INL/LTD-18-51536

2018 Laboratory Agenda

Changing the world's energy future and securing our critical infrastructure

SCIENTIFIC AND TECHNICAL EXCELLENCE

COMMUNITY EXCELLENCE

www.inl.gov

18-GA50471

Idaho National Laboratory

OPERATED BY BATTELLE ENERGY ALLIANCE

Idaho National Laboratory

Introduction

Idaho National Laboratory (INL) has a vision of changing the world's energy future and securing our nation's critical infrastructure.

INL's mission involves discovering, demonstrating, and securing innovative nuclear energy solutions and other clean energy sources. The Laboratory also has a mission focused on protecting the nation's power grids and other vital systems against man-made and natural threats.

Completing our mission and fulfilling our vision requires carefully charting our path and priorities, building and strengthening our core capabilities, focusing on key research and development (R&D) and mission-support initiatives, assessing our performance, and correcting our priorities when necessary. INL's Laboratory Agenda articulates INL's priorities, goals, and initiatives to deliver our mission and vision efficiently, effectively, and collaboratively. It describes our commitment to simultaneous excellence in science and technology, management and operations, and community service, and sets priorities for Laboratory investments.

As we continue on the path to establishing nuclear energy as an integral part of meeting a growing energy demand, INL, as the nation's lead nuclear energy research, development, and demonstration (RD&D) laboratory, will focus on five science and technology (S&T) outcomes:

- Establish and maintain INL as a national and global leader for the nation's nuclear energy RD&D programs. This means maintaining science and technology leadership, enabling U.S. industrial leadership, and optimizing domestic deployment of advanced nuclear energy systems as part of a national energy portfolio.
- Develop effective and integrated fuel-cycle solutions for management and disposition of spent nuclear fuel and high-level radioactive waste to support nuclear energy production for the remainder of the century.
- Advance the development and deployment of integrated energy systems that coordinate the use of nuclear, renewable, and fossil energy sources to produce reliable, affordable, and sustainable electrical and nonelectrical energy products and reduce waste energy.
- Provide energy and security system components to supply chains in extreme environments through transformational and integrated advanced manufacturing.
- Develop enduring cyber-physical innovation capabilities and solve complex global-security challenges in the areas of critical infrastructure, national and homeland security, nuclear nonproliferation, and intelligence.

INL's calling card must be outstanding scientific and technical impacts. Raising the Laboratory's scientific and technical impact requires strong leadership; recruitment of young and diverse talent; transformational S&T infrastructure, systems, and processes; efficient and effective Science and Technology (S&T) environment and operations; a high-performance culture; and effective performance measurement. INL embraces private/public partnerships as a leadership paradigm to accelerate S&T innovations and impacts. The Laboratory leverages national and international S&T infrastructure and expertise, as well as R&D investment, through strategic partnerships with national and international laboratories, universities, and industries to accelerate the pace of innovation and deployment.

INL is an integral part of local, regional, national, and international RD&D and innovation enterprises. The Laboratory works directly with industry, for example, through the INL-led Gateway for Accelerated Innovation in Nuclear (GAIN). Through strong public/private partnerships, we are creating innovative approaches to advance S&T and build new RD&D facilities at INL.

Our broad capabilities allow INL to address today's most challenging energy and security issues and we are positioned to:

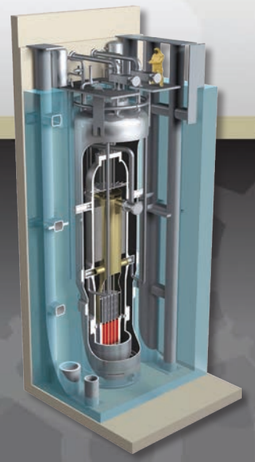
- Accelerate discovery, development, and deployment of nuclear energy technologies
- Develop effective and integrated fuel-cycle solutions
- Integrate nuclear and renewables, balance energy supply and demand, and optimize energy-use applications
- Solve complex global security challenges in many areas, including cybersecurity for critical infrastructure protection and nuclear nonproliferation

Dr. Mark Peters,
Director, Idaho National Laboratory

INL's RD&D are critical in building U.S. competitiveness and leadership, and meeting the nation's energy, security, economic development, and environmental goals. By following our Laboratory Agenda, we will complete the mission and fulfill our vision of providing the clean and reliable and resilient energy needed to power the future and ensure national and homeland security.

Dr. Mark Peters
Director, Idaho National Laboratory

Nuclear energy competitiveness and leadership

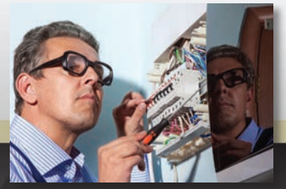


Integrated spent nuclear fuel cycle solutions

Adva nced integrated en ergy systems

Advanced design and manufacturing

Enduring control systems cybersecurity capabillity



Executing INL's Mission

INL's strategic S&T initiatives are designed to advance scientific and technological capabilities, and sustain and build INL's core capabilities and leadership positions to provide for national-scale energy and security solutions for DOE in critical mission areas. As an applied-energy laboratory with unique geography, INL retains core competencies and capabilities to develop, test, and demonstrate advanced concepts for proof of concept and technical and economic viability.

The objectives of INL's nuclear-energy-related strategic initiatives are to revive, revitalize, and expand nuclear energy to ensure the affordability, reliability, and resiliency of baseload power in meeting the nation's energy needs by:

- Advancing R&D of nuclear energy systems through private/public partnerships to maintain global S&T leadership
- Establishing and demonstrating INL as the nation's integrated nuclear energy RD&D test bed for advanced nuclear energy systems including small modular reactors (SMRs) and very small modular reactors (vSMRs)
- Reducing the time and costs associated with development and qualification of nuclear materials, fuels, and components
- Establishing the case for a new versatile advanced (fast) test reactor
- Achieving a consistently high level of operational performance, including increasing the availability and evaluating the long-term viability of Advanced Test reactor (ATR)
- Developing and executing TREAT experimental and testing program to maximize utilization and advance fundamental science for advanced nuclear fuels and materials

Advancing nuclear energy also requires developing effective and integrated fuel-cycle solutions for management and disposition of both used nuclear fuel (UNF) and spent nuclear fuel (SNF), and also high-level nuclear waste (HLW) to support projected nuclear energy demand.

Leveraging INL's recognized leadership and capabilities in solving problems holistically, INL focuses on advancing integrated energy systems (IESs) through coupling and demonstrating nuclear, renewable, and fossil energy to produce reliable, affordable, and sustainable energy products for industry while minimizing rejected energy. The goal of IES is to accelerate the pace of energy-technology innovation and transition and to close the gap between supply and demand.

In order to mitigate risk in the design and operation of integrated nuclear energy systems and advanced nuclear reactors, INL is transforming and integrating advanced extreme-environment material design and manufacturing capabilities. INL is designing and developing smart materials for use in harsh, demanding, or extreme environments and optimizing chemical, material, and energy processes that convert strategic materials and waste into energy and products, conserve energy, and limit hazardous emissions and residuals.

As a globally recognized R&D leader in nuclear safeguards, critical infrastructure protection, and control systems cybersecurity, INL is making important technological advancements to secure and modernize the nation's critical infrastructure, emphasizing the protection of energy, nuclear, and military systems. A strategic component in being able to solve complex global-security challenges in areas of critical infrastructure, advancing national and homeland security, and intelligence, involves the establishment of Cybercore Integration Center (Cybercore) to build an enduring cyber-physical innovation capability.

Strategic partnership and collaboration regionally, nationally, and internationally are key elements in executing INL's mission and achieving its strategic objectives. INL is broadening Idaho and regional understanding of INL outcomes and impacts, strengthening academic partnerships, translating advances in R&D to technology innovations and applications, leveraging energy-innovation ecosystems to accelerate the pace and impact of advances in energy and security technologies, and leveraging and pooling collaborators' capabilities and resources. INL's international strategy builds on Nuclear Energy Advisory Committee recommendations as well as international efforts that have not previously been defined in a public strategy. INL's unique capabilities give the U.S. unprecedented access to develop R&D programs, export U.S. products and services, and influence safety standards and practices. INL's growing international leadership enables the Laboratory to exert global influence to enhance U.S. competitiveness and leadership.

INL's discretionary-resource investments are necessary to strengthen its core capabilities, advance the Laboratory's mission, and achieve its strategic objectives. The annual Laboratory Directed Research and Development (LDRD) budget is developed after careful consideration of investment needs and overall INL indirect budget. The LDRD program benefits INL and DOE by providing the Laboratory with resources for maintaining the scientific vitality of the Laboratory, enhancing the Laboratory's ability to address future DOE missions, stimulating exploration of forefront S&T development, serving as a proving ground for new research, and supporting high-risk, potentially high-value R&D. Through LDRD investments, INL makes new discoveries and charts new paths, develops and delivers responsive capabilities through anticipation of national challenges and needs, and builds S&T leadership and talent pipeline. INL's LDRD plan aligns with INL's S&T strategy.

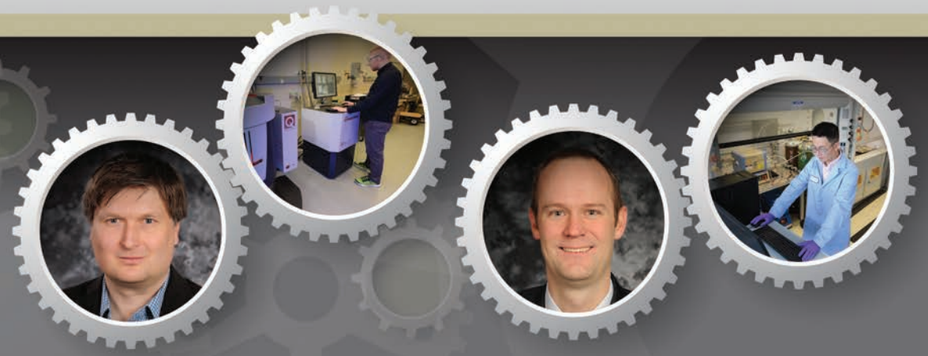
Raising the Laboratory's leadership, and scientific and technical impacts requires building a sustainable, competitive, and continuously learning RD&D organization, i.e., creating a high-performance culture. INL is increasing RD&D productivity, quality, and impact through leveraged learning, setting standards and measures for S&T performance, valuing research outputs as an asset to build and grow new programs, vastly simplifying programs and processes to create a culture of trust, enabling continuous organizational learning, transforming INL to a customer-service mindset from a compliance mindset, and advancing R&D services to increase research productivity and collaborations.

STRATEGIC S&T INITIATIVES

Nuclear energy competitiveness and leadership	**Integrated spent nuclear fuel cycle solutions**	**Advance integrated energy systems**	**Advance design and manufacturing**	**Critical national and homeland security capabilities**

FOUNDATION

- **Recognized and exceptional set of core capabilities**
- **World-class leadership and talent**
- **Proven management and operations → Creating a high performance culture**
- **Strategy-driven plans, investments, budgeting**
- **World class RD&D infrastructure and facilities**
- **Integral part of local, regional, national, and international innovation enterprise**



The INL Lab Agenda provides a structured framework championed by the Senior Leadership Team that identifies the critical outcomes, strategic initiatives, and near-term R&D and mission-support activities necessary to accomplish INL strategic objectives for the Department of Energy (DOE), Office of Nuclear Energy (NE), and other DOE programs and federal agencies, and delivers on INL's commitment to simultaneous excellence in S&T, operations, and community service.

	SCIENCE AND TECHNICAL EXCELLENCE				OPERATIONAL EXCELLENCE	STAKEHOLDER AND COMMUNITY EXCELLENCE
Strategic Objective (10–20 years)	Increase the contribution of nuclear energy to the nation's energy mix	Advance integrated energy systems	Advance design and manufacturing	Develop critical national and homeland security capabilities	Achieve excellence in Laboratory operations	Achieve excellence in stakeholder engagement and community service
Critical Outcomes (5–10 years)	• Nuclear energy competitiveness and leadership • Integrated fuel cycle solutions	Couple and demonstrate nuclear, renewable, and fossil energy to produce reliable, affordable, and sustainable energy products and minimize rejected energy for industry	Transform and integrate advanced manufacturing capabilities for extreme-environment energy and security systems component supply chains.	Enduring control systems cybersecurity innovation capability for the nation and global transformation to cyber-informed science and engineering, applied to critical infrastructure and national security systems	Transformed INL infrastructure, capabilities, systems, and processes to enable modern science	INL positioned as a high-value partner nationally and in the community, state, and region
Strategic Initiatives (2–5 years)	• Accelerate and reduce the cost of nuclear energy RDD&D –Advance nuclear energy systems through private-public partnerships with key stakeholders –Establish and demonstrate the national nuclear energy R&D testbed –Establish and demonstrate the national nuclear energy demonstration platform –Dramatically reduce the time and costs associated with development and qualification of nuclear materials and fuels –Enable SMR and advanced reactor demonstration and deployment –Establish a new fast-spectrum test reactor • Safe, secure, and economic management of nuclear fuel from conception (front end) to final disposition (back end) –Develop options for future fuel cycles, coupled with advanced reactors that improve energy competitiveness and minimize SNF and secondary waste while improving proliferation risk –Provide technical solutions that support the safe, secure, and economic management and disposition of current and future SNF and HLW generated by light-water reactors	• Establish a real-world Energy Systems Integration Lab to demonstrate the value added by integrated systems in the electricity sector, where flexibility is achieved by production of multiple energy products via thermal and electrical integration • Establish an electrical-energy integrated Digital Real-Time SuperLab comprising cooperating universities, national laboratories, and private research facilities to demonstrate system-optimized energy management • Develop and demonstrate scalable transformational processes to maximize the value of the energy derived from nuclear, renewable and fossil energy resources, with a focus on optimal utilization of limited natural resources and minimization of waste streams • Accelerate integration of transportation and energy-storage system solutions • Introduce hydrogen to store and deliver energy within integrated systems and among a broad set of energy users	• Modernize INL's manufacturing capabilities • Establish a manufacturing-demonstration consortium with focus on application of advanced manufacturing techniques for advanced energy-system components working in extreme environments • Design tailor-made materials with microstructures optimized for performance in extreme environments • Design and manufacture nuclear fuels and nuclear reactor components • Develop process applications to integrate nuclear heat output with industrial chemical processes and design and manufacture the key components of such process applications • Advance and design embedded sensors and associated instrumentation to increase plant reliability and efficiency • Apply advances in solid mechanics to other compressible-solids handling challenges	• **Multiagency center:** Address the most critical control system challenges that require a national collaborative, multidisciplinary teaming environment • **Talent:** Develop and execute a centralized strategy to accelerate talent pipelines with universities, industry, agencies, and other collaborators • **Energy:** Advance energy infrastructure for both cyber and physical resiliency with DOE lab and industry partners • **Defense:** Develop and advance national defense security solutions to cyberthreats in critical infrastructure and embedded systems in military platforms • **Homeland Security:** Advance homeland security solutions for defense, response, and recovery of lifeline infrastructures • **Nuclear cyber:** Holistically address research, engineering, and technical policy challenges in nuclear cybersecurity across the energy and materials life cycle	• Transform how INL performs and manages work • Build INL's future workforce • Modernize and mature INL information systems and services • Optimize cost management • Revitalize security and enabling infrastructure • Achieve leadership in safety to enable cutting-edge S&T • Advance INL's stewardship of its environmental legacy • Advance INL's security	• Broaden Idaho and regional understanding of INL outcomes and impacts • Strengthen academic partnerships • Translate advances in R&D to technology innovations and applications

Critical outcomes are institutional ends focused on fulfilling INL's mission, vision, and strategic objectives. They distinguish INL and represent our greatest potential for scientific and technical leadership and inspire sustained stewardship investment from sponsors, stakeholders, and ourselves.

I. SCIENCE & TECHNOLOGY

I.1. Nuclear Energy Competitiveness and Leadership

Increase contribution of nuclear energy to the nation's energy mix

Develop and demonstrate technology breakthroughs, technical solutions, and capabilities that substantially improve the performance of existing and future nuclear energy systems and enable the expanded use of nuclear systems.

Responsibility

John Wagner, Sean O'Kelly, Ronald Crone

Shape the next 50 years of American leadership in global nuclear markets.
- **Advance existing fleet**
- **Advance technology pipeline**
- **Establish strategic fuel cycle infrastructure**

STRATEGY

- Create American nuclear technology future
  - – Strengthen energy security
  - – Establish leadership in global markets
  - – Strengthen and expand strategic assets and capabilities

PEOPLE

- Grow INL into the research institute of choice for nuclear S&T
- Initiate talent-growth initiatives
- Leverage postdoc and intern program as strategic recruitment tool
- Increase research population by 15%

INFRASTRUCTURE

- Advance Irradiated Materials Characterization Laboratory (IMCL) and construct Sample Preparation Laboratory (SPL)
- Next-generation national reactor testing station
  - – Integrate digital design and analysis, digital manufacturing, irradiation science, thermal energy systems testing
- Advanced fast-spectrum test reactor
- Collaborative Computing Center
- Next-generation industry access model

INITIATIVES

- Advanced graphite fuels and accident tolerant fuel (ATF)
- First-of-a-kind SMR deployment
- First prototype vSMR
- Nuclear heat integration applications
- Non-light water reactor (LWR) advanced demonstration reactor
- Advance modeling and simulation (M&S) and testing capabilities

PARTNERSHIPS

- Initiative-based university research partnerships
- Strategic private-public partnerships
- Partnerships with Department of Energy, Defense, and intelligence community
- User-friendly partnerships with key private sector innovators

I.2. Integrated Fuel Cycle Solutions

Develop the science, technology, and infrastructure to support the safe, secure, and economic management of nuclear fuel from conception to final disposition

Develop effective and integrated fuel-cycle solutions to sustain the current reactor fleet and enable replacement and expansion with advanced reactors

Responsibility

John Wagner, Monica Regulbuto, Ronald Crone

STRATEGY*

- Technical support to DOE
- Options for SNF management for current reactors with advanced fuels
- Options for future fuel cycles coupled with advanced reactors
- High-assay, low-enriched uranium (HALEU) from SNF
- Laboratory cross functions

* *Strategy will be impacted if ISA near-term commitment is not met by 2023*

PEOPLE

- Expand and develop science and engineering talent to advance knowledge and innovation in
  - Computational chemistry
  - Geochemistry
  - Nuclear reactor chemistry
  - Process instrumentation
  - Geology

INFRASTRUCTURE

- Hot Fuels Examination Facility (HFEF)
- SPL
- Remote Handled Low Level Waste Facility (RHLLW)
- Pilot plant for flowsheet testing
- Safeguards and security (S&S) test bed for spent fuel and canister interrogation
- Separations research laboratories – wet and dry processes
- Spent fuel handling and research facilities
- Idaho Nuclear Technology and Engineering Center facilities

INITIATIVES

- Advance radiochemistry
- Advance M&S
- S&S test bed implementation National Nuclear Security Administration
- Upgraded and expanded facilities to provide data needed to support safe and secure storage, transportation, treatment, and disposition of SNF, HLW
- Capability to mitigate damaged SNF packages
- RD&D for extended dry storage for metallic aluminum alloy SNF

PARTNERSHIPS

- National Laboratories
- Nuclear Regulatory Commission, Depaertment of Energy (DOE)
- Universities
- Nuclear Energy Institute, Electric Power Research Institute
- International Atomic Energy Agency (IAEA), Organisation for Economic Co-operation and Development, Naval Nuclear Laboratory, Empresa Nacional de Residuos Radiactivos, S.A, Studiecentrum voor Kernenergie, Commissariat à l'Energie Atomique, European Union (EU), Korean Atomic Energy Research Institute

- **Advance S&T and infrastructure base for "all things fuel cycle"**
- **Develop capabilities to advance understanding of SNF and HLW**

I.3. Advance Integrated Energy Systems

Coordinate and optimize use of nuclear, renewable, and fossil energies to produce cost-effective, reliable, sust ainable electrical and nonelectrical products to meet energy demands of industry and transportation sectors

ncrease access to low-cost, reliable, and resilient electricity and other energy services.

Responsibility

Todd Combs, John Wagner, Zachary Tudor

STRATEGY

- Advanced heat and transport modeling
- Lab-scale experimentation
- Energy systems integration (Dynamic Energy Transport and Integration Lab, superlab)
- Utility, industry, and university engagement
- Scaleup and demonstration

PEOPLE

- Program development and technical lead
- Increase Center for Advanced Energy Studies (CAES), National University Consortium (NUC) student engagement

INFRASTRUCTURE

- Energy Innovation Laboratory
  - Hybrid Energy Testing
  - Engineering Demonstration Facility
- Energy Systems Laboratory
  - Electrical generation and excess heat utilization
  - Electricity for production and materials products
  - Demo integration techniques for affordable and stable nuclear, grid, and energy
  - Superlab
- Reactor test complex
- Security systems

INITIATIVES

- Thermal energy - nuclear, solar, geothermal
- Electrical energy - test grid, microgrid
- Process intensification – hydrogen, chemical production
- Monitoring and control – superlab, human systems, Nuclear Hydrogen Initiative, cyber security

PARTNERSHIPS

- DOE Office of Nuclear Energy, Science, and Technology (NE), DOE Office of Energy Efficiency and Renewable Energy (EERE)
- National Laboratories
- Pacific Gas and Electric, Exelon, TerraPower, Nikola
- IAEA – Partner with Nuclear Energy Agency international institutes
- Utility and industry advisor boards

- Dynamic generation and delivery of high- and low-temperature thermal energy
- Tightly coordinated operations of electricity grids and energy storage options
- Management of the risk and complexity of tightly coupled energy systems
- Advanced industry competitiveness - hybrid thermo-electro-catalytic processes

I.4. Advance Design and Manufacturing

Increase economic competitiveness of energy-generation systems, structural components, security systems and industrial processes leveraging advances in fabrication and manufacturing S&T

Leverage advanced manufacturing S&T to reduce nuclear power plant capital and operating cost, and advance process applications matched to nuclear reactor energy properties.

Responsibility

Todd Combs, John Wagner, Ronald Crone



STRATEGY

- Advanced nuclear fuel – high burnup, higher efficiency, reduced spent-fuel waste
- High-performance materials for extreme environment – GEN IV, SMR, micro reactors, heat exchangers, armors
- In-pile, in-situ sensors and measurements
- Process innovations to effectively use steam or indirect heat source for industrial and transportation sectors

PEOPLE

- Strategic hires
- Expanded CAES and NUC student engagement

INFRASTRUCTURE

- Computer technologies (computer-aided design, engineering, and manufacturing)
- Novel fabrication and joining processes
- Additive manufacturing processes for fuels
- Advanced robotics and intelligent production systems
- Control systems
- Platform technologies to manufacture composite materials

INITIATIVES

- Assessment, qualification, and codification of advanced high-temperature materials
- Nuclear fuel fabrication
- Fabrication of irradiation test capsules
- Creation of novel and specialty materials for extreme conditions with defined/expected reactions and responses

PARTNERSHIPS

- National laboratories
- ExxonMobil, TerraPower, AREVA

- Design-driven manufacturing for reactor materials and fuels with advanced performance
- Accelerated time of development and qualification of nuclear materials and fuels
- Innovations in process technologies to expand use of nuclear energy

I.5. Enduring Control Systems Cybersecurity Innovation Capabilities

Apply INL's leadership capabilities to solve complex global security challenges in critical infrastructure, natio nal and homeland security, nonproliferation, and intelligence

Transform cyber-informed science and engineering of control systems in critical infrastructure and vital national security systems.

Responsibility

Zachary Tudor, Wayne Austad, Scott Cramer

STRATEGY

- Establish consequence-driven cyber-informed science and threat analysis
- Align national partners
- Build scientific rigor for long-term, complex R&D
- Plan R&D pathways for early deployment of innovative solutions

PEOPLE

- Shape national curriculum and training programs for government, industry, and academia
- Strengthen INL talent pipeline
- Develop rotational opportunities
- Energize science, technology, engineering, and math (STEM)-cyber programs

INFRASTRUCTURE

- Establish INL as a collaborative center
- Create functional and operational requirements for cyber-physical R&D labs
- Expand access to real equipment
- Create networked research and education ecosystem
- Complete State of Idaho-built Cybercore Integration Center

INITIATIVES

- DOE: Reinvention of energy infrastructure for both cyber and physical resilience
- DoD: Develop security solutions for military critical infrastructure
- DHS: Advance homeland security solutions
- Nuclear: Cyber-informed engineering of digital instrumentation and control
- Training: Accelerate transfer of cyber knowledge

PARTNERSHIPS

- Department of Energy
- Department of Homeland Security
- Department of Defense

- Solve critical control systems cybersecurity challenges
- Create a collaborative, interdisciplinary environment to advance foundational science in control systems cybersecurity
- Accelerate S&E talent pipeline development and increase proficiency of workforce in operations and defense

II. OPERATIONS

II.1. Transform How We Perform and Manage Work

Improve how we do our work and find opportunities to reinvest

Simple and intuitive workflows that deliver value to users because they are designed from the user's perspective and seamlessly integrate all requirements.

Responsibility

Curt Fleming, Robert Hillier, Carlo Melbihess, Carol Mascareñas

STRATEGY

- Eliminate non-value added laboratory-wide processes and training
- Intuitive and seamless and cost effective access to laboratory support services
- Remove order requirements that impede research and research productivity
- Leverage IT tools and solutions

PEOPLE

- Increase employee retention
- Increase INL collaboration
- Increase innovation

INFRASTRUCTURE

- Enhance IT/IM systems for
  - Financial system
  - Human resource management system
  - Contract/agreement system
  - Business intelligence system
  - Communication and collaboration platform
  - Knowledge management

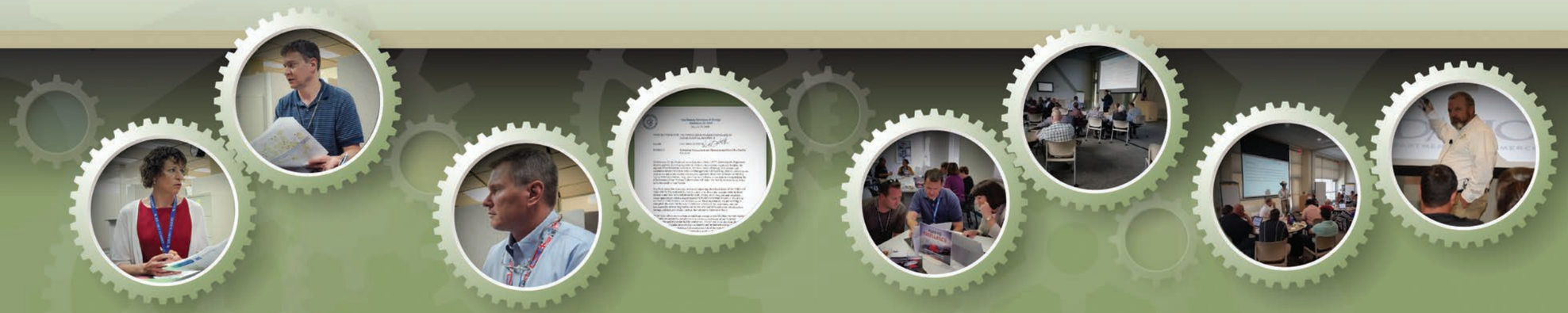
INITIATIVES

- Streamline and improve access to processes
- Unify service-management approach for commonly used support services
- Integrate and simplify requirements
- Enhance enterprise business processes and systems

PARTNERSHIPS

- Asset Suite upgrade
- Conduct of research
- Safety-culture improvement

- Efficiency: Improve process performance; improve employees ability to understand requirements
- Effectiveness: Clear processes for establishing roles, responsibilities, accountability, and authorities
- Safety: Create desired safety culture with simplified processes
- S&T Environment: Advance processes and systems to improve employee retention



II.2. Build INL's Future Workforce

World-class leadership and talent

Build a talent pipeline that continuously attracts and retains top talent to INL, creates a culture of talent development, inclusion and engagement, and rewards and recognizes employees with innovative, cost-effective, market-based compensation and benefit programs.

Responsibility

Mark Holubar

STRATEGY

- Strategy-aligned work force
- Supportive, collaborative, high-performance work environment
- Workplace that reflects inclusive diversity
- Continuous development and employee growth
- Market-based compensation, benefits, and wellness programs
- Positive relationship with collective bargaining and agreements focused on laboratory goals

PEOPLE

- Enhance leadership - Leadership styles and trademark competencies
- Broaden talent acquisition research
- Train staff – enhance internal work environment
- Hire senior diversity specialist

INFRASTRUCTURE

- Improve
  - People management system and tools
  - Employee development tools

INITIATIVES

- Attract top scientific and engineering talents
- Strengthen INL's competitive-compensation market position
- Plan succession and staff development
- Partner strategically to enhance talent pipeline
- Widen circle of talent pool - grow and strengthen underrepresented talent
- Integrate inclusive diversity into every function of INL's mission

PARTNERSHIPS

- Partnership, engagement and technology deployment
- CAES, NUC
- Community college partnership
- Partnering for research grants and opportunities
- The National GEM Consortium, The Interdisciplinary Consortium for Research and Educational Access in Science and Engineering

- Attract: Select the best, grow the pipeline, improve inclusive diversity
- Engage: Build trust, maintain high standards of performance, focus on outcomes
- Develop: Encourage professional and personal growth
- Reward: Recognize performance, competitive compensation

II. OPERATIONS

II.3. Modernize and Mature INL Information Systems and Services

Advancing information systems and services to support reliable, secure, efficient, and proactive information technology and management services

Efficiently and securely deliver modern technology capabilities that enable and improve S&T outcomes. Transition Information Management (IM) from reactive to proactive service delivery.

Responsibility

Robert Hillier

STRATEGY

- Deliver IT capabilities and services that align with S&T strategy to enable science that matters

PEOPLE

- Establish enterprise capabilities with improved usability and user experience
- Improve and train IT workforce
- Simplify IT processes and increase self service to improve employee satisfaction
- Increase automation and data-center orchestration to increase efficiencies and reduce delivery time

INFRASTRUCTURE

- Upgrade legacy and unsupported equipment
- Establish long-term equipment refresh cycle for aging infrastructure
- Upgrade and unify communications capabilities
- Expand wireless
- Upgrade core and external network backbone
- Consolidate and optimize the data center
- Advance regional optical networking with connectivity to Internet2 and the National Lambda Rail

INITIATIVES

- "Sawtooth" High Performance Computing (HPC) in FY-20
- HPC data storage
- Cloud computing and mobile-focused solutions
- Modern business systems
- Advanced knowledge management and business intelligence
- Upgraded aging infrastructure

PARTNERSHIPS

- Foster and grow relationships with IT hardware and software vendor
- DOE labs to baseline information technology (IT) capabilities
- INL's support and mission organizations

- Reliable, accessible, timely computing resources and business systems
- Automated mechanisms for self-service technology requests
- Next-generation HPC
- IT solutions and services with hardware-and software-life-cycle management
- Reporting, analytics, and visualization capabilities

II.4. Optimize cost management

More investment towards advancing mission by driving down costs

A cost-management culture and model that enables mission performance and is valued for the R&D output delivered per dollar spent.

Responsibility

Dennis Newby

STRATEGY

- R&D capabilities management model
- Establish resilient indirect planning
- Institutionalize multi-year planning, programming, and budgeting
- Leverage IT tools and solutions
- Reduce rising trend in capital and construction projects
- Reduce site services cost

PEOPLE

- Cost conscious culture – create more value at lower cost

INFRASTRUCTURE

- Enhance IT/IM systems and tools for
  - Financial system
  - Acquisition system
  - Contract/agreement system for (Strategic Partnership Project [SPP], Cooperative Research and Development Agreement [CRADA])
  - Project management
  - Business intelligence system

INITIATIVES

- Sunset or transfer mission organization's program-ready, operations cost from overhead to direct or other indirect-funding sources
- Strategic buy-downs and alternate pension funding
- Mature, dynamic, and multiyear Integrated Priority List
- Implement time billing, travel, Asset Suite, business analytics
- Review and revise INL's capital and construction costs
- Make/buy analysis for INL site services

PARTNERSHIPS

- Key vendor relationships
- National Laboratory Directors' Council groups to drive cost and regulatory reforms
- Battelle communities of practice to leverage best practices

- **Competitive cost model to drive cost-conscious behavior and aligns stewardship and resource-allocation decisions to program owners**
- **Efficient and effective investment decisions aligned to mission priorities**
- **More indirect funds for discretionary investment (e.g. LDRD)**
- **Optimized service delivery and cost models**

II. OPERATIONS

II.5. Revitalize Security and Enabling Infrastructure

Transform enabling infrastructure to advance mission-critical outcomes

Provide safe, secure, sustainable, and efficient facilities and end-to-end infrastructure that meet mission needs while supporting goals to consolidate and revitalize INL campuses.

Responsibility

Carlo Melbihess, Randall Hughes, Ronald Crone, Sean O'Kelly, Walter Gonzalez, Robert Hillier

STRATEGY

- Improve habitability for R&D staff and external user/sponsor experience at INL
- Establish facilities to improve efficiency in mission execution
- Pursue targeted direct investment
- Raise indirect investment
- Seek partnership with industry and private sector
- Address rising cost of project and construction
- Provide long-term stewardship of INL

PEOPLE

- Laboratory identity and employee morale
- Collaboration with local community colleges to maintain skilled workforce

INFRASTRUCTURE

- Real-property asset management
- Space requests, utilization processes, and measurement

INITIATIVES

- Leverage and correctly size INL facilities, infrastructure, and capabilities
- Operate and maintain INL facilities and infrastructure safely, reliably, and securely within approved budgets
- Sustain and renew enabling infrastructure and systems
- Optimize master-campus design
- Implement sustainability practices to meet or exceed INL commitment to conservation and environmental protection

PARTNERSHIPS

- Idaho Department of Transportation
- Idaho Board of Education
- City of Idaho Falls
- Bonneville County Metropolitan Planning Organization
- Idaho Department of Labor
- Idaho State University, minority-serving institutions
- Idaho State Historic Preservation Office
- Shoshone-Bannock Indian Tribes
- Butte, Bingham, Bonneville, Clark, Jefferson Counties

- Address infrastructure gaps
- Refurbish unique infrastructure
- Reduce deferred maintenance
- Perform major maintenance for general-purpose infrastructure
- Target decommissioning and demolition to manage footprint
- Ensure sustainability

II. OPERATIONS

II.6. Achieve Leadership in Safety to Enable Cutting Edge S&T

Actions to drive more-lasting reductions in injuries

Perform Lab operations in a reliable and effective manner to protect the environment and ensure the safety and health of INL staff, visitors, and the public.

Responsibility

Carol Mascareñas, Carlo Melbihess

- Efficient and effective implementation of operations through a culture that values excellence in safety, health, quality, security, and environmental-management requirements
- Giving employees a sense of mission to give their best performance – embedded organizational values, adjust to changes, drive collective purpose

STRATEGY

- Create a culture of trust that enables organizational learning
- Make it easy to do the right thing through sustained excellence in operations through program and process simplification

PEOPLE

- Develop engagement and cultural influence of our leadership
- Establish the Culture Integration Team

INFRASTRUCTURE

- Process changes
- Performance indicators to monitor culture improvements

INITIATIVES

- Embed human performance throughout Lab culture and processes
- Leverage process changes and IT/IM
- Participate on Culture Integration Team
- Understand and manage "all" influences that result in unwanted outcomes
- Proclaim a single safety message centered around safe conduct of research
- Advance the use of comprehensive employee-wellness program
- Advance the use of performance indicators

PARTNERSHIPS

- Senior Leadership Team
- Human Resources
- Battelle Corporate
- DOE

II.7. Advance INL's Stewardship of its Environmental Legacy

Addressing INL's environmental liabilities using a broad-based strategy

An effective and integrated program for life-cycle management of radioactive materials, including disposition of INL past and future waste and SNF.

Responsibility

Carol Mascareñas, Ronald Crone, Sean O'Kelly, Juan Alvarez

STRATEGY

- Good faith effort towards meeting NE/INL controlled regulatory milestone commitments to the State (Idaho Settlement Agreement [ISA], Site Treatment Plan [STP])
- Reduce NE/INL environmental liability
- Life-cycle stewardship for the use, generation, and disposition of radioactive materials
- Increase stakeholder awareness of NE/INL's commitment to environmental stewardship
- Post 2021 Idaho Cleanup Project (ICP) contract

PEOPLE

- External stakeholder awareness of INL liabilities and disposition successes

INFRASTRUCTURE

- RHLLW

INITIATIVES

- Collaborations with DOE-Idaho Office and site contractors to meet STP and ISA milestones
- Disposition paths or alternatives for INL environmental liabilities
- RD&D to reduce financial liabilities with waste legacy
- Plan for external stakeholder engagement
- Inform post 2021 ICP procurement strategy - Technical-needs assessments

PARTNERSHIPS

- ICP contractor
- Savanah River National Lab
- DOE Office of Environmental Management
- Leadership in Nuclear Energy Commission
- Technology and service providers – Veolia Nuclear, PermaFix, AREVA

- EM investments to remove waste and resolve technical issues
- NE investment to disposition Advanced Test Reactor and Experimental Breeder Reactor-II spent fuel
- Indirect and private investments in waste-treatment technology development

II.8. Advance INL's Security

Addressing INL's environmental liabilities using a broad-based strategy

An effective and integrated program for protecting nuclear materials, information, infrastructure, and people in a manner commensurate with national and departmental standards and that enables the INL mission

Responsibility

Randall Hughes, Robert Hillier

STRATEGY

- Secure reliable environment to perform critical national RD&D with nuclear materials, classified information, and other high-value security interests without risk to national security
- Protect special nuclear material (SNM), personnel, information, the environment, and government property from theft, diversion, sabotage, and malicious acts
- Secure computing capabilities which enable access to information at any time, from any location, on any device

PEOPLE

- Improve inclusive diversity
- Develop and mentor front-line leadership
- Train and deploy staff associated with facility-security upgrades

INFRASTRUCTURE

- Safeguards and security upgrades

INITIATIVES

- Complete INL 2016 DOE Design Basis Threat Policy Implementation Plan
- Security performance based strategy
- Cyber-protection framework adapted to include control systems and conventional digital systems
- Facility security upgrades
- Robust technology governance integrated into planning and work execution
- Cyber-risk assessment methodology streamlined for cloud and mobile systems evaluations

PARTNERSHIPS

- National Laboratories
- DOE-NNSA
- Naval Reactor Facility (NRF)
- Fluor Idaho, LLC
- Spectra-Tech, Inc.
- Local, regional, national law enforcement and response agencies

- SNM, other nuclear material, operating reactors, security areas, classified matter, high-value property, and people are adequately protected
- Security is perceived by relevant stakeholders to be a facilitator of mission initiatives
- Security is integrated with the INL work flow

III. STAKHOLDER ENGAGEMENT & COMMUNITY SERVICE

III.1. INL is a High Value Partner Nationally and in Community, State, and Region

Strategic partnerships to increase capabilities, leverage resources, and accelerate delivery of S&T outcomes and impacts

Enable discovery in energy and security by cultivating positive and enduring partnerships with researchers, academia, industry, national laboratories, and community.

Responsibility

Amy Lientz

STRATEGY

- Broaden Idaho and regional understanding of INL's outcomes and impacts
- Strengthen academic partnerships
- Translate advances in R&D to technology innovations and applications

PEOPLE

- Increase employee volunteerism to promote science, technology, engineering, and mathematics (STEM)
- Increase the numbers of staff engaged in S&E student committees, providing input to course curriculum and performing as adjunct professors

INFRASTRUCTURE

- Improve industry's access to information about technologies, ease in understanding technology transfer mechanisms, and ability to connect to the right people

INITIATIVES

- Expand INL's Idaho/regional presence and partnership and increase talent and research opportunities
- Provide STEM outreach and internship, include underrepresented students
- Build research capacity in collaboration with Idaho universities, NUC partners, and strategic institutions
- Seek targeted, high-potential R&D talent
- Advance INL partnering and collaboration agreement mechanisms, programs, and opportunities

PARTNERSHIPS

- State of Idaho and its state education organizations
- NuScale/Utah Associated Municipal Power Systems, Terrestrial, and other advanced reactor manufacturers and their suppliers
- Regional incubators/accelerators, talent pool, and universities
- Office of Technology Transitions, DOE-ID counterparts, GAIN, Small Business Innovation Research Program, CAES, NUC
- Battelle Commercialization Council, Techonlogy Transfer Working Group, National Laboratory Techonlogy Transfer Group
- Idaho Technology Council/ Tech2Market, Breakthrough Energy Ventures/Others

- SPP, CRADA: Leverage resources and capabilities to support private sector and other federal partners
- Technology Transfer: Work with industry, increase the pace of technology to marketplace
- CAES, NUC: Strategic university partnership to advance education and research
- Regional: Leverage regional energy-innovation ecosystems
- National & International: Enable strategic engagements and exert global influence