Using Residential Customer Experience to Improve Power Systems Resilience

By Bivek Gurung
Candidate for Master of Science in Industrial Engineering

Abstract

Large scale power outages can have severe negative impacts. The August 2003 power outage in the North East of the United States lasted for 31 hours, affected approximately 50 million people, and cost between $4 billion and $10 billion in the U.S. To prevent and mitigate these impacts, adequate economic and technological investments needs to be made in different areas of the power system. These investment decisions are made with the help of power system reliability assessment, i.e. assessing the benefits of reliable supply of power to a consumer, which is equivalent to the economic impact of power outage to a consumer. However, the assessment is often limited to short term economic impacts, and does not incorporate other impacts of power outage, such as social impacts. There is a need for a more complete impact assessment model that allows assessment of economic and social impacts of power outages for all consumers beyond the initial failure event.

To incorporate social impact in power system reliability assessment, social impact assessment of power outage is necessary. However, there is a lack of social impact research in the literature on power systems. To fill this void, and to provide a base for future research, the objective of this study was to identify and understand social impacts such as health impacts to a residential consumer. To that end, a survey analysis was used to evaluate the influence of different consumer and outage characteristics on consumer’s perception regarding the likelihood of occurrence of certain health impacts due to a power outage event. A total of nine hypotheses were developed to support the research objectives. An internet survey was created to collect data to test the nine hypotheses. The population of interest was the U.S population, age 18 years and above. Initially, 399 responses were collected, which was later reduced to 387 responses. The analysis performed indicated that five variables influenced the likelihood of occurrence response for all given health impacts, and the rest of the variables influenced the response for certain health impacts.

The results from this study show that consumers are aware of health impacts that can occur due to power outage, and likelihood of occurrence of certain health impacts are influenced by consumer and outage characteristics. The results from this study help partially fill the void that was missing from power outage research and provides a basis for future research. Future research can provide decision support information for prevention and mitigation of impact during power outage events. Future research can also provide information to guide investment and policy decisions, and improve overall situational awareness within power systems. Such improvements would increase and thus help in the diffusion of grid technology by improving consumer trust in utility.

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