Siting Energy Storage for Resilient Distribution Systems

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Project Goals:

- Algorithm to design storage, distribution configuration for societal benefit during a long-term disaster.
- Explore semantic graphs for resilient distribution system design.

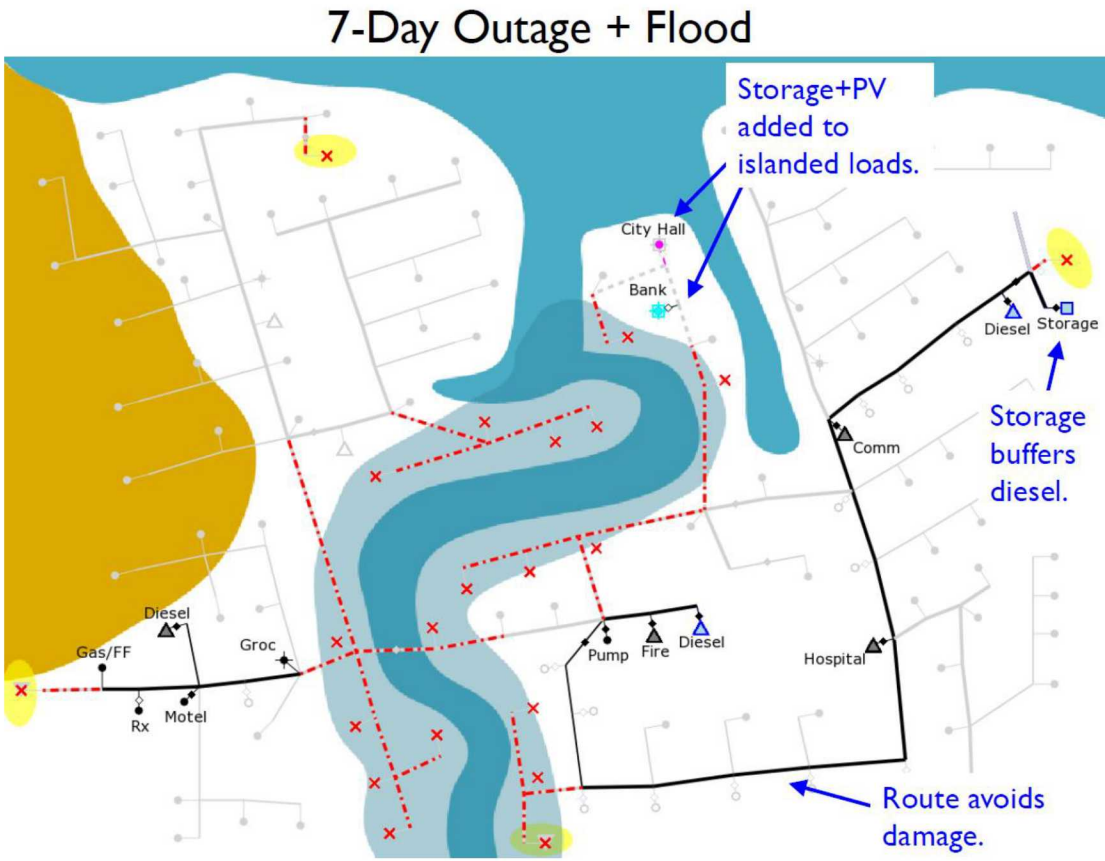
Why Semantic Graphs?

- Highly flexible representation for data spanning mixed topic areas.
- Graph analysis is a strong tool for managing large problem combinatorics.

Results:

- Implemented algorithm using graph techniques to design resilient distribution system response to outage.
- Considers semantics, design outage duration, threat model.

Example:



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Abstract

Natural or man-made disasters can have a significant impact on individuals, families, and society as a whole. A significant contributing factor is disruption to the electrical system. For significant disasters, power can be interrupted for weeks or even months in some areas. In this work, we study the problem of how to equip a feeder distribution system with energy storage and other components to aid resilience and reduce societal impact during a disaster. We explore the application of semantic graph representations, exploiting their capability to represent and analyze information spanning multiple domains (such as societal benefit, electricity model information, geospatial factors, existing and potential infrastructure options, etc), and also their ability to identify incisive toplogical constraints to reduce the size of the problem space. We report an initial implemented algorithm demonstrating these capabilities on a multi-faceted example.

Randy C. Brost

Biographical Information

Dr. Randy Brost is a technical staff member at Sandia National Laboratories pursuing computer science research in a variety of topics. He received his Ph.D. in Computer Science from Carnegie-Mellon University in 1991, and performed robotics research at Sandia National Laboratories until 1997. He then served at Eastman Kodak Company until 2007, implementing a variety of custom software tools supporting advanced manufacturing, metrology, and physics analysis. He then joined SkyFuel, a concentrating solar power company, where he helped develop utility-scale solar collectors, and applied computational methods to optimize new solar collector designs. He returned to Sandia in 2011.