

**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.

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

**COMMENTS OF JACK ELLIS ON  
ENERGY STORAGE FRAMEWORK STAFF PROPOSAL**

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Dated: January 31, 2012

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**I. Introduction**

As noted in my motion for party status on June 30, 2011, I am not representing a stakeholder or party interest in this proceeding. Instead, I am participating on my own initiative and at my own expense. I assist other parties from time-to-time in various matters before the Commission, but I have not solicited their permission to offer these comments or provided them with copies to review.

While I believe California's electric grid could benefit from modest amounts of additional storage, it is still quite expensive. Moreover, its use for time-shifting energy (also referred to as arbitrage), providing ancillary services, and generally dealing with the variability and uncertainty associated with certain forms of renewable energy production is neither cost-effective nor feasible under the market and institutional arrangements that currently exist in California. While the barriers mentioned in the Staff Framework

Proposal (“Staff Framework”) need to be dealt with, they are not the only barriers and they are also not the most significant ones. I am providing these comments in the hope they will help clarify some of the issues raised in the Staff Framework and also make parties aware of other, likely more significant issues that the Staff Framework has not considered.

## **II. Energy Storage Adoption Barriers**

In this section I comment on some of the adoption barriers set out in the Staff Framework.

### **Lack of definitive operational needs**

The California ISO (CAISO) has, in fact, been very clear regarding its operational needs, even if their preferences have not been as specific as some parties would like them to be. Those operational needs include the ability to a) begin injecting or withdrawing real power within a short period of time (fast startup – within minutes or perhaps an hour), b) increase or decrease the rate of injection or withdrawal as rapidly as possible (fast ramp rate), c) sustain the rate of increase or decrease over a long period of time (continuous ramping), d) stop injecting or withdrawing real power as quickly as possible (fast shutdown –within minutes or perhaps an hour), e) start up again within a short time after shutting down (short minimum downtime). All of these attributes have been discussed in the context of the CAISO’s 33% RPS analyses which became part of the CPUC’s 2011 LTPP proceeding.

The CAISO has also published estimates of the maximum amounts of ramping, load following and regulation services it expects to require in the 2020 time frame. It is my understanding that the CAISO plans to publish some additional information around February 7, 2012. It is not clear how the CAISO or the Commission would count various technology alternatives toward meeting these estimates.

### **Evolving market and market product definitions**

Unfettered proliferation of market products and regulatory constructs has complicated investment decisions for all market participants. Market participants generally and consumers in particular would be better served if there were fewer market products with fewer and simpler rules.

In order to reliably balance supply and demand, the CAISO needs options<sup>1</sup> to purchase or sell energy at a variety of prices that can be called up subject to a variety of advanced notification times and performance durations<sup>2</sup>. Today the CAISO and the CPUC meet these needs with variety of disparate market products, each of which has its own very specific rules for delivery, performance, operation and compensation. Another way to accomplish the same objectives is by defining a generic option product with a single set of technology-agnostic rules for delivery, performance duration, operation and compensation. To buy or sell an option, parties would have to specify notification time,

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<sup>1</sup> Examples include resource adequacy capacity, ancillary services and the CAISO's proposed new flexible ramping product.

<sup>2</sup> In this context, performance duration is the length of time for which energy must be supplied to or withdrawn from the grid once the option is exercised.

strike price, duration and an option premium<sup>3</sup>. This would allow the CAISO, and other parties who might want to manage imbalance risk themselves, to issue and respond to tenders for fully fungible optionality to meet any conceivable balancing requirement. It would minimize or perhaps even eliminate the market product barrier, which currently plagues all forms of demand and supply resources. It would also deal with the resource adequacy capacity accounting barrier, since resource adequacy capacity is an option on energy with a daily strike price and an as-yet undefined performance duration.

### **Resource adequacy capacity accounting**

There are currently no rules or standards that define how long a resource that qualifies under the CPUC's resource adequacy (RA) program must supply energy to the grid when it is called upon to do so (performance duration). An engineering measure known as equivalent load carrying capability (ELCC)<sup>4</sup> can be used to determine the perfect capacity equivalent of limited energy resources, but it does not explain how a limited energy resource like storage will respond to grid conditions that give rise to the need for capacity when the limited energy resource is capable of providing several market products concurrently, such as RA capacity, ancillary services and time-shifting energy. For example, a storage device that is paid for its RA capacity and is committed day-ahead to time-shift energy may be unable to provide capacity late in the afternoon if its stored energy is mostly depleted. Similarly, a storage device committed day-ahead to absorb off-peak renewable energy based on energy market prices may be unable to provide

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<sup>3</sup> In physical market terms, the capacity price.

<sup>4</sup> See for example, Milligan, M. and K. Porter, "Determining the Capacity Value of Wind: A Survey of Methods and Implementation" at <http://www.nrel.gov/docs/fy05osti/38062.pdf>

additional energy absorption capacity for which it is paid a premium under an RA-like program to deal with overgeneration conditions if its storage is already mostly full. Even if the CAISO and the CPUC agree on technology-specific RA rules for storage, they must also define the length of time for which an RA resource must perform (and be capable of performing) when called upon in order to qualify for RA payments.

I would also point out that the Commission's RA program is poorly suited to an environment in which a significant and growing volume of resources qualifies under administrative rules that fail to reflect limitations on energy production and controllability<sup>5</sup>. Unless the RA program is based on being paid for capacity only to the extent capacity actually performs when and as needed<sup>6</sup>, it is a paper exercise that creates a false sense of security.

#### **Lack of cost-effectiveness evaluation methods**

A simple, objective method for assessing the cost-effectiveness of storage used for ancillary services, time-shifting, RA capacity and certain renewable integration already exists in the form of market prices – forecast or historical - for ancillary services, energy and RA capacity. A developer can compute the benefits its project provides by adding up expected operating margins for each service its project can provide, accounting for operational feasibility and round-trip efficiency. The developer can also assess the project's costs and do a simple comparison to assess cost-effectiveness.

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<sup>5</sup> Applicable resource types include hydro, storage, solar and wind.

<sup>6</sup> Dr. Frank Wolak and others have proposed requiring parties that are paid for capacity under the RA program to bear the cost of replacement energy if they fail to deliver when called up on to do so. This would represent a significant change in the nature of the current RA obligation.

Whether storage costs are too high or too low, and whether historical market prices or market price forecasts are too high or too low is a separate matter. The fact remains that cost-effectiveness for storage can be readily and objectively assessed like the cost-effectiveness of any other good or service by comparing the amount of revenue an asset must earn in the market in order to be economically viable with market prices for the services that asset can sell.

### **Lack of cost recovery policy**

Cost recovery is only an issue for assets built in connection with an obligation to serve. If the Commission sets procurement targets<sup>7</sup>, then it must provide parties that build storage to meet those procurement targets with an opportunity to recover their prudently incurred costs.

The Staff Framework actually refers to a different issue, which is how to structure compensation for storage devices that can concurrently be used as substitutes or supplements for transmission or distribution assets, and as generation asset. Generators (and certain other resources like demand response) are justifiably concerned about whether revenues from providing transmission and/or distribution services amounts to an unfair subsidy that allows storage to also compete in the market for bulk power.

There aren't any perfect solutions for this problem, but following is one proposal for addressing it:

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<sup>7</sup> I advise against procurement targets at the end of these comments.

- Require all transmission and distribution infrastructure investments to be bid competitively. This would require a faster, much simpler solicitation mechanism than currently exists for generation. Storage, distributed generation and other technologies could bid into these solicitations, which would have to be designed so they were completed on much shorter time frames and at much lower cost than the current processes for generation. Requiring multiple providers to compete with one another will ensure that the consumers who fund cost recovery for these assets in their rates pay the lowest reasonable price for their transmission and/or distribution benefits if they win a solicitation.
- If storage designated as both a generation asset and a transmission asset is unavailable when needed, require the asset owner to pay consumers for any inconvenience caused by localized outages and/or higher LMPs that result from its failure to perform. This forces storage operators to consider their transmission and distribution service obligations as they formulate bids for a multiple purpose resource and decide whether and how they compete in the markets for energy, capacity and ancillary services at the bulk power level.
- Ensure that LMPs at the nodal level reflect any scarcity that results from the failure of a network element. This is necessary to ensure that when network elements fail to perform, owners of those elements are the ones who pay for



consumers' opportunity and other costs, rather than having any additional costs paid by affected consumers or all consumers.

### **Lack of cost transparency and price signals**

The Staff Framework contains almost no explanation of this barrier. Stakeholders have legitimate concerns regarding price discovery<sup>8</sup> for RA capacity and long-term contract capacity, which are struck in forums that the IOUs insist be opaque in order to protect consumers<sup>9</sup>.

Prices for energy and ancillary formed in the CAISO's markets are very transparent. The ISO publishes its price-setting algorithms, its prices, and a substantial volume of bid data. However I would argue that price outcomes from the CAISO's markets are not generally useful as a means of informing or guiding investment and operating decisions, and prices from the CAISO's energy markets useless to an operator of a storage device whose principal application is to cost-effectively time-shift energy.

Regarding the general usefulness of prices from the CAISO's markets:

- In the short term, they are artificially depressed by a sizable supply surplus created by CPUC procurement policies that required contracting for brand new gas-fired generation rather than allowing existing gas-fired generation coming off

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<sup>8</sup> Readily available information about prices.

<sup>9</sup> One could argue that an opaque market in which there are many sellers and a few large buyers is not in the *public* interest.

long-term contracts to be chosen in recent IOU resource solicitations<sup>10</sup>. The current economic downturn and increasing penetration of renewables have also played a role.

- Ever since the Energy Crisis of 2000 and 2001, policymakers have been very reluctant to tolerate any price volatility. At a meeting on January 20 of this year to discuss sending wholesale prices to retail consumers, CAISO representative Heather Sanders stated that one of the ISO's objectives was to avoid price volatility. The CAISO's flexible ramping product is another attempt to minimize price volatility by moving revenues out of the energy market and into some sort of capacity market, the costs of which are spread largely on a volumetric basis. Without price volatility, storage operators lack the information they need to operate cost-effectively and to be paid fair value for the services they provide.
- The CAISO's Department of Market Monitoring (DMM) consistently measures the success of the CAISO's markets in terms of prices that meet an ideal competitive benchmark and are as low as possible, rather than whether market outcomes are able to inform rational decision-making by buyers, sellers and consumers that are consistent with state policies.

However the biggest obstacle that faces both existing and new storage facilities is the structure of the CAISO's markets, which are designed to accommodate thermal resources

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<sup>10</sup> Both the CPUC and the CAISO have made proposals for ensuring that the ten year old Sutter plant is not retired at the end of 2012 when its existing contracts run out even though CPUC policy made it ineligible to be selected in several recent long-term procurement auctions.

that know their costs with a reasonable degree of certainty when the day-ahead market opens and can therefore make offers that ensure they do no worse than break even. Storage plants, on the other hand, buy their “fuel” in an hourly wholesale electricity market for which prices are not known with any reasonable degree of certainty until the opportunity to purchase at those prices has passed. In other words, storage operators must submit blind price-quantity bids and offers without ever knowing what price they will pay to buy energy or how much they will receive for selling energy. Like thermal plants, they can estimate both<sup>11</sup>, however the volume and price risks inherent in those estimates tends to limit the operating profits they can realize since not only must the price at which they buy be below the price at which they sell, but the amount of the differential must be sufficient to pay for the cost of the losses that are incurred by all storage devices in a round-trip transaction. Consequently, storage built in California to time-shift energy will likely earn little or no money on an operating basis<sup>12</sup>. Storage built to absorb surplus off-peak energy<sup>13</sup> might well avoid relatively infrequent circumstances where renewable energy production has to be curtailed, but at a significant cost that is ultimately borne by consumers.

### **III. Staff Questions**

In this section, I respond to some of the questions posed by staff.

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<sup>11</sup> However this becomes much more problematic as day-to-day uncertainty about market prices increases with higher levels of renewable energy production which is itself variable and uncertain from one day to the next.

<sup>12</sup> In fact, if on- to off-peak price differentials narrow further they could well lose money on an operating basis.

<sup>13</sup> Essentially the same thing as time-shifting, but without considering operating economics.

### **Relative usefulness of the standard practice tests**

The purpose of these tests is to assess cost-effectiveness from a variety of perspectives. They can be worthwhile if they are performed with a set of objectively determined assumptions, and they can provide a distorted view of the relative impacts if the assumptions are not derived carefully and objectively, particularly if one outcome of the exercise is to develop incentive programs for storage. Whether explicitly or implicitly, if one purpose of an incentive plan is to provide investors<sup>14</sup> with acceptable rates of return by allowing them to recover most of their investment in a relatively short time, then the time period used in the tests should also be relatively short. In the interest of fairness, consumers need to be able to realize most of the benefits of storage projects that receive incentives in about the same time frame over which investors are allowed to earn the bulk of their returns.

### **Procurement objectives**

Notwithstanding the genesis of AB 2514, procurement objectives are unnecessary and unwise. If storage is cost-effective, it will be built. If it is not cost-effective, it should not be built. By setting procurement targets and subsidizing storage, the Commission undermines the cost-effectiveness of other, competitive technologies in the same way the cost-effectiveness of storage is undermined by setting procurement targets and/or subsidizing other alternatives. Set-asides, mandates and incentives perpetuate a vicious cycle in which the economic viability of various alternatives is largely dependent on the

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<sup>14</sup> In this case, an investor could be a competitive firm or a firm regulated by the Commission.

Commission's largesse rather than economic merit and technological superiority.

Consumers would be better served by having the Commission and the CAISO deal with market structure and rules barriers that inhibit development of otherwise cost-effective technology alternatives and remove themselves from the process of deciding winners and losers.

Moreover, mature storage technologies like pumped storage are typically unable to benefit from manufacturing economies of scale. For less mature technologies, the public interest might be better served by allocating a fraction of the amount that would otherwise be directed toward incentives to targeted R&D efforts that focus on improvements in storage efficiency and cost performance. Incentives that prematurely flood the market with devices that could be economically obsolete within a year or two are not a productive use of consumer funding.

Respectfully submitted,

/s/ Jack Ellis

Dated: January 31, 2012

**CERTIFICATE OF SERVICE**

I hereby certify that pursuant to the Commission's Rules of Practice and Procedure, I have this day served a true copy of **COMMENTS OF JACK ELLIS ON ENERGY STORAGE FRAMEWORK STAFF PROPOSAL** on all parties identified on the service list for CPUC Docket R.10-12-007 obtained from the Commission's web site as of January 31, 2012.

In accordance with ALJ Kikugawa's May 31, 2011 Scoping Ruling, paper copies have been served on the ALJ and assigned commissioner Peevey via first class mail.

I certify and declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on this 31<sup>st</sup> day of January, 2012 at Tahoe City, California.

/s/

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Jack Ellis

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