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NREL NATIONAL RENEWABLE ENERGY LABORATORY | ENERGY SYSTEMS INTEGRATION FACILITY

U.S. DEPARTMENT OF ENERGY

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Energy Systems Integration Laboratory

The Energy Systems Integration Laboratory at NREL's Energy Systems Integration Facility (ESIF) provides a flexible, renewable-ready platform for research, development, and testing of state-of-the-art hydrogen-based and other energy storage systems. The main focus of the laboratory is assessment of the technical readiness, performance characterization, and research to help industry move these systems towards optimal renewable-based production and efficient utilization of hydrogen. Research conducted in the Energy Systems Integration Laboratory will advance engineering knowledge and market deployment of hydrogen technologies to support a growing need for versatile distributed electricity generation, applications in microgrids, energy storage for renewables integration, and home and station-based hydrogen vehicle fueling.

Laboratory Specifications

This laboratory provides over 3,000 sq. ft. of monitored Class I, Division 2 approved test space, a 600 sq. ft. control room, an electrical room, and a separate gas analysis area. Features of the laboratory include:

- Large test bays to accommodate various sized electrolyzers, fuel cells and related systems
- Combustible gas monitoring
- Automated monitoring and control systems
- Liquid and air cooling, nitrogen, natural gas, and electrical power supply options
- Two high pressure testing bays fully rated for testing systems to 15,000 psig
- A large adjacent outdoor testing area for hydrogen storage, compression, or other large equipment

Application Scenarios

Research activities are targeted to improve the technical readiness of the following:

- Low and high temperature electrolyzers, reformers and fuel cells
- Mechanical and electrochemical compression systems
- Hydrogen storage
- Hydrogen vehicle refueling
- Internal combustion or turbine technology for electricity production.

Examples of experiments include:

- Close- and direct-coupling of renewable energy sources (PV and wind) to electrolyzers
- Performance and efficiency validation of electrolyzers, fuel cells, and compressors
- Reliability and durability tracking and prediction
- Equipment modeling and validation testing
- Internal combustion or turbine technology for electricity production
- Safety and code compliance

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 Energy Systems Integration Laboratory may include:

- Hydrogen equipment manufacturers
- Automobile OEM's
- System developers, integrators, and installers
- Vehicle refueling equipment manufacturers
- High-pressure hydrogen component manufacturers
- Certification laboratories
- Government agencies
- Universities
- Other National laboratories

Contact Us

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

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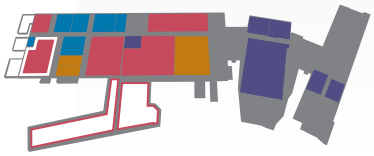
303-275-3036

Major Laboratory Equipment

- High accuracy hydrogen mass flow systems for improved efficiency monitoring
- PEM electrolyzer
- Alkaline electrolyzer
- Fuel cell
- H2 high pressure compressor
- AC and DC electrical research buss connections
- Advanced data acquisition and monitoring equipment
- Gas Chromatograph
- Ion Chromatograph



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