

Testimony of Keith Casey,  
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Chairman Upton, Vice Chairman Olson, Ranking Member Rush, and Members of the Committee:

My name is Keith Casey. I am the Vice President of Market and Infrastructure Development at the California Independent System Operator. The California ISO operates wholesale energy and ancillary services markets to reliably manage the high-voltage transmission system that serves approximately 80 percent of California electric load as well as a small portion of Nevada's electric load. Thank you for the opportunity to appear before you today to discuss the role of energy storage in the organized wholesale electricity markets in California.

California clean energy policies are dramatically transforming the resource portfolio that serves electric load. California's ambitious renewable portfolio standard, greenhouse gas emission reduction goals, policies concerning the use of water for power plant cooling, as well as distributed energy resource and rooftop solar goals have all contributed to a dramatic shift away from conventional power plants and to the deployment of new technologies such as battery storage and demand response. Today, renewables comprise about 33 percent of total energy produced in our markets and are on track to meet 50% by 2030 – if not sooner.

These high levels of renewables, which are predominately solar, do, however, present operational challenges such as oversupply during the middle of the day when solar output is greatest and ramping challenges during the late afternoon and early evening when solar output declines but demand on the system is increasing. Today, these integration challenges are largely managed with natural gas-fired generation but achieving California's clean energy goals will require moving off of gas to cleaner resources such as energy storage that can absorb surplus solar output during the middle of the day and put it back on the grid later when it is needed. Storage can also mitigate the reliance on natural gas power plants for serving local electricity demand in transmission constrained areas of the grid.

Today, California ISO operates with approximately 2,000 MW of energy storage on its system. Most of this is legacy pumped hydroelectric generation but in recent years 134 MW of battery storage has been added to the ISO system. Development of battery storage is being driven primarily by state policy. The California Public Utilities Commission requires the investor-owned utilities to procure 700 MW of transmission-level electricity storage, 425 MW of distributed electricity storage, and 200 MW of customer electricity storage by 2020 and the utilities are making good progress in achieving that goal.

Over the past several years, we have made numerous changes to our wholesale energy market to enable storage resources to effectively participate. Most notably, we developed a specific storage resource participation model so that our wholesale market can optimally manage the state of charge of a storage resource. We also developed special participation rules for storage to provide other grid reliability functions and have

evolved our transmission planning process to consider storage as an alternative to conventional wires and generation. Earlier this year through our transmission planning process we identified and approved two battery storage projects for meeting grid reliability needs. These projects will be treated as transmission assets with their costs fully recovered through transmission rates.

While battery storage is finding development opportunities in California, the value proposition and need for additional large scale pumped hydro generation is less clear. New large scale pumped hydroelectric projects can significantly help with managing solar oversupply and the need to ramp energy up as solar production declines in the late afternoon but whether such large infrastructure projects are needed given the declining costs of batteries and solar is an open question that is being further investigated at the California Public Utilities Commission.

Currently, we allow storage resources as well as other types of resources to participate in the wholesale energy market even if they are connected to the distribution system. While development is at a very nascent stage, we believe the future grid will be one where the distribution and transmission networks are highly integrated, providing for bi-directional flow of energy versus the traditional grid where power flows one direction from large centralized power plants to end-use consumers. The grid of tomorrow will have a much more diverse set of smaller resources – with many located behind a customer’s meter and will have the potential to provide services to the host customer, the distribution network, and the transmission network. Getting there, however, will require overcoming a number of challenges – most notably how do you enable resources behind the meter to provide multi-use services to their host customer, the

distribution, and transmission grid in a coordinated and verifiable way that ensures the services being paid for are actually being provided, are not operating at cross purposes, and are not being double counted. California is currently grappling with this multi-use concept.

We are also examining how to allow storage resources that are approved as transmission assets and therefore able to fully recover their costs through transmission rates to also participate in the wholesale energy market and earn market revenues. FERC policy allows for this type of hybrid treatment but I do not believe any ISO or RTO has currently implemented this hybrid model so the California ISO may very well be the first.

Finally, the California ISO appreciates and supports the proposed reforms in the FERC's Order 841, which seeks to remove barriers to electric storage resources participating in the organized electricity markets. The California ISO is seeking clarifications on certain aspects of the order but frankly, we have already implemented all of the major reforms called for under Order 841 so our compliance will mainly involve fine tuning certain design elements we already have in place. Nonetheless, we are very committed and focused on continuing to evolve our market design to better enable storage participation, particularly as we gain actual experience with these resources in our market. We are also working with our participating utilities to develop better ways to coordinate transmission and distribution system operation to enable this energy transformation in an efficient, safe, and reliable manner.

That concludes my comments and I would be happy to answer any questions you may have.