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Science and Technology for Emergency Preparedness and Resilience

October 20, 2023

Washington Legislative Work Session

House Committee on Innovation, Community and Economic Development, and Veterans



U.S. DEPARTMENT OF ENERGY BATTELLE

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PNNL Overview

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PNNL is a **U.S. Department of Energy** National Laboratory

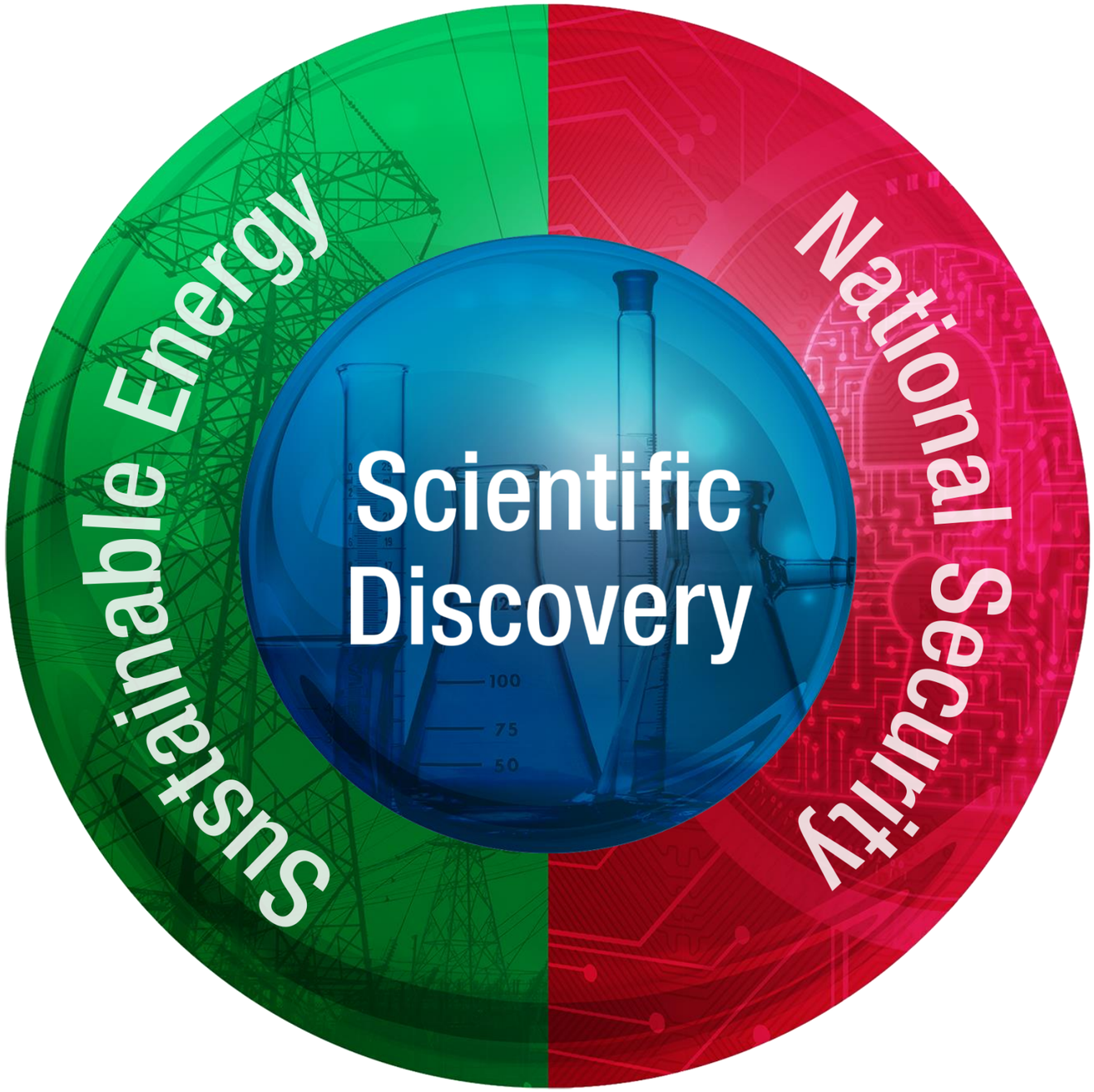
- Established in 1965
- Managed by Battelle
- 6,100 staff





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PNNL is **advancing scientific frontiers** and **providing solutions** to critical national needs



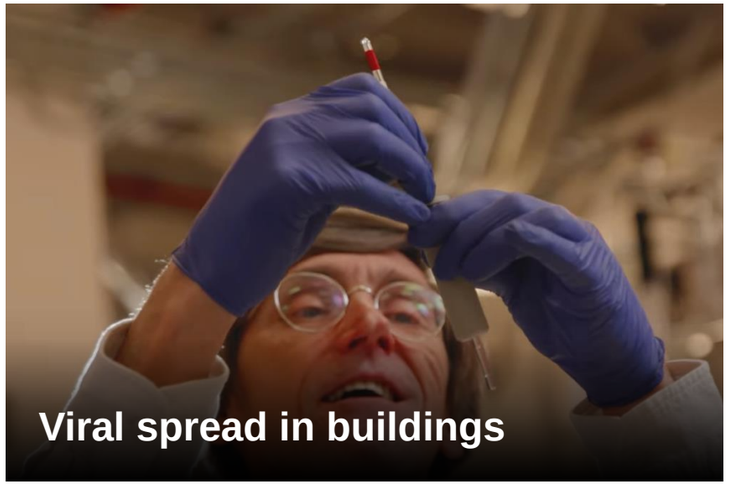
Multidisciplinary expertise enables a **systems approach** to critical challenges: COVID-19 example













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A regional, national, and international **scientific and technical resource**



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Technology Development for Emergency Preparedness

October 20, 2023

Ann Lesperance
Director,
Northwest Regional Technology Center @ PNNL

PNNL-SA-150586

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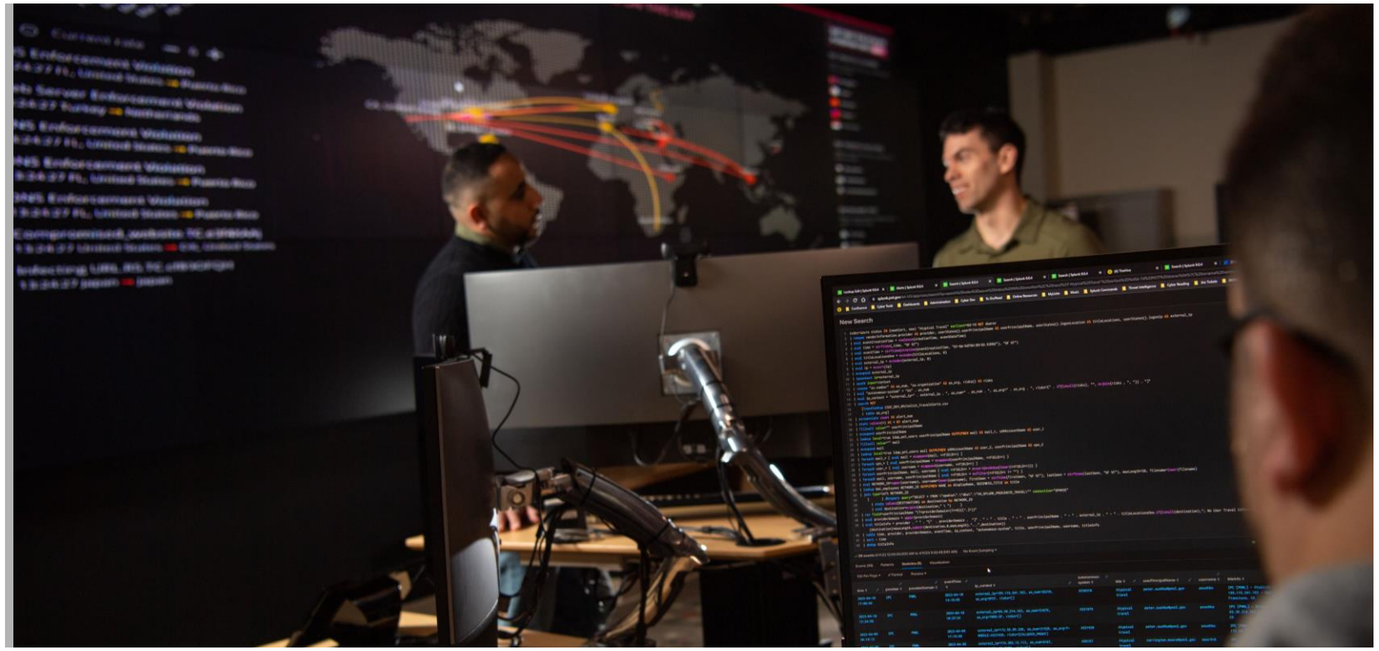


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The emergency management **threat landscape is changing**—and so is technology

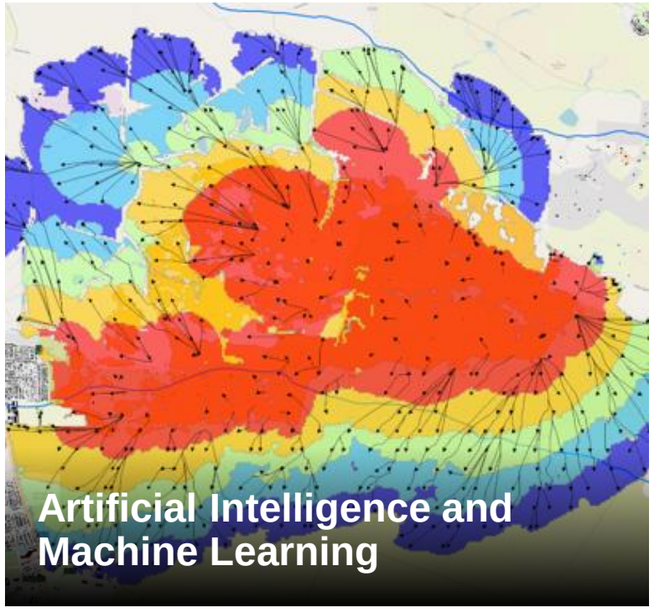






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PNNL is advancing science and technology partnerships for **regional preparedness**









Our Northwest Regional Technology Center is **transforming outreach and engagement**

- Enhancing connectivity to state/local public safety, emergency management, and critical infrastructure owners

- Enabling science and technology solutions for:
  - Prevention and Detection
  - Emergency Preparedness
  - Response, Resilience, and Recovery
  - First Responder Technology

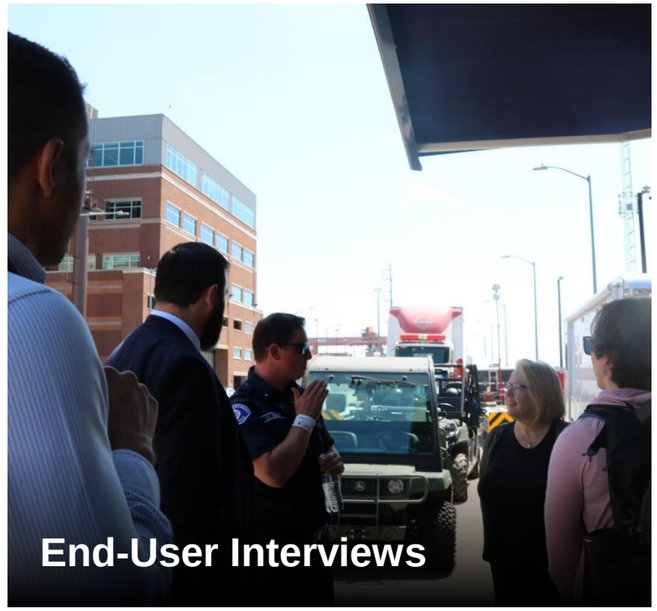


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We **collaborate** with technology developers and federal, state, local, and tribal users to:

- Identify critical technology needs and requirements
- Enable technology testing and evaluation
- Provide unbiased S&T
- Accelerate technology development and deployment







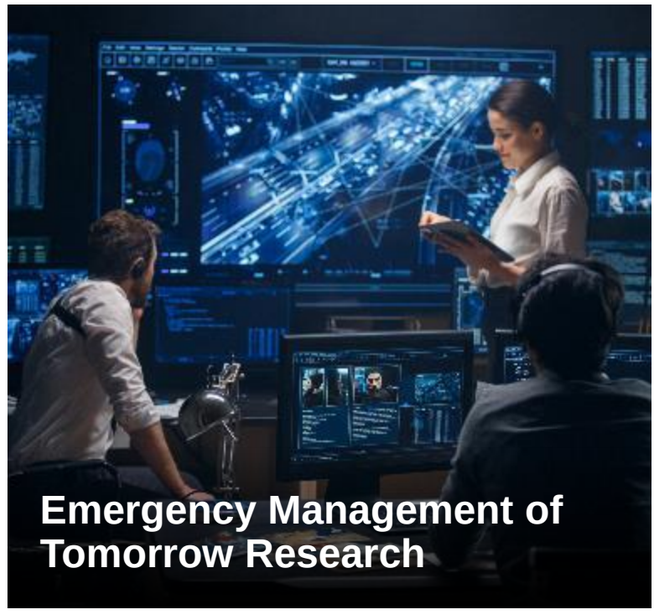


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We are delivering solutions to **keep communities and first responders safe**



Incident Response and Disaster Management


Emergency Management of Tomorrow Research


First Responder Technology Assessments


Regional Workshops and Recovery Frameworks

Contact Information



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Visit NWRTC online at http://www.pnnl.gov/projects/nwrtc or email nwrtc@pnnl.gov to subscribe to our monthly *Around the Region in Homeland Security* newsletter.

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Electric Grid Resilience Planning

October 20, 2023

Marcelo Elizondo, Ph.D.
Principal Research Engineer,
Electricity Security Group

PNNL-SA-191528

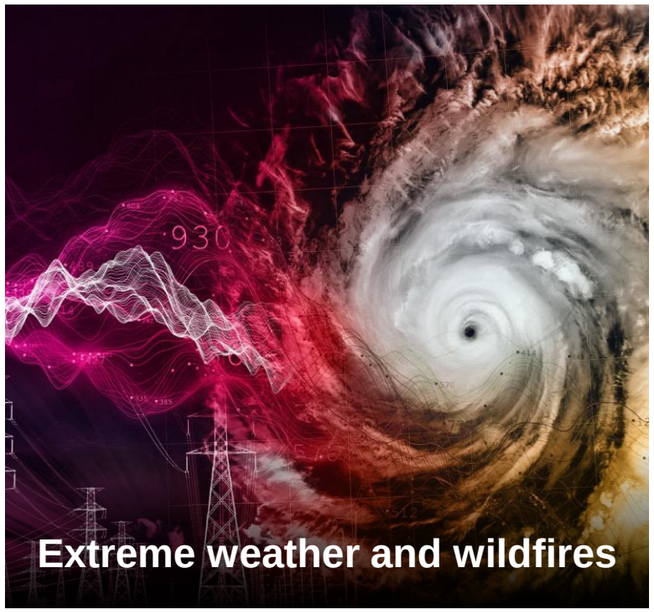
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A **changing landscape** of challenges to grid resilience









(Image by KoSSSmoSSS | Shutterstock.com)

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Strategies for **strengthening** grid resilience to extreme events





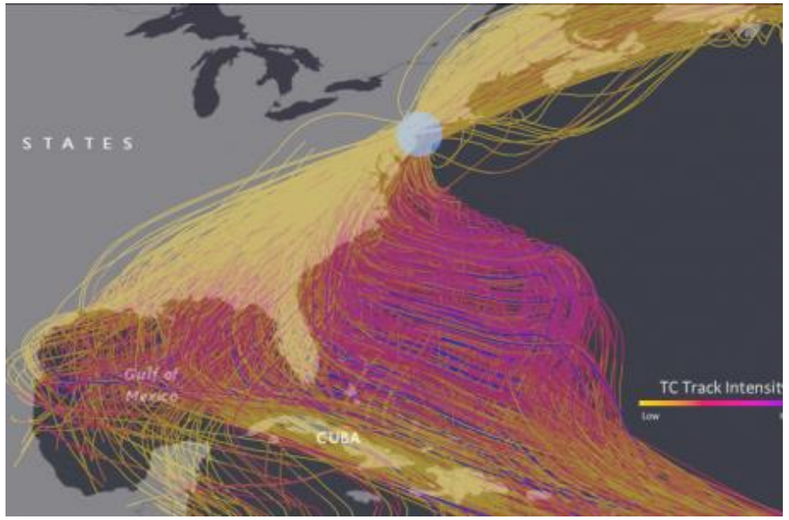




Elements for Successful Resilience Planning

- Understand resilience needs of both utilities and communities
- Adopt a flexible and adaptable planning process
- Incorporate lessons from previous extreme weather events
- Incorporate extreme weather predictions into planning
- Develop technology and operating solutions to improve resilience

PNNL Multidisciplinary Modeling Capabilities





- Characterize future weather stressors (e.g., flooding, heat waves, hurricanes)
- Estimate probability of infrastructure failure
- Analyze impact to grid functions (e.g., cascading failures)
- Estimate time and effort for recovery
- Prioritize infrastructure investments
- Estimate level of emissions

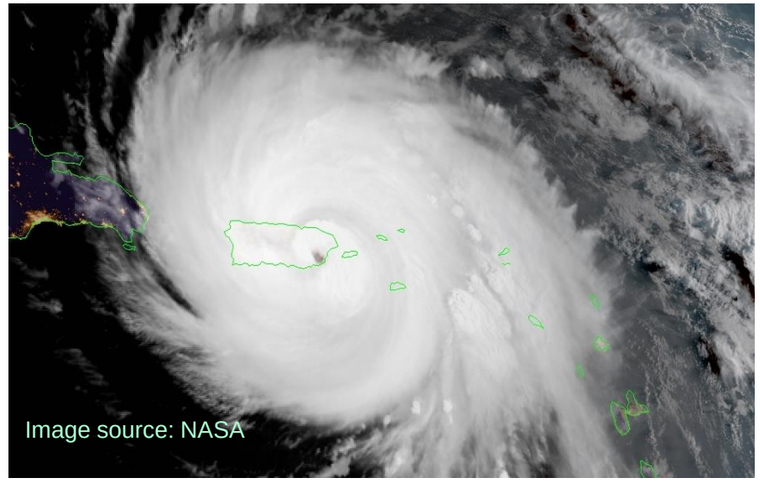
Example: Puerto Rico Resilience Planning

Irma (Cat 5, passed close to land), Sept 7, 2017
- Less than 1 week to restore 70% affected customers; others **expected to recover in months**

Maria (Cat 4 at landfall), Sept 20, 2017
- Full blackout
- **11 months to recover**

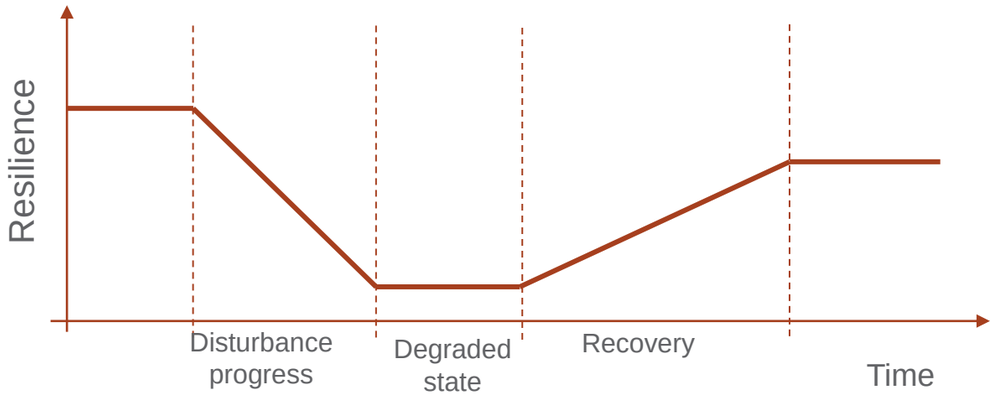
Fiona (Cat 1 at landfall),Sept 6, 2022
- 12 days to recover 90%
- **25 days** to recover 99%

Puerto Rico Energy Public Policy Act: 100% renewable resources by 2050

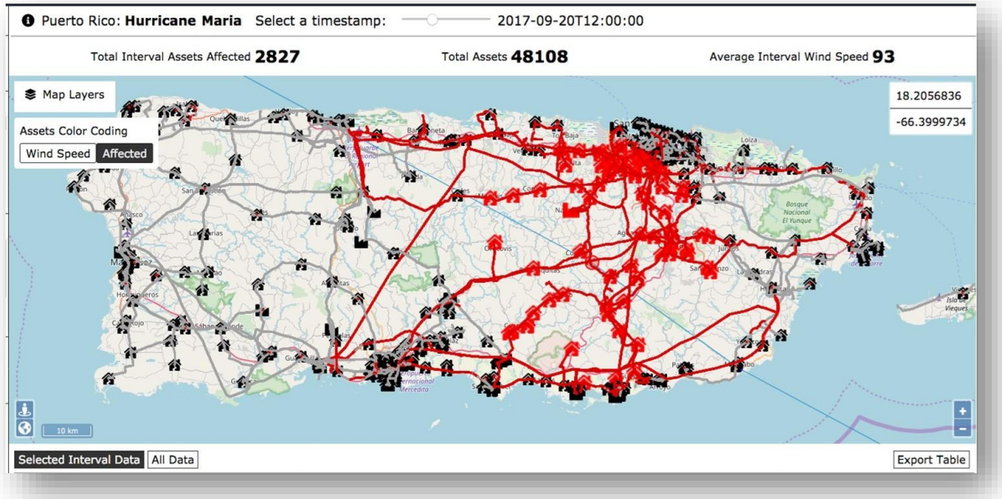

Image source: NASA

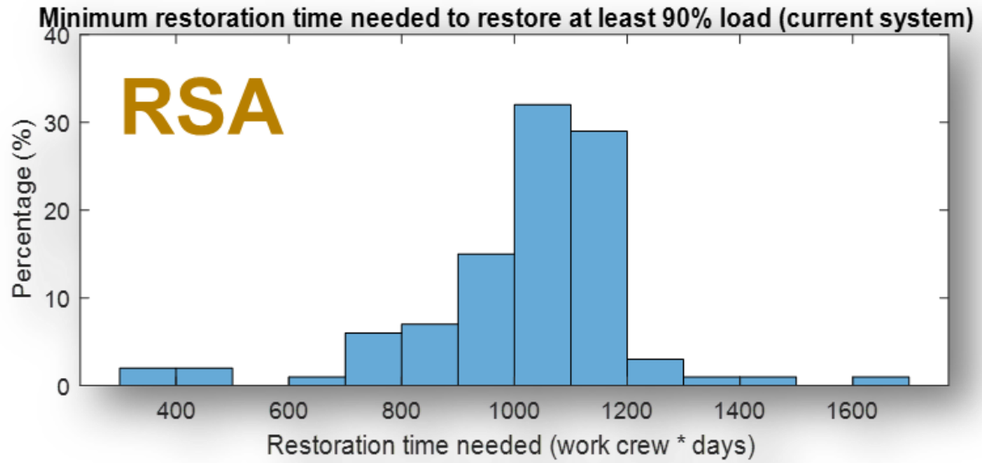

Source: Business Insider

Customized planning tools for Puerto Rico

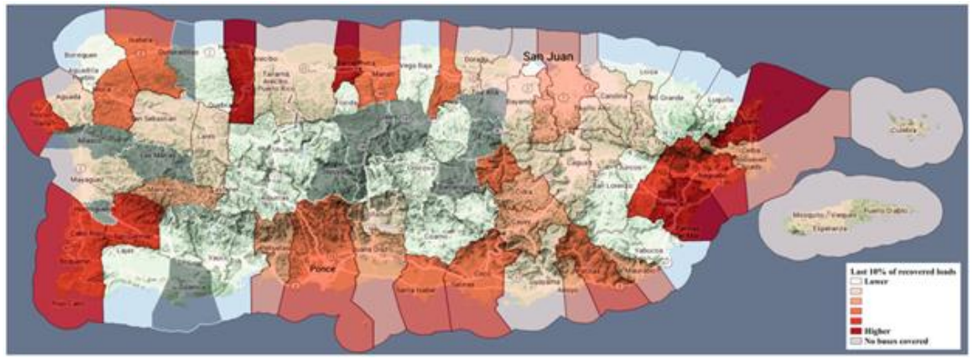


Electrical Grid Resilience and Assessment System

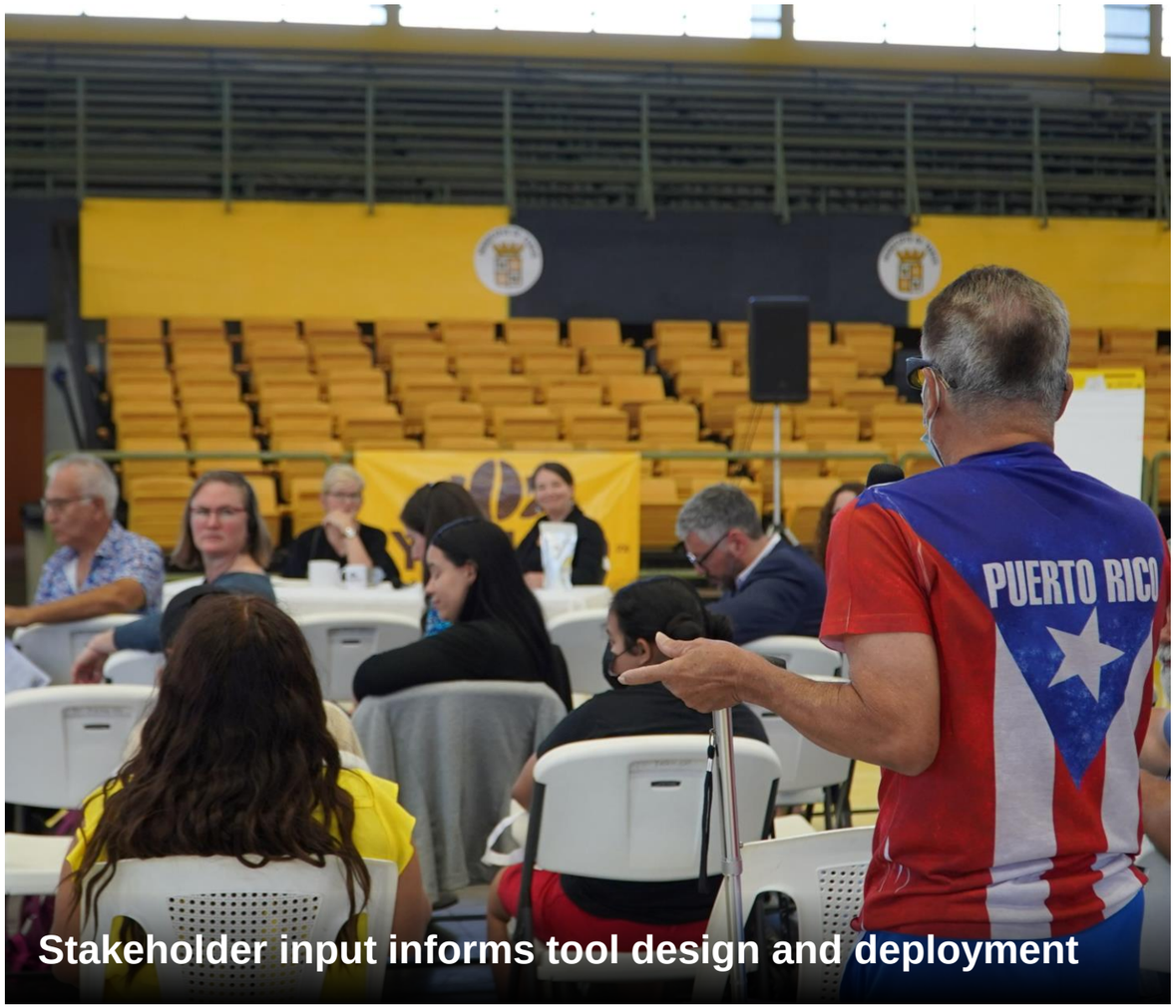




Load Recovery Predictions



Co-designing solutions to address **utility and community** resilience needs



Stakeholder input informs tool design and deployment

Photo credit: U.S. Department of Energy

Contact Information



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https://www.pnnl.gov/electric-grid-modernization

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Thank you

