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

Energy Systems Laboratory

In August 2012, INL added the new Energy Systems Laboratory to update and complement its history of engineering design and testing capabilities.

Research at ESL ranges from bio-energy to nuclear energy and includes work scopes from laboratory-scale prototypes to full-scale operations. The laboratory is also known for its multidiscipline scientific, engineering and project management capabilities and successful history of developing first-of-their-kind systems and testing protocols to resolve energy and environmental challenges.

The purpose of this facility is to provide work space and tools to principal investigators that conduct research and development to reduce technical and economical risks associated with the deployment of new energy technologies. This infrastructure will facilitate moving new energy security concepts from the realm of scientific and engineering investigation to the marketplace of commercially scalable and economically driven industrial processes and new consumer products.

Three related energy system programs use the majority of the space, including Biomass Feedstock National User Facility (BFNUF), Energy Storage and Transportation and Energy Systems Integration.

Biomass Feedstock National User Facility

In July 2013, the Department of Energy designated INL's biomass feedstock research effort as a national user facility. INL is the research and development technical leader for developing bioenergy feedstock supply systems, important to renewable energy portfolios.

The goal of INL's program is to overcome key technical barriers facing the U.S. bioenergy industry by systematically researching, characterizing, modeling, demonstrating and harnessing the physical and chemical characteristics of the nation's diverse agricultural and forest biomass resources to more cost-effectively produce biofuels and other value-added products.

Creating a uniform format biomass feedstock commodity on a national scale brings with it a spectrum of challenges—one of the toughest being how to densify products to make them commercially viable

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to store and to transport—especially since this material is vulnerable to degradation due to weather, insects, bacterial actions and other mechanisms. To elevate this material as a significant component of the national energy mix, biomass must be gathered, processed and handled in a manner that results in an economically viable net energy gain.

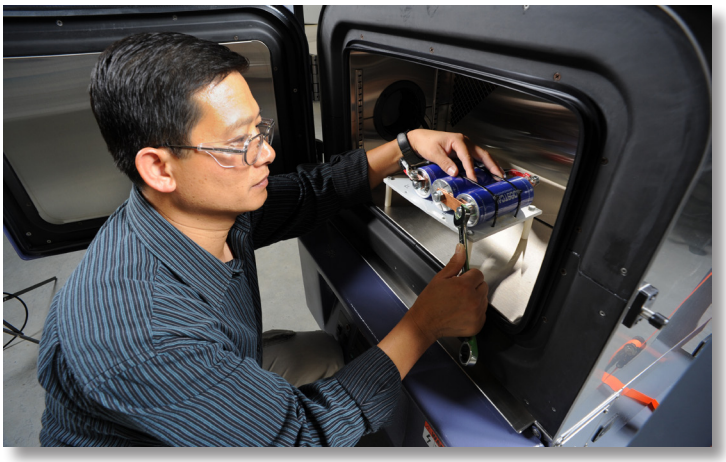
INL's feedstock supply goal is to transform a wide variety of biomass materials into easily handled and transportable commodities. One of the major requirements of this enormous task is to have sufficient space and height for the large equipment and machinery required to conduct the necessary RD&D.

One wing of ESL provides approximately 27,000 square feet of high-bay space (40-foot ceilings) and approximately four acres of outside lay down and storage space for BFNUF.

Already, BFNUF has demonstrated excellent progress in collaborating with the bioenergy industry in several key research areas, including development of a feedstock supply industry.

Energy Storage and Transportation Systems

Advanced batteries that live longer, are safer, and more cost effective are critical to the nation's long term goals to deploy large numbers of electric drive vehicles. INL's energy storage program plays a critical role in meeting this challenge through applied research, development and diagnostic testing. The Energy Storage/Battery Test Facility at INL significantly expands the DOE's ability to evaluate new battery technologies under development for automotive applications. INL is a lead DOE laboratory for this function—and is operating at full capacity—supporting battery research and development sponsored by DOE's Vehicle Technologies Program.



The Energy Storage/Battery Test Facility at INL significantly expands the DOE's ability to evaluate new battery technologies.

There is rapidly growing demand for research, and testing support on advanced batteries. This modern facility adds 11,000 square feet of high-bay battery testing lab space dedicated to the DOE energy storage and battery programs.

Energy Systems Integration

The third program in ESL is an emerging INL effort focused on integrating energy systems using innovative approaches and disparate energy system component testing. This research leverages hybrid energy concepts and complementary characteristics of different energy sources—such as renewable, conventional and unconventional fossil, and nuclear sources—to gain efficiencies through advanced integrated system controls and engineering technologies that improve a given system's or process' environmental and energy performance. Researching hybrid approaches in this lab also may be used to significantly expand the application for new nuclear reactor technology beyond electricity.

A significant purpose 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 demonstrate commercial readiness of integrated energy systems. The lab will provide dedicated test platforms to demonstrate the specifications necessary to carry hybrid energy system concepts through the right levels of technology readiness required for commercialization.

Experiments in this facility will acquire performance data, identify scalability issues, quantify technology gaps and needs for various hybrid or other energy systems. To accommodate the robustness of testing protocols, 16,000 square feet of lab space is available in ESL for testing purposes.

For more information

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