National Laboratory of the Rockies

Securing the Nation's Energy Future

Energy security is national security. Energy keeps us connected, powers and fuels our homes and businesses, enables our national defense, and keeps our economy strong.

With increasingly complex and fast-evolving threats to the energy sector, securing the nation's long-term access to affordable, reliable, and abundant energy is vital for our American way of life.

Global trends are reshaping the geopolitics of energy, as nations compete for technological advantages and key manufacturing resources. Critical minerals, for example, are essential to U.S. energy infrastructure—for grid components, generation technologies, energy storage systems, and advanced computing. But the supply chains for these materials remain vulnerable to geopolitical tensions, market fluctuations, and disruptions in social and political stability.

The National Laboratory of the Rockies (NLR) provides deep expertise to help partners navigate these complexities. From assessing global supply chain risks to advancing grid technology innovations, NLR supports efforts to safeguard both energy and national security in an increasingly dynamic and interconnected world.

Defining Energy Security

Energy independence, as defined by the U.S. Department of Energy, means ending our nation's reliance on foreign energy resources, securing critical energy infrastructure against natural hazards and physical and cyber threats, and insulating our power system from market volatility and political instability abroad.

Evolving energy needs, advanced energy technologies, and the growth of cyber threats have expanded the scope of what constitutes energy security today. Compounded with grid resilience challenges from extreme weather and other physical threats, the United States must be positioned to secure our current and future energy systems.

Supply Chain Expertise for the Energy Economy

Because energy technologies require a variety of supply-constrained minerals, it is essential to assess the vulnerabilities that could prevent the nation from meeting its energy needs and economic demands.

NLR is evaluating a range of potential supply chain impacts on American infrastructure—from critical minerals, to manufacturing, to software and firmware.

Significant opportunities remain that can strengthen U.S. energy markets and improve energy security. NLR has developed cutting-edge tools that help identify the most impactful and cost-effective components of the domestic energy supply chain—enabling job creation, enhancing competitiveness, and reducing reliance on foreign sources of materials, components, and technologies.

NLR Tools for a Robust Domestic Flow of Materials

- **Recursive Integrated Networks for Growth (RING) model:** RING identifies supply chain gaps and investment opportunities to help meet projected U.S. demand for the most economically viable mix of energy technologies while decreasing U.S. dependence on foreign resources.
- **Lithium-Ion Battery Resource Assessment Model (LIBRA):** This model helps researchers explore technological advances, overlapping demands, and market signals that could affect global supply chains for raw materials and batteries. LIBRA has demonstrated that the increasing demand for lithium-ion batteries presents many opportunities for domestic manufacturing and industry partnerships.

Advancing Technology for Global Competitiveness

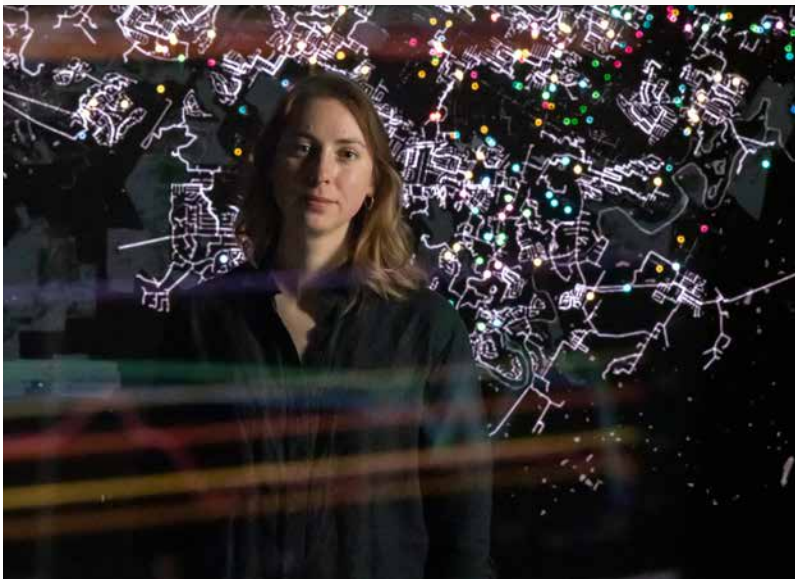
Innovative NLR technologies and applications, such as space-based photovoltaics (PV) are advancing U.S. competitiveness in global markets and national security operations. Building on decades of novel PV innovations, NLR is developing the next generation of lightweight, high-efficiency, and domestically manufactured PV technology for space applications with the U.S. Department of War (DOW). Securing power in space not only advances American scientific discovery, but it is also a mission-critical need for warfighting and national security, while ensuring low-cost domestic energy supply for the DOW. NLR conducts work to advance U.S. competitiveness across several other technologies, including microelectronics, biomaterials, perovskites, energy storage, and others.

A Whole-System View for Long-Term Energy Supply

From generation, to delivery, to end use, NLR's energy security portfolio helps the nation meet projected growth in energy demand while ensuring robust security solutions for evolving systems. Our expertise in advanced energy system modeling, global resource analysis, cybersecurity, intelligent grid controls, and advanced experimentation is leading the nation toward an integrated energy future that is reliable and secure.

NLR Difference

- **Strategic partnerships for national security:** NLR brings energy domain knowledge to national security and defense partners.
- **Advanced energy technology innovation:** NLR is actively researching ways for the United States to maintain a competitive edge in emerging technologies.
- **Security for artificial intelligence (AI):** NLR's expertise in data center efficiency and AI for energy system operations is essential to meet rising electricity needs and secure U.S. generation ability.
- **Energy systems integration expertise:** With advanced capabilities for energy systems integration research, NLR develops solutions for the most challenging energy system challenges by removing barriers to energy that is reliable, affordable, and secure.



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Contact Us

Engage with NLR's energy security program by contacting our Resilient Infrastructure and Security Center at RISC@nlr.gov.

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