Additional Questions for the Record

Dr. Zachary Kuznar
Director, CHP Microgrid and Energy Storage Development
Duke Energy Corporation

The Honorable Greg Walden

1a) FERC Order 841 will certainly ensure the barriers are removed for storage participating in capacity, energy and ancillary service markets. However, we need to give these markets time to implement the new rules to see the true impact regulation has on storage adoption

1b) Although we operate in six different states, some of which are in wholesale markets (Indiana, Ohio and Kentucky) and some that are not (North Carolina, South Carolina and Florida), our overall goal around storage deployment is consistent: to capture and deliver the greatest value from these assets for our grid operations, and ultimately, our customers. We believe the vertically integrated utility is in an ideal position to invest and own these assets. We can identify the locations on our electric system where we can capture the most value by stacking the benefits these individual deployments will have over our distribution, transmission and generation systems. The only technical difference between our regulated states that operate in a wholesale market and those that do not is that in a wholesale market, there are specific price signals on bulk system benefits such as frequency regulation. Outside of these wholesale markets, it is a service that is inherently built into our system and valued based on the benefits of delivering the system and the communities we serve.

The Honorable Fred Upton

1a) The reason for the large number of energy storage assets in PJM was driven by a price signal that PJM developed called "Regulation D" pricing. It paid a higher value for regulation service to assets that could perform faster and more accurately than traditional resources such as fossil generation units. This market signal was the driving factor behind these deployments.

1b) Yes. A change in a price signal in other RTOs that rewards assets such as storage for their speed and accuracy could certainly be replicated in other markets to drive additional deployments.

2a) Around 10 years ago, Duke Energy recognized that storage could provide significant benefits to our electric system, but the technology was still quite nascent and therefore was too premature to implement projects at any large scale. Therefore, we invested in smaller systems (less than 1 MW in size) to learn how to operate the systems in the optimal manner for our grid. We continued to monitor the evolution of this technology and believe we are ready to begin deploying it at scale to benefit our customers. Applications may include hardening our transmission and distribution system and providing bulk system benefits such as frequency regulation and capacity value.

2b) The technology has definitely evolved since our earlier pilot projects. We have seen improvements in energy density, reliability and the controls systems necessary to integrate these assets into our electric system along with significant cost declines. The services we envisioned during the pilots are what we are now leveraging in our implementation: using storage to defer or eliminate traditional transmission and distribution upgrades, helping to integrate intermittent renewable generation assets such as solar into our system, and providing bulk system benefits such as regulation and capacity.

3a) As Duke Energy starts to deploy more assets on our distribution system, we believe that partnering with cities, the Department of Defense and other critical infrastructure sites will provide benefits to our broader system as well as customers who provide important services for our communities.

In my testimony, I highlighted our Camp Atterbury project in Indiana as a specific example. This base provides training, equipping and mobilizing resources for all U.S. Armed Forces branches. For this deployment, we are building a 3 MW solar farm and a 5 MW battery asset on base. During normal operation, the solar farm will produce energy for our Indiana customers and the battery asset will provide bulk grid services such as frequency regulation. During a grid outage, the battery/solar microgrid will be able to provide back-up power for the critical base infrastructure and services they provide.

We are also building storage assets that can benefit residential customers in a similar way. We have several projects under development that will be located at substations of communities located at the end of radially-fed distribution lines that have poor reliability. These storage assets will be utilized to provide back-up power to entire communities during a grid outage.

4a) Energy storage can be used in place of a traditional infrastructure upgrade. An example of this would be similar to what I discussed in the response to answer 3a above. In many cases where we realize that a city or community has poor system reliability, we will evaluate running a second feed into that area. Many times, that is cost prohibitive or not technically feasible. Instead, we can now evaluate placing a battery asset at this location to provide back-up power during a grid outage while also providing bulk system benefits such as frequency regulation.

5a) Energy storage provides our customers with the most value when it is located in areas of the grid where you we can leverage it for multiple benefits. The vertically integrated utility is in the best position to identify these locations and deploy these assets to capture primary value on its transmission and distribution systems by also providing bulk system benefits.

5b) In service territories that are part of competitive electricity markets, utility-owned and third-party owned storage assets can co-exist. Third-party owned systems will only provide one value stream (such as frequency regulation) while the utility-owned assets will be able to stack multiple value streams. Deploying storage to only provide one value stream is underutilizing the asset and adds cost for customers.

The Honorable Jerry McNerney

1. Storage is properly valued when you are able to capture the distribution, transmission and generation values that it provides. It takes an integrated planning methodology across all three systems.