



# Reliability Insurance and the Value of Flexibility in the Changing Electric Power Industry

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# Economic Aspects of Sensing Technologies

- Benefit-cost analysis
- Valuation of using technology to avoid failures due to large events
- Comparison of this value to cost of maintaining reserve margins
- Ability of reliability insurance to provide decentralized reliability mechanism
- Infrastructure requirements to enable decentralized reliability



# Valuation of Benefits of Sensing Hardware/Software

- Ability to avoid large-event-induced failures
  - Supply: enables islanding to avoid cascading failure
  - Demand: large variations connected with equipment failure (can sensing prevent this failure, or just make it easier to find them ex post?)
- Fault detection: prevention cheaper than recovery
- Automation of routine maintenance tasks increases reliability
- Enhanced resilience if coupled with repair processes
- Reduces entry barriers for DG and demand participation



# Valuation of Costs of Sensing Hardware/Software

- Implementation, purchase costs
- System integration
- Others?



# Net Benefit Comparison

- Net benefit = benefits-costs
- How does net benefit of sensing compare to cost of maintaining reserve margins?
  - Opportunity cost of foregone sales + cost of additional generation construction
- Can sensing technology enable us to increase load factor while simultaneously increasing reliability?
- Others?



# Sensing and Differentiated Reliability

- Claim: end-use customers have different preferences over reliability, and different risk preferences
- Sensing technology further enables the sale of reliability as a differentiated product, thus increasing economic surplus
- Selling differentiated reliability further contributes to network resiliency, even at higher load factors



# Reliability Insurance

- A contractual means of selling differentiated reliability
- Customers “buy their place in line”
- In the process, customers reveal valuable, heretofore unknown, information about how they value reliability



# Infrastructure Requirements

- Distributed sensing and control technologies
- Others?





# Conclusion

- Valuing the implementation of sensing technology is difficult
- Some of the unseen value relates to enhanced reliability through products like reliability insurance
- The benefit of reduced transaction costs => more robust, integrated competitive markets is hard to quantify
- More research is needed!