

ESIF

ENERGY
SYSTEMS
INTEGRATION
FACILITY

Bring us your
challenges



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.



More than 60% of the energy that is generated in the United States each year is wasted by inefficient systems.

What if solving our energy challenges wasn't just about producing more, but finding better ways to use what is already there?

Energy Systems Integration (ESI) is an approach to solving these big energy challenges that explores ways for energy systems to work more efficiently on their own, with each other, and with the electric grid.

ESI is about tapping into the combined strength of energy systems—from those that operate in individual homes and communities to those that span the country—and squeezing more value out of every unit of energy we produce and use. It's about making sense of the enormous reserves of data that are giving a voice to systems and behaviors so this knowledge can drive technologies and solutions. And it's about finding ways to safely get more renewable energy onto the electric grid so our energy future is cleaner, more secure, and more sustainable.

ENERGY SYSTEMS INTEGRATION FACILITY

The Energy Systems Integration Facility (ESIF) is the United States' premier lab focused on energy systems research, development, and demonstration (RD&D). It's a designated U.S. Department of Energy User Facility where new technologies can be tested using state-of-the-art equipment and resources.

WHAT WE DO

The researchers, scientists, and engineers at the ESIF provide RD&D support to energy system innovators. Our work helps companies, utilities, and research institutions reduce their risk of investment when developing and implementing leading-edge technologies and optimize their RD&D dollars.

NREL and ESIF staff adhere to the highest standards of research excellence and perform independent, objective modeling, simulation, testing, analysis, visualization, and fundamental research of energy systems up to a multimewatt scale.

"The ESIF team and our partners are tackling the biggest challenges facing the nation's energy system: How do we incorporate new technologies into our existing energy infrastructure? How do we keep the lights on and the fuel flowing in a world of extreme weather events, cyber threats, and aging infrastructure? And how do we fashion new business models, regulatory frameworks, and value propositions for consumers in this changing world? These problems are too big for one company or one government entity to solve. That's why the ESIF was designed to be a connecting point where industry, academia, and government could work together on these most complex and important global challenges of our time."

—Bryan Hannegan, Associate Laboratory Director for Energy Systems Integration



Research Focus Areas

- Renewable Energy to Grid Integration
- Advanced Distribution Management Systems (ADMS)
- Microgrids
- Battery and Thermal Energy Storage
- Advanced Inverters
- Home and Building Energy Management
- Plug-in Electric Vehicles
- Fuel Cell Electric Vehicles
- Charging and Fueling Infrastructure
- Hydrogen Electrolyzers
- Power-to-Gas
- Combined Heat and Power
- Cybersecurity and Resilience
- High Performance Computing and Visualization
- Energy-Water Nexus



WORLD-CLASS RD&D TOOLS

The ESIF's industry-leading tools and equipment can support activities from bench-scale RD&D to multimegawatt scale full-system testing. These are a few of the tools that make the ESIF unique.

Hardware-in-the-Loop at Megawatt-Scale Power: Allows researchers and manufacturers to conduct real-time integration tests at full power and actual load levels within the context of much larger, simulated systems.

Research Electrical Distribution Bus: The ultimate power integration test circuit, made up of two AC and two DC buses connecting multiple sources of energy and plug-and-play testing components.

High Performance Computing and Data Center: Petascale computing using Peregrine—the ESIF's high performance computer—makes possible unprecedented large-scale numerical modeling. Peregrine is also one of the world's most energy-efficient high performance computers, using one-tenth of the energy for cooling as similarly sized data centers.

Data Analysis and Visualization: The ESIF's 3D visualization laboratory and network operations center emulation rooms allow researchers and partners to see and understand complex systems and operations in a completely virtual environment.



PARTNER WITH US

We believe that with the right tools and the right team, great things can happen. The ESIF offers utilities, industry, manufacturers, universities, and other government laboratories access to an award-winning, state-of-the-art lab space and a team of specialized scientists and engineers to help move new technologies forward. Bring us your biggest energy system challenges, and let's solve them together.

Contact the ESIF User Program at 303-275-3027 or userprogram.esif@nrel.gov to discuss opportunities.

Learn more about the ESIF and see a list of current partners at <http://www.nrel.gov/esi/partnerships.html>.

For complete details on the ESIF's capabilities, tools, research focus areas, and user facility opportunities, please visit www.nrel.gov/esif.



Awards

- 2014 Lab of the Year by *R&D Magazine*
- 2014 R&D 100 award for the HP Apollo 8000 liquid-cooled supercomputing platform
- LEED Platinum designation from the U.S. Green Building Council



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