NREL NATIONAL RENEWABLE ENERGY LABORATORY | ENERGY SYSTEMS INTEGRATION FACILITY

U.S. DEPARTMENT OF ENERGY

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Power Systems Integration Laboratory

At NREL's Power Systems Integration Laboratory in the Energy Systems Integration Facility (ESIF), research focuses on developing and testing large-scale distributed energy systems for grid-connected, stand-alone, and microgrid applications. The laboratory can accommodate large power system components such as inverters for photovoltaic (PV) and wind systems, diesel and natural gas generators, battery packs, microgrid interconnection switchgear, and vehicles. Closely coupled with the research electrical distribution bus at the ESIF, the Power Systems Integration Laboratory will offer power testing capability of megawatt-scale DC and AC power systems, as well as advanced hardware-in-the-loop and model-in-the-loop simulation capabilities. Thermal heating and cooling loops and fuel also allow testing of combined heating/cooling and power systems (CHP).

Laboratory Specifications

- 8,600 sq. ft. - space enough for three 40 ft. and three 20 ft. ISO containers
- 30 ft. high ceilings
- 30 ft. high overhead roll-up doors
- In floor carbon monoxide exhaust systems
- Diesel storage tank
- AC and DC power source
- Service connections include:
  - *Process cooling water*
  - *Process heating water*
  - *Research cooling water (chilled water)*
  - *Natural gas*
  - *Compressed Air*
  - *480 / 277 Vac*
  - *208 / 120 Vac*
  - *240 Split-phase Vac*

Application Scenarios

Hardware-in-the-loop experiments:

- Development of control algorithms for power electronics
- Simulation of grid conditions for development and evaluation of power system components and systems

Power system integration:

- Development and evaluation of optimal dispatch algorithms
- Development and evaluation of communication interfaces

Prototype testing:

- Electrical interconnection testing (i.e., IEEE 1547, UL 1741 type of tests)
- Advanced functionality testing (i.e., IEEE 1547.8, IEEE 2030 capability tests)
- Electrical performance testing (efficiency, maximum power)
- Safety testing
- Model validation testing
- Long duration reliability testing

Partner with Us

Work with NREL experts and take advantage of the state-of-the-art capabilities at the ESIF to make progress on your projects, which may range from fundamental research to applications engineering. Partners at the ESIF's Power Systems Integration Laboratory may include:

- Manufacturers of distributed generation and microgrid system components (e.g., PV inverters, microgrid switches, batteries, generators)
- Utilities
- Microgrid and stand-alone power system integrators
- Certification laboratories
- Government agencies
- Universities
- Other National laboratories

Contact Us

If you are interested in working with NREL's Power Systems Integration Laboratory, please contact:

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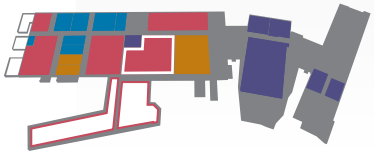
Major Laboratory Equipment

- Hardware-in-the-Loop Simulator
- Grid simulator
- AC load banks
- Bidirectional DC supplies
- Research Chiller
- Research Boiler
- SCADA Data Collection and Control System
- PV Simulator



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NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

NREL/FS-5500-52841 • October 2011

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