GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

Dynamic Contingency Analysis for Cascading Failures

CHALLENGE

Cascading failures on the grid occur when a sequence of events results in an uncontrolled chain reaction, leading to widespread blackouts. On guard for warning signs, grid operators analyze the system to study whether or not certain events will result in cascading failure. However, traditional grid planning tools struggle to model extreme events that are less likely to occur. The simulated scenario can overwhelm the software algorithms, making it difficult to distinguish between a dangerous sequence of events that could lead to a widespread blackout, or simply a problem with the modeling tool.

SOLUTION

With funding from DOE's Office of Electricity Delivery and Energy Reliability and in partnership with the Electric Reliability Council of Texas (ERCOT), Siemens, and the Electric Power Research Institute, PNNL developed the Dynamic Contingency Analysis Tool, or DCAT. DCAT uses cascading failure analyses to screen for weak spots on the grid, evolving beyond previous "steady-state contingency analysis" tools to "dynamic analysis" to simulate the sequences of cascading outages. It integrates dynamic models with protection schemes for generation, transmission, and loads, as well as other automatic or manual corrective actions that would be implemented during the response to the event.

DCAT allows operators to adjust power delivery and avoid domino effects that could lead to critical outages and impacts.

IMPACT

The additional modeling detail enabled by DCAT provides a more realistic assessment of system reliability. With DCAT, electrical utility companies can identify power instability during extreme events, and have a greater chance of stopping a domino effect of power loss that can lead to a blackout. The information is also valuable for system planners to reinforce weak spots in the system and lessen the chance for recurring instability.

Contact
Jeff Dagle, Pacific Northwest National Laboratory
jeff.dagle@pnnl.gov or 509.375.3629

In November 2014 the U.S. Department of Energy launched the GMLC, a strategic partnership between DOE and the national laboratories to bring together leading experts and resources to collaborate on national grid modernization goals.

This integrated effort builds on prior individual projects at the national laboratories to deliver grid-related advancements, such as the **Dynamic Contingency Analysis Tool**.