
National Laboratory
of the Rockies
NLR: Energy Innovation and State Coordination
Jud Virden
Laboratory Director
October 29, 2026
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Department of Energy National Laboratories

Their role is to tackle **complex challenges leveraging unique facilities and multidisciplinary teams** to produce innovations that benefit the nation and the world.



U.S. DEPARTMENT of ENERGY

Our Role in the National Laboratory System

- 2,900 staff dedicated to the DOE applied energy mission
- Spans fundamental science, technology innovation, scale-up and industry partnerships
- Integrated research facilities, capabilities, and test beds that support scientists, engineers and industry
- Strong industry collaborations to ensure market adoption of energy innovations



Our Campuses

South Table Mountain Campus



161-acre campus in Golden, Colorado.

Flatirons Campus



The 307-acre Flatirons Campus is approximately 25 miles north of the main NLR facility.

Alaska Campus



Proving ground for technologies in some of the most extreme environments.

Washington, D.C., Office

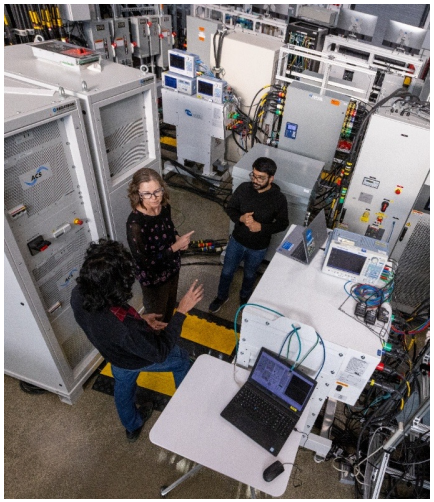


NLR's Washington, D.C., office provides energy analysis and technical program support to the U.S. Department of Energy.

National Assets: Unique Facilities



Energy Materials and Processing at Scale (EMAPS) Facility



Energy Systems Integration Facility (ESIF)



Flatirons Campus

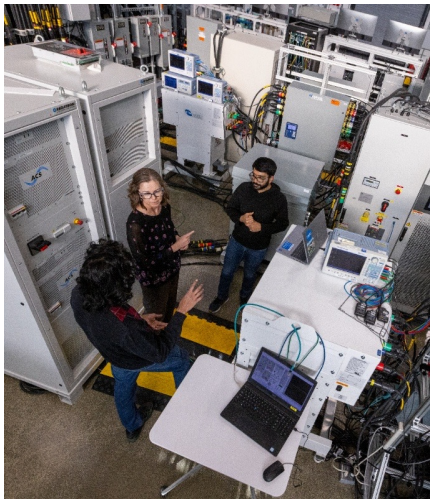


Integrated Biorefinery Research Facility (IBRF)

National Assets: Unique Facilities



Energy Materials and Processing at Scale (EMAPS) Facility



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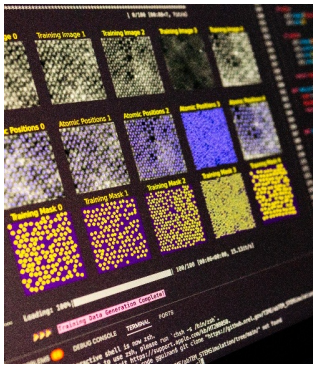


Flatirons Campus



Integrated Biorefinery Research Facility (IBRF)

National Assets: Distinctive Capabilities



AI for Scale-Up Science



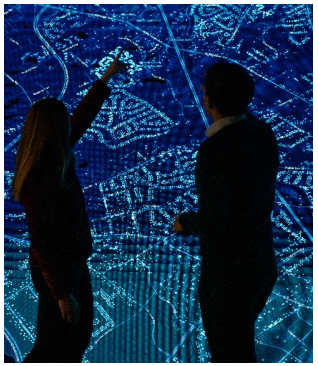
Applied Energy Dedicated High-Performance Computing



Energy Systems Analysis



Advanced Next-Generation Photovoltaics



Energy for National Security

What We Do Best is to Help Decision Makers!

Put analytical tools and modeling capabilities directly in the hands of the organizations working on energy affordability, reliability, and long-term planning.

How NLR Helps States

- **SAVE**: Support consumer affordability
- **PLAN**: Plan for changes in the energy system
- **SECURE**: Increase system resilience
- **DECIDE**: Understand options and trade-offs that best meet their needs
- **LEARN**: Build capacity to understand changing regulatory and policy landscapes




NLR – Solving State
Energy Challenges

State Energy Program Direct Technical Assistance: Analysis Supporting State Decisions

State energy offices get on-demand access to up to 80 hours of national laboratory expertise, with public deliverables other states can use.

24
projects supported with LBNL

29
state energy office requests

$240K+
in value delivered to states

Utah	Transmission infrastructure and market price congestion analysis produced a congestion heat map that informed a legislative session and investment planning under Operation Gigawatt.
West Virginia	Modeled the optimal resource mix to meet the state's baseload target, accounting for geography, population density, and cost, to set priorities under its 50 GW by 2050 initiative.
Kentucky	Quantified how economic development zones drive industrial load growth to help the state prioritize investments.

Colorado Springs: Enabling Utility to Validate and De-risk Grid Controls for Critical Infrastructure

- NLR and LBNL testing showed building HVAC systems can shed up to 50% of load at peak, and it validated a commercial off-the-shelf microgrid controller, with no risk to the live grid.
- Developed a modular digital twin that the municipal utility can use to expand or make future investment decisions before investing significant capital.

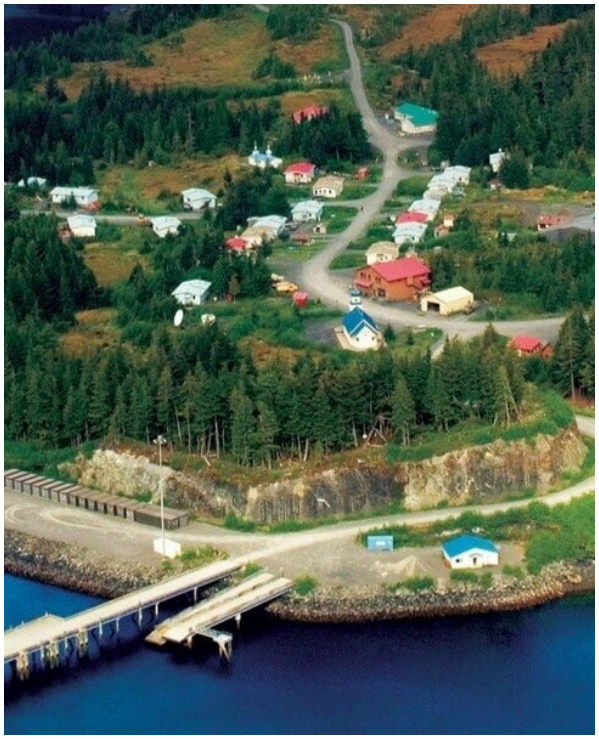


Mesa Tollefson Wastewater Treatment Plant
Cost-benefit case and a plan to add microgrid control, a battery and generation at the site - model it can reuse for future investment decisions.

Lowering Energy Bills and Strengthening Systems with Office of State and Community Energy Programs

- In Chenega, Alaska, about $20,000 in block grant funds identified efficiency measures that would save about $541,000 over 15 years—about $1,280 a year per household.
- NLR provided targeted technical assistance to design and deploy downstream Home Energy Rebates programs
- NLR built a toolkit to help state energy offices partner with private lenders and co-hosted training with NASEO, so states can stretch public dollars further.

We take what we learn in the field to see trends in coming challenges and inform the research agenda.



Chenega Bay Village, Alaska

Reduced construction costs, increase the speed of construction and productivity of the construction workforce.

- NLR is providing technical assistance to **BoulderMOD** factory, which increased Flatirons Habitat for Humanity's capacity from 3-4 homes per year to 50 homes per year
- NLR leads operation of DOE's **Building America New Construction Support** Program to help builders cut construction costs and save Americans money.
- $3M Department of Energy Initiative to reduce construction cost.



BoulderMOD installs its first duplex home on its permanent foundation in North Boulder.

Validation of Demand Response Controls Enables HVAC Energy Cost Savings

Super-intelligent building controls show the potential for up to 30% or more HVAC energy cost savings while bolstering grid affordability and reliability.

- NLR's **Platform for Advanced Controls Evaluation and Research (PACER)** accelerates market acceptance of advanced controls.
- In coordination with NASEO staff, PACER is being leveraged to develop an assessment framework for cyberattacks on behind-the-meter equipment.



Installing controls without first validating their performance can lead to costly delays, operational disruptions, and missed savings.

NLR and Geothermal Energy

- **NLR- NETL Geothermal Center of Excellence**
  - Uniting world-class national laboratory capabilities with industry to accelerate discovery and development of gigawatt-scale geothermal energy.
- **Geothermal Power Accelerator**
  - 15 states, led by NASEO with support from NLR
  - Working to establish statewide geothermal power goals/policies
- **Regulatory and Permitting Information Desktop (RAPID) Toolkit**
  - Step-by-step roadmaps to help navigate federal and state requirements
- **Geothermal Data Repository**
  - 764 TB of geothermal data accessible through AskGDR AI research assistant.



Validating New Technologies at Scale

Grid Interconnection



"… the National Laboratory of the Rockies … the only place in the Western Hemisphere that can replicate real grid faults and AI-scale load swings concurrently in the same loop." – ON.Energy



Looking forward to working with you Q&A

National Laboratory of the Rockies

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Technical Assistance to States

NLR, LBNL and PNNL

Trained state energy office and regulators across the country,

- Load Forecasting
- Resource adequacy
- Load forecasting
- transmission planning
- resource accreditation



Utah Office of Energy Development, University of Utah, and NLR researchers train for power system modeling

DOE Office of Electricity funded follow-on work and NLR now has a direct partnership with Utah to continue supporting Operation Gigawatt

Advancing Energy Resilience in Hawaii

- After wildfires in 2023, Lahaina is able to identify which places would benefit most from microgrids and a realistic path to pursue projects
- By pairing high-resolution hazard data with detailed models of power system infrastructure, NLR identified where the grid is most vulnerable and helped local decision-makers compare grid-hardening options based on the risk each one reduces and the cost of putting it in place.



Lahaina, Maui, after fires in August 2023.

Helping Communities Evaluate Energy Options that Retain Jobs and Tax Revenue from Retiring Plants

- States are able to compare energy options across a range of priorities: local job transferability, job creation, economic development, and tax revenue
- NLR worked with coalitions in three states (Colorado, Utah, and Montana)
- The reports identified actions that the states can take to upskill workers and improve transportation access to realize benefits.



Smart Thermostat Program in Iowa

- Iowa Economic Development Authority sought technical assistance from NLR in the design of a smart thermostat program to help customers save money
- The team developed three potential frameworks and key considerations around a range of priorities:
  - simplicity and cost-effectiveness to enable a fast rollout
  - targeted implementation to support residents that will achieve the greatest affordability improvements, or
  - a hybrid approach to balance cost and benefits

