INL's Energy & Environment Science and Technology Directorate added a 91,000-square-foot testing and demonstration facility called the Energy Systems Laboratory (ESL) in 2012.

Energy Systems Laboratory

Research at Idaho National Laboratory's Energy Systems Laboratory ranges from laboratory-scale science to full-scale operations. The laboratory is known for its multidiscipline scientific and engineering capabilities as well as a history of developing first-of-a-kind systems and testing protocols to resolve energy and environmental challenges.

This facility supports research and development to reduce technical and economic risks associated with the deployment of new energy technologies.

Three related energy system programs use the majority of the space: the bioenergy research and user facility, energy storage and advanced vehicles, and energy systems integration.

Bioenergy Research

Raw biomass material is vulnerable to degradation due to weather, microbes and other factors, which presents challenges to achieving a uniform biomass feedstock commodity on a national scale. To be a significant component of the national energy mix, biomass gathering, processing, and handling must result in an economically viable net energy gain.

In July 2013, the Department of Energy designated INL's biomass feedstock research capability as a national user facility. The Biomass Feedstock National User Facility (BFNUF) is now the R&D technical leader for developing bioenergy feedstock supply systems.

INL's program aims to overcome key technical barriers by understanding the physical and chemical characteristics of the nation's diverse agricultural and forest resources. This work will help the bioenergy industry more cost-effectively produce biofuels and other value-added products.

The BFNUF's flagship Process Development Unit (PDU) has a modular and reconfigurable design that helps companies find the best way to convert feedstock into fuel. The BFNUF Characterization Laboratory analyzes feedstocks and their storage performance to aid development of high-quality products. Physical and chemical material evaluations are entered in the Bioenergy Feedstock Library database to provide fundamental data on biomass characteristics for researchers and industry.

Changing the World's Energy Future

INL
Idaho National Laboratory

Energy Storage and Advanced Vehicles

Transportation in the United States — and around the world — is undergoing a major transformation. From new fuels and batteries to new charging systems and infrastructure, every aspect of modern transportation is becoming more energy-efficient and technologically advanced. INL's Energy Storage and Advanced Vehicles departments are at the forefront of these developments.

One of two walk-in chambers that allow environmental testing of vehicle battery packs in INL's Battery Test Center.

Advanced batteries that are longer-lived, safer and more cost-effective are critical for electric drive vehicles. INL's Energy Storage group plays an important role in meeting this challenge through applied research, development and diagnostic testing. INL's Battery Test Center is a U.S. Department of Energy Core Capability for independent, third-party battery testing. The center houses more than 700 channels that can test everything from watch-sized batteries to full-sized vehicle battery packs.

INL also provides unbiased, real-world testing for advanced vehicles such as plug-in electric cars. The Electric Vehicle Infrastructure Laboratory enables collaborations with industry to test charging systems and help establish benchmarks for future technology.

Energy Systems Integration

An emerging INL effort is focused on integrating energy systems using innovative approaches and disparate energy system component testing.

At the microgrid test bed, INL experts test dynamic storage and load-balancing options and perform simulations using real-world data and hardware. The Power and Energy Real-Time Laboratory (PERL) has advanced capabilities for modeling the power grid. Testing and refining of a digital real-time simulator (DRTS) approach includes the ability to integrate power systems hardware and software into simulations (hardware and controller-in-the-loop).

A primary goal of this research is to reduce both technical and economic risks associated with energy systems of the future. This lab will provide configuration-flexible facilities to conduct experimental laboratory-, bench-, pilot-, and engineering-scale research and testing necessary to validate commercial readiness of integrated energy systems.

INL energy system testing integrates a renewable energy microgrid with load-control, simulation and storage capabilities.

For more information

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