Smart Reconfiguration of Idaho Falls Power Distribution Network for Enhanced Quality of Service

CHALLENGE

Severe weather conditions during winter impact the power grid's transmission and distribution infrastructure, disrupting power delivery to consumers. Idaho Falls Power (IFP) relies on the surrounding transmission system to supply 75% of the town's demand for electricity. The connection between the transmission system and IFP offers limited redundancy, making IFP vulnerable to events and vandalism that impact this connection. Moreover, no advanced measurement devices are currently used to monitor the IFP grid. Small "run-of-the-river" hydropower plants connected to the IFP grid can serve about 25% of the total load demand, but if a disconnection occurs, they cannot operate. Thus, the impacts from transmission-level events on reliability are very high.

APPROACH

In this project, North Western Smart Reconfiguration and Protection System (NWSRPS) aims to test the use of advanced methods for enhancing the quality of power service for the IFP distribution network, located in Idaho Falls. The project uses real-time software simulations and real-time Hardware-In-the-Loop (HIL)-based testing, as well as experimentation to develop methods for smart reconfiguration, smart islanding to forma microgid, and intelligent demand response using the loads as a resource.

A centralized controller will ensure critical loads are served and stable islanded operation is achieved by implementing smart reconfiguration procedures and sending commands to the IFP grid's run-of-the-river hydropower plant. The protection system and control will use advanced-measurement devices such as distribution phasor measurement units and will allow more efficient use of system components while operating within safety margins. A systematic approach will be developed to formulate a baseline for the development of power system control algorithms and reliability calculations. The testing will be done using HIL and will include a communication layer that emulates network latency issues. Reliability and resiliency measurements and comparisons will be done for the upgraded system against the baseline to quantify improvements.

At-A-Glance

PROJECT LEADS

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PARTNERS

- Idaho Falls Power
- Schweitzer Engineering Laboratories
- Washington State University

BUDGET

$1 million

DURATION

June 2016 – December 2017

TECHNICAL AREA

System Operations and Control

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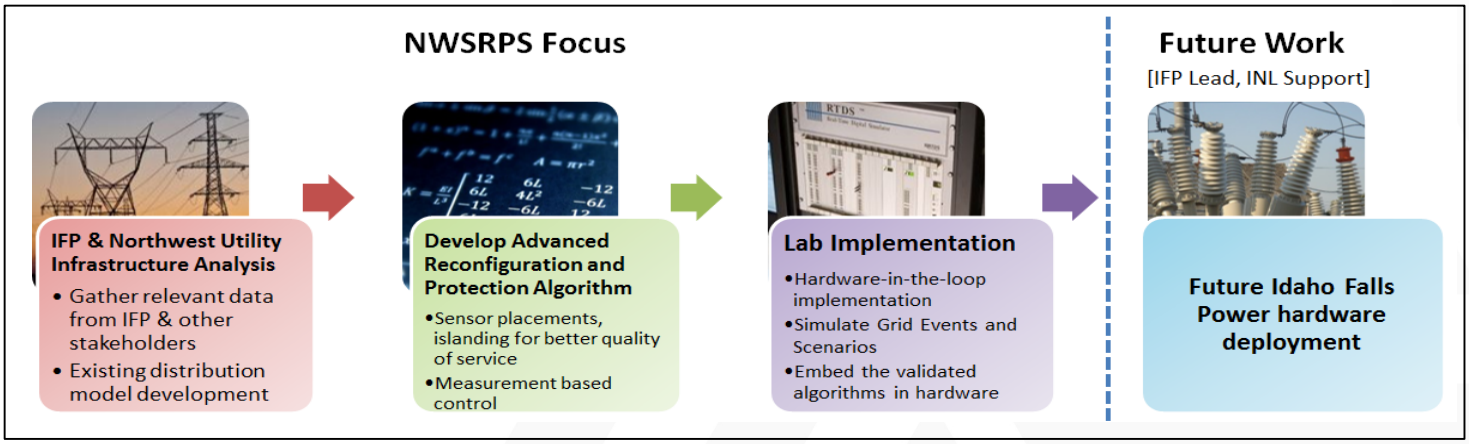
EXPECTED OUTCOMES

Intelligent algorithms and controls will enable the formation of critical load microgrids based on measurements such as synchrophasors, the reconnection of the microgrid with the transmission system, and the restoration of the entire IFP system . The reliability of the IFP grid will be improved by providing faster response and pathways for maintaining utility supply to critical loads during the emergencies. The methods developed under this project will be adoptable for other similar utilities that have high dispatchable energy resources and harsh weather conditions. Successful testing of the NWSRPS Project through HIL simulations will be useful for guiding future decisions related to hardware required for improving the quality of service provided by IFP.



LAB TEAM

Idaho National Laboratory

Pacific Northwest NATIONAL LABORATORY

Launched in November 2014 under the U.S. Department of Energy's Grid Modernization Initiative, the GMLC is a strategic partnership between DOE Headquarters and the national laboratories, bringing together leading experts and resources to collaborate on national grid modernization goals. The GMLC's work is focused in **six technical areas** viewed as essential to modernization efforts:

Devices and Testing | Sensing and Measurements | Systems Operations and Control
Design and Planning | Security and Resilience | Institutional Support