Testimony

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(written statement)

by

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Chairman Upton, Ranking Member Rush, Vice Chairman Olson, and Distinguished Members of the Subcommittee, thank you for the opportunity to provide this testimony on the role of consumers in the evolving electricity grid. My name is Karen Butterfield, and I serve as Chief Commercial Officer at Stem, a California-based technology and services company that operates the world's smartest energy storage network. We applaud the interest of the Subcommittee to explore how consumers can play a more active role in the modernization of our electric infrastructure, and we believe that software-driven energy storage enables such participation, empowering consumers to reduce their energy costs while providing important services to the grid.

The key themes that I'll be covering in this testimony include:

- Energy storage for commercial and institutional electricity customers is no longer a future concept. Stem is proving that it is viable and cost-effective today.
- Energy storage is key to enabling consumers to both take control of their energy cost and become active participants in dynamic energy markets.
- Networked energy storage, managed by advanced software, can provide the same benefits as traditional power plants, improving the reliability and resilience of a modern electric grid.
- The federal government can accelerate the deployment of this technology by helping open energy markets to consumers that are using energy storage and by helping reduce the time and money required to install energy storage.

Introduction to Stem

Stem was founded in 2009 on the premise that energy storage could provide a range of services that would be highly valuable to both electricity consumers and the reliability of one of the nation's most critical infrastructures – the electrical grid. We start with installing energy storage systems (lithium ion batteries) to help a wide range of business and institutional electricity customers save money on their monthly bills, take greater control of their energy usage, and more actively participate in energy markets. This is known in the industry as customer-sited or "behind-the-meter" energy storage that performs real-time energy optimization. For our customers, we provide storage-as-a-service based on a monthly fee with no upfront payment. We finance the hardware so that customers only pay a subscription, making energy storage a

cost-saving operating expense rather than a capital investment. Our software then automatically charges and discharges the storage to produce the most savings by providing energy from the battery to the building rather than from the grid. Customers save money from day one and can often save up to two-to-three times what they pay each month in subscription fees.

We then network all these storage installations together into what we call Virtual Power Plants (VPP) and manage those networks with the world's smartest artificial intelligence (AI) for energy storage, Stem's "Athena". Only a "superintelligence" like Athena can handle millions of data points from the grid, the weather, and the buildings' histories to optimize, in real-time, the benefits energy storage can provide to customers and the grid. Our traction in the market demonstrates that cost-effective, flexible energy storage is in strong commercial demand today:

- Since 2012, we have been operating storage systems ranging from 30 Kwh (e.g. for a small hotel) to 2.5 MWh (e.g. for a large integrated office park).
- We have 8 contracts to provide grid services to U.S. utilities totaling 350 MWh (enough to power roughly 30,000 homes for 4 hours).
- We currently have over 700 customer sites and 150 MWh installed or in deployment
- Stem is active in 7 major markets as broad ranging as California and Texas.
- Managed by the Athena AI, the Virtual Power Plants in the Stem network have successfully responded to more than 500 dispatch requests from utilities and grid operators to help grid reliability over the past three years.

- We have secured over $500 million in project financing, the most in the industry.

The Engaged Consumer

The traditional paradigm of large-scale electricity generators sending energy over long distances to passive customers is evolving at different speeds around the country as new technologies become more and more cost-effective. Consumers, starting at scale with commercial and institutional ones, are looking for more energy control, first to reduce their energy costs, and increasingly to participate in US energy markets. Enabling more customer control depends on advanced energy technologies and software, transacting over a highly efficient electrical infrastructure, in a modernized grid.

All types of energy providers are looking for more customer satisfaction options, and utilities increasingly agree that cost-effective energy storage at homes, businesses, and institutions is integral to facilitating this heightened customer interest. Behind-the-meter energy storage gives a consumer second-by-second control over the timing of their energy usage to reduce their energy bills, and software-driven storage makes those decisions and market transactions automatic, without impacting the consumer's operations, freeing the customer to focus on their core business. Stem empowers dozens of Fortune 500 leaders, such as Adobe, Cargill, Extended Stay America, Intercontinental Hotels, JC Penney, Macy's, Marriott International, Albertsons, Wells Fargo, and Whole Foods. For our public sector customers, such as University of California, the resulting energy cost savings are important resources to redirect to other critical budget needs.

Now, more than ever, the consumer-driven electric grid requires AI-driven energy storage to manage real-time energy optimization and to connect and activate virtual power plants when and where they are needed most.

The Modernized Grid

The modern economy is more and more dependent on an electrical system that is efficient, flexible, resilient, and managed with artificial intelligence. Energy storage is emerging as the key technology to help with all of those needs. As both supply and demand become more variable with technologies like wind, solar, and electric vehicles, the grid needs more flexibility, with resources that can respond quickly to steep ramps, up or down, to help balance the grid. Advanced energy storage is the fastest, most flexible resource, with the ability to respond to a signal in under a minute and to be precisely-positioned within distribution grids, to address system "peaks" in the grid and smooth out spikes in demand, as we are showing in our system tests for Hawaiian Electric. Energy storage can also engage customers in systems that directly work to integrate renewable energy resources, as we have contracted to do in Texas with Austin Energy.

Utilities and their regulators also increasingly seek to get the most of our energy infrastructure at the lowest cost to ratepayers. Networks of energy storage are perfect for creating "non-wires alternatives" to traditional investments in grid infrastructure, as we have contracted to perform in the Brooklyn Queens Demand Management distribution deferral project for

Consolidated Edison in New York. Large scale grid operators and policymakers are attracted to the reliability of these networks to provide an improved type of "demand response" or load reduction when called. Finally, major incidents in the last few months and years have highlighted the growing need for resilience, or the ability to maintain critical infrastructure and bounce back from major events that disrupt electricity delivery. Networked energy storage can not only provide resilience to specific buildings, but can also improve resilience at the level of the community, city, or regional grid.

By joining Stem's energy storage network, the engaged electricity customer participates in Virtual Power Plants during the times that their storage system is not needed for their own site's interests. In this way, the customer's system can provide other services in energy markets, contribute to the reliability and resilience of the grid, and be compensated for it. In this way, customers engaged by Stem in Virtual Power Plants not only benefit themselves but can meaningfully help their community, as well.

Virtual Power Plants are Real Today

Although "Virtual Power Plant" sounds like a futuristic concept, they exist today and Stem is proving how they work. Stem's Athena-branded software "brain" manages dozens of VPPs across the Stem network, grouping customers in certain specific regions to respond automatically to the needs of the grid while continuing to save each customer money on their own bills.

For example, on a single day last month, when the California grid was strained by a record breaking heat wave, Stem's Athena AI dispatched over 100 energy storage systems within 14 VPPs spread across the state—all without manual intervention. In the first half of 2017, Stem's network responded to over 150 real-time grid events with only 5-minute notice for just the smallest of California's major utility companies, San Diego Gas & Electric. And, as we'd expected, our customers enjoyed learning that they were helping California reduce strain on the grid and avoid blackouts. In fact, Stem's California and Hawaii VPPs have led to industry awards such as this year's Innovator of the Year from the Smart Electric Power Association.

Spread the Success

The Federal government can help drive the modernization of the nation's electric infrastructure by empowering consumers everywhere with the technology and policies that Stem and others are proving successful today. The primary initiative should be to evolve energy infrastructure around the country with market mechanisms that fully value and compensate all the services customer-sited energy storage can provide. FERC has begun this effort by opening a rulemaking on enabling energy storage and distributed energy resources to more fully participate in wholesale energy markets. Both the storage and DER portions of this proceeding should move forward with urgency since together they have tremendous potential to increase market competition, driving down energy costs while increasing reliability and resilience.

The other areas ready for Federal leadership are in education, quantitative analysis, and standardization of interconnection and permitting of energy storage systems. As an example of

the latter, hundreds of local jurisdictions as well as state and local regulators are beginning to develop policies and processes for installation of storage at private and public buildings. Stem has installed in over 75 different jurisdictions in the US and knows firsthand how the lack of standards and basic education can be a major barrier to permitting, costing considerable time and money with unrelated code review. Moreover, Stem and other storage industry leaders have been working with the National Fire Protection Agency on a forthcoming fire safety code with an entire chapter on energy storage, NFPA 855. The federal government can help disseminate knowledge of these new storage standards. Creating consistent and streamlined best practices for these installations would allow for much more efficient storage deployment, reducing costs for consumers and the grid without sacrificing important safety reviews.

Conclusion

In summary, I am honored to have the opportunity to testify before the Committee on Stem's experience with engaging customers; thank you. We appreciate the Subcommittee's exploration of public policy and new technologies and services that can spur engagement of the 21st century energy consumer in the modernization of electric grid infrastructure. We conclude that customer demand for software-driven energy storage will be an essential facet of a modern, participatory grid and will increase the reliability and resilience of vibrant energy markets. We look forward to working with Members of the Committee to answer any questions about energy storage and the interests of the consumer in building a safe, reliable energy infrastructure.