Fairbanks, Alaska

Energy Technology Facility: Power Systems Integration (PSI) Laboratory

Laboratory system integration testing with power levels and system architecture representative of small-to-medium sized microgrids.

The PSI Lab operates on the same scale as an Alaskan village power system and has the ability to be modified for individual test scenarios. The lab emulates an isolated hybrid-diesel grid at up to 500 kW of permanently installed capacity and potential capacity of several MW. The lab transforms a potentially chaotic field testing environment into a continuously improving process for optimizing efficiencies. The R&D and testing capabilities of the PSI Lab are complemented with experienced faculty and staff providing engineering and research services from energy analysis, and design development and review, through full-scale in-system R&D, product testing and hardening.

Expertise

The PSI program and lab have excellent capabilities for research, testing, and education in the integration of new technologies and alternative as well as intermittent energy generation sources into existing diesel microgrids. We have partnered with government and defense agencies, various research entities and industry to provide a controlled environment for a broad range of product testing and development, capable of closely mimicking a real-world environment. The PSI team has expertise and provides consultation for deployment of equipment into remote and/or islanded microgrids. We conduct design reviews, data analysis, model development, hardware/software R&D, systems integration, in-system R&D and testing and professional training.

Project examples include next generation utility energy storage such as innovative battery systems and flywheel technology, diesel-off operation, power electronics development and testing, and model verification.

Infrastructure

Diesel Gensets:

- 320 kW Caterpillar C-15
- 125 kW Detroit

Emulators:

- 100 kW wind turbine emulator
- 100 kW photovoltaic emulator
- 3-phase 480 V fault emulator
- 250 Amp Line Impedance Emulator

Electrical Energy Storage:

- 220 KWh / 600 kW / 719 VDC Lithium-ion Battery Storage System
- 11 kWh/33 kW lithium-ion battery
- 313 kVA ABB PCS100 Energy Storage Inverter

Programmable Load Banks:

- 2 - 250 kW Resistive/Reactive (AC)
- 1 - 300 kW Resistive (AC) w/ single phase load capability
- 1 - 55 kW Resistive (AC)
- Various kWs DC Load Banks

Power Supplies:

- 64 kW / 1000 VDC Bidirectional DC Power Supply
- 50 kVA Bidirectional AC Grid Simulator

Other Equipment/Services:

- Flexible 12-station 600 A - 480 VAC 3-phase bus
- ABB Distributed Control System MGC 600
- Woodward Easy-Gen generator control system
- Supervisory control and data acquisition (SCADA) system developed by ACEP
- Portable data acquisition equipment including scopes and power analyzers
- Battery system analyzers, and chargers
- Hardware-in-the-Loop equipment: Opal- RT OP5707 Real-Time Digital Simulator
- Elspec G4K High Resolution Power Quality Analyzer
- Kral BEM500 Diesel Fuel Measurement System

Contact

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