Idaho National Laboratory
Overview

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INL Maturing as a Multi-program National Laboratory

Research and Education Campus (REC) – before and after
Our Vision and Mission Positions INL to be Relevant to Tomorrow’s Energy Future

INL Vision
INL will change the world’s energy future and secure our critical infrastructure.

INL Mission
Discover, demonstrate, and secure innovative nuclear energy solutions, other clean energy options, and critical infrastructure.
Three Pillars of Simultaneous Excellence Shape the Future of INL as a Research, Development, Demonstration, and Deployment (RDD&D) National Laboratory
Idaho National Laboratory Site

890 square miles
Reconfigurable city-sized site to address energy & security challenges at scale

INL Maintains a Robust Research, Development, Demonstration and Deployment, (RDD&D) Capacity Unmatched in the Nation
S&T Strategy –
Critical Outcomes Aligned to Our Leadership Position, Mission Outcomes, and National Priorities

*Enterprise-wide interdisciplinary research, development, demonstration, and deployment*

Enhance core capabilities, Talent, S&T infrastructure, Programs, and Partnerships

**Gateway for Accelerated Innovation in Nuclear (GAIN)**

**Enable Small Modular Reactors (SMRs)**

**Regional innovation for clean energy systems**

**Cyber and physical innovation organized around Cybercore Integration Center**
Gateway for Accelerated Innovation in Nuclear (GAIN)

Removing barriers to a cleaner, safer nuclear energy source

In parallel, create private-public partnership and funding approach, engage industry on technology needs and focus advanced reactor R&D on common technology needs, innovative designs, and reducing cost of advanced nuclear energy systems.

Integrated Approach for Innovation to Achieve All 3 Strategic Objectives Simultaneously

DOE-VENDORS-UTILITIES
Private-Public Partnership Model
Optimized strategy for development, demonstration, and deployment of advanced technologies.
**R&D Test Bed and Demonstration Platform are Critical for Rapid Development and Commercialization of Advanced Nuclear Reactor Technologies**

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<th>Proof-of-Performance</th>
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<td><strong>R&amp;D Test Bed to Address Technical Feasibility</strong></td>
<td><strong>Demonstration Platform to Address Economic/Operational Feasibility</strong></td>
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<td>- Knowledge and Validation Center</td>
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<td>- Validated predictive modeling and simulation capabilities</td>
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✓ Major missing element is a versatile fast-spectrum test reactor.
Enabling Small Modular Reactors (SMRs)

- INL works with all vendors
- INL works with industry on SMR technology development and deployment
- INL is supporting DOE in deploying SMRs

- Utah Associated Municipal Power Systems (UAMPS) is a not-for-profit group of 45 community owned power systems in 8 western states
- UAMPS entered a site use agreement with DOE with intent to build a NuScale SMR on the INL site
- Proposed – Joint Use Modular Plant (JUMP) to enable accelerated demonstration, validation, and wide-scale deployment

3-D view of Six NuScale Modules
Materials and Fuels Complex

- Transient Testing
- Analytical Laboratories
- Post-Irradiation Examination
- Advanced Characterization
- Fuel Fabrication
- Space Nuclear Power and Isotope Technologies
Advanced Test Reactor

- Steady State Neutron Irradiation of Materials and Fuels
  - Naval Nuclear Propulsion Program
  - Industry
  - National laboratories and universities
Cybercore Integration Center – Integrated Missions, Assets, and R&D Focus

Virtual Research Park

Applying Multidisciplinary Teams Across Core Capabilities

Urgent Mitigation

Large Scale Validation

Long-Term R&D Challenges

- Emulations & Virtualization
- Wireless & Dynamic Spectrum
- Military Subsystems
- NOC, Demo Center
- Energy Management Systems
- Cyber/Physical Sandboxes

- Controller Protocols, Embedded Systems Experiment, RE
- Full-Scale Critical Infrastructure Test Range Complex
- Cyber/Physical Sandboxes
Regional Innovation in Clean Energy Systems

Regional Power & Clean Energy Initiatives
- Clean energy grid integration
- Grid-scale energy storage
- Hybrid/Carbon Conversion
- FORGE geothermal demo

Regional Manufacturing Initiatives
- Food processing waste minimization
- Industrial Water Cleanup
- Carbon Conversion

- Regional engagements can help the U.S. meet COP21 goals and enhance U.S. industrial competitiveness
- Our region contains rich and strategic energy resources and infrastructure
- Regional clean energy transitions are underway
- INL partners to accelerate these transitions

Energy systems have strong geographic identities that can effect low-carbon strategies
Center for Advanced Energy Studies (CAES)

Collaborative Energy Research
- **Explore:** Energy & Environmental Research
- **Educate:** Energy & Environmental Education
- **Engage:** Apply Knowledge to Industry
- **Enable:** Energy Transitions and Economic Development

Core Capabilities
- Energy Systems Design and Analyses
- Nuclear Science and Engineering
- Materials Science and Engineering
- Environmental and Resource Sustainability
- Carbon Engineering
- Geological Systems and Applications
- Policy

CAES by the Numbers
In the past 6 years:

- **$131.8 M** Research and development funding and equipment acquired
- **3754** Number of students supported by CAES-related projects
- **1051** Number of publications, presentations, and proceedings CAES researchers produced
Working Hand-in-hand with Industry

Increasing the pace of technology to marketplace and fostering economic development

- Accelerate IP to market
- Increase Technology Transfer and impact
- Focus on key area of technology maturity
- Increase federal partnership engagement

DOE impact initiatives:
Lab Corps, SBV, Technology Commercialization Fund with matching funds from industry

Technology Maturation, venture capital, SBV

Nuclear modeling and simulation, nuclear cyber, wireless communications, nuclear nonproliferation, biomass manufacturing
One Mission, One Team, One Lab

- **External Communication**
  - Broaden understanding of INL outcomes and impacts in Idaho and regionally

- **Internal Communication**
  - Horizontal integration across directorates to work together as one team

- **Collaboration Across the Lab**
  - Access to more ideas, knowledge and a wider range of subjects; multidisciplinary collaboration

- **Building Strong Partnerships**
  - Enable discovery in energy and security working with industry, community, academia, and other national labs

*Modern science requires excellence in communication and collaboration*