Energy & Environment Science and Technology

Enhancing U.S. competitiveness through clean energy transitions

In the next 25 years, we will be sharing our planet with more than 9 billion people. This will drive an 80 percent increase in electricity demand. National transitions in power generation, expanded development of renewable energy systems and limited water resources are presenting new global opportunities.

Idaho National Laboratory's Energy and Environment Science and Technology Directorate (EEST) is responding with innovations in transportation systems, clean energy, advanced manufacturing and environmental sustainability. Each day, the directorate conducts performance science-based research to produce solutions with worldwide impact.

Advanced transportation

Increasing greenhouse gas emissions are driving efforts to modernize transportation with new vehicles, fuels and manufacturing standards. INL's work to improve energy storage and electric vehicle systems is based on scientific understanding, computational analysis, experimental design, testing and validation, and uncertainty analysis.

The lab's on-the-road vehicle systems analyses and data integration makes it possible to validate and improve industry designs while helping establish U.S. and international standards for testing, regulation and performance. EEST also researches fuel cells and hydrogen systems to provide energy storage alternatives.

The Biomass Feedstock National User Facility is helping industry deploy biomass-based fuels and chemicals by providing proof-of-concept and demonstration tests. The user facility includes an industrial-scale Process Demonstration Unit, a Biomass Feedstock Characterization Laboratory and a Bioenergy Feedstock Library, which houses more than 70,000

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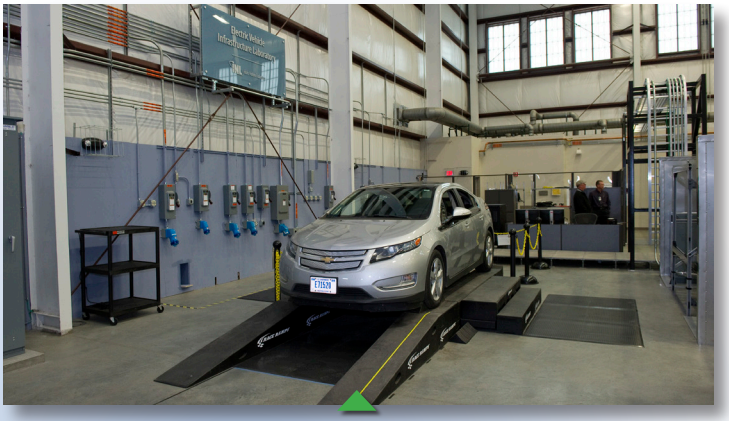

Our advanced transportation research involves on-the-road vehicle systems analyses and data integration.

INL's Clean Energy Integration program has the ability to model, simulate and test system dynamics at multiple scales.

The Energy of Innovation

INL Idaho National Laboratory

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samples representing over 90 types of crops.

Clean energy integration

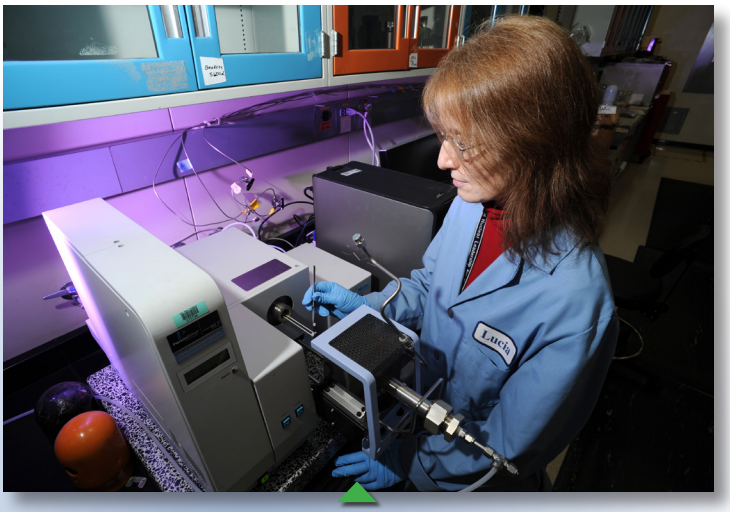
Electricity systems with 50 to 75 percent average renewable energy content can be technically and economically challenging to stabilize. Yet numerous factors are driving increasing demand for renewable integration and widespread use of distributed energy resources. For that reason, the ability to model, simulate and test system dynamics at multiple scales has become critical.

INL's work is enabling step-change innovations to meet energy supply and demand variability. Laboratory researchers design, test and demonstrate microgrids and systems for enhancing grid stability. The lab's work is helping accelerate cost-effective integration of nuclear power with renewable energy sources, including geothermal, wind, water and solar power.

With the goal of doubling the use of renewables to create a reliable and affordable U.S. energy portfolio, INL experts are finding ways to optimize and integrate low-carbon energy sources.

Advanced manufacturing

The manufacturing sector converts a wide range of raw materials and components into finished goods. It also consumes large amounts of energy, water and other natural resources. EEST's strategic drivers include lowering energy consumption, securing supplies of critical energy materials and reducing waste.



INL experts in chemical and materials separations science are addressing critical resource availability, reuse and material substitution challenges.

Advanced manufacturing research relies on process systems science and engineering, coupled with modeling and experimental validation. INL is addressing critical resource availability, reuse and material substitution challenges. That's why INL plays a key role in DOE's Critical Materials Institute, a consortium focused on securing the U.S. supply of critical and strategic materials such as rare earth elements.

INL is working to develop manufacturing processes with net-zero waste and new ways to convert carbon into useful fuel sources. INL researchers also apply their expertise in performance science to understand how materials behave in harsh environments.

Environmental Sustainability

Transportation, energy production and competitive manufacturing require new approaches to environmental surveillance and sustainability, including use of autonomous systems. Careful monitoring and mitigation of environmental, energy and water impacts involves greater collaboration among government, academic and industry organizations. INL staff helps ensure nuclear materials from around the world are safely recovered, transported and stored.

Collaboration is in our DNA

Making foundational contributions is in our DNA, and INL collaborations include national and international research enterprises. The laboratory partnered with four universities to form the Center for Advanced Energy Studies, which works with industry to enhance technology deployment, education and economic competitiveness. The lab's exceptional talent, INL's modern infrastructure and its effective partnerships are the essential elements of research with impact.

For more information

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