

MegaWatt Storage Farms, Inc.

Comments on Integration of Energy Storage Technology White Paper

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MegaWatt Storage commends the CAISO staff for its initiative in identifying issues and solutions that would enable storage technology to fully participate in CAISO markets and to support renewables integration. Our comments are intended to further strengthen the final version of this excellent draft white paper.

1. New storage will probably find pure frequency regulation to be an attractive market.
 - a. MegaWatt appreciates the suggestion by the CAISO on Page 2 that a primary pure frequency response service might be attractive to new storage facilities.
 - b. Since this would be a new ancillary service for the CAISO, it would be very helpful to develop a technical description of such a service as early as possible so storage facility designers can decide how to configure storage and the associated power electronics to provide the appropriate amount of such services.
 - c. An interim tariff for such services at a known price would also help in the design of the facilities and the early development of storage with the control and physical capabilities to provide a pure frequency regulation service and demonstrate its value to the grid. An interim tariff would also avoid software delays while waiting for MRTU to be more fully complete.
 - d. Grid connected stationary providers of pure frequency regulation with communication and control to verify readiness

and actual response should be properly compensated in comparison to dispersed load based services whose readiness and actual response may not be as verifiable.

2. There is a need for clarity on which storage services costs can be recovered in markets and which are recovered in transmission and distribution rates.

a. Any lack of clarity in the rate treatment of storage services inhibits investment in storage.

The FERC decision on the LEAPS pumped storage plant that pumped storage costs cannot be recovered as a transmission asset is helpful clarification. Further clarity on which services of storage devices are merchant services and which might be recovered by contracts paid from transmission and distribution rates would be helpful. For complete clarity, MegaWatt suggests that storage devices should always be a market based facility.

b. Also helpful is the categorization of storage services provided on page 3 of the white paper as follows:

1. Transmission device – voltage support, VAR source, mitigation of transmission loading, etc. – and therefore storage is financed through transmission rates.
2. Distribution device – power quality improvement, voltage support, load relief, load leveling, etc. –included in distribution rates.
3. Customer device – demand peak reduction, power quality, uninterruptible power supply, plug-in hybrid vehicles, etc. – paid for by the customer or a curtailable load provider.
4. Market services – Ancillary Services such as regulation and operating reserves, arbitrage of energy prices (shifting of energy from low cost periods for deliver during higher cost periods). Obviously these services are financed through the energy and capacity markets.

However, items 1, 2, and 3 should refer to Transmission services, Distribution services and Customer services. Such services can be performed by many devices including storage.

For Item1 (Transmission services) mitigation of transmission loading using storage requires buying off-peak energy in CAISO markets and delivering on peak energy in CAISO market at market prices and typically at a net profit. This is clearly a market service.

Voltage support and VAR support a can be provided by generation and can also be provided by storage. Generation and storage should not be financed though transmission rates based on long tradition and FERC policy. Benefits to the grid beyond those realized in markets might be recovered through contracts paid to merchant storage owners for transmission deferral, voltage support, etc.

For Item 3 (Distribution services) as with Item 1, load relief and load leveling are services that can be sold in CAISO markets at market prices. Benefits to the distribution grid beyond those realized in these markets might be recovered through contracts paid to merchant storage owners for load relief and load leveling, etc.

3. Storage can be part of the solution to interconnection for renewables and other generation.

a. Storage can be flexibly located and sized to reduce interconnection problems

Storage can be located to reduce congestion and increase transmission utilization. Since storage is modular, the right amount of storage can be deployed at a given location and the amount deployed can be increased as the need increases or moved if the need decreases.

b. Storage should therefore be given a special role at the head of the interconnection queue to facilitate the interconnection of

renewables and increase the utilization of transmission investment.

Placing storage at the end of a long interconnection queue will typically inhibit storage from helping renewables gain access to timely and less expensive transmission assets. When appropriate, storage should go to the head of the queue to help open room on the grid for others.

4. Price caps and price floors need to be expanded to improve the efficiency of the use of all resources on the grid and especially storage.

Currently the price floor is only $-\$30 / \text{MWh}$. There appears to be little or no justification for this price floor. At this price with increasing renewables penetration, the CAISO will increasingly be forced into out-of-market operations or curtailment of renewables to balance the grid. Storage can help add liquidity to the off-peak markets and store renewable energy for later use, but only if it can compete with out-of-market transactions. The best way to do this is to lower the price floor to be symmetric with the price cap, currently at $\$400 / \text{MWh}$ and rising in steps to $\$1000 / \text{MWh}$ with MRTU.

The existence of price caps will artificially limit the revenues from storage just as it limits revenues for generation and a capacity payment mechanism is then necessary. Additionally, limits on the price floor will also limit storage revenues and a downward capacity payment mechanism for storage may be necessary.

5. MegaWatt suggests consideration of availability payments to storage to compensate for reduction in revenues storage to from depressed prices caused by startup and no load payments to generators.

Energy and ancillary services prices can be depressed by payments to generators for startup and no load. To the extent that such prices are depressed, storage should be provided an availability payment to put it on a level basis with such generation.

6. A new load following and or ramping service may be necessary to meet increased needs from renewables.

Renewables integration will demand substantial increases in load following and ramping. Storage providers will have to manage their level of charge and other commitments to stand ready to provide ramping and load following when needed. Otherwise without storage there may be insufficient bid depth in the both the decremental and incremental supplemental energy stacks to meet load following and ramping needs that occur infrequently but are large. Market prices and payments from a new load following and ramping service will provide the incentives for storage to stand ready to provide ramping and load following when needed.

Comments on FAQ about markets for energy storage

Q: Should a storage facility be treated as a transmission facility or an energy market facility?

A: Storage facilities can provide a variety of services, some are transmission related and some are market. So storage might provide both types of services and the treatment may depend on the application and location of the facility. For example, if the facility is used to support voltage at a transmission constrained area, this service could be a transmission based facility and included in transmission rates. If the facility is providing Ancillary Services such as Regulation, then it would be a market based facility.

MegaWatt Comment:

For clarity, MegaWatt suggests that storage should always be a market based facility, but that storage services may be either transmission or market based. So a storage facility in transmission constrained area could receive a payment for voltage support or transmission deferral that would be paid from the Transmission Access Charge (TAC), but the storage facility itself would not be in the transmission rate base. And any storage facility, such as a capacitor bank that is treated as a transmission asset, should not be permitted to provide any market based services such as pure frequency response.

Q: The CAISO Master File software allows specification of a maximum run time and, if so, whether there are software or tariff limitations preventing specification of a maximum run time as short as 15 minutes ?.

A: Today's market structure for regulation is a 1 hour product and it assumes the unit is available for the entire hour. We are discussing a different dispatch algorithm for storage that recognizes it is a limited energy storage device. If we could send it more frequent charge/discharge signals, it could provide some of the regulation services we need – but the current market rules probably have to be modified for regulation from storage devices.

MegaWatt Comment:

MRTU documentation states that regulation is purchased as a 1-hour product in the day-ahead market and as a 15-minute product in the real-time market. So pending further clarification, under MRTU there appears to be no requirement that the unit be available for regulation for the entire hour, at least in the real-time market.

Not all storage has the same storage limits so any dispatch algorithm should specify the service to be provided without specifying the technology. By specifying the service required by the grid, storage service providers will have the incentive to deploy storage with the right balance of power and energy capability rather than hard wiring the current technology designs into a new market service.

MegaWatt suggests that regulation should be a truly a zero net energy service over some short duration such as 10 to 20 minutes. Real-time supplemental energy services should supply any energy needs beyond that. There is no need for a regulation signal that limits the amount of energy from storage in serving regulation. Generation and storage owners should then receive the same regulation signal. Owners of storage devices and the CAISO in its testing will figure out how much regulation they can bid and then supply from a given storage device.

Furthermore, use of regulation energy to reduce the dispatch of supplemental energy should be avoided as it suppresses real time supplemental energy price signals and discourages the deployment of the optimal amount of storage.

MegaWatt strongly agrees that a fast response regulation services should be incented with higher payments resulting from a reduction in the total amount of regulation that would need to be deployed.