Testimony

of

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before the

House of Representatives

Committee on Rules

Subcommittee on Legislative and Budget Process

September 24, 2019

Good morning. Thank you to Committee Chairman McGovern, Subcommittee Chairman Hastings, Ranking Member Woodall, and the entire Subcommittee for inviting me to testify before you today regarding resilience technologies and policy in the United States. My name is Katherine Hamilton and I am Executive Director of the Advanced Energy Management Alliance ("AEMA"),[1] focused on consumer-sited resources that can provide cost-effective, resilient, flexible, and clean solutions to our nation's electric grid.

AEMA has engaged in public policy in states, regions, and federally, to ensure that customer-sited distributed energy resources ("DERs")—such as rooftop solar, demand response, energy efficiency, smart inverters, batteries, thermal storage (from hot water heaters, for example), fuel cells, combined heat and power, microgrids, electric vehicles, and geothermal heat pumps—are taken into consideration as resources that can provide resilient services to the electric grid. AEMA has weighed in on numerous and diverse proceedings regarding resilience, including at the Federal Energy Regulatory

[1] For more information about AEMA, see https://aem-alliance.org. The opinions expressed in this

Commission,[2] Puerto Rico's microgrid proceeding,[3] and in California's wildfire response.[4] In all of these state and federal proceedings, we have used examples of these resources providing resilience to the grid in a consumer-friendly, cost-effective, flexible, and reliable manner. Federal agencies such as the Department of Energy,[5] Small Business Administration,[6] Federal Emergency Management Agency,[7] and U.S. Department of Agriculture[8] have programs to provide both technical and financial assistance that can be leveraged for rebuilding efforts throughout the U.S., but my testimony seeks to demonstrate how preparation in advance of these events using flexible distributed energy technologies can lessen the burden on communities and the government.

There are numerous examples of how distributed energy resource deployment has provided resilience to the electric system during times of grid constraint, whether because of extreme temperature, natural disaster, or even the solar eclipse. The ability to fail fast, and then recover fast, is particularly suited to distributed energy resources.[9] As far back as Hurricane Sandy, microgrids in New York and New Jersey enabled university campus facilities to continue operation in the face of massive power outages.[10]

Grid system operators recognize that distributed energy resources can enhance system resilience. The New York Independent System Operator, in their 2017 DER

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[2] https://aem-alliance.org/aema-files-comments-doe-nopr-ferc/ and https://aem-alliance.org/aema-files-reply-comments-in-resilience-proceeding/

[3] Comments here https://aem-alliance.org/aema-makes-resilience-recommendations-puerto-rico-commission/

[4] https://aem-alliance.org/aema-urges-consideration-of-der-in-wildfire-mitigation/

[5] At DOE, the Infrastructure Security and Energy Restoration ("ISER") program within the Office of Electric Delivery and Energy Reliability has been focused on this issue.

[6] The SBA provides loans to small businesses that can be used for distributed energy resource applications.

[7] See Hazard Mitigation Grant Program: https://www.fema.gov/hazard-mitigation-assistance

[8] The Rural Utilities Service program at USDA provides grants for these projects.

[9] See article on disaster rebuild technologies here: https://www.utilitydive.com/news/a-trio-of-storms-could-mean-grid-modernization-in-hard-hit-areas/506138/

[10] Article on Princeton's microgrid can be found here: https://www.princeton.edu/news/2014/10/23/two-years-after-hurricane-sandy-recognition-princetons-microgrid-still-surges

Roadmap, states: "DER can help grid operators by *improving system resilience* [emphasis added], energy security, and fuel diversity. DER can lower consumer prices, improve market efficiency, and allow consumers to take greater control of their electricity use and costs through a variety of new technologies."[11]

PJM Interconnection credited demand response with helping the grid withstand the Polar Vortex, stating: "Although demand response is usually only needed by grid operators in the summer, operators also successfully deployed it during the power emergencies occasioned by the bitter cold 'Polar Vortex' weather in January 2014. As PJM set multiple winter peak records early that month, it called on demand response, and received more megawatts as load reductions than it could obtain as generation from all but the very largest generating stations. . . . In the midst of those challenging conditions, demand response—responding to PJM's dispatch as a wholesale market resource—helped maintain the reliability of the system."[12]

After Hurricane Irma, demand response helped maintain balance between supply and demand to stabilize the Florida electric grid. As thousands of customers were rapidly having their power restored, demand threatened to outpace supply due to generation outages from the storm. This imbalance could have created another blackout for consumers who had already been without power for an extensive period due to the Hurricane. Fortunately, Tampa Electric Company had the foresight to contract for a

[11] Distributed Energy Resources Roadmap for New York's Wholesale Electricity Markets, A Report by the New York Independent System Operator, January 2017, Page 4. http://www.nyiso.com/public/webdocs/markets_operations/market_data/demand_response/Distributed_Energy_Resources/Distributed_Energy_Resources_Roadmap.pdf

[12] Petition For Rehearing En Banc Of PJM Interconnection, L.L.C., Electric Power Supply Ass'n v. FERC at 10-11, No. 11-1486 (D.C. Cir. July 7, 2014).

diverse set of resources, and dispatched demand response. In this case, demand response provided grid resilience, allowing the grid to bounce back from a major disturbance.[13]

As Hurricane Harvey unleashed 33 trillion gallons of rainwater along the Gulf of Mexico, the storm caused a range of energy impacts, including coal-to-gas switching as coal piles were too wet for conveyer systems to handle. However, the Texas Medical Center--the largest medical facility in the world--was able to sustain its air conditioning, refrigeration, heating, sterilization, laundry, and hot water needs throughout the storm thanks to a combined heat and power system which operated without interruption during the storm.[14]

During heat waves in California, hundreds of energy storage facilities at office buildings in San Francisco were called to operate collectively as "virtual power plants" reducing demand on an over-taxed grid.[15] During the solar eclipse in August of 2017, over 750,000 programmable thermostats were lowered by their consumers to reduce demand by 700 MW as electrical systems across the country were displaced in the temporary darkness.[16] In California alone, 800 MW of demand response was called upon to mitigate potential power surges during re-energization of the electric grid during that eclipse.[17] Given the start of wildfire season in California and the calling of public safety outages, microgrids and other distributed resources will only become more important. It is crucial for the Federal government to provide best practice planning and technical

[13] Program was through EnerNOC, now Enel X: https://energysmart.enelxnorthamerica.com/following-hurricane-irma-demand-response-stepped-amid-efforts-restore-power
[14] https://www.energy.gov/eere/amo/articles/chp-installation-keeps-hospital-running-during-hurricane-harvey
[15] https://www.energy-storage.news/news/stems-virtual-power-plants-take-heat-off-californian-grid
[16] See blog from Nest thermostats: https://nest.com/blog/2017/08/10/solar-eclipse-meet-the-nest-thermostat/
[17] See commentary from AEMA here: https://aem-alliance.org/solar-eclipse-clean-response-california/

assistance for at-risk communities through the FEMA Pre-Disaster Mitigation Grant program.[18]

In addition to grants and technical assistance, however, we need federal programs that can leverage private financing. An example of a local financing mechanism that has provided resilient services is the Florida Solar and Energy Loan Fund ("SELF"), a Community Development Financial Institution ("CDFI") formed in St. Lucie County, Florida that raises philanthropic and low-cost capital from a wide range of sources, including private banks, foundations, and crowd-funding.[19] SELF then delivers renewable energy, energy efficiency and climate resilience (roof repairs and replacement, impact windows, and hurricane shutters) in underserved neighborhoods. The organization has financed $3.4 million for resilience projects. SELF also partnered with My Strong Home to finance fortified roofs that incorporate reduced home insurance rates—by as much as 50% reduction in cost (from $2000 to $1000 per year)--due to lower risk to the insurance company. These projects enable the homeowner to use those insurance savings to help pay for all or part of the project, while keeping their insurance. Those households in turn save thousands of dollars each year through reduced insurance costs because of stronger roofing from the solar panels.[20] Having a national non-profit entity, such as that contemplated in the National Climate Bank Act,[21] could fund regional resilience projects and enable more states to create and seed institutions like SELF that serve frontline communities.

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[18] https://www.fema.gov/pre-disaster-mitigation-grant-program

[19] SELF has raised over $627,000 and helped more than 110 homeowners through KIVA's international crowd funding platform, expanding this partnership to offer crowd funded loans (5% interest, fixed) for resilience projects. See stories of assistance to a single mother https://www.kiva.org/lend/1702425 and a veteran https://www.kiva.org/lend/1484421.

[20] "SELF and St. Pete Partner on Clean Energy, Sustainability and Resilience," SELF, November 9, 2017.

[21] National Climate Bank Act, S. 2057, https://www.congress.gov/116/bills/s2057/BILLS-116s2057is.pdf

Thanks to U.S. innovation and creative deployments, Haiti, the number one country in the Americas at risk from climate change, has undergone a transformation since the devastating earthquake in 2010. Solar plus storage microgrids have deflected the need for generation fuel, which is experiencing an extreme shortage in that nation.[22] This is a stark illustration of how back-up generation using diesel and other fuels can be riddled with supply constraints. The Army Corps of Engineers deploys diesel generators in its emergency back-up generator program and should be encouraged to ship energy storage batteries that can be easily paired with solar as back-up resources with no risk of fuel shortage.[23]

As you are likely well-aware, Mr. Chairman, Massachusetts is one of the leading states in the U.S. on energy resilience, passing a $1.3B GreenWorks bill to establish funds for green infrastructure.[24] Market mechanisms like the Clean Peak Standard[25] provide extra credit to utilities for clean energy resilient solutions. The Commonwealth is being intentional in deploying clean energy technologies as solutions to resilience needs; other states and the federal government could learn from these programs as additional policies are developed to shore up resilience.

Military bases around the United States are also confronting the need for more resilient infrastructure. Following a letter request in January of this year from Congressman Langevin, the Department of Defense identified the top ten most at risk

[22] http://www.earthsparkinternational.org/blog/no-shortage-of-opportunities-how-a-solar-microgrid-is-providing-resiliency-in-uncertainty
[23] https://www.dla.mil/AboutDLA/News/NewsArticleView/Article/1410067/usace-quality-assurance-checks-help-keep-temporary-emergency-generators-running/
[24] https://www.sierraclub.org/press-releases/2019/07/massachusetts-house-passes-greenworks-bill-extends-essential-lifeline-popular
[25] https://www.mass.gov/service-details/clean-peak-energy-standard

installations in each branch.[26] The criteria included recurrent flooding, drought, desertification, wildfires, and thawing permafrost. Those at-risk installations were in states as diverse as Florida, Georgia, Texas, Virginia, Utah, Oklahoma, Missouri, and Maryland. Two bases in Georgia—Fort Benning and Fort Gordon—have both established resilience plans with solar energy baked in. [27] [28]

The town of Nags Head, North Carolina--in a particularly vulnerable position for sea level rise and hurricanes--adopted a plan in 2017 that created a vision for its future and steps the community could take to secure that future.[29] Other communities are learning from each other through the government's own U.S. Climate Resilience Toolkit.[30] That platform has the potential to become more useful in identifying clean and flexible energy solutions for communities at risk of prolonged outage as a result of these events.

The point with these examples is to illustrate that customer-sited distributed energy resources—which are available today--can provide critical services to the grid when it needs them the most. And yet, in many venues our regulators and legislators focus more on the need for large, "baseload" power plants. The evidence suggests that we should instead ensure that, in our public policy and planning, we maximize the ability for consumers to participate in and contribute to the stability and resilience of our electric system by deploying flexible distributed energy resources. These cost-effective and available technologies, financing mechanisms, and services are resources we should

[26] http://www.airforcemag.com/DRArchive/Documents/2019/Updated%20Ranking%20of%20Installations.pdf
[27] https://www.atlantaga.gov/government/mayor-s-office/executive-offices/office-of-resilience/sustainability-initiatives
[28] https://www.asaie.army.mil/Public/ES/oei/docs/Ft%20Gordon,%20GA_Fact%20Sheet_Aug2019.pdf
[29] http://www.focusnagshead.com/DocumentCenter/View/924/FOCUS-Nags-Head-Comprehensive-Plan-July-5-2017-PDF
[30] https://toolkit.climate.gov

implement before a hurricane strikes our coast, a flood destroys our business, or a heat wave endangers our most vulnerable populations.

I urge the Committee to take these examples and solutions into consideration as we think broadly and strategically about how as a nation we prepare for and respond to events that are beyond our control. The very solutions we choose could have the co-benefits of reduced cost of and time for recovery; increased jobs and economic development for communities at risk; and reduced environmental impact through clean, flexible technologies. Thank you again for the opportunity to testify before the Committee.