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

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| Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local Procurement Obligations. | Rulemaking R.11-10-023<br>(Filed October 20, 2011) |

# COMMENTS OF MEGAWATT STORAGE FARMS, INC. ON THE April 9, 2014 WORKSHOP STAFF PROPOSALS

April 18, 2014

Edward Cazalet
Vice President
MegaWatt Storage Farms, Inc.
101 First Street, Suite 552
Los Altos, CA 94022
(650) 949-5274
email: ed@MegaWattsf.com

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## INTRODUCTION

Thank you for this opportunity to provide comments on the April 9, 2014 workshop Staff Proposals.

MegaWatt Storage Farms, Inc. ("MegaWatt") is focused on developing grid-scale storage, and storage-related consulting and analysis services.

MegaWatt submits these comments on the Resource Adequacy (RA) Staff Proposals workshop presentation of April 9, 2014.

*Unfortunately, as we explain in our comments, the CPUC and the CAISO propose that storage that discharges at 1 MW and charges at 1 MW with only 0.75 MWh of energy storage will receive 2 MW of Effective Flexible Capacity (EFC). Longer duration storage would receive the same EFC. Because 0.75 MWh of energy per MW of storage capacity(0.75 hours) is far too low,*

*the proposal will largely destroy the ability of the AB 2514 storage portfolio to be an effective tool for renewables integration for California.*

# COMMENTS

Our comments are focused on the staff proposals for Net Qualifying Capacity ("NQC") and Effective Flexible Capacity ("EFC") for Energy Storage ("ES").

MegaWatt supports the staff proposal requirements for ES for 4-hour minimum duration at $P_{maxRA}$ for System and Local NQC. MegaWatt also supports the requirements to operate for 4-hours over three consecutive days and the Must-Offer Obligation (MOO).

MegaWatt supports the calculation of EFC: EFC $\leq$ Maximum (NQC, NQC – $P_{min}$). *However, this calculation for storage is rendered meaningless by the following three points:*

(1) "Co-located storage operating in conjunction with (i.e., not independently dispatchable from) another, larger RA-eligible resource need not meet the RA eligibility requirement of being able to operate for four consecutive hours on three consecutive days; the RA qualification of the primary generating facility is sufficient." ( Page 2 Revised Staff Proposal Resource Adequacy Proceeding R.11-10-023 April 9, 2014)

(2) "for the 2016 RA compliance year" the CPUC will "explore the possibility of exempting flexible resources from satisfying system RA requirements." ( Page 4 Revised Staff Proposal Resource Adequacy Proceeding R.11-10-023 April 9, 2014)

(3) The CAISO FRACMOO proposal approved by the CAISO Board of Governor's on March 18, 2014 does not require that resources meet the RA edibility requirement to qualify for EFC.

With (1) a facility with battery storage that can charge or discharge at 100 MW for 45 minutes (0.75 hours) that is located alongside a 100 MW gas turbine and dispatched with the gas turbine has facility EFC of 300 MW; the gas turbine facticity without this storage would have an EFC of 100 MW.

MegaWatt did <u>not</u> support the January 24, 2014 staff proposal to reduce from 3 hours to only 1.5 hours that a positive *and* negative operating range facility (storage) must operate at $P_{min}$ for full EFC credit.

MegaWatt does not support in the April 9, 2014 staff proposal to further reduce from 3 hours to only 0.75 hours the time a positive *and* negative operating range facility (storage) must operate at $P_{min}$ for full EFC credit.

Our reasons for the above are set forth below:

**Reason 1: 0.75 hours of storage dispatched as proposed does not reduce a 3 hour ramp**

The staff proposal assumes a storage facility can ramp its charge from $P_{min}$ (a negative number) to zero over the first half of the three-hour ramp, and then ramp its discharge to $P_{max}$ for the second half of the 3 hours"

Figure 1 below illustrates this staff proposal case. As shown at the bottom of the figure, a storage facility with -1000 MW $P_{min}$ and 1000 MW $P_{max}$ and 0.75 MWH of energy storage is first charged at a linearly decreasing rate for 1.5 hours from $P_{min}$ and then discharged at linearly increasing rate for 1.5 hours to $P_{max}$.

The figure also shows an illustrative net load of 20,000 MW before time 0 and a 10,000 MW up-ramp over 3 hours to a 30,000 MW net load. The figure also shows the net load adjusted for this storage dispatch.

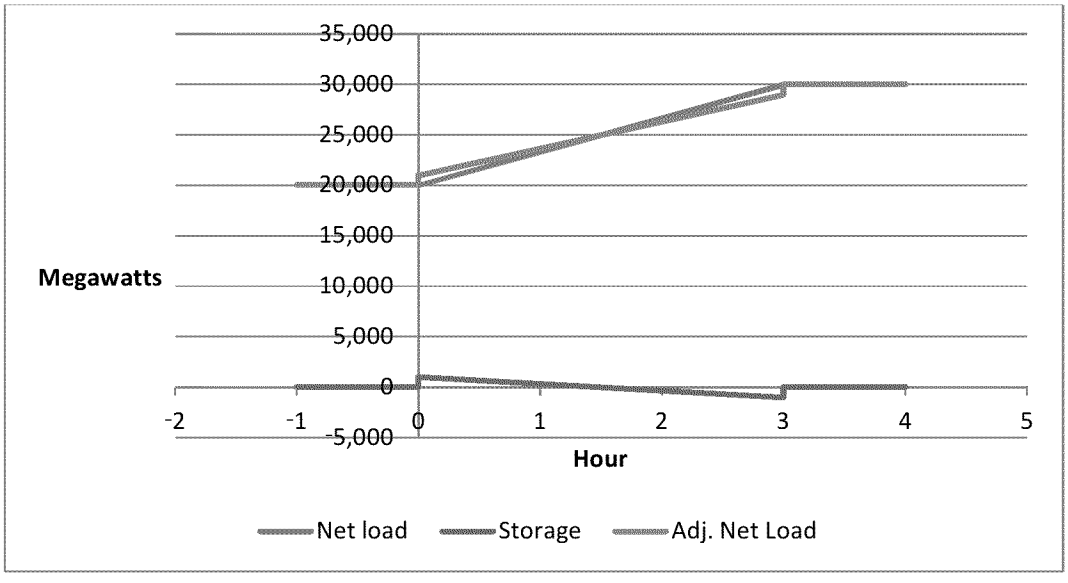


**Figure 1: Impact of 1000 MW of 0.75 Hour Storage on 10,000 MW 3 Hour Net Load Ramp**

The figure shows that 0.75 hours of storage dispatch has no net impact on the 3-hour ramp. Furthermore, the increased up-ramp in the first 1.5 hours is likely to complicate the dispatch of other resources to meet the overall ramp.

We have heard the CPUC and CAISO staff claim that the CAISO dispatchers will find ways to combine 0.75 hours of storage with other resources to overcome the limitations of 0.75 hours of storage. This sounds as if the CAISO will be aggregating storage and fossil generation rather than aggregation by market participants. We reject this argument.

**Reason 2: The 2020 CASIO "Duck Curve" illustrates that that storage durations of 0.75 provides insignificant smoothing of the curve ramp support and that storage durations of 4 to 6 hours may be ideal for California.**

Figure 2 shows the net load for the 2020 California ISO Duck Curve for a day in 2020 (blue line). The red line in the figure shows the dispatch of the 4 GW of 6 hour storage with up to 4 GW of charge in the middle of the day to raise the belly of the duck, and up to 4 GW of discharge during the evening peak to reduce the beak of the duck. The green line shows the adjusted net load with the operation of the storage.

Figures 3, 5, and 5 show the same curves with 4, 1.5 and 0.75 hours of storage.

All of the figures show the impact of 4 GW of storage. The current CPUC portfolio standard is for 1.325 GW, so the impact of 1.325 GW will be proportionally less in each case.

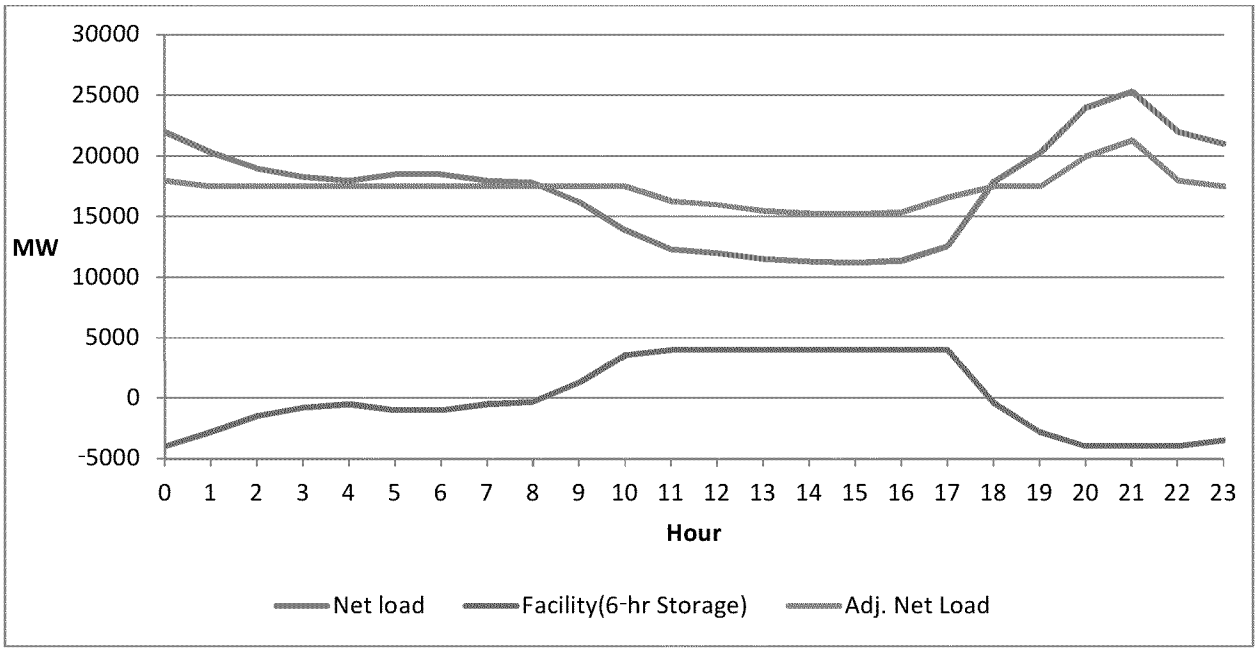


**Figure 2: CAISO 2020 Net Load with 4 GW of 6-Hour Storage**

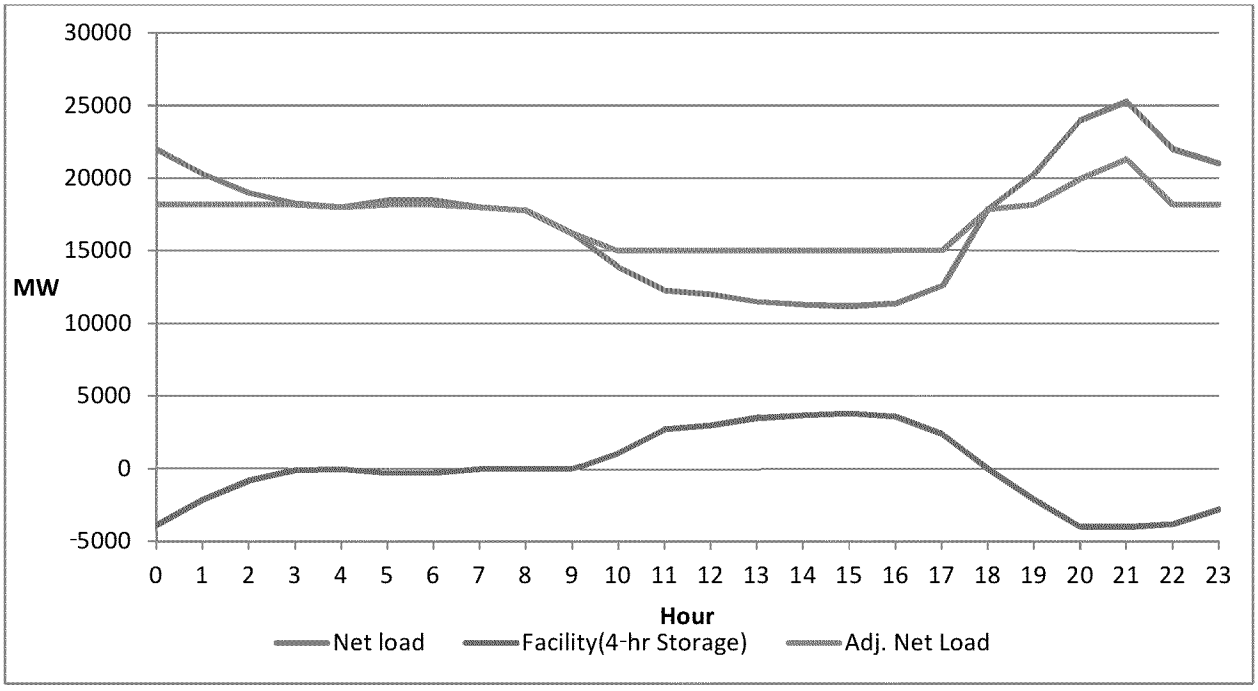


**Figure 3: CAISO 2020 Net Load with 4 GW of 4-Hour Storage**

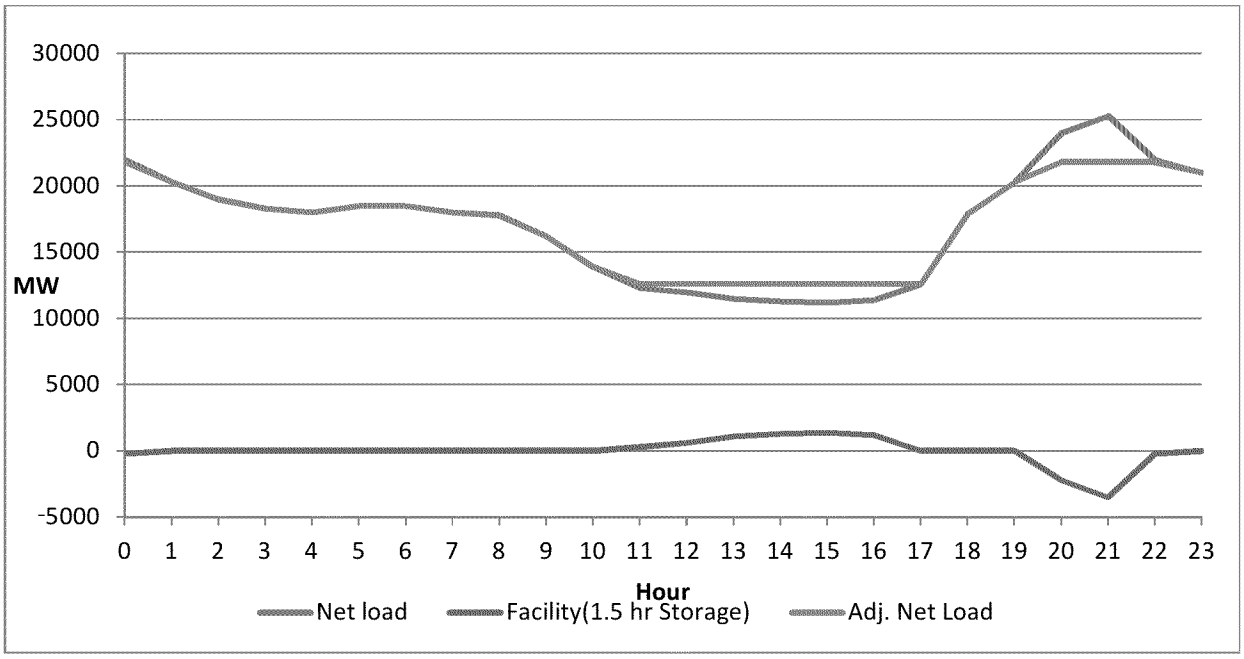


**Figure 4: CAISO 2020 Net Load with 4 GW of 1.5-Hour Storage**

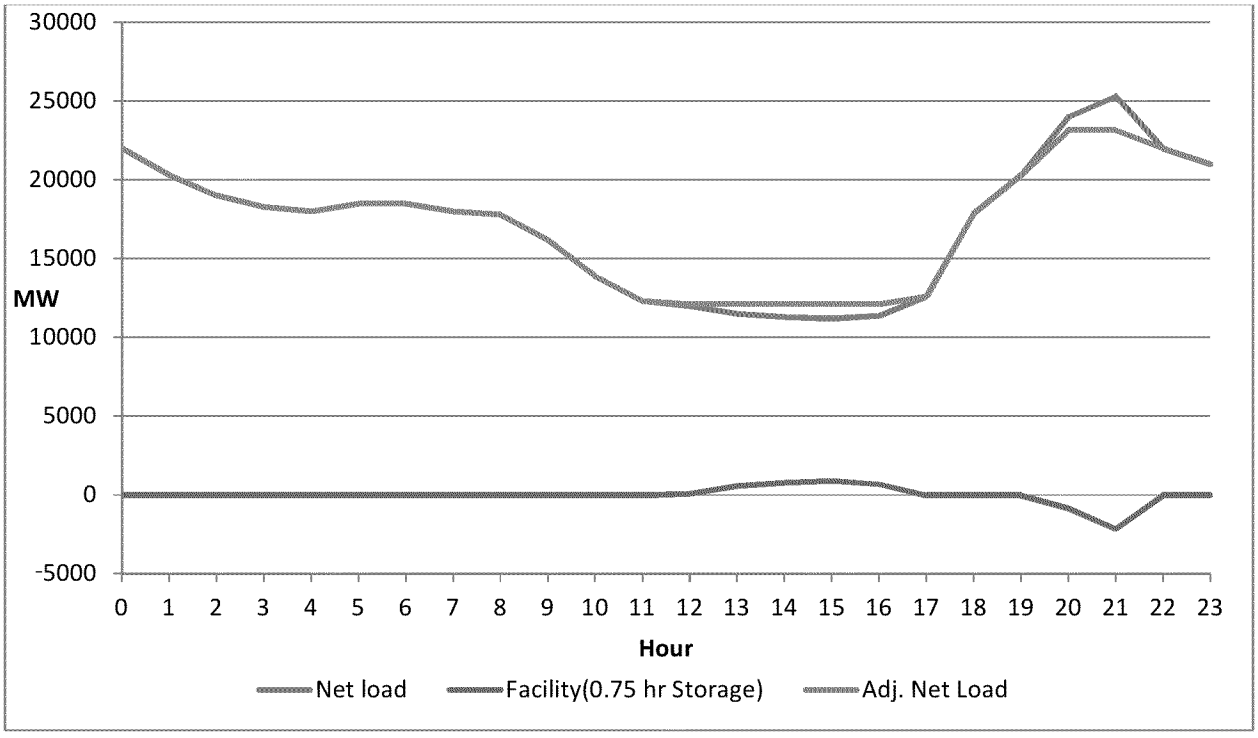


**Figure 5: CAISO 2020 Net Load with 4 GW of 0.75-Hour Storage**

The graphs show that 0.75 hours of storage has negligible impact on the net load ramp and potential over generation at the base of the "Duck" relative to 4 and 6 hours of storage. Hence, from a longer-term perspective, QC and EFC requirements that favor short duration 0.75-hour storage will offer little support to renewables integration as compared to storage facilities that are required to have 3 to 4 hours or more of storage.

## A SIMPLE, NON-DISCRIMINATORY EFC CALCULAITON

MegaWatt supports the following simple EFC calculations for all resources:

For storage the simple EFC is (the total energy discharge over 3 hours plus the energy charge over 3 hours) /divided by 3. This EFC for storage requires 3 hours of charging at $P_{min}$ and 3 hours of charging as $P_{maxRA.}$ Thus storage with 100 MW of discharge capacity and 100 MW of charge capacity and at least 300 MWH of energy storage has an EFC of 200 MW. 100 MW of storage with 100 MWH ( 1 hour ) of energy storage has an EFC of 67 MW.

For generation the simple EFC is the average increase in energy a generator provides over 3 hours. Thus a generator that can ramp linearly over 3 hours from 0 to 100 MW has an EFC of 50 MW. A fast generator that can ramp from 0 to 100 MW full output in 30 minutes has an EFC of (25 + 250) / 3 = 91.7 MW.

This approach is non-discriminatory for all resources including generation, storage and DR.

## CONCLUSIONS

The CPUC and CAISO EFC proposals effectively require only 0.75 hours of energy for storage.

The result of the CPUC and CAISO flexible capacity proposals will be to pay existing fossil generators to submit bids so that the CAISO can dispatch on 5-minute intervals within the rather slow ramp rates of many of these technologies. The payments to generators for 5 minute bids will further suppress price variability in the CAISO real time market. Storage could respond to price variability and likely would bid into the 5-minute intervals without additional payment. But the lower price volatility will discourage procurement of storage.

The combination of the 0.75 hour energy requirement for storage and the payments to ramp limited fossil fuel plants means more of the ramping and variability from renewables will be smoothed by fossil fuel plants producing CO2 and other emissions. This calls into question the viability of the CPUC and CAISO flexible capacity proposals.

*.If the procurement of storage under AB 2514 results in large amounts of storage with only 0.75 hours of storage then the legislative intent of AB2514 to support renewables and reduce GHG will be frustrated. The CPUC must therefore reject the staff proposal and find a better way to deal with storage and flexibility for all resources.*

*Finally, MegaWatt outlines a simple, non-discriminatory EFC calculation for consideration by the participants.*

Respectfully submitted,

/s/ Edward G. Cazalet

Edward G. Cazalet
Vice President
MegaWatt Storage Farms, Inc.

April 18, 2014