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Summary of the PROGRESS MATRIX Project

December 4, 2024

Jim Follum

U.S. DEPARTMENT OF ENERGY BATTELLE

PNNL is operated by Battelle for the U.S. Department of Energy

PNNL-SA-204503

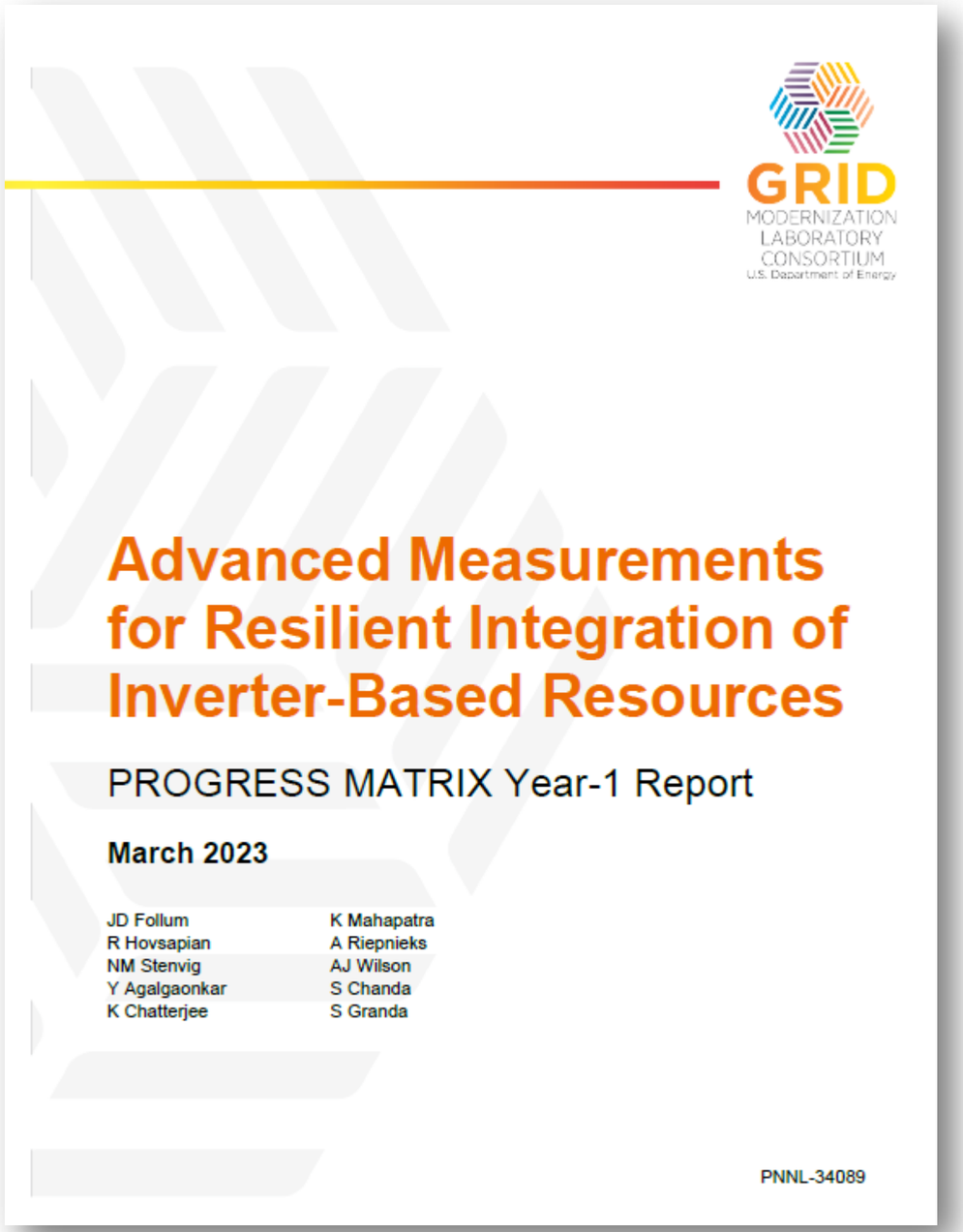
Project Summary

- April 2022 – June 2024
- Jointly funded by DOE's Office of Electricity (OE) and Solar Energy Technologies Office (SETO)
- Joint effort between PNNL, LBNL, ORNL, and NREL with cost share from McEachern Laboratories and contributions from Lingling Fan of the University of South Florida
- Objectives:
  - Develop advanced measurement capabilities and analytics
  - Accelerate adoption of IBRs
  - Improve the reliability and resilience of the bulk power system

Approach

GridSweep deployed in Hawaii

- Gap analysis
  - Survey of utility partners' measurement capabilities: BPA, WAPA, KIUC (Kaua'i, Hawaii)
  - Review of measurement-based IBR application requirements
- Distribution grid probing and waveform measurement with the GridSweep instrument
- Application, software, and testbed development



Advanced Measurements for Resilient Integration of Inverter-Based Resources

PROGRESS MATRIX Year-1 Report

March 2023

JD Follum, R Hovsapian, NM Stenvig, Y Agalgaonkar, K Chatterjee, K Mahapatra, A Riepnieks, AJ Wilson, S Chanda, S Granda

PNNL-34089

Year-1 report containing gap analysis

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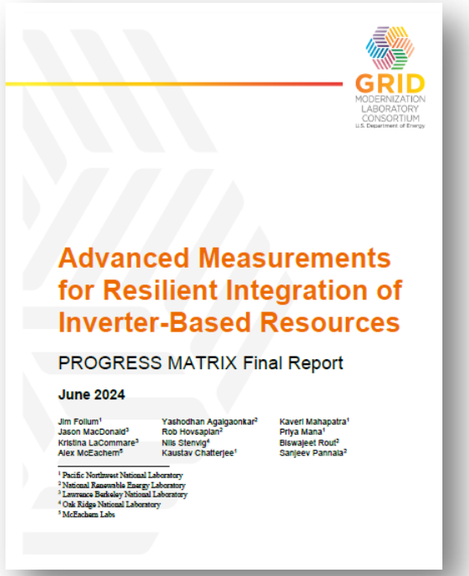
Outcomes



Final report coming soon

Analytics

Measuring Apparent Impedance: Feeder Instability Risk Evaluation

Disturbance Monitoring and Analysis

- Frequency Characterization and Event Detection
- Oscillation Detection and Mitigation
- Disturbance Monitoring
- Analyzing Disturbances with PMU and Triggered POW Measurements
- POW-Based Event Detection and Characterization

Power Plant Evaluation

- Automated Frequency Response Analysis
- Automated Voltage Response Analysis
- Voltage Schedule Tracking

Model Development and Analysis

- Measurement-Driven Power Plant Modeling
- Distribution Grid Models with High IBR Penetration
- EMT Model Calibration and Validation

GridSweep Hardware

Field Deployment

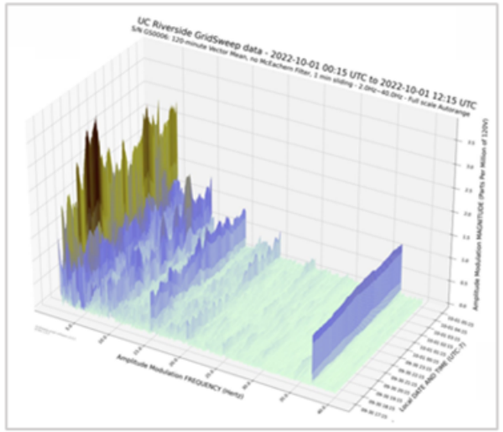
GridSweep

- Dominion Energy
- U.C. Riverside

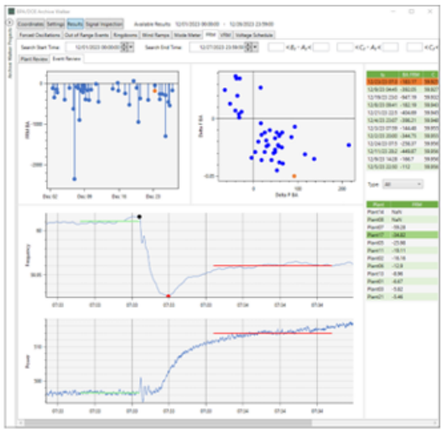
Generator Scorecard

- Bonneville Power Administration

Software

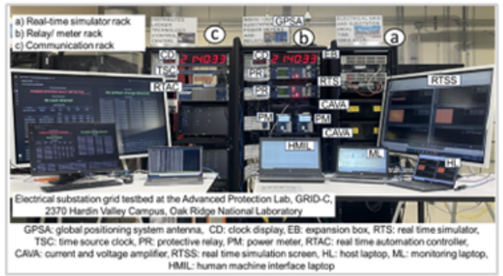


GridSweep Graph Tool

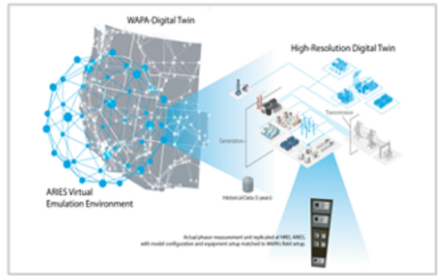


Generator Scorecard

Testbed Development and Demonstration



Electrical Substation Grid Testbed



Advanced Research on Integrated Energy Systems (ARIES)

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Thank you