

# **New system trains good grid operators with bad data**

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Power grid operators now have the ability to train like pilots, with simulators providing faulty readings designed to throw them off. Such misleading data and resulting loss of "situational awareness" was identified as a major cause of the August 2003 blackout – which cost the country between \$4 billion and \$10 billion. Better training to identify and resolve bad data was one recommendation in the final report on the August 2003 blackout.

Researchers at the Department of Energy's Pacific Northwest National Laboratory, looking to train grid operators to recognize bad information due to instrument failure or malicious hacking, were surprised to learn from vendors that this wasn't standard industry practice for hands-on training simulators currently used by the electrical transmission industry.

AREVA T&D, one provider of transmission and distribution products including grid simulator software, agreed to work with PNNL to create specific scenarios for the simulation of misleading, false data. Now, it's possible to intentionally insert false data and manipulate grid conditions to create plausible bad information conditions. PNNL researchers are able to study the response of operators dealing with conflicting or bad data both before and after receiving the training.

"We've seen how undetected faulty readings can cause the electrical system to crash, just like they can cause a plane to crash," said Jeff Dagle, an electrical engineer supporting this project. "However, pilots are trained to cross-check their instruments by comparing pertinent

information from each to their mental model of the big picture."

The hands-on training curriculum developed at PNNL can do the same thing for the nation's power grid operators when they drill emergency scenarios.

To demonstrate the new curriculum, PNNL asked seasoned operators from the Bonneville Power Administration to participate in a pilot training class. Simulations included malfunctioning instruments or fake signals sent by hackers to get a baseline response. Then operators received training on cyber security and awareness of the threats hackers can pose to the grid which was followed up with another "shift" in the simulator.

"We found that once operators became aware of the very real potential for bad information, they were better able to come up with new courses of action and troubleshoot faster when confronted with a situation that could lead to widespread power outages," said Dagle.

However, researchers found the responses of operators varied significantly, indicating that more rigorous training in this area would provide a standardized approach for emergencies involving compromised data.

Dagle addressed the software, curriculum and the need for simulations like these at the Institute of Electrical and Electronics Engineers Power Engineering Society meeting in Montreal on June 21.

"We believe this work advances the state of the art for grid operator training," said Dagle. "We feel it has a place in ongoing certification processes and we hope that electric utilities and DOE will take advantage of the training to prevent blackouts through better situational awareness."

Source: Pacific Northwest National Laboratory

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