



September 30, 2011

Chairman Donna Nelson
Commissioner Kenneth Anderson
Commissioner Rolando Pablos
1701 N. Congress Suite 7-100
Austin, Texas 78701

**Re: PROJECT NO. 39764 - ISSUES RELATING TO ENERGY STORAGE AND
EMERGING TECHNOLOGIES**

Dear Commissioners,

The Texas Energy Storage Alliance (TESA) is a group of energy storage manufacturers, developers, and related companies that are interested in creating an open and fair market for energy storage resources in Texas. Our members include AES, Altairnano, Beacon Power, Duke Energy, Xtreme Power, Prudent Energy Systems, Saft, Samsung, Ideal Power Converters, and Exergy Systems. TESA's focus is on battery and flywheel technologies which have the ability to respond nearly instantaneously to a control signal and accurately follow rapid changes in frequency. Because of this unique characteristic, batteries and flywheels are ideally suited to provide Regulation service for sustainable grid reliability and these resources have been commercially providing Regulation service in other regions in the country since 2008. Storage technologies can also be complimentary to Transmission & Distribution as it can be sited easily and allow for deferral of capital costs for Transmission and Distribution build-out to support integration of intermittent resources such as solar and wind. Batteries and flywheels are additionally capable of providing voltage support, peak shaving, load leveling, ramp control, accurate frequency response and can act as an immediate resource during a reliability event. In these comments, the reference to energy storage is directed at fast-acting advanced energy storage technologies, like batteries and flywheels, unless otherwise stated. Furthermore, energy

storage has been successfully deployed alongside renewable resources such as wind farms and solar to support real-time management of variable output.

As background, TESA has been working through the ERCOT working groups and committees to bring storage issues forward and address some of the immediate barriers that have been identified to date. This document outlines four major issues that need to be addressed if storage resources are to be integrated into the ERCOT market. In an effort to resolve some of the identified issues, TESA members have proposed Nodal Protocol Revision Requests and worked with stakeholders and ERCOT staff. However, to date, there has been no final resolution of the identified issues.

This has been an unusual year for ERCOT. We have experienced extreme weather events that have challenged the reliability of the grid and we are now subject to EPA rules which will require significant amounts of generation to be shut down unless stayed by the court. In the midst of this, we applaud the Commission for taking up the issue of resource adequacy and being proactive on ensuring appropriate price signals are sent to the market. Energy storage stands ready to play a role in alleviating some of the uncertainty with our resource issues in ERCOT. Although storage resources have been deployed in other jurisdictions and around the world, energy storage is still new to the Texas market. The challenge in bringing storage and its benefits to ERCOT lies in the current rules and protocols. The current protocols were written and the market designed with conventional generation in mind. The emergence of new technologies with differing characteristics and benefits requires us to take a fresh look at some of these rules to allow these new resources to be utilized for maximum efficiency and benefit to the system.

With this in mind, TESA appreciates the opportunity to answer the question:

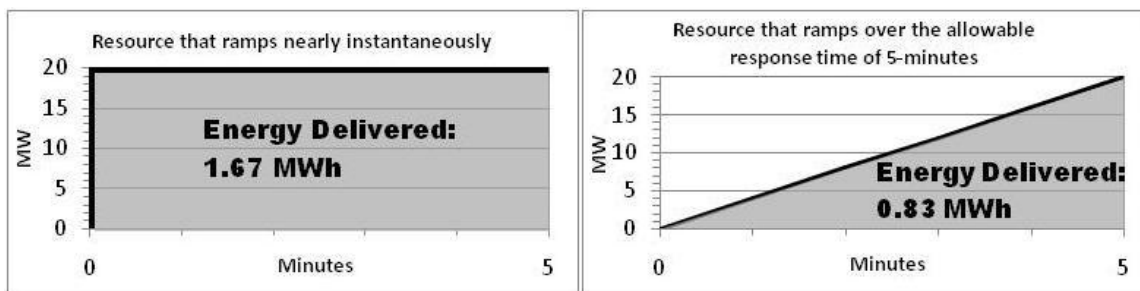
What issues should the Commission address and what actions should the Commission and ERCOT take on these issues to facilitate the deployment and use of energy storage facilities in ERCOT?

- I. Modify Regulation Deployment to Eliminate the Barriers to Flywheels and Batteries providing Regulation service and to take advantage of their ability to respond nearly instantaneously and extremely accurately to system needs.**

Maintaining grid stability and reliability requires constant balancing of the output of generating units with demand. ERCOT maintains this balance by directing generation resources in the Regulation market to increase or decrease their output to match generating power to load. Unlike traditional generation resources which can take up to 10 minutes to adjust their output, advanced energy storage technologies have the unique ability to respond immediately (within seconds) to a Regulation signal or up to 100x faster than traditional resources. The fast and accurate response capability of advanced storage resources has the potential to provide numerous benefits to ERCOT and, ultimately to Texas ratepayers. 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 by ERCOT to maintain system reliability. The Pacific Northwest National Lab conducted a study which determined that with faster Regulation resources on the grid, the CAISO could reduce procurement of Regulation by as much as 40%.

There are two reasons why utilizing faster responding resources can result in fewer total MW capacity of Regulation that needs to be procured. First, resources that can ramp more quickly will reach their dispatch target faster and thus the total amount of energy supplied by fast regulation resources to correct ACE is much greater per MW of procured capacity than would be provided by slower ramping resources. For example, a resource that responds instantaneously with their full output provides twice the amount of energy to correct system imbalances over 5 minutes than a resource that takes the allowable 5 minutes to respond. (See Figure 1)

Figure 1



Second, because slower-ramping resources cannot switch directions quickly, they sometimes provide Regulation in a counterproductive direction. As a result, slow-acting generators

sometimes actually add to the ACE, requiring dispatch of additional Regulation resources just to counteract their negative effect.

Using the fast resources will reduce the amount of conventional generation needed for Regulation and free up those resources to help with our resource adequacy. The faster response of storage resources results in higher efficiency, meaning that a MW Regulation capacity of energy storage can displace 2 – 4 MW of conventional generation from the Regulation market. Furthermore, conventional generation displaced in the Regulation market can operate at a constant output in the Energy market, thus improving their heat rate efficiency, reducing wear and tear on equipment, and lowering their cost to generate power, thus allowing more efficient use of our existing generation fleet. Lastly, deploying energy storage for Regulation Service can reduce costs to Texas ratepayers by introducing new competition to the market and thus displacing relatively high cost regulation deployments by traditional generators.

However, certain protocol and operational changes will need to be made in order to effectively integrate energy storage into the ERCOT market. Below are TESA's recommendations:

- 1. Enable State of Charge Management to maximize utilization of Faster and More Accurate resources**

ERCOT currently purchases regulation hourly and assumes that traditional resources will be available to sustain a prolonged increase or decrease in their output if regulation deployments persist in either direction for the full hour. It is worth noting that regulation is defined in the ERCOT Nodal Protocols as a service “that provides capacity that can respond to signals from ERCOT within three to five seconds to respond to changes in system frequency”. This notion is reinforced by the ERCOT Nodal Operating Guides which state:

ERCOT shall operate the Load Frequency Control (LFC) system to maintain the scheduled frequency at 60 Hz (correcting periodically for time error) and to minimize the use of energy from Resources providing Regulation Service.

However, ERCOT deploys its Regulation service in such a manner that can result in sustained periods of Regulation Up or Regulation Down deployments, sometimes providing energy from regulation for multiple hours at a time because regulation deployments are not quickly recalled into units' economic basepoints.

TESA does not take issue with ERCOT's choice to deploy regulation in this manner for traditional resources, but would like the Commission and ERCOT to recognize that it is not sustainable for resources such as energy storage. While batteries and flywheels are capable of providing exceptional Regulation service when Regulation is deployed in a manner consistent with its definition, the prolonged deployments present a challenge for resources whose typical full rated output duration ranges from 15 to 45 minutes. Furthermore, resources with almost instantaneous high power capacity, such as those described herein, are ideally suited to providing this service accurately and efficiently. A manner of deploying regulation that recognizes the unique attributes of energy storage resources would also provide superior value to customers. The value drivers are improved reliability from improved response to changes in system frequency and lower costs from regulation performance being more closely matched to system needs.

In the event that Regulation deployment continues to require a Storage Resource to provide Regulation energy in one direction for a sustained period of time, the Storage resource must be enabled to manage its state-of-charge in real-time, by either absorbing or injecting power, and thus maintain its capability to respond to regulation deployments.

In the absence of this dynamic State-of-Charge management, the capacity availability from a Storage Resource is significantly limited below the full potential of the energy storage, and ERCOT cannot take advantage of the improved performance in Regulation service which these Resources provide.

To address this issue, ERCOT could allow storage resources providing Regulation service to utilize the 5-minute Realtime energy market to manage its state of charge, thereby maintaining its ability to continuously provide Regulation service, by permitting Storage Resources with less than one hour of storage capacity to be treated similarly to Dynamically Scheduled Resources (DSR). Alternatively, ERCOT could utilize real-time telemetry from a Storage Resource to include State of Charge telemetry in the calculation of both Reg-Up and Reg-down signals issued to energy storage, thereby deploying energy storage resources accordingly to ensure maximum Regulation service from these resources

2. Modify the Protocols to Raise the Ramp-rate

Bearing in mind the fast-acting response of Storage resource, ERCOT could reconsider the Protocol Requirement which limits the ramp-rate of the signal sent to a QSE to 125% of the

total amount of Regulation Service in the ERCOT System divided by the number of four-second Load Frequency Control (“LFC”) control cycles in five minutes (i.e., 300 seconds/4 second interval = 75). This limit effectively creates a regulation deployment signal that changes more slowly than frequency or ACE and limits the use of fast-ramping storage resources that can provide their full capacity in one 4-second LFC cycle. Revising this limit may allow ERCOT to fully benefit from the integration of Energy Storage resources, as well as benefit from better utilization of the ramp rates of generation resources.

3. Send “Negative” Signal to Storage indicating they should withdraw power/Eliminate Dual Registration Requirement

Unlike generators that provide Regulation by modifying the amount of energy they are injecting on the grid, energy storage resources provide Regulation Service by both rapidly withdrawing and injecting energy from the grid in order to manage moment-by-moment imbalances between supply and demand. Therefore, energy storage resources need to receive a “positive” Regulation signal for Regulation up service signaling the resource to inject energy and a “negative” Regulation signal for Regulation down service signaling the resource to withdraw energy. Receiving both a “positive” signal and a “negative” signal is necessary in order for the storage resource to differentiate when it is being asked to withdraw power versus inject power. As a solution to this technical problem, a storage resource is now required to dually register, as a generator for discharging (Regulation up) and as a controllable load resource for charging (Regulation down) in order to receive the appropriate Regulation down signal. This technical solution has caused storage to be considered a load for energy even though it is not consuming energy, but rather recycling energy to provide service to the grid. The registration as a load has caused a myriad of issues to arise, including modeling issues, settlement issues, interconnection issues, and issues relating to load charges. By creating a new storage resource category and by sending an appropriate signal for storage resources, these resources would no longer be required to register as a load and would avoid the negative implications of this dual registration.

II. Establish Nodal Settlement of Storage Resources

Under PUC Subst. R. 25.501, resources are to be settled on a nodal basis and loads are settled on a zonal basis. As a result, this dual registration requirement has been interpreted to require

energy storage to be settled on a nodal basis when discharging, and on a zonal basis when charging. While the nodal system is designed to incentivize resources to locate where needed for congestion or other purposes, load is settled zonally to mitigate any high prices that would otherwise be incurred. It is important to understand that the power taken in by storage resources is not consumed, but is simply held and recycled for later use. Thus, the resource is not truly a load. It is simply re-distributing the electricity to the grid when dispatched. Consequently, storage resources should be settled nodally both when charging and discharging. To do otherwise sends inappropriate price signals for location and provide economic uncertainty to the resource by either unfairly rewarding or punishing the storage resource. Additionally, there is concern among the stakeholders that an unintended arbitrage incentive may arise to take advantage of the disparity between load and generation settlement prices.

Because this settlement issue stems from the technical inability to send a negative signal to the storage resource, this issue could be resolved by restoring that signal. However, this system solution may not be feasible, until the new Nodal 2.0 Implementation. In the absence of that fix, ERCOT could pass NPRR 410 which proposes a new storage resource category and that each storage resource would become its own load zone and, effectively, be settled on a nodal basis. This NPRR is inspired by the settlement of DC ties which are also treated as their own load zone and settled accordingly and by tariff changes made in other regions and approved by FERC for settling the energy injected and withdrawn by storage resources. Alternatively, the PUC could adopt a rule establishing that the settlement of storage resources be solely on a nodal basis.

III. Exempt Storage Resources from the High Sustained Limit Determination Method

Nodal protocol 8.1.1.2. specifies that each QSE must provide a seasonal HSL for each Generation Resource with a capacity greater than 10 MW. The HSL is determined based on real-time averaged MW telemetered by the Resource during the 30 minutes of constant output. This requirement was adopted based on the capability of traditional generation resources which are constrained by ramp rate rather than by duration of energy output. However, as discussed above, some storage resources have a limited energy duration. Requiring an HSL test for these energy limited resources provides an immediate barrier to market entry and would significantly diminish the capacity they would be allowed to offer into the market. As proposed in NPRR

340, ERCOT should exempt these storage resources from the HSL test just as wind and hydro are exempted as a result of their unique characteristics.

IV. Give ERCOT Authority to Conduct a Pilot to Gain Experience with Storage Resources (and other Emerging Technologies)

The barrier issues outlined by TESA could be resolved more expeditiously by granting ERCOT the authority to conduct a pilot while stakeholder discussions continue at ERCOT. TESA has been engaged in the stakeholder process and our members have sponsored Nodal Protocol Revision Requests in an effort to address some of the issues that we have identified to date. However, addressing the barrier issues through the stakeholder process has proven to be a challenge since ERCOT has no actual operating experience with storage resources. Allowing ERCOT to move forward with a few projects to be operated based on their unique characteristics would provide ERCOT staff with a first-hand understanding of the benefits and capabilities of these resources. This “learning by doing” approach would also provide ERCOT staff and stakeholders with desired information about the manner in which energy storage should be integrated into the ERCOT market. With some storage developers ready to embark on major projects in ERCOT, TESA would urge the Commission to grant the authority to ERCOT to allow these projects to be developed and operated so that ERCOT can take advantage of their capabilities and the stakeholders can develop appropriate protocols for this resource as the knowledge is gained. TESA believes the stakeholder process will benefit from pilot projects operating while the solutions are explored by the pertinent committees.

TESA recommends that the Commission adopt a rule allowing ERCOT the authority to conduct a pilot for storage projects and other emerging technologies. The issue of trying to fit new resources into the current protocols can be difficult and time consuming and will actually be a smoother process once some experience can be gained.

Conclusion

Advanced energy storage technologies are being deployed around the country where ISOs are making necessary changes in order to realize the benefits of energy storage (see attachment). Texas has a unique opportunity to benefit from integration of storage in several ways. The 10,000+ MW of wind energy provides an opportunity for storage resources to optimize the renewable energy being placed on the grid by providing ramping and smoothing

services, and storing the energy until it is needed. These resources are capable of peak shifting in a variety of ways. Additionally, as ERCOT procures additional Regulation service, these storage resources can fill that need, thereby, freeing additional capacity of conventional generation. With the environmental limitations being placed on Texas, energy storage is an emission free resource that can provide energy from any site without restriction. In an environment, where we need every MW we can get, we should take advantage of the interest of storage developers to locate projects in our state.

We appreciate the opportunity to outline the major barriers to entry for storage. We know that final resolution of these issues will take some time, and we have already begun the process. The key to facilitating the deployment and use of energy storage resources in ERCOT is providing guidance and resolution to the issues above and ensuring that any necessary protocol revisions are made during the next system upgrade. This effort combined with the simultaneous implementation of storage pilot projects will provide a market where energy storage can begin to develop and bring significant benefits to the ERCOT grid. TESA appreciates your attention to these important issues and looks forward to working with you.

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ISO Efforts to Integrate Limited Energy Storage Resources (LESRs)

California ISO (CAISO)

The CAISO has developed market rules that will assist Energy Storage resources providing Regulation Service with managing their energy level during operation. The CAISO, like ERCOT, has separate up and down Regulation Markets and have scheduling entities. These market rule changes received approval from the CAISO Board of Governors on February 3, 2011. CAISO filed the tariff changes at FERC on August 22, 2011.

New York ISO (NYISO)

After a comprehensive six-month stakeholder process, NYISO filed for FERC's approval of its Proposed Tariff Revisions to Integrate Energy Storage Devices into the NYISO-Administered Regulation Service Market on March 11th, 2009.

To take advantage of the benefits of LESRs in a manner that treats them comparably to other generation facilities, and without impacting the NYISO's ability to meet all existing reliability criteria, the NYISO made changes in three major areas – scheduling, operations and settlements. FERC approved the NYISO's proposed tariff changes to integrate Limited Energy Storage Resources (LESR) on May 15, 2009.

Midwest ISO (MISO)

MISO was the first ISO to officially recognize energy storage as different from generation or demand response. MISO made numerous changes to its tariff incorporate Stored Energy Resources (SERs); these changes were approved by FERC on December 18th, 2008.

In the spring of 2009 MISO and other stakeholder worked to make additional enhancements to the dispatch of SERs in the MISO Regulating Reserves market. This effort resulted in a new round of tariff changes, which were filed with FERC on May 12th, 2009 and were approved by FERC on December 31st, 2009.

ISO New England (ISO-NE)

On August 5th, 2008, ISO-NE filed rules for a pilot program for alternative technologies to provide and be paid for Regulation. These rules were approved by FERC on September 15th, 2009. The ISO-NE is planning to propose permanent market rules in 2011.

PJM

PJM has two regulation signals, a faster signal that is based on the frequency portion of the Area Control Error and is less biased with respect to energy, and a slower signal for traditional generators. The fast signal is better suited for Energy Storage resources and enables them to provide more effective Regulation. Because it is using a fast, energy neutral signal for storage resources, PJM does not have a standardized mechanism for managing the energy storage resource's energy level, as found in the NYISO or MISO, but it allows resource operators the flexibility to manage the energy level themselves.

PJM filed with FERC on July 6, 2010 several tariff changes to integrate storage. PJM created a new resource type for storage resource called Energy Storage Resources (ESR). The rules also allow for injections and withdrawals from storage resources to be netted at whole energy prices. FERC approved PJM's proposed tariff changes to integrate storage resources on September 3, 2010. PJM has been developing Pay-for-Performance Regulation compensation rules since April 2011. The Regulation Performance Senior Task Force (RPSTF) was created to develop rules to incent and improve performance in the regulation market and completed draft rules in September 2011. These draft rules are being reviewed by the senior stakeholder committees in Fall 2011 and are expected to be submitted to FERC in December 2011.