U.S. DEPARTMENT OF ENERGY | Office of Cybersecurity, Energy Security, and Emergency Response

Cybersecurity for Distance Relay Protection

Pacific Northwest NATIONAL LABORATORY

Protecting distance transmission relays by mitigating risks

The project team is helping to protect distance transmission relays by defining the taxonomy of relay protection functions and associated communications, identifying use cases describing approaches to reduce the cyberattack surface on those protective relays, and evaluating loss of operational capability as a consequence of various changes to communication coverage. Mitigating controls will be evaluated to understand if there are other approaches to reduce attack surfaces while maintaining communications. The team will also complete a modeling effort that supports testing at Western Area Power Administration's Electric Power Training Center.

KEY TAKEAWAYS

- Identifies protective relay functions with communications capabilities that are potentially vulnerable to remote cyberattack
- Reviews key transmission relay function interfaces to see which should be isolated from communication
- Uses peer-to-peer communication to make fast relay tripping decisions that help maintain grid stability and minimize physical damage

OUTCOME

The project identified five promising techniques for future research that can help to balance the risks of cyberattack and slow fault clearing: evaluate the performance of relaying schemes that may be less dependent on reliable peer-to-peer communication; develop new methods of monitoring distributed physical attacks on the grid; implement a scalable public key infrastructure for electric utility systems; evaluate the benefits of software defined networking and software defined radio to secure communication between relays; and test the situational awareness, operator response times and other human factors in realistic scenarios. The team published a final report "Cybersecurity for Distance Relay Protection" at https://www.osti.gov/biblio/1602545.

PARTICIPANTS	ROLE
Pacific Northwest NATIONAL LABORATORY	Analyzes the roles and vulnerabilities of communications in transmission line fault protection. Develops test plans and simulations to illustrate the differences.
Western Area Power Administration	Provides electric utility review and hosts tests at the Electric Power Training Center's Miniature Power System.

CONTACT INFORMATION

Initial Leads:

Carol Hawk
Program Manager

Tom McDermott
Principal Investigator
Pacific Northwest National Laboratory
509-375-4434
Thomas.McDermott@pnnl.gov

Current Contact as of February 2020:

Akhlesh Kaushiva
Senior Technical Systems and Cybersecurity Advisor
Department of Energy (DOE)
Office of Cybersecurity, Energy Security, and Emergency Response (CESER)
202-287-6062
Akhlesh.Kaushiva@hq.doe.gov

Period of Performance: November 2018 – January 2020

Total Award Value: $200,000
DOE Share: $200,000
Cost Share: $0

CYBERSECURITY FOR ENERGY DELIVERY SYSTEMS (CEDS)

CEDS projects are funded through DOE CESER, which aims to enhance the reliability and resilience of the nation's energy infrastructure by reducing the risk of energy disruptions due to cyberattacks.

Website: https://www.energy.gov/ceser

Date Written: June 2021