

Study on the Model for the Cascade and the Resilience of Electric Power Supply System

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Research Objectives

Electric Power Supply System (EPSS) is the backbone of modern societies. Its serviceability is significant to the security and sustainability of communities being much more sophisticated and integrated than before. Unfortunately, as exemplified by many incidences during the recent history, the EPSSs were shown to be vulnerable under natural hazards as well as the random failures. Consequently, serious economic and societal losses of the community would be aroused. More importantly, due to the intrinsic characteristics of EPSS, a seemingly not serious local damage can propagate and lead to a phenomenal global failure of the system and even other connected infrastructure systems.

Against this backdrop, the adaptive mitigation strategy for the potential cascade within the damaged EPSS will firstly be investigated in this project. Furthermore, the recovery process of the corresponding EPSS will then be consider and modeled.

Research Roadmap

For the ongoing project, the Agent-Based Modeling approach is powerful and will be employed to fulfill our goals.

Specifically, the predefined agents include the set of different technical components such as the generation substation as well as the

distribution substations within EPSS, and the non-technical component like operators or emergency administrators.

The interaction rules between the non-technical agent and different technical agents shall also be predefined in a rational way.

Accordingly, the proposed framework will be applied on the example network and the results will be examined and discussed finally.

Reference

Schlaepfer, M. et al. Reliability Analysis of Electric Power Systems Using an Object-oriented Hybrid Modeling Approach. *Proceedings of the 16th Power Systems Computation Conference, Glasgow, 14-18 July 2008*