Reliability vs. Resilience and Reliability Value-Based Planning Principles, Tools, and Resources

Joseph H. Eto

Lawrence Berkeley National Laboratory

Planning for the Electric System of the Future

The Path to a More Resilient Energy Grid

Critical Consumer Issues Forum

April 28, 2020

Reliability vs. Resilience: features, metrics, actions

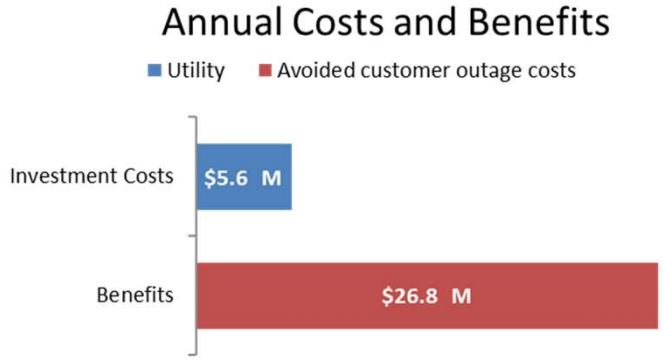
	Reliability	Resilience
Common features/ characteristics	Routine, expected, normally localized, shorter duration interruptions of electric service Larger events will make it into the local headlines	Infrequent, unexpected, widespread/long duration power interruptions, often with significant corollary impacts Almost always "event" based Always national headline worthy
Metrics	Well-established, annualized (SAIDI, SAIFI, MAIFI), with provisions for "major events" Rarely include non-electricity impacts	Familiar, but non-standardized, and generally event-based (number of customers affected; hours without electric service) Routinely also include non-electricity impacts (e.g., costs to firms; health and safety impacts)
Actions to improve	1. Plan and prepare; 2. Manage and endure event(s); 3. Recover and restore; and 4. Assess, learn, and update plan.	No qualitative difference But generally larger in scope/cost (see below)

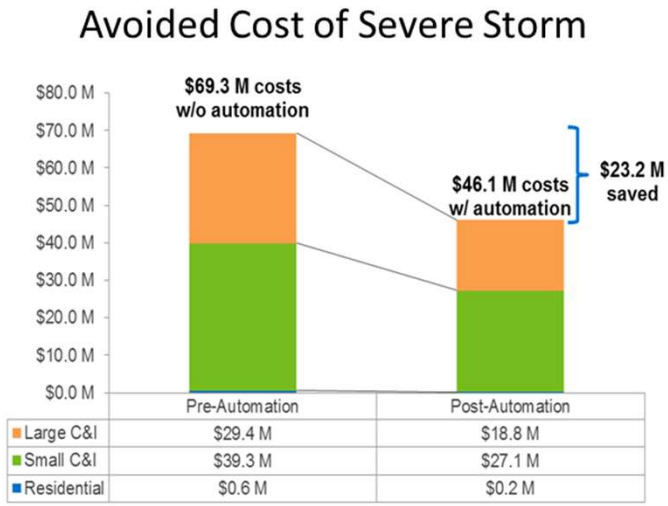
Reliability vs. Resilience: decision-making

	Reliability	Resilience
Entities involved in decision making	Electric utility and its regulator/oversight board, primarily	Electric utility and regulator; sometimes acting in response to State legislative direction or Governor's orders Routinely in conjunction with parties that have responsibilities for other critical infrastructures, including local/regional/state/federal agencies/authorities, and communities/elected officials
Factors affecting decision making	Actuarial records on frequency of exposure – widely understood risks: insurable Well-understood/tested practices/approaches Understood to be an expected cost of doing business	No actuarial basis to establish likelihood of occurrence – widely varying perceptions of risk/exposure: "un-insurable" risk Limited opportunities to test strategies Large dollar amounts/extraordinary expenditures may require special approval/vote Political leadership critical

Reliability Value-Based Planning example: Distribution Automation

- Utility: EPB of Chattanooga
- Customers Impacted: 174,000 customers (entire territory)
- Investment: 1,200 automated circuit switches and sensors on 171 circuits
- Reliability Improvement:
  - SAIDI ↓45% (from 112 to 61.8 minutes/year)
  - SAIFI ↓51% (from 1.42 to 0.69 interruptions/year) (between 2010 and 2015)





Interruption Cost Estimate (ICE) Calculator



- ICE Calculator is an interactive tool for estimating customer interruption costs for a circuit, region, or utility service territory
- The ICE Calculator was developed using customer survey responses from 34 utility-sponsored Customer Interruption Cost (Value of Loss Load) studies

http://www.icecalculator.com/

ICE Calculator - Caveats

- ICE Calculator is based on the most extensive body of survey research on customer interruption costs available

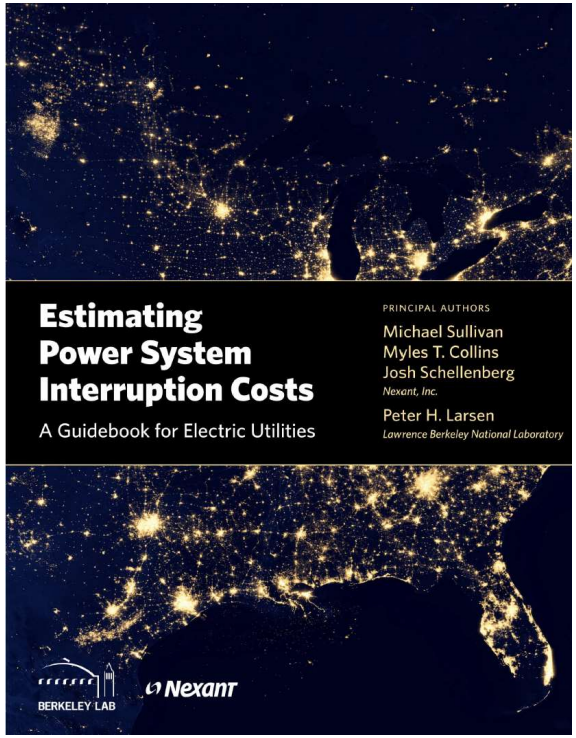
HOWEVER

- The surveys, taken together, may not be statistically representative of US customers, as a whole
  - *The utility sponsors are primarily located on the west coast and in the southeast*

- The surveys are not current
  - *The oldest survey was conducted in 1989; the latest survey was conducted in 2012*

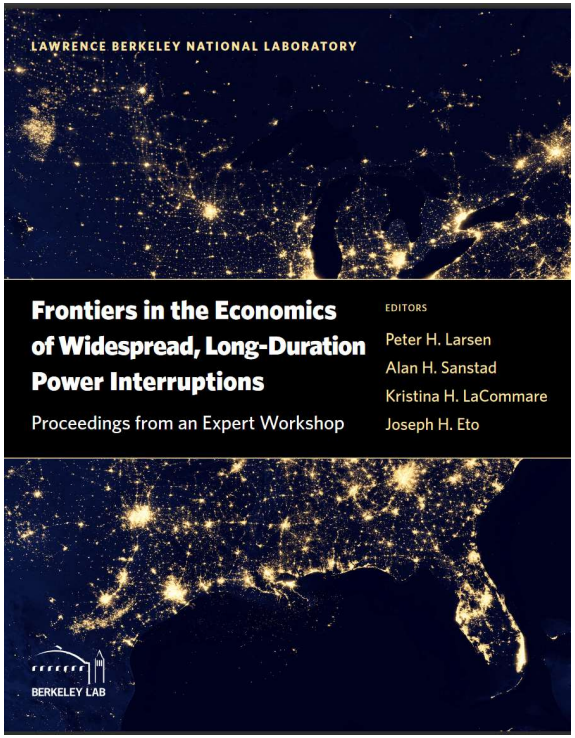
- The surveys did not consider widespread, long-duration power interruptions
  - *The longest interruption scenario assesed was 12 hours*

Recent LBNL Research on Economic Cost of Power Interruptions to Customers



Guidance to utilities designing surveys to assess the direct costs of power interruptions

Reviews of the state of the art in estimating the direct *and indirect* costs of widespread, long-duration power interruptions



https://emp.lbl.gov/research/electricity-reliability

Thank You

Joseph H. Eto

jheto@lbl.gov

(510) 486-7284

https://emp.lbl.gov/