Technology Innovation Project

Project Brief

TIP 243: RESILIENCE ASSESSMENT FOR BULK POWER SYSTEMS

Context

A system approach to transmission system security is not entirely new to BPA, having just recently undergone a rigorous process to conform to NERC CIP regulations aimed at preserving transmission system functioning under extreme duress. That process, a response to the terrorism of Oklahoma City and the World Trade towers, aimed to create priority pathways that ranked facilities in terms of their importance to system electrical reliability. Electrical "system hardening" received due emphasis and enlightened both the security and transmission communities on how difficult it is to assess system risk and rank system component criticality – and then apply adequate protection methodologies. This project, extending and adding nuance to the understanding of whole-system risk, introduces a new and important element -- cost/benefit. The goal is to be able to accurately assess the risk and resilience of a bulk power system across a broad spectrum of threats, along with the ability to perform "what if" analyses to evaluate the costs and benefits of various investment strategies intended to enhance the resilience of the system and to decrease overall risk. Here, impacts and economic costs of decreased functionality, resource needs associated with recovery, and resilience issues and enhancements will point to the correct investment decisions to make for whole-system hardening along with the necessary electrical considerations. This project is a big step forward in fully understanding how to protect the BPA system.

Description

Physical protection of important, individual assets is the primary means through which critical infrastructure protection practices are applied. For distributed network systems, such as bulk power systems (BPSs), it may be inefficient, or even infeasible, to protect all assets, all of the time, from all threat events. This document describes a proposal to develop a systems-based analytical capability that evaluates high-consequence disruptive incidents, critical system components (e.g., SCADA systems, substations, etc.), system dependencies, and industry practices to assess the security and resilience of bulk power systems. This capability can be used to complement existing physical security practices, resulting in a more efficient use of limited resources and decreased risk to the overall bulk power system.

Why It Matters

1. Objective investment evaluation: This capability will provide analytic metrics for objectively evaluating how investments decrease risk and enhance resilience of the electric grid.
2. Development of enterprise-wide solutions: By taking a systems-based perspective, the capability will be developed to represent how investments improve overall systems performance, enabling the development of "enterprise-wide" solutions instead of asset- or site-specific solutions.
3. Enhanced contingency action planning: This capability will integrate prevention, protection, and recovery into a unified framework that will provide enhanced contingency planning.

Deliverables

At project end, Sandia National Laboratories will draft a project report that describes the model development, testing, and analyses performed as a part of this project. If Sandia develops journal papers related to this topic, Sandia will share them with BPA. External publications will not require any proprietary Bonneville data or information.

Goals and Objectives

The end result of the project will be the development of a modeling and analysis capability that can be used to evaluate whole-system risks to a bulk power system. The capability can be used to assess the risk and resilience of a bulk power system across a broad spectrum of threats. Furthermore, one can perform a series of "what if" analyses to evaluate the costs and benefits of various investment strategies intended to enhance the resilience of the system and to decrease overall risk.

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Project Start Date: Oct 1, 2011

Project End Date: Sept 30, 2012

Funding

Total Project Cost:	$515,000
BPA Share:	$ 15,000
External Share:	$500,000
BPA FY2012 Budget:	$ 15,000

Participating Organizations

Sandia National Laboratories

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