Written Testimony for the Record
Submitted by the GridWise Alliance[1]

Energy Subcommittee of the House Energy & Commerce Committee
"The 2017 Hurricane Season: A Review of Emergency Response and Energy Infrastructure Recovery Efforts" Hearing
November 2, 2017

Background:

Current disaster relief law generally requires rebuilding or replacing damaged infrastructure with "like" (i.e., similar) infrastructure in most cases, though it can be rebuilt "to code." However, as we have witnessed, neither the status quo, nor building to code, are anticipated to be sufficient to withstand projected future extreme weather events. Recurrence of destruction in future storms could be extremely costly – tens of billions of dollars (at least, potentially), as we are seeing now.

In the wake of Hurricanes Harvey and Irma, Texas and Florida were able to re-energize their power grids significantly faster than in previous hurricanes (further data are provided below). These quicker recoveries were due, in no small part to, to grid modernization investments by local utilities.

Thus, steps should be taken now to rebuild infrastructure in a manner that increases system resilience, reliability, and security to reduce the scale of damage and destruction and the speed of power restoration in the future. In other words, this is why some changes in law are needed to enhance flexibility to enable the electric system to be rebuilt in a more resilient and "smarter" manner.

In addition to the transmission and distribution lines, the generation in Puerto Rico is (or was) vulnerable because it is situated near the coast to take advantage of cooling water.

[1] The GridWise Alliance consists of electric utilities, information technology and telecommunications equipment and service providers, National Laboratories, Regional Transmission Organizations (RTOs)/Independent System Operators (ISOs), and academic institutions. This testimony does not represent the views of all GridWise members.

Key Messages:

- Consideration should be given to repairing and/or rebuilding in the short- and longer-term in a more resilient, "smarter" manner – where it makes sense to do so, as elaborated on below.

- **Flexibility in current law is needed to enable this approach of near-term and longer-term rebuilding in a more resilient, "smarter" manner to occur.**

- A number of process and coordination-related steps also need to be addressed.

- **A holistic systems planning approach is needed**. Planning at least can be started in parallel with immediate restoration of power, at least to major portions of populations in Puerto Rico and the U.S. Virgin Islands.
  - More specifically, a damage assessment can be done, likely fairly quickly, as can some immediate power restoration efforts.
  - These steps can occur along with planning for, and implementing, some near-term solutions that could be more resilient and "smarter," as well as a longer-term, *phased approach* toward developing and re-building a more resilient, sustainable electric system, which will take time to completely rebuild.
  - System planning can be iterative and can be updated along the way.
  - Different approaches might be appropriate for different parts of the islands.
  - Cost-effectiveness should be ensured over the long term or project lifetime.
  - Public-private partnerships should be leveraged for the recovery effort, where appropriate.

- **Focusing on the desired outcomes or objectives is important:** i.e., to create a resilient, reliable, and secure system design.
  - Thus, picking specific technological or other solutions likely should be avoided, especially on an ad hoc basis – again, focusing outcomes or objectives.
  - Planners and engineers should aim to design a system that meets resiliency, cost, and other metrics and, in doing so, utilize the best mix of technologies and capabilities for the intended outcomes. Options for technologies and capabilities that are available to achieve such outcomes include but are not limited to: outage detection and management systems (e.g., smart meters), those that enable "islanding" of portions of the grid, microgrids, distributed energy resources, and energy storage (e.g., flywheels, batteries), and digital and flood-resistant substations.

- Many critical infrastructure systems and sectors have interdependencies, so there is a need to look holistically at systems and across critical infrastructure sectors. For instance, planners should consider coordinating, including co-locating (or optimizing other synergies), between and among multiple infrastructures/sectors, e.g., telecommunications, electricity, and water infrastructure.

- Having checks and balances in place, as well as transparency, and reporting/metrics/accountability for funding also are recommended, where appropriate.

Examples of Rebuilding in a More Resilient, "Smarter" Manner:

- Wooden poles could be replaced with concrete or steel ones.

- A transmission line, or portion of a line, could be repaired to help restore power. Then, the line could be made more resilient, e.g., by creating redundancies or hardening. After these steps occur, the original line could be replaced or upgraded, if necessary.

- A variety of resources, such as solar, batteries, microgrids, and/or diesel could be used to help restore power in certain parts of the island and/or to critical facilities relatively quickly. These systems could later be upgraded to provide more permanent grid support.

- Given the current location of generation sources, some type of reliable generation with adequate "fuel supply" near critical loads, such as hospitals, likely should be part of the overall resiliency planning considerations.

Information about Restoration in the Wake of Hurricane Irma:

FPL:

- Hurricane Irma "impacted all 35 counties and 27,000 square miles of FPL service territory, causing more than 4.4 million customers [(i.e., 90 percent of the company's customers)] to lose power."[2]
- To prepare, "FPL assembled and pre-positioned the largest restoration workforce in U.S. history, which grew to approximately 28,000 at its peak."[3]
- "This preparation and coordinated response, combined with [$3 billion in] hardening and automation investments that FPL has made since 2006 to build a stronger, smarter and more storm-resilient energy grid, enabled the company to restore service to over ***2 million customers in 1 day***" – i.e., to restore nearly 50 percent of the outages.[4] (Emphasis added) This is an "80% improvement compared to [Hurricane] Wilma restoration efforts."[5]

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[2] Edited Transcript of NextEra Energy, Inc. earnings conference call or presentation, text version of transcript, October 26, 2017 (1:00 p.m. GMT), available at: https://finance.yahoo.com/news/edited-transcript-nee-earnings-conference-122613065.html?.tsrc=applewf.

[3] NextEra Energy, Inc. and NextEra Energy Partners, LP, Third Quarter 2017 Release, October 26, 2017, available at: http://www.investor.nexteraenergy.com/phoenix.zhtml?c=88486&p=EarningsRelease.

[4] Edited Transcript of NextEra Energy, Inc. earnings conference call or presentation, text version of transcript, October 26, 2017 (1:00 p.m. GMT), available at: https://finance.yahoo.com/news/edited-transcript-nee-earnings-conference-122613065.html?.tsrc=applewf.

[5] Edited Transcript of NextEra Energy, Inc. earnings conference call or presentation, text version of transcript, October 26, 2017 (1:00 p.m. GMT), available at: https://finance.yahoo.com/news/edited-transcript-nee-earnings-conference-122613065.html?.tsrc=applewf.

- "Within three days, 75 percent of FPL customers were restored and within five days, 90 percent of customers were back on."[6] The "full restoration was completed 10 days after Hurricane Irma left FPL's service territory."[7]
- FPL "completed the fastest storm restoration of the largest number of customers by any one utility in U.S. history."[8]
- "Hurricane Irma had an approximately 50% higher damage potential than Hurricane Wilma" and 15% more of the population (90% in Irma versus 75% in Wilma) lost power during Irma.[9] Yet, "there was an approximately 80% reduction to pole damage and an 80% improvement in the time to energize all substations following the storm when compared to Hurricane Wilma." Moreover, "while the average customer outage from Hurricane Wilma lasted for over 5 days, the average outage for customers affected by Hurricane Irma was roughly 2 days, a 60% improvement."[10]
- "The total GDP within [FPL's] service territory averages over $1 billion per day. By reducing the average customer outage by more than 3 days when compared to Wilma," the "avoided economic loss to the state has more than paid for the $3 billion in hardening investments . . . made since 2006."[11]
- Final storm costs are preliminarily estimated to be "approximately $1.3 billion."[12]

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[6] Von Ancken, Erik, "FPL shares lessons learned after Hurricane Irma knocked out power statewide," Orlando.com, October 17, 2017, available at: https://www.clickorlando.com/news/lessons-learned-for-fpl-after-irma.
[7] NextEra Energy, Inc. and NextEra Energy Partners, LP, Third Quarter 2017 Release, October 26, 2017, available at: http://www.investor.nexteraenergy.com/phoenix.zhtml?c=88486&p=EarningsRelease.
[8] NextEra Energy, Inc. and NextEra Energy Partners, LP, Third Quarter 2017 Release, October 26, 2017, available at: http://www.investor.nexteraenergy.com/phoenix.zhtml?c=88486&p=EarningsRelease.
[9] Edited Transcript of NextEra Energy, Inc. earnings conference call or presentation, text version of transcript, October 26, 2017 (1:00 p.m. GMT), available at: https://finance.yahoo.com/news/edited-transcript-nee-earnings-conference-122613065.html?.tsrc=applewf.
[10] Ibid.
[11] Ibid.
[12] Ibid.