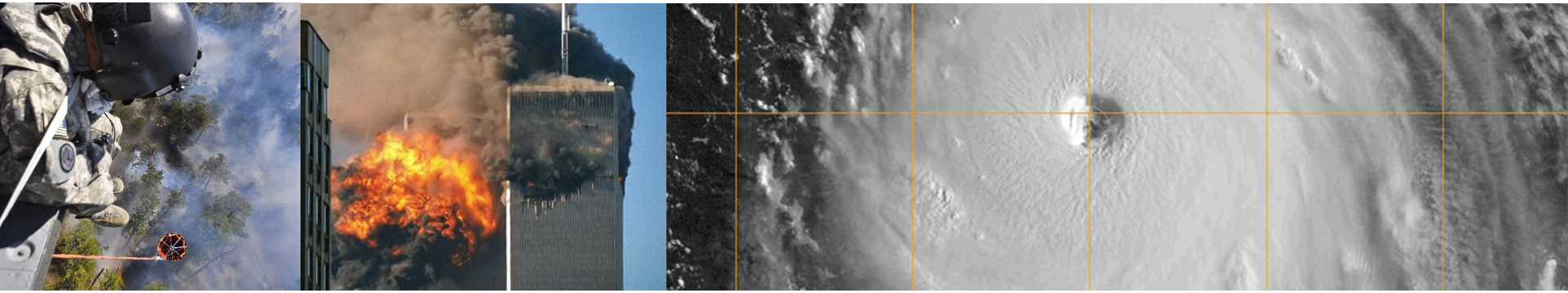
SAND2015-3179PE

Exceptional service in the national interest

Sandia National Laboratories



Sandia National Laboratories

Overview of Lab Capabilities Germane to 100RC

Steve Conrad, Manager in the Critical Infrastructure Protection Group

October 17, 2014

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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Largest National Laboratory – Multiple Missions and Locations

Sandia National Laboratories

Albuquerque, New Mexico

Livermore, California

- Budget and Staffing: $2.5 Billion and 12,000 employees
- Mission Space: Nuclear Weapons, Homeland Security, Cyber Security, Nonproliferation, and Energy Security

What it means to be a National Lab and Federally Funded Research and Development Center

Sandia National Laboratories

- Long-term government relationships afford the continuity to maintain currency in its fields of expertise.
- Meets special long-term research or development needs.
- Operates in the public interest with objectivity and independence, is free from organizational conflicts of interest.

Sandia Strategy Targets Several National Security Missions Germane to 100RC

Sandia National Laboratories

- Increase security and resiliency of critical infrastructures
- Strengthen the nation's S&T base in
  - Energy
  - Climate
  - Infrastructure
- Reduce our dependence on foreign oil
- Increase deployment of low carbon stationary power generation
- Understand risks and enable mitigation of climate change impacts

NISAC History & Mission

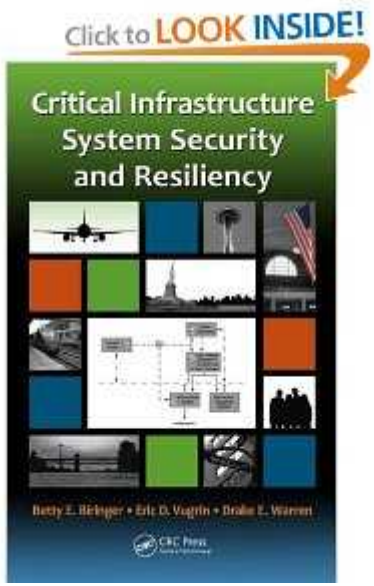
What we do

- Provide fundamentally new modeling and simulation capabilities for the analysis of critical infrastructures
  - Conducts incident consequence analyses
  - Provides support for national and regional exercises

Prior investments can be leveraged for future national needs

Our Quantitative Resilience Assessment Approach

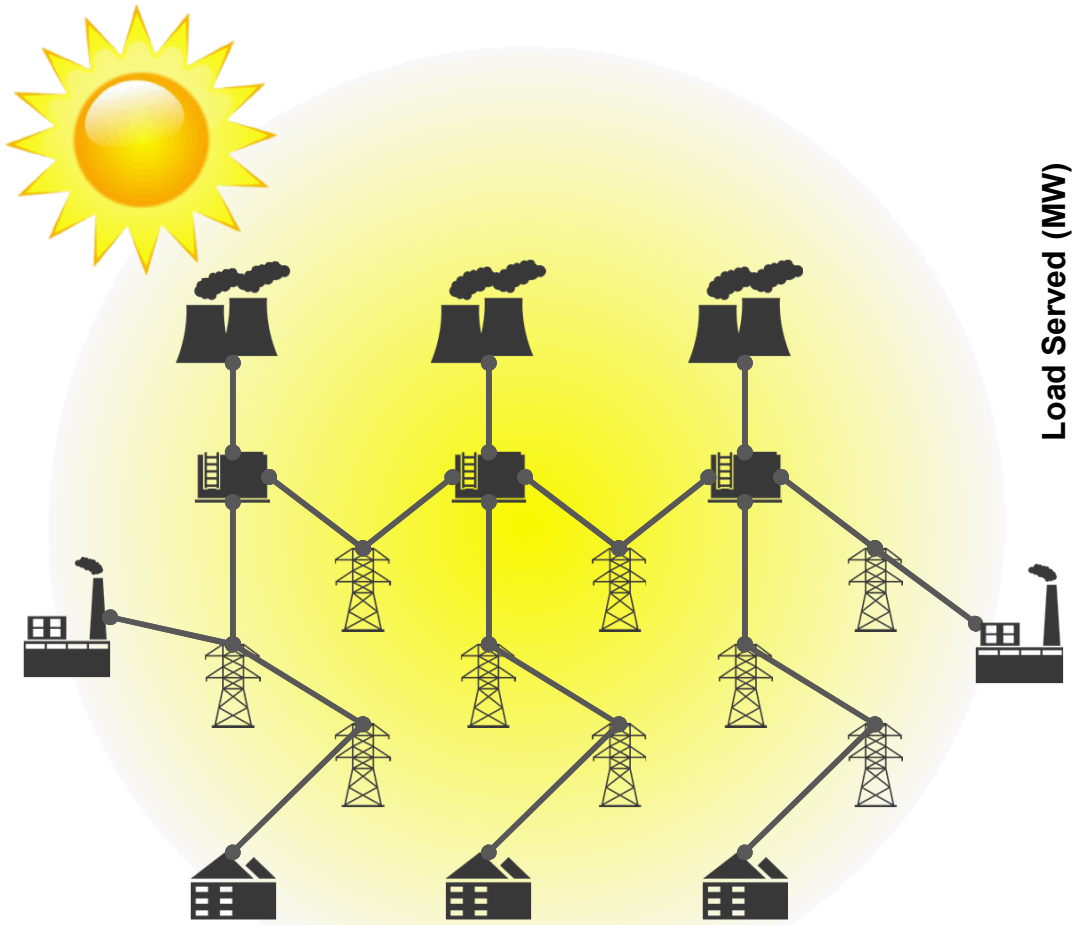
Sandia National Laboratories

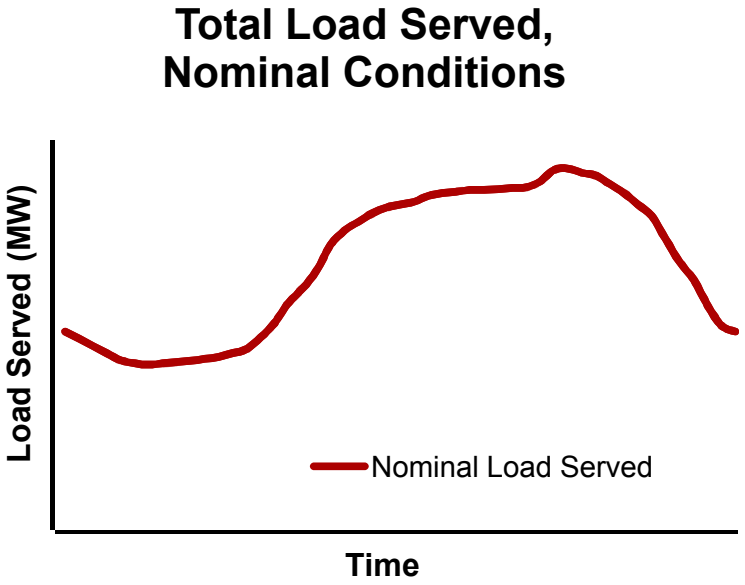


Critical Infrastructure Security and Resilience
Biringer, Vugrin, and Warren (2013)

- Single Disruption
- Multiple Disruptions
- Case Study
- Things we do well
- Q&A

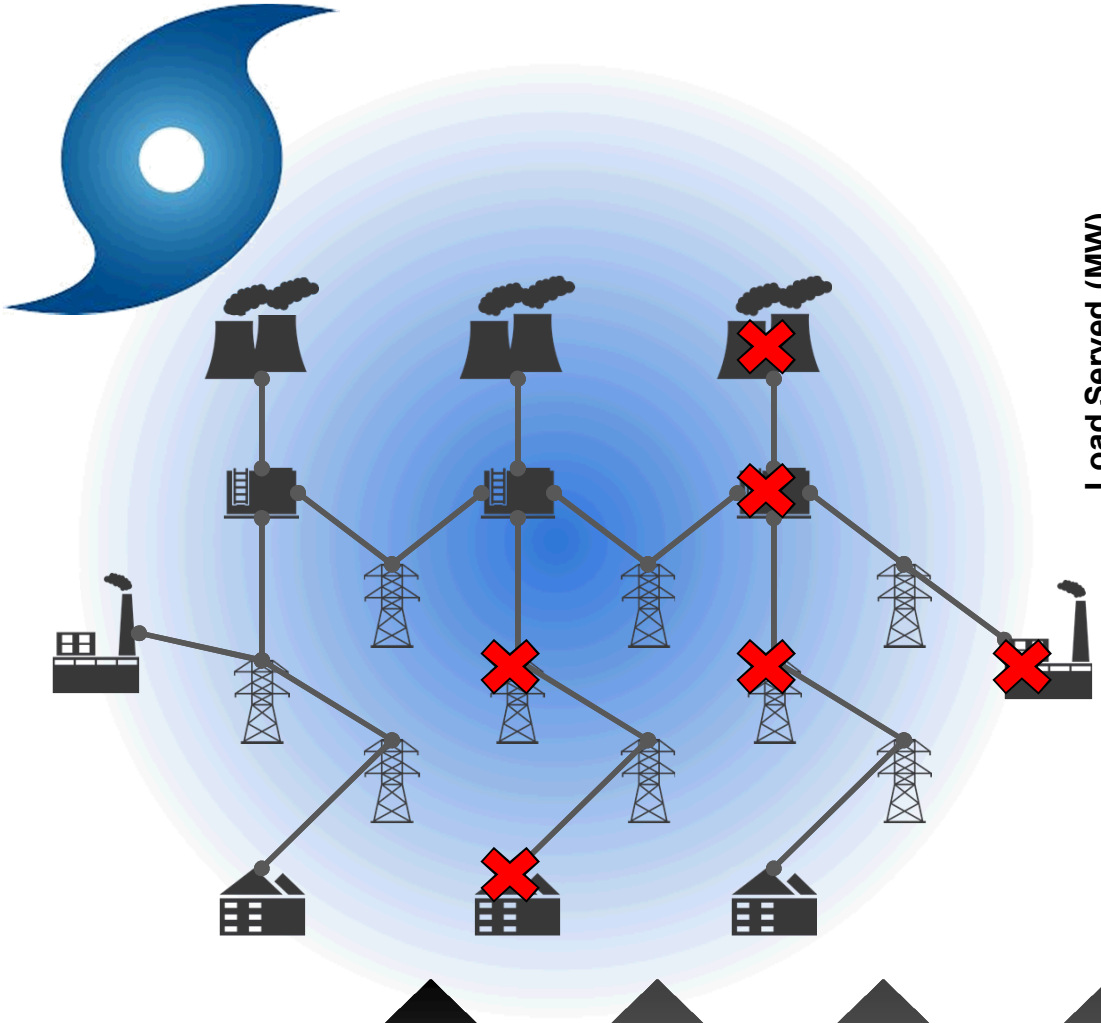
The Energy System Works

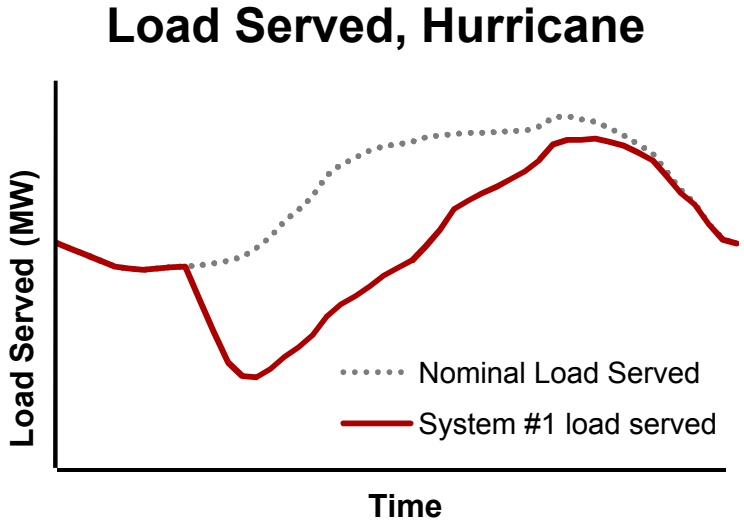




Single Disruption | Multiple Disruptions | Case Study | Things we do well | Q&A

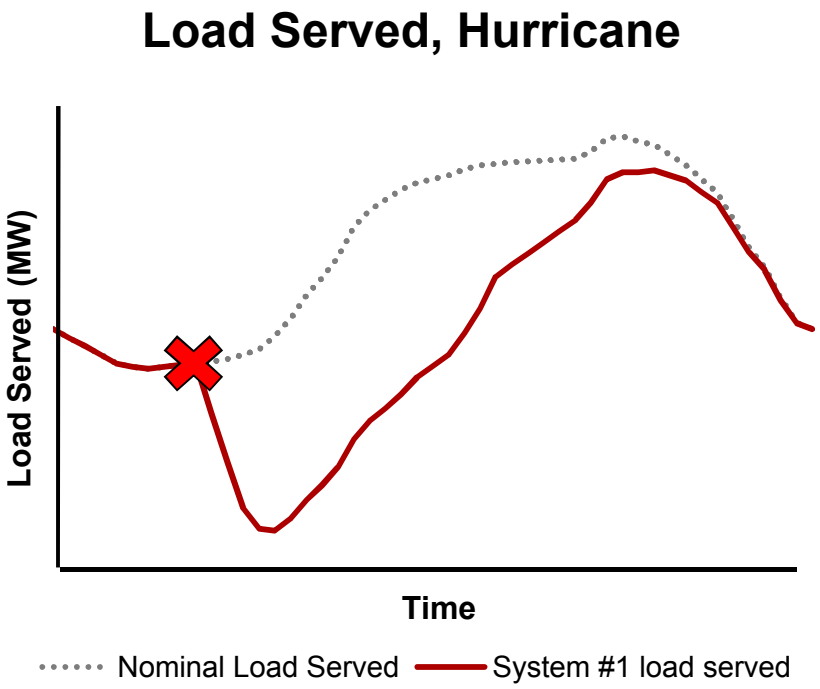
Hurricane

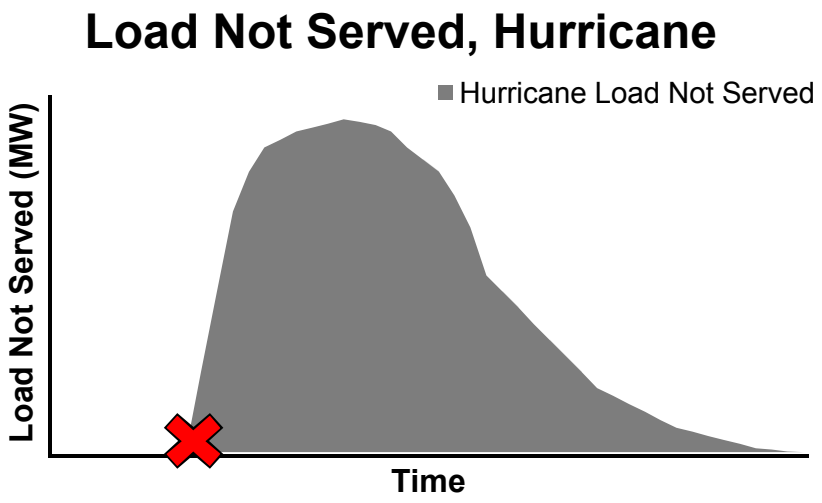


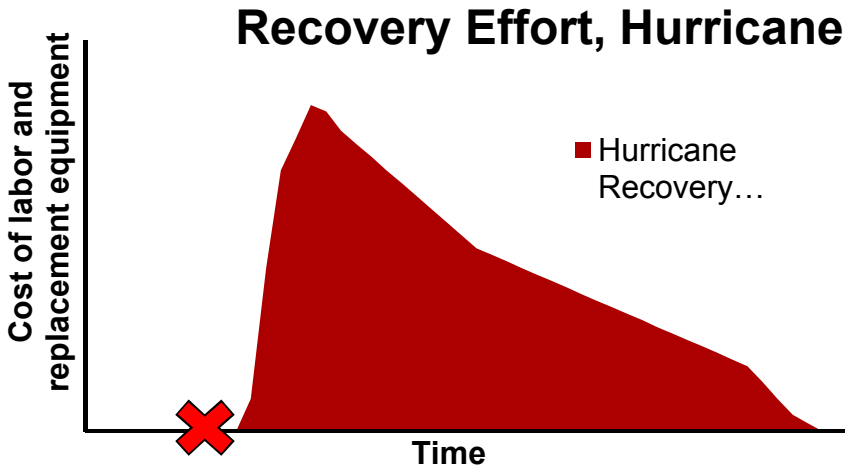


Single Disruption | Multiple Disruptions | Case Study | Things we do well | Q&A

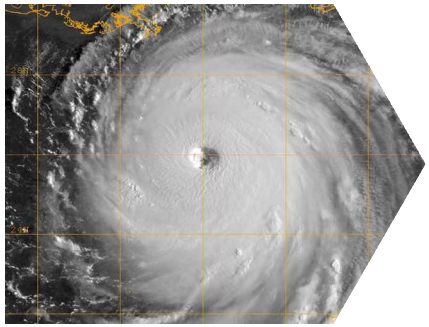
Hurricane Impacts

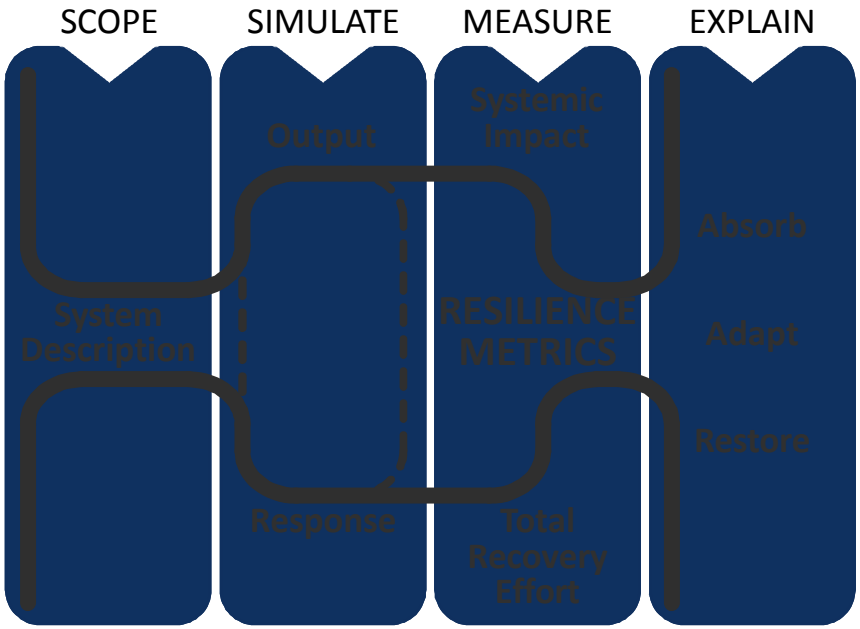






Single Disruption (Deterministic)

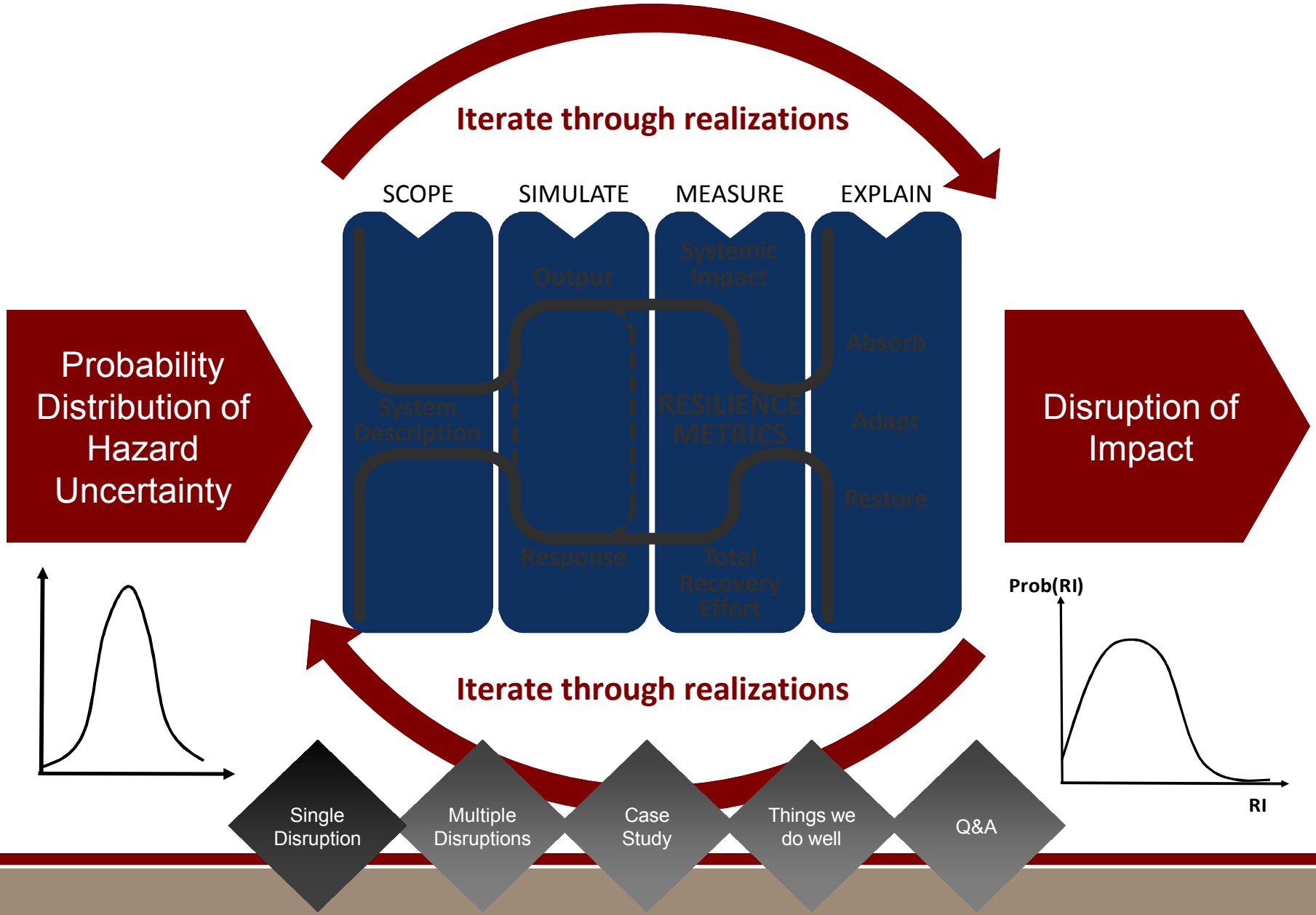




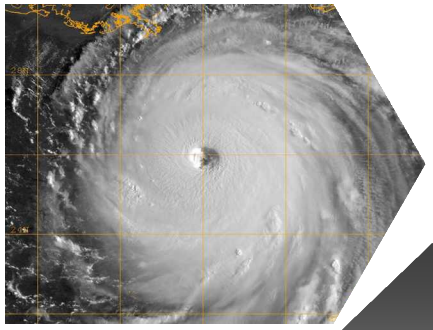
IMPACT

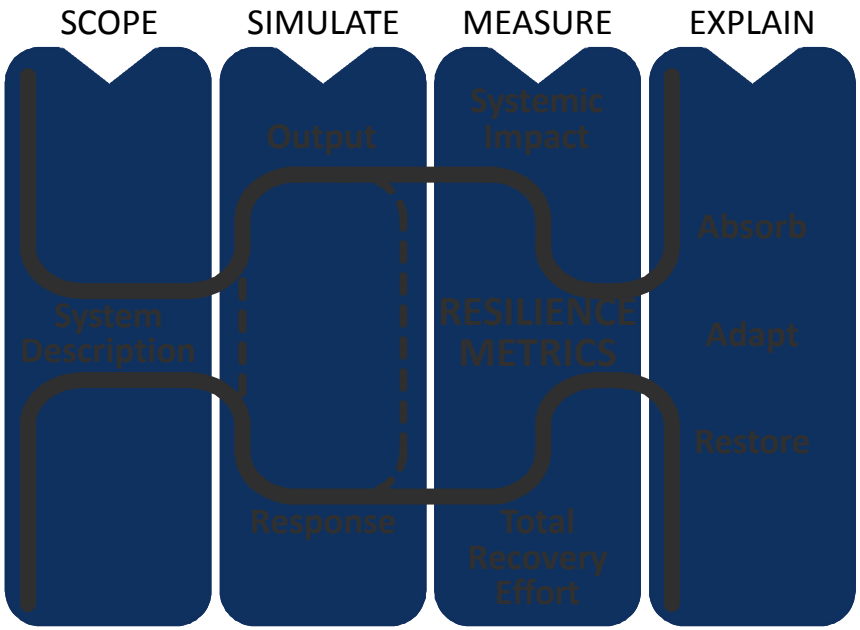
Single Disruption | Multiple Disruptions | Case Study | Things we do well | Q&A

Single Disruption (Probabilistic)



Multiple Disruptions (Deterministic)

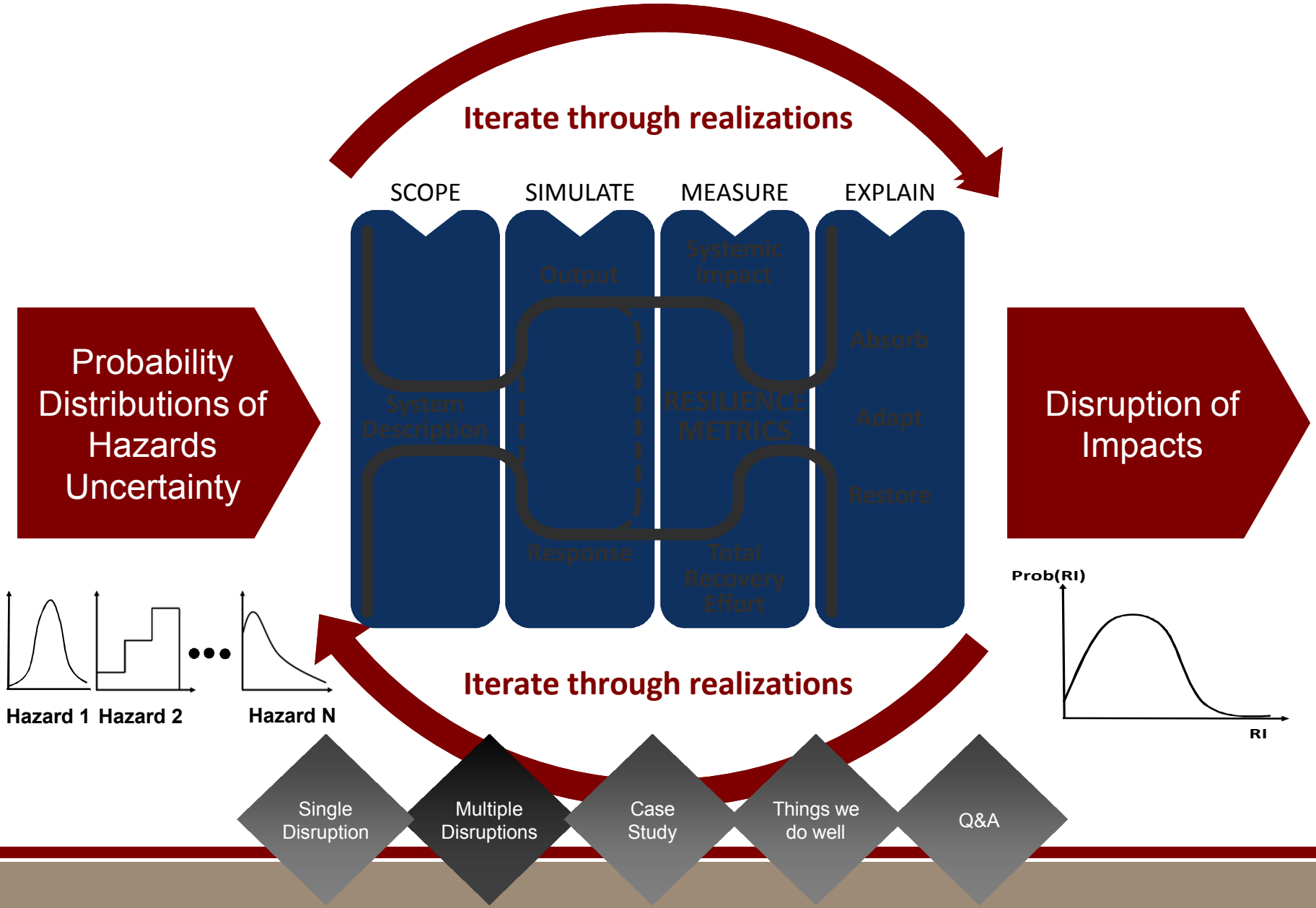




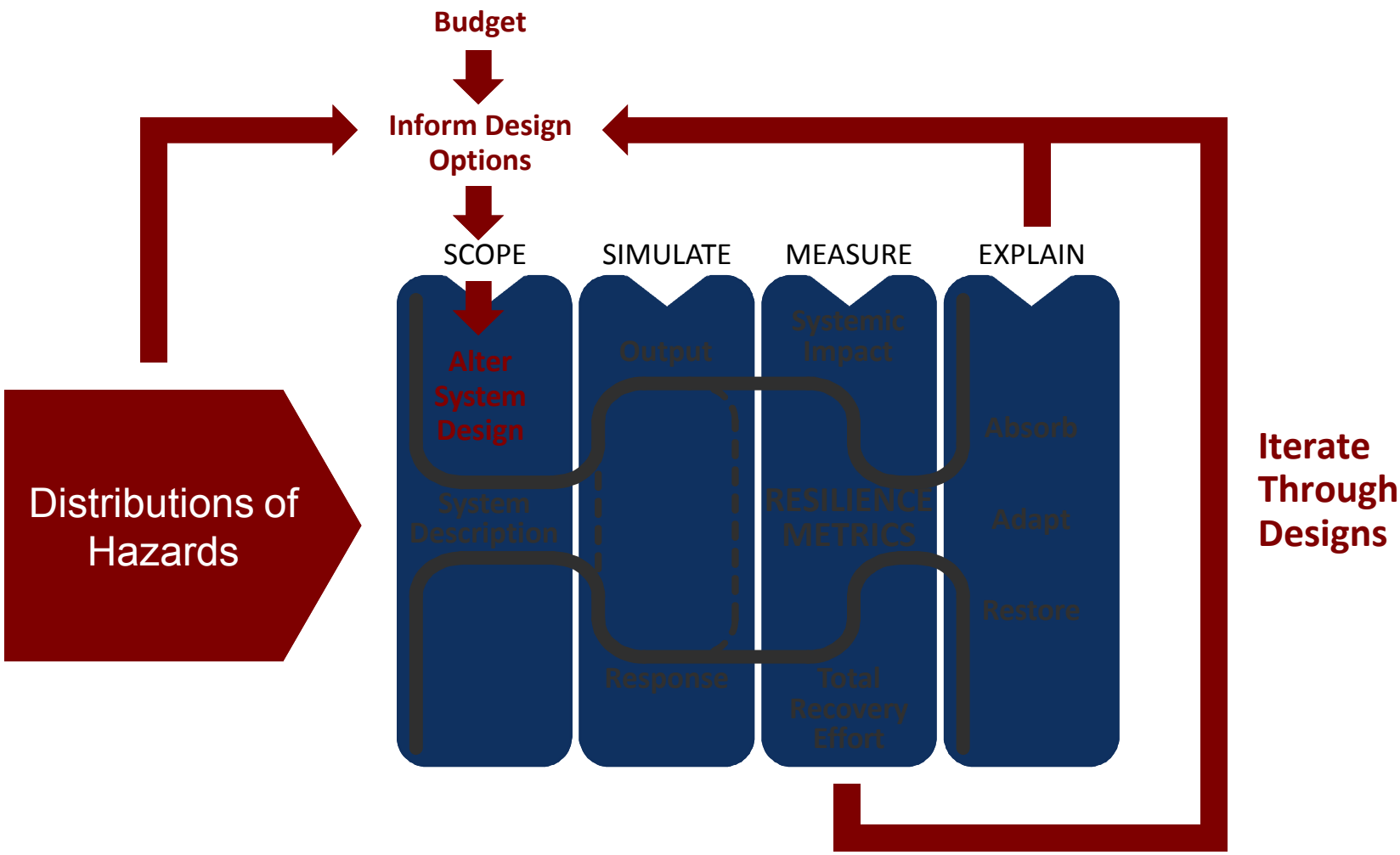
IMPACTS

Single Disruption | Multiple Disruptions | Case Study | Things we do well | Q&A

Multiple Disruptions (Probabilistic)



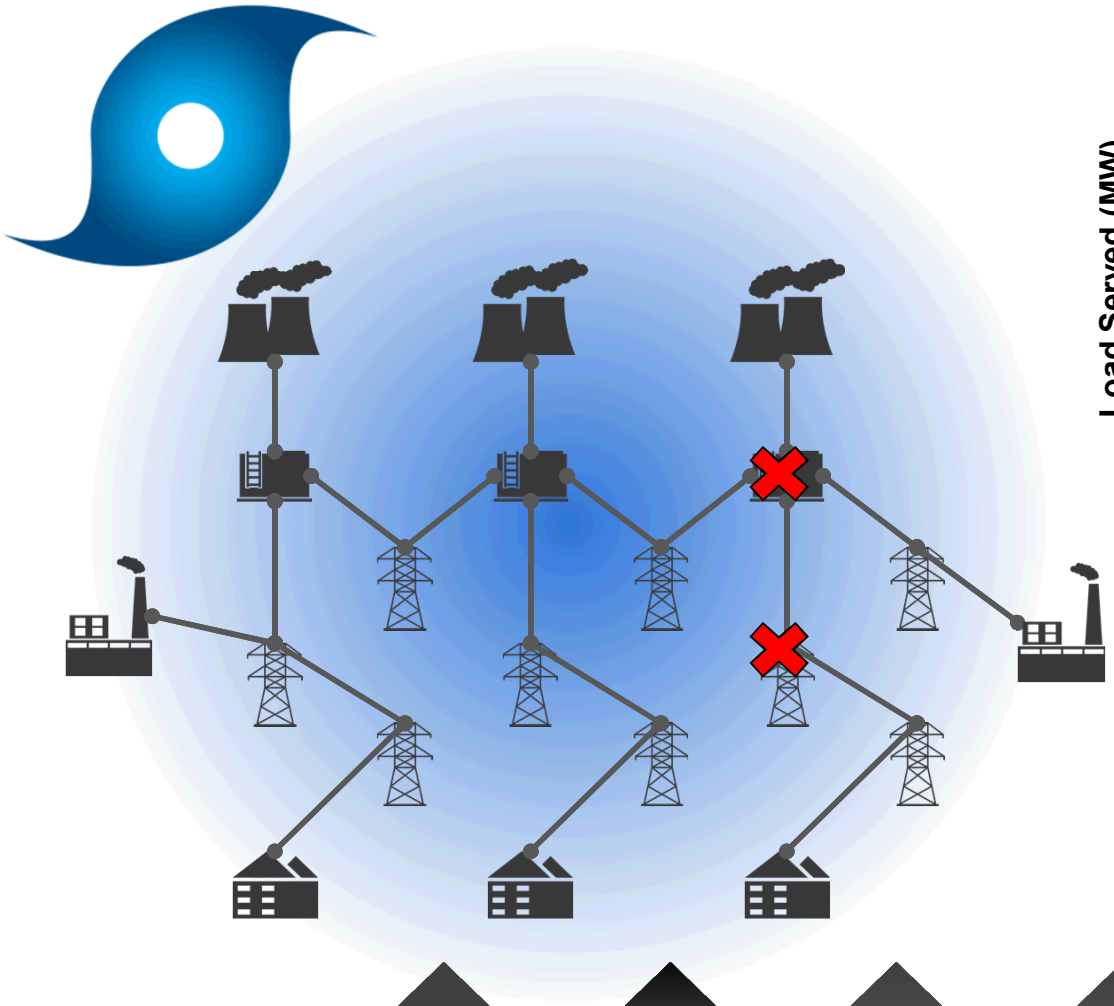
Design for Resilience

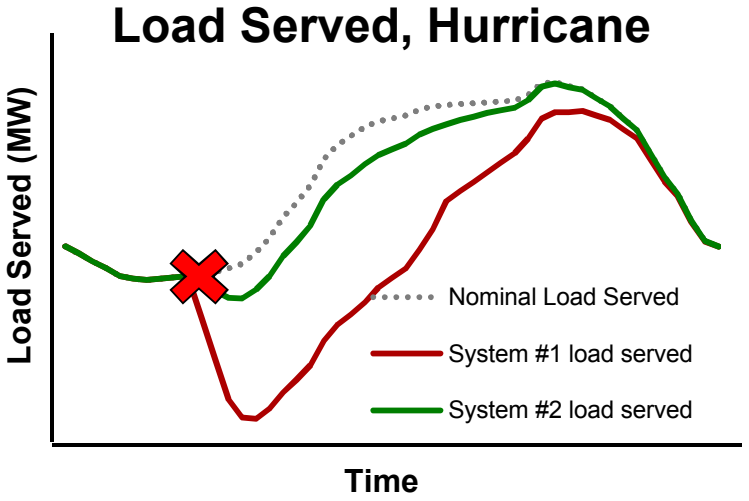


Single Disruption | Multiple Disruptions | Case Study | Things we do well | Q&A

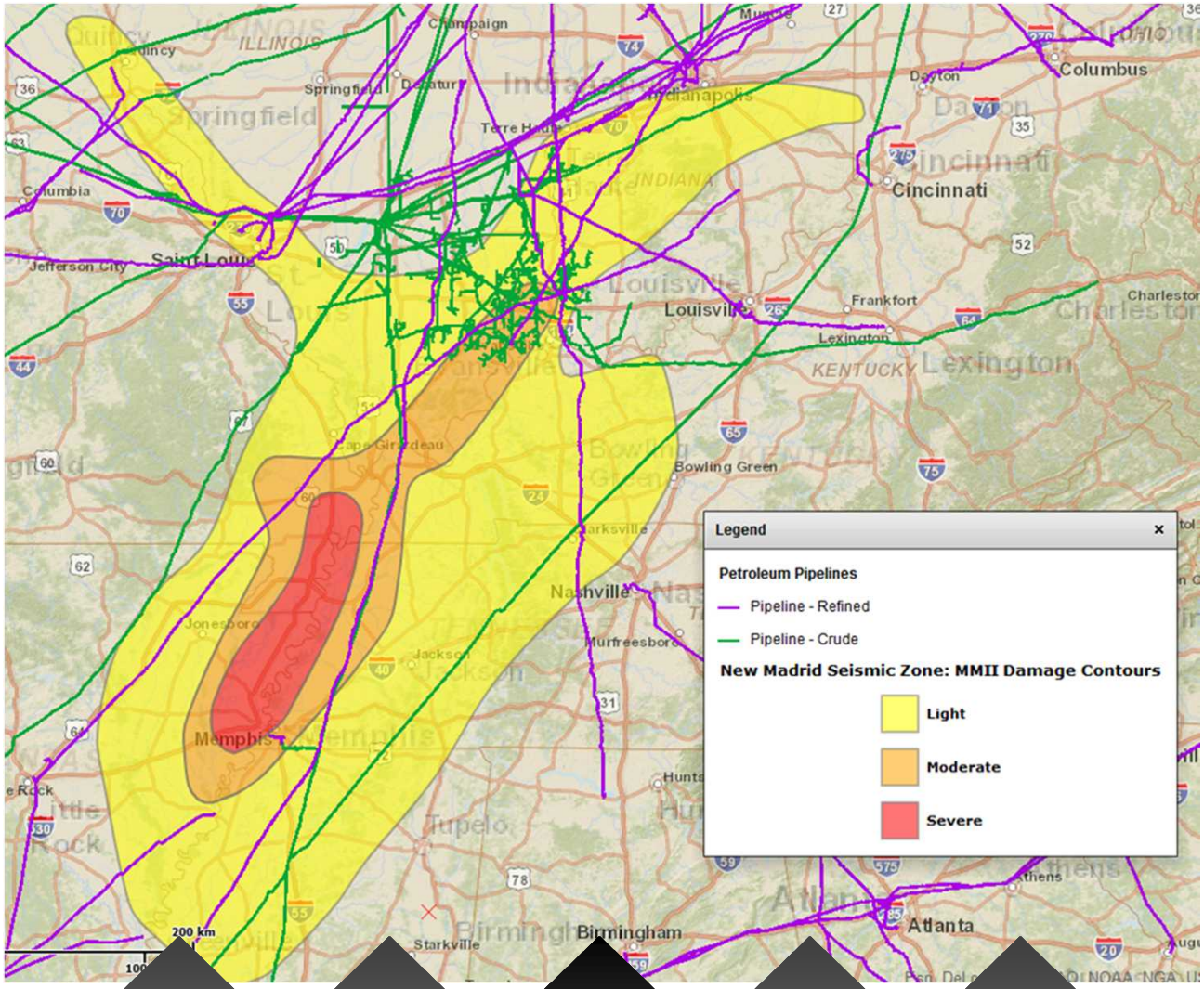
RESILIENCE **IMPROVING ACTIVITIES**

A more resilient system exhibits improved performance





Oil System Earthquake Scenario



Single Disruption | Multiple Disruptions | Case Study | Things we do well | Q&A

The DHS/SNL National Transportation Fuels Model was used for this Scenario

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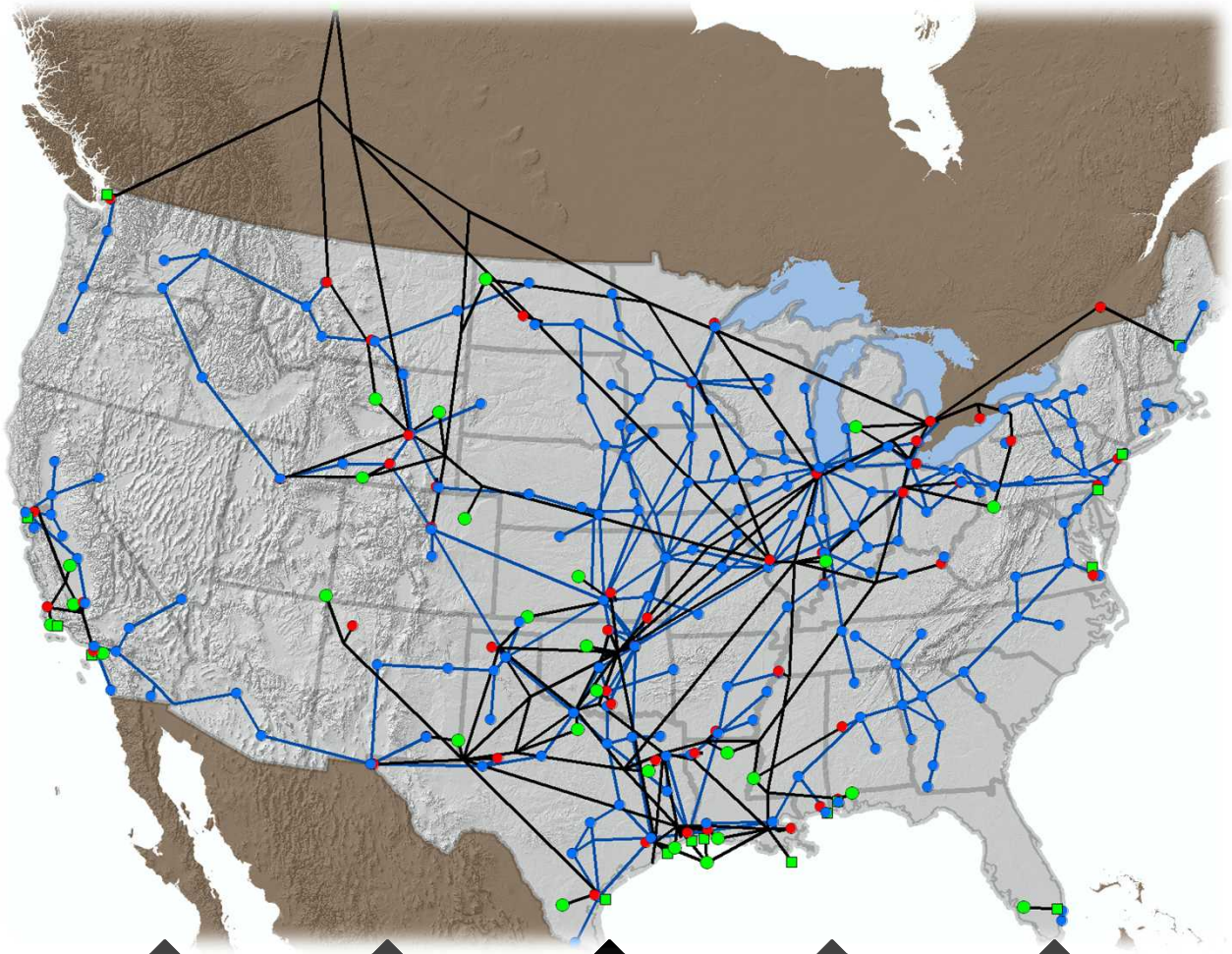
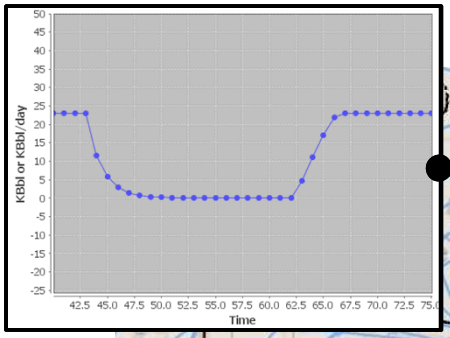
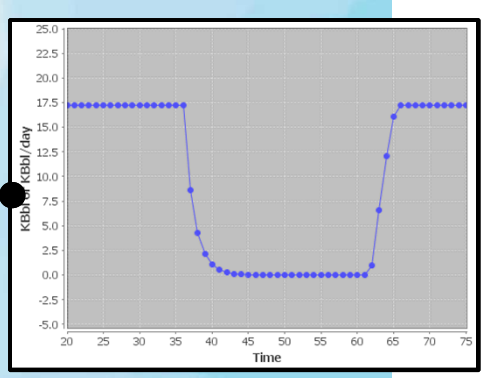


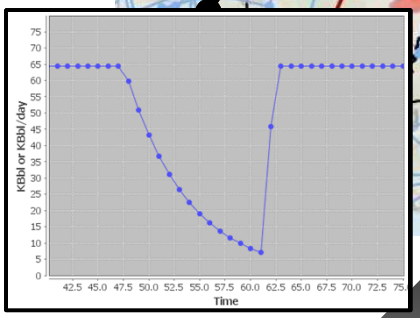
Single Disruption | Multiple Disruptions | Case Study | Things we do well | Q&A

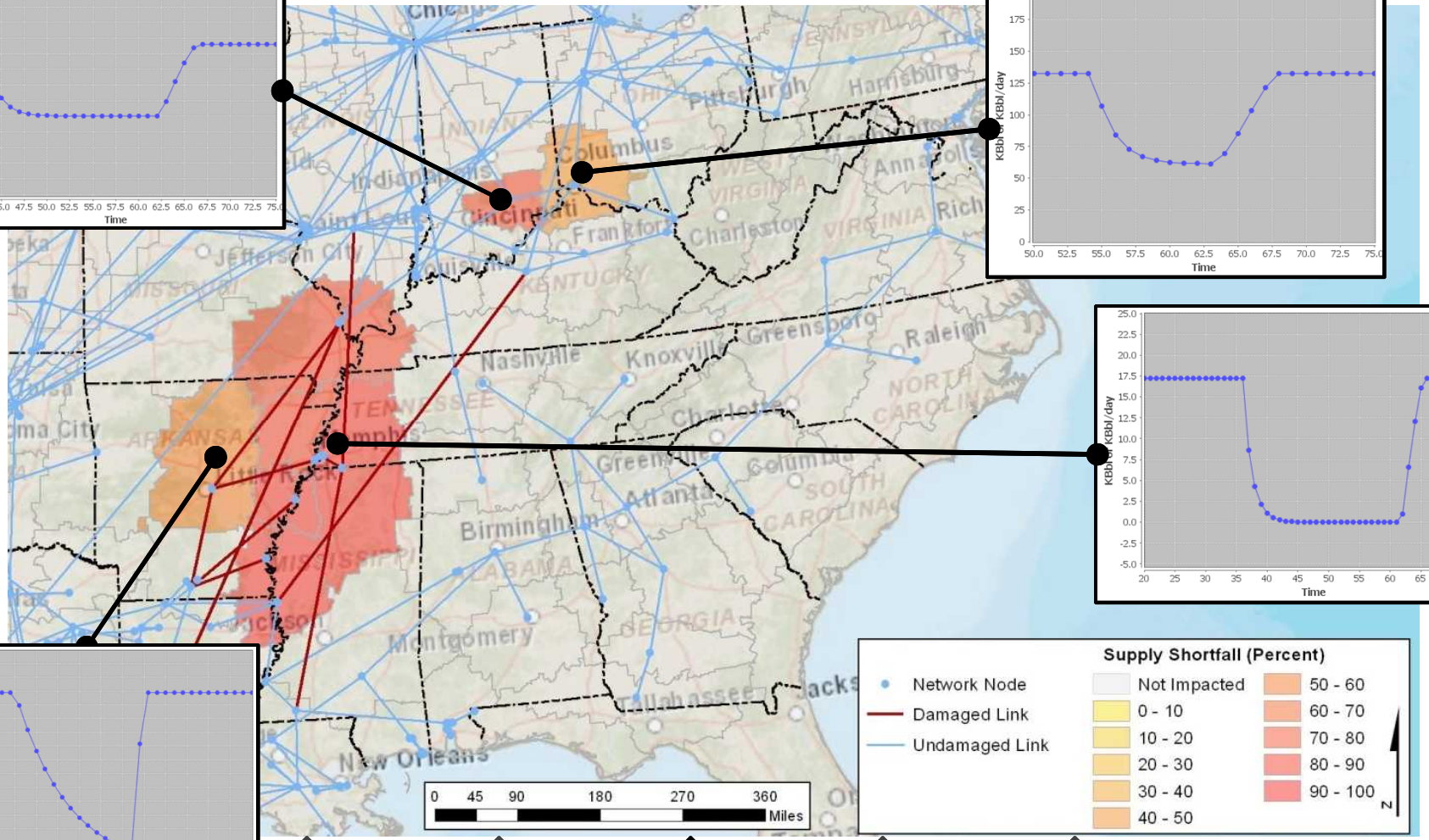
New Madrid Earthquake Fuel Supply Shortfalls

Sandia National Laboratories





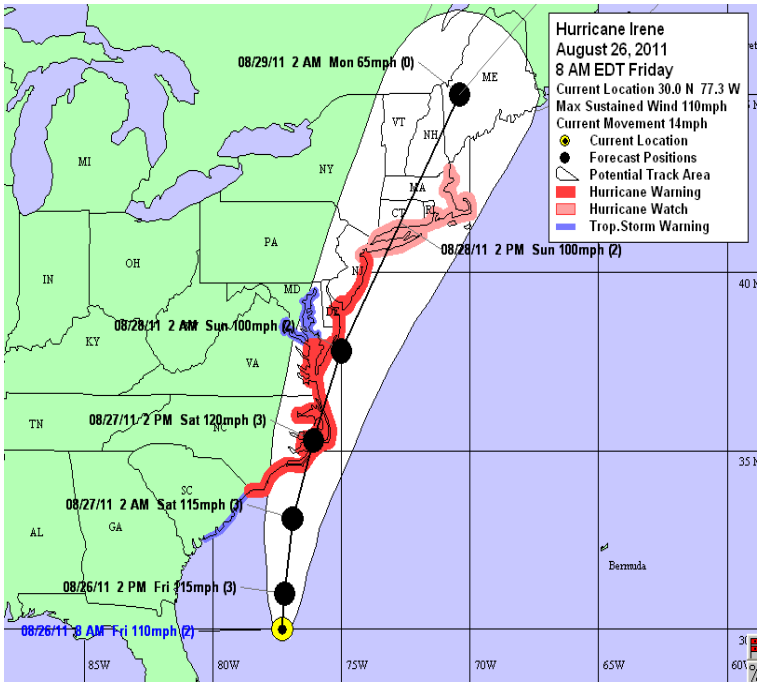




Single Disruption | Multiple Disruptions | Case Study | Things we do well | Q&A

NISAC FAST Analysis Capability

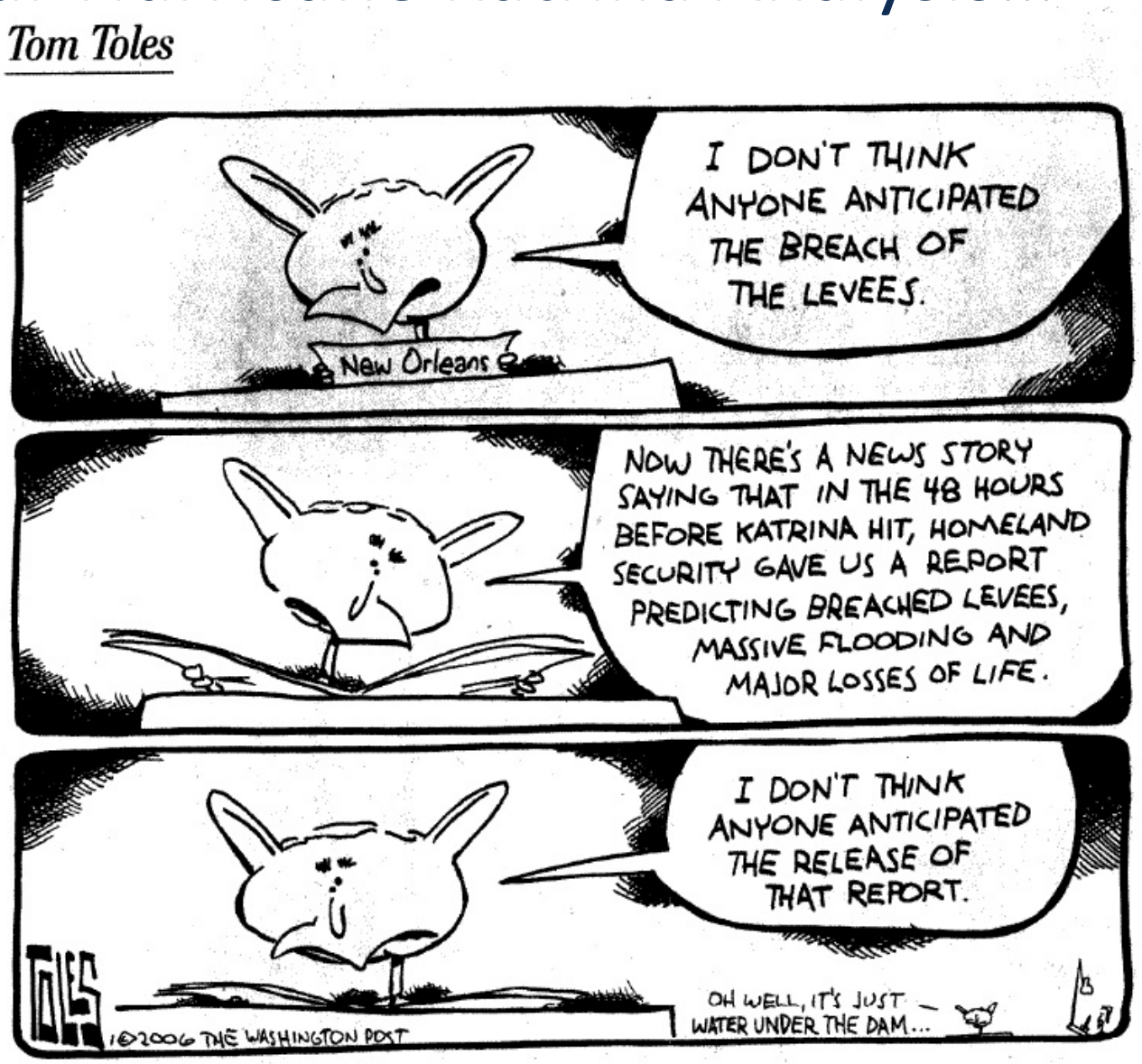
Hurricane Irene Analysis Summary (Before Landfall)



Potential Impacts by Infrastructure Sector

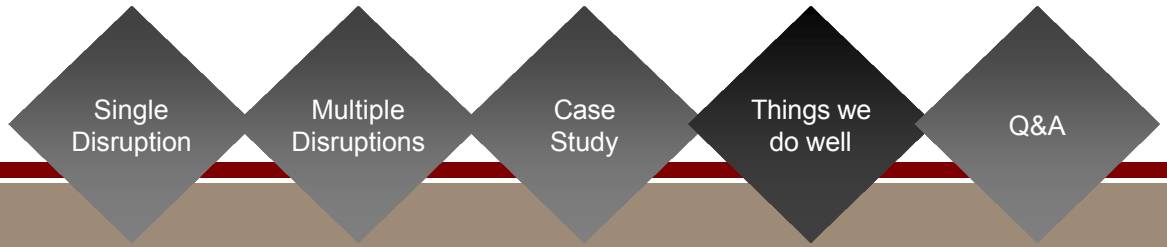
Infrastructure	Local /Regional Impact Level	National Impact Level	Impact (L - Low, M - Medium, H - High)
Food and Agriculture	H	L	Logistical difficulties will make distribution and availability of basic food supplies locally difficult.
Banking and Finance	M	L	Local banking/ATM access disruptions in local outage regions. Delays may occur in processing insurance claims.
Chemical: Plants	H	M	High short-term regional impact (700+ facilities) due to power outages. Potential isolated supply chain impacts.
Dams	M	L	If a dam fails, there will be notable local impacts. No regional or national impacts are expected. There are 256 high-risk dams in the projected Irene wind area.
Emergency Services	H	L	Demand for emergency services is expected to be significant. Some services can be expected to be covered if the National Guard is activated.
Energy: Electric Power	H	L	Restoration time is 4 to 14 days after the damage assessment is completed. 3 generating plants in hurricane zone, no expected national impacts
Information Technology	H	L	Regional effects are high due to key internet facilities in projected surge zone including MAE East, New York International Internet Exchange, Flag Telecom landing.
Hospitals	M	L	27 hospitals in the expected 100% electric power outage area. These are assumed to have some back up generation, which should sustain them unless they run out of fuel; 8 hospitals in > 3 feet surge area, 3 days to evacuate those facilities
Petroleum	M	L	Some disruption could occur due to electric power loss or delay in receiving water shipment. Available fuel stocks are sufficient such that severe shortages of fuel are not expected.
Telecomm: Wireline	L	L	Local calls may be dropped or incomplete. Most impacted area codes: 551 and 201, New Jersey; 646 and 212, Manhattan, 516 and 631, Nassau and Suffolk counties; and 609 in Ocean County.No expected national impacts
Telecomm: Wireless	M	L	Local impacts due to downed towers, misdirected antennas, and failures of battery backup-systems in power outage regions.
Transport: Road/Rail	M	L	Storm surges along the Northern Atlantic states may have a significant regional disruption on rail transport in the short term.
Transport: Airports	H	M	Flooding and power outages at DCA and ORF as well as some level of inundation at all NYC airports could have regionally significant impact and potential national slowdowns in air traffic.
Transport: Maritime	M	M	Direct damage to port facilities and aids to navigation expected as a result of inundation and storm surge. Port of New York/New Jersey heavily impacted by surge.
Water: Drinking Water	L	L	No regional or national impacts expected.
Water: Wastewater	L	L	No regional or national impacts expected.

On Our Hurricane Katrina Analysis…



Things we do well

- Comparative Hazard Analysis
  - What threats should we be most concerned about?
- System Vulnerability Analysis
  - What system features are contributing to a lack of resilience?
- Response Strategy Development
  - What is a better (optimal) response to improve resilience, given constrained resources?
- System Design
  - How can we design the system to overcome weaknesses and spectrum of threats?
- Investment
  - How can we best invest our resources to maximize resilience given the uncertainty of future disruptions?



Sectors we do well

Infectious Disease Risk Assessment

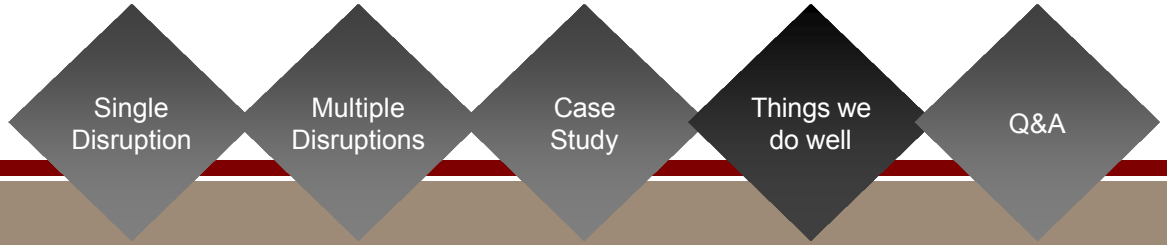
- Helps cities with all phases of infectious-disease risk assessment and resilience planning: modeling disease spread; assessing health infrastructure, hospital-surge, and supply-chain constraints; and designing intervention strategies.

Water Management Planning

- Helps cities with all phases of water management and planning: forecasting water supply/demand given climate uncertainties; and conducting risk assessments on water system interdependencies with other infrastructures.

Energy Resilience Design

- Helps city evaluate its grid interdependencies (transportation, water, and waste systems); identify disasters that pose greatest risks to energy system; and develop simulation-based conceptual designs that can meet city's energy-resilience needs.



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Q&A