EPRI’s Resilience Initiative
Expanding Perspectives in Energy System Resilience

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USEA Resilience Briefing
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Introduction to EPRI

BORN IN A BLACKOUT
Founded in 1972 as an independent, nonprofit center for public interest energy and environmental research

New York City, The Great Northeast Blackout, 1965

EPRI’S VALUE
To provide value to the public, our members, and the electricity sector

THOUGHT LEADERSHIP

INDUSTRY EXPERTISE

COLLABORATIVE MODEL

OUR MEMBERS...

• 450+ participants in more than 30 countries

• EPRI members generate approximately 90% of the electricity in the United States

• International funding – nearly 25% of EPRI’s research, development, and demonstrations

• $415M Annual Funding

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Integration of Interdependent Energy Resources:

Improves Reliability, Resiliency, Efficiency, Productivity, Create New Opportunities, and Expand Customer Choice
North America—United States
- 200,000 miles of transmission line over 230 kV.
- 58,000 substations between bulk transmission and distribution feeder systems.
## EPRI's Power System Resilience R&D

### Supply Resilience
- **Events**
  - Extreme weather (i.e., extreme cold)
  - Natural disasters (hurricanes, flooding)

- **Strategy**
  - Generator hardening
  - Fuel supply assurance
  - Local supply: DER and microgrids

- **EPRI Work**
  - Nuclear risk assessments
  - 2018 supply resilience white paper
  - Environmental impacts of backup generation
  - Markets impacts and opportunities

### Transmission, Substation and Distribution Resilience
- **Events**
  - EMP, GMD events
  - Natural disasters & extreme weather
  - Manmade threats

- **Strategy**
  - Line hardening & network redundancy
  - Strategies for reliable network architecture & communications
  - Local supply: DER and microgrids

- **EPRI Work**
  - Frameworks & metrics assessments
  - EPRI/NATF/DOE maturity model
  - Investment decision support
  - Decision support tools for system emergency & restoration

### Communications Resilience
- **Events**
  - Cyber attacks
  - Natural disasters

- **Strategy**
  - Enhanced cyber security
  - Strategies for reliable network architecture & communications

- **EPRI Work**
  - Cyber security cross-cutting program
  - Black sky communications
  - Customer data outage initiative
  - Integrated security operations center
Imagine an energy future when customers’ assets become energy solutions that enhance reliability, resiliency, and value for all.

https://www.youtube.com/watch?v=PknNL0TnCxQ&feature=youtu.be
# Why pay more for the one kilowatt-hour?

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<th>Grid-Supplied Electricity</th>
<th>Standard AA Battery</th>
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<td>▪ About 10 cents for 1 kWh in the United States</td>
<td>▪ 250 AA = 1 kWh</td>
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<td>▪ At 1000x the cost*</td>
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* Retail price, on sale for $25 per cell ($1 per 4-pack) at local Powell, TN grocery store, 5/27/2018.

Customer Preferences Extend Beyond Costs—Control, Comfort, Certainty, Connectivity, and Choice Contribute to the Value Proposition
A portable light for nights spent up with a newborn baby—non-stimulating, illuminating, and right where you need it, it’s worth it!

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Customer Resilience in the Shared Integrated Grid

Residential Advanced Heating System—space heating during a power outage

Rooftop PV with Off-Grid Inverter—opportunity power supply while solar resource is available

Backup Generation/Microgrids for Critical Services—opportunity for additional customer value streams
Key Areas of EPRI’s Resiliency Focus

1. The Value of Resiliency and Flexibility in the Integrated Energy Network

2. Supply and T&D Threats Assessments (including EMP and GMD), Impacts Modeling, Maturity Models (joint EPRI/NATF/DOE), Nuclear Risk Assessments, and Decision Support Tools

3. Cyber and ICT Resiliency in the Shared Integrated Grid

4. Customer Resilience Technologies—Opportunities to Empower and Enable Customers to be more Self-Resilient, and in doing so Increase Community and Overall Grid Resilience
Questions?

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Together…Shaping the Future of Electricity