Insurance Perspective: Energy Resilience

Energy Master Planning for Resilient Communities
National Academy of Sciences
Washington, DC

Wednesday, December 6, 2017
David R. Tine
Returning to Routine

**Resilience**
The objective of resilience is to help ensure people can overcome a potentially catastrophic event and return to normal life as quickly and effectively as possible. The range of possible precautions includes setting up early warning systems, structural protection, adequate organisation and teaching people how to respond in an emergency situation. This infographic shows that creating a high level of resistance is a dynamic and flexible process.

**Prepare**
What natural hazards can affect me? Am I ready?

Even if an extreme event is not imminent, you should know how to prepare and protect yourself against it and how to respond if it does occur. It is important to be aware of your individual situations.

**Prevent**
How can major losses be prevented?

In many cases, major losses from moderate events can be prevented using early warning means. Avoiding the past is the first step in always the best solution.

**Protect**
How can I better secure my possessions?

Precautions taken by the authorities offer a general level of basic protection. This level can be permanently or temporarily increased for objects especially worthy of protection.

**Recover**
How can I get back to my normal routine?

The most important requirement is that banks, shops and infrastructures are quickly restored to allow reconstruction to begin. A key step must be the opportunity to begin on how things were before the disaster. The situation will require future resilience, bringing us back to the topic of preparedness.

**Respond**
How can I limit the damage?

It is not possible to prevent damage entirely. But it can be minimised by responding appropriately and taking the right steps. The response begins with the early warning, reaches its peak during crisis management, and continues into the recovery phase.

Source: Munich Re Topics GEO 2016
Frequency/Severity/Threat

Resilience

Threat

Frequency

Severity
Insurance Perspective

• Insurance companies are central to the revitalization efforts of communities and businesses as they respond to the effects of natural disasters.

• Two models utilized from the perspective of risk mitigation and insurance:
  - Blackout Risk Modeling
  - Microgrid Reliability Model

“How Reliable is Your Microgrid” by Richard Jones, Public Utilities Fortnightly, July 2015
Blackout Risk Model™

Focuses on the U.S. power grid and incorporates extensive data on four peril categories: Hurricanes, winter storms, thunderstorms, and equipment failure or operator error. Wild fires and terrorism attack loss scenarios can also be tested. This includes:

- **Severe weather events**
- **Electrical grid**
- **Tree proximity to power lines**
Blackout Risk Model™ Hurricane Outage Duration, 5yr return per., 2.47 days average

Source: Blackout Risk Model™
Blackout Risk Model™ Hurricane Outage Duration, 100yr return per., 3.96 days average

Source: Blackout Risk Model™
Blackout Risk Model™ Hurricane Outage Population, 5yr return per., 7,716,839 people impacted

Source: Blackout Risk Model™
Blackout Risk Model™ Hurricane Outage Population, 100yr return per., 25,095,957 people impacted

Outage Population
100yr_Outage_Population
Population_impacted

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Blackout Risk Model™ Winterstorm Outage Duration, 5yr return per., 1.92 days average

Source: Blackout Risk Model™
Blackout Risk Model™ Winterstorm Outage Duration, 100yr return per., 6.45 days average

Source: Blackout Risk Model™
Blackout Risk Model™ Winterstorm Outage Population, 100yr return per., 15,206,691 people impacted

Source: Blackout Risk Model™
Notional Loss Analysis

- Assume $10 Mil of annual BI exposure in all US zip codes
  - This could represent 1 $10 Mil exposure or several smaller exposures totaling $10 Mil.
- 24 hr. waiting period / deductible
- Return period is probability of occurrence
  - i.e. 5 yr is 20% chance in one year
  - i.e. 100 yr is 1% chance in one year

<table>
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<th>Return Period</th>
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<th>Winterstorm</th>
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<td>Average</td>
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Hurricane Harvey Power Outages
Peril Considerations – Flood vs Wind
Munich RE applications
NATHAN & natcatService

Source: Munich Re NATHAN
Loss events in North America 1980 – 2016
Geographical overview (including Caribbean and Central America)

Source: Munich Re NatCatSERVICE
Valuing Resilience: Risk Considerations

1. Risk Modifiers for loss prevention activities
   a) A robust, fast response repair program has a major risk reduction effect for both availability and lost production risk.
   b) Energy storage has a risk reduction benefit.

2. Weather influences need to be considered during design and construction specifications.

3. A Performance Risk Analysis Model can help direct resources to the major risk drivers.

4. Standard property insurance is prudent but system performance insurance may help in funding if performance can be related to revenue.
CONTACT INFO

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Source: Munich Re Topics GEO 2016
Appendix - Standard Insurance Coverage: Loss Valuation

- Equipment Breakdown
- Business Income Extra Expense
- Spoilage Damage Utility Interruption
Appendix: typical risk model results
NY Prize Microgrid: illustration only

Energy Storage (ESS) Duration of 2 Hours – For this situation (modeled in this case only) ESS has significantly less value risk reduction value than the Component Repair Strategy

There is ~ 10% chance that the annual availability will be < 99.96%.

There is ~ 40% chance that the annual Lost Kwh will be < 100.