

# *National & Homeland Security at INL*



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# Idaho National Laboratory — Missions

## Programs of National Importance

### Nuclear Energy

- GNEP
- NGNP
- Space Nuclear
  
- *National Reactor and Fuel Cycle Laboratory and an International leader*



### National & Homeland Security

- ▶ SCADA Work
- ▶ Grid Reliability and Security
- ▶ Wireless Communications
- ▶ Nuclear Nonproliferation

*A leader in critical infrastructure protection and homeland security*



### Energy & Environment

- ▶ Clean Energy and Water
- ▶ Bio-fuels and Synfuels

*A leader in developing solutions to energy, resources and infrastructure challenges in the State, Region and Nation*



***Technologies that Benefit Our Communities, State, Region and Country***



# Our N&HS Mission is Synergistic With the Nuclear Mission

- **Development of National & Homeland Security technologies focused on Critical Infrastructure Protection (CIP) and Nuclear Nonproliferation**
- **By 2014:**
  - Center of Excellence for Critical Infrastructure Protection
  - Center of Excellence for Grid Reliability / Resilience
  - Center of Excellence for Nuclear Nonproliferation / Safeguards and Security
- **Principal Customers:**
  - DOD/DHS/NNSA/DOE-OE
  - Industry (Critical Infrastructure Asset Owners)





# N&HS Focus Areas

**Global  
Security**

**National  
Defense**

**Homeland  
Security**

**Special  
Programs**

**Energy  
Security**

## Focus Areas



**SCADA /  
Cyber/ Power  
Grid**



**Wireless  
Technology**



**Unmanned  
Systems**



**Explosives  
Detection &  
Testing**



**Nonproliferation /  
Safeguards &  
Security**



**Armor  
Development**



# Our Approach is Focused on Asset Owner and Warfighter Challenges



- ***Hire proven talent from relevant industries and national security organizations – builds domain expertise and credibility with customers***
- ***Adopt a science-based “Build-Test-Build” approach for early solutions, demonstrating customer value***
- ***Focus and prioritize resources and efforts on becoming “thought leaders” among providers.***



# Our Expertise and Unique Infrastructure are Tailored to Address Threats

## Process Control Systems / Power Engineering:

- **Supervisory Control and Data Acquisition (SCADA) Systems**
- **Relationship with equipment vendors (85% of electric sector)**
- **Link SCADA systems to real infrastructure**
- **Real Time Digital Simulators (RTDS)**

## Communications:

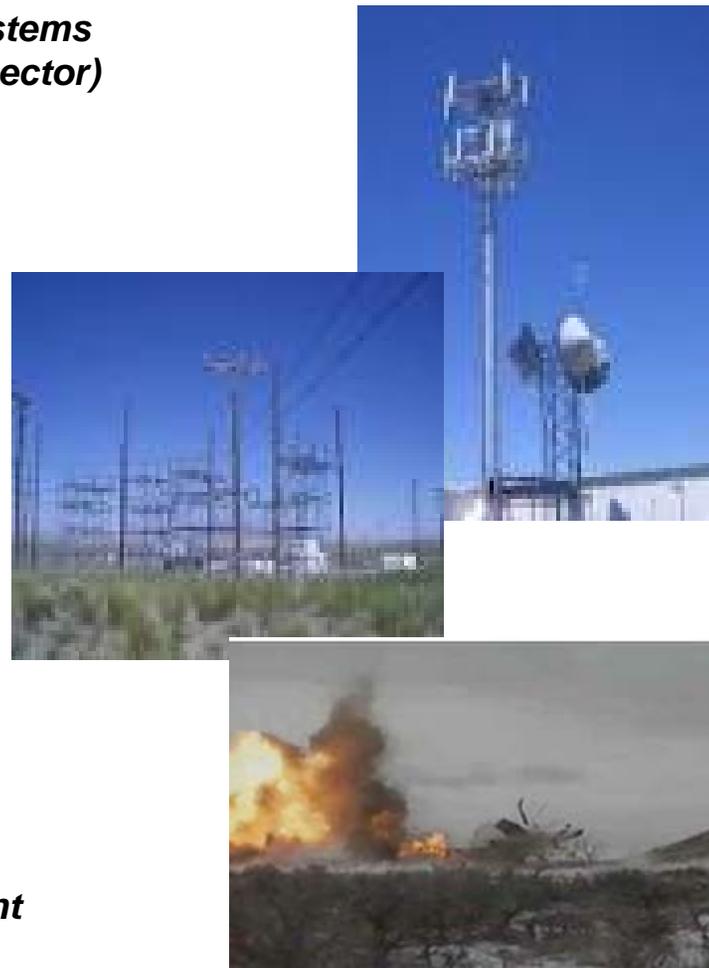
- **Low electromagnetic background**
- **Spectrum of capabilities (HF, Cell, Microwave, Fiber)**
- **NTIA experimental station status (foreign frequencies)**
- **Tier 1 GSM Cellular Network**
- **True end-to-end testing in field**

## Cyber Security:

- **Deep expertise and skills**
- **Linked Cyber Test Beds to other Test Beds**
- **Security Solution experience**

## Physical Security

- **Chemicals and Explosives Detection (Trace; Bulk)**
- **Explosives Testing – Permitted in-house range**
- **Blast Effects/Survivability (Modeling & Testing)**
- **NNSA Center of Excellence for Vulnerability Assessment**
- **Light Weight Armor Development**
- **Unmanned Systems (UGV / UAV)**





# INL Core Competencies and Unique Assets for Nuclear Nonproliferation / Counterproliferation

- ***U.S. Research Reactor Conversions (RERTR) (HEU to LEU)***
- ***Russian Research Reactor Fuel Return***
- ***Fuel Development / Testing***
- ***Nuclear Materials Safeguards and Security***
- ***Advanced Fuel Cycle Initiative***
- ***Nuclear /Radiological Detection (Passive / Active)***
- ***Nuclear Signatures and Forensics***
- ***RDD Training***

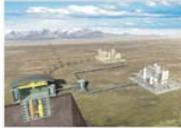




# INL Core Competencies

## I&C and Intelligent Systems

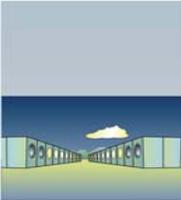
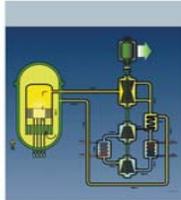
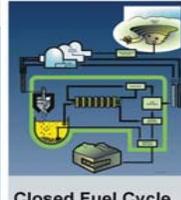
**Increased Performance, Reliability, and Safety**

<ul style="list-style-type: none"> <li>Decision Making &amp; Support</li> <li>Intelligent systems theory and algorithm development</li> <li>Control theory and algorithm development</li> </ul>  <p><b>Applications</b></p>	<ul style="list-style-type: none"> <li>Natural language to support intuitive decision making</li> <li>Automated &amp; Shared control strategies</li> <li>Modeling and simulation of dynamic systems.</li> </ul>  <p><b>Evolutionary R&amp;D</b></p>	<ul style="list-style-type: none"> <li>Adaptive Control</li> <li>Next generation embedded hardware and software development</li> <li>Sensor suites and simulation for prognostics and control</li> </ul>  <p><b>Revolutionary R&amp;D</b></p>
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**Advancing Human Centered Design, Automation in I&C and Intelligent Systems**

## Separations and Actinide Science

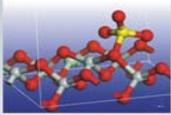
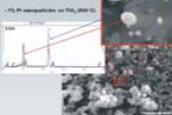
**Increasing Nuclear Sustainability**

 <p><b>Once Through Fuel Cycle Advanced Light Water Reactors</b></p> <ul style="list-style-type: none"> <li>Fate and transport of radionuclides</li> </ul>	 <p><b>Generation III Reactors</b></p> <ul style="list-style-type: none"> <li>Limited recycle of advanced fuels</li> <li>Recycle of Pu and U</li> <li>Advanced waste forms for Cs/Sr, Ln/An species</li> </ul>	 <p><b>Closed Fuel Cycle</b></p> <ul style="list-style-type: none"> <li>New separations technologies</li> <li>Advanced proliferation resistant reprocessing methods</li> <li>Improved materials for transmutation of Ln/An advanced waste forms</li> </ul>
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**Increasing Processing Sophistication**

## Modeling and Simulation

**Complexity of Physical Systems**

<p>SO<sub>3</sub> interacting with metal oxide surface</p>  <p><b>Modeling for Mechanistic Understanding</b></p>	<p>Three dimensional catalyst particle with flow</p>  <p><b>Mesoscale/Macroscopic Modeling</b></p>	<p>SI Hydrogen Production System</p>  <p><b>Process Simulation</b></p>
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**Complexity of Conceptual and Mathematical Models**

## Materials

**Increasingly Demanding Environments**

<p>Temperature (300°C) Corrosive 20 year license Radiation</p>  <p><b>Engineering Application</b></p> <ul style="list-style-type: none"> <li>Shutdown inspection</li> <li>Material properties based on measurement</li> <li>Plant operating parameters</li> </ul>	<p>Temperature (1000°C) Corrosive Creep-fatigue regime 60 year license High dose radiation</p>  <p><b>Evolutionary R&amp;D</b></p> <ul style="list-style-type: none"> <li>Processing/properties/performance</li> <li>Phenomenological/Models</li> <li>On-line performance validation</li> </ul>	<p>Temperature Extremes Remote Operation</p>  <p><b>Revolutionary R&amp;D</b></p> <ul style="list-style-type: none"> <li>Multi-scale material models</li> <li>Integrated model/validation</li> <li>Science based new materials discovery</li> </ul>
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**Increased Performance and Reliability**



***The U.S. is faced with unprecedented National & Homeland Security challenges and INL offers expertise and unique infrastructure assets to make an impact.***