR.

As part of this proceeding, Beacon Power respectfully recommends that the proceeding be designed to address the following items that will greatly enhance the ability of fast responding storage devices to be deployed in California, thereby providing economic and environmental benefits for California's ratepayers.

A. Encourage the CAISO to open its Regulation market to LESRs and to appropriately compensate the additional value provided to the grid by fast responding Regulation technologies.

1. CPUC support of the CAISO's REM Proposal

The CAISO is proposing to implement a Regulation Energy Management ("REM") market functionality (as described in the CAISO's *Regulation Energy Management Draft Final Proposal* dated January 13, 2011), which removes the barriers to providing Regulation by energy storage entities. The REM design is the culmination

of an extensive stakeholder process and will align the CAISO's Regulation market rules with those implemented and approved by FERC to enable the participation by LESRs in other ISO markets. By using the 5-minute real-time energy market to manage the state of charge of resource, REM will enable resources with 15-minute storage capability to continuously provide Regulation service for a full hour – and for hours in succession, almost without limit.

We urge the CPUC to support the REM Proposal when it is presented to the CAISO's Board of Governor's on February 3, 2011, and at FERC once it is submitted for approval. Active support by the CPUC will greatly assist in the deployment of storage in CA.

2. Encourage the CAISO to structure payments for Regulation using a performance compensation mechanism ("mileage payment") that values the speed and accuracy with which a resource responds to a regulation control signal rather than only nameplate power rating of the resource.

Today, the CAISO compensates Regulation service based only on the amount of capacity offered into the market and not the resource's speed of response, even though the CAISO has identified a need for faster-ramping regulation resources. However, as discussed at the stakeholder meeting, it is not necessary to create a new "Fast Regulation" product, or carve out part of the market for fast resources.

Instead, the CAISO should simply change its Regulation payment method from a straight \$/MW capacity to also include a payment based on actual MWs of response to an ISO control signal ("mileage payment"). The existing Regulation market would then compensate all resources, regardless of technology, for the additional *value* added by providing more ramping and for the additional *cost* incurred by the resource as a result of frequently moving up and down.

This would:

- **Incent existing resources to improve their performance, attract new fast resources, and compensate providers based on the service that they actually provide.** Resources that respond faster and more fully would naturally receive higher total payments
- **Lower CAISO Regulation procurement.** There are two reasons why encouraging fast response resources to provide regulation can result in fewer total MW capacity of Regulation that needs to be procured.

First, resources that are more flexible and can ramp more quickly will reach their dispatch target faster and can then be re-dispatched more often. Thus, fast regulation resources provide much greater ACE correction than more ramp-limited resources. Second, because slower-ramping resources cannot switch directions quickly, they sometimes provide regulation in a counterproductive direction and, as a result, actually add to the ACE, requiring dispatch of other resources to counteract it.

A Pacific Northwest National Laboratory (PNNL) study, “Assessing the Value of Regulation Resources Based on Their Time Response Characteristics,” determined that:³ faster Regulation resources could reduce CAISO procurement of Regulation by as much as 40%. Moreover, a recent CEC study found that a 30-50 MW fast-response storage device could provide as much or more Regulation capability than a 100 MW combustion turbine.⁴

An example: ISO-NE dispatches regulation based on ramp rate and has a market incentive for faster response (*i.e.*, “mileage”) in its Regulation settlement. The results prove the benefits of this type of Regulation compensation – ISO-NE procures a lower

³ Makarov, Y.V., Ma, J., Lu, S., Nguyen, T.B. “Assessing the value of Regulation Resources Based on Their Time Response Characteristics.” Pacific Northwest National Laboratory, PNNL – 17632, June 2008.

⁴ “Research Evaluation of Wind Generation, Solar Generation, and Storage Impact on the California Grid,” Study by KEMA, Inc., done for California Energy Commission funded via Public Interest Energy Research Program (PIER) page 6, June, 2010.

amount of Regulation as a percentage of average load (0.66% of average load) than any other ISO.

In 2009, CAISO ratepayers bought 116% more Regulation per MWh of load than ISO-NE ratepayers. If the CAISO procured the same percentage of regulation per average load that ISO-NE procures, California ratepayers would have saved \$25 million.

These data demonstrate the dramatic reduction in Regulation procurement that can be achieved with incentives for increasing ramp capability. The CAISO should make the relatively small investment in the tariff and software changes necessary to implement the changes recommended herein, as it can yield significant benefits for ratepayers.

B. Develop a methodology to determine a Resource Adequacy (“RA”) value for storage resources, thus enabling load serving entities to meet part of their requirements under the RA program with storage resources.

The current market structure treats regulation services like a spot market, *i.e.*, there are no long-term purchase agreements for regulation services. Consequently, it is impossible to obtain project financing for energy storage regulation assets because the capital markets will not provide debt financing without some level of revenue certainty. In contrast, traditional generators are financed on the basis of long-term power purchase agreements (PPAs). With PPA-backed financing in place based on its primary wholesale energy function, a generator has the option to provide part of its operating range in the form of regulation services (a secondary function). Including regulation-only energy storage systems in RA obligations and long-term procurement requirements would help overcome the project financing barrier similar to conventional generators.

Like capacity and energy to meet current RA Requirements, the ability of new technologies or existing technologies/facilities to provide the additional needed services

will be greatly enhanced by (and may require) revenue certainty from long-term contracts. In addition, it makes sense to plan in advance for expected increased Regulation needs with higher penetration of renewable resources through reflection of those new needs in RA Requirements.

C. Consider developing incentives

In this proceeding, the Commission is respectfully requested to allow incentives for using energy storage technologies. Such incentives would include, but not be limited to:

- implementing an energy storage procurement standard and/or feed-in tariff
- allowing increased utility rates of return for storage investment
- allowing utilities to earn an incentive rate of return on long-term contracts signed with storage developers.

V. CONCLUSION

Beacon Power respectfully requests that it be allowed to participate as a party to the above-captioned proceeding. As an energy storage company with extensive experience establishing markets, creating opportunities and removing barriers for the utilization of energy storage resources on the grid, Beacon Power has a significant interest in this proceeding and will provide the Commission with pertinent information that can be used in the decision-making process. We look forward to participating in this OIR and in the initial workshop.

Respectfully submitted,

BEACON POWER CORPORATION
by its attorney,

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Dated: January 21, 2011

CERTIFICATE OF SERVICE

I, Patricia A. Muse, certify that I have on this 21st day of January 2011, a copy of the foregoing “**BEACON POWER CORPORATION REQUEST TO BECOME A PARTY AND COMMENTS**” on the service list for R.10-12-007 by serving a copy to all known parties to R.10-12-007 listed on the most recently updated service list available on the California Public Utilities Commission website, via email. I have also caused copies to be hand-delivered to the parties who are unable to accept service by electronic mail.

Executed this 21st day of January 2011 in Boston, Massachusetts.

/s/ PATRICIA A. MUSE

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