Idaho National Laboratory

Strategic Plan

Leading the Renaissance in Nuclear Energy

FY 2007-2016

INL Idaho National Laboratory

Introduction

Leading the Renaissance Through Transformation

John J. Grossenbacher

The outlook for energy security for the U.S. and world clearly demands the expanded use of carbon-free sources of energy. A year after establishing a new laboratory, the professionals at the Idaho National Laboratory (INL) are now pursuing challenges associated with national and global imperatives to research, develop, demonstrate, and deploy technologies to deliver energy security. Of special importance is enabling the expanded use of nuclear energy with (1) a nuclear fuel cycle that addresses nuclear waste in the U.S. and proliferation concerns around the world, and (2) technology for making hydrogen that can make nuclear energy relevant to meeting America's transportation needs.

The first year for the new INL has been a time of organizing and consolidating. We have taken steps toward a revitalization of INL's people, processes, facilities, and information technology, and we are leading a complex-wide initiative to revitalize and integrate civilian nuclear facilities and capabilities. We are now executing an aggressive transformation campaign to better utilize our resident and emerging science and engineering capabilities.

Our transformation during the next decade will require bold and deliberate steps in leading the development of nuclear energy and national and homeland security. It will be focused on enabling technology development supporting the Global Nuclear Energy Partnership and Next Generation Nuclear Plant. The former creates the fuel cycle of the future, and the latter makes nuclear energy relevant to a broad range of energy industries—from process heat for petrochemical to hydrogen for petroleum refineries. We will invest in: improvements in both the Advanced Test Reactor and the Critical Infrastructure Test Range; the Center for Advanced Energy Studies; and INL's world leadership in safe operations. Eventually, as the Idaho Cleanup Project comes to a successful completion, INL must also assume responsibility for future INL environmental stewardship.

We are working hard to earn the trust, confidence, and support of our many stakeholders. These efforts will be evidenced by refurbished, state-of-the-art infrastructures; evolving academic, industrial, and laboratory networks; strong research centers of excellence building our five distinctive scientific signatures; world-class researchers; and notable energy security contributions.

Only through disciplined effort and unprecedented performance can we attain our goals. INL's Strategic Plan outlines the hard work and actions necessary for us to lead the renaissance of nuclear energy. Within these pages, you will see our strategic framework and initial efforts to build a laboratory that inspires our people, intensifies and accelerates our research, and will lead us to the achievement of our vision.

We are excited about INL's future as we continue this important and successful journey—a journey that will lead us to recognition as a preeminent and enduring, world-class laboratory.

Director, Idaho National Laboratory and
President, Battelle Energy Alliance, LLC.

INL: Leading the Renaissance in Nuclear Energy

MISSION

Ensure the nation's energy security with safe, competitive, and sustainable energy systems and unique national and homeland security capabilities

VISION

Within ten years, INL will be the preeminent nuclear energy laboratory with synergistic, world-class, multiprogram capabilities and partnerships

PRINCIPAL PRIORITIES

- World-leading safety behavior, safety performance, and environmental stewardship
- Respect and caring for our people
- Mission accomplishment

This Strategic Plan presents the objectives that will transform the Idaho National Laboratory (INL) during the next decade. These eighteen objectives are summarized in the INL Strategy Map on the next two pages and are defined in five areas:

- Build our nuclear energy leadership
- Build our national and homeland security leadership
- Focus our multiprogram science and technology portfolio on energy security
- Develop our supporting science and engineering capabilities and revitalizing U.S. nuclear science and engineering education, academic research, training, and infrastructure
- Enable the strategy by building public trust and confidence, achieving excellence in laboratory operations and management, and leading the effort to revitalize and integrate nuclear facilities and capabilities across the DOE complex.

This plan summarizes the actions our Laboratory must execute for this ambitious agenda. A timeline at the end of the plan summarizes the key INL milestones.

"To build a secure energy future for America, we need to expand production of clean, safe nuclear power."
- Secretary Samuel Bodman

Dr. Jim Lake (left) briefs President George W. Bush (center) and Secretary of Energy Samuel Bodman (right) on INL's contribution to national energy needs.

INL Strategy Map

2015

INL is the preeminent Nucl
synergistic world-class multiprog

Mission Accomplishment

and ensure that we attain

Customer Service Excellence

"Lead the Renaissan

Regional Community
"We trust the INL, and they're an asset to our community in its cultural and economic growth"

Scientific Community
"We want to build our careers at INL"

that drive our

The Strategic Actions

Multiprogram Na

Nuclear Energy Leadership

OBJ. 1 - Build the fuel cycle of the future Pg 1

OBJ. 2 - Lead and deliver advanced nuclear reactor systems Pg 2

OBJ. 3 - Lead the global nuclear energy agenda Pg 3

OBJ. 4 - Power space exploration for the nation Pg 4

OBJ. 5 - Build strategic relationships with industry organizations and regulators Pg 5

OBJ. 8 - Deliver innovative technology through strategic

enable us to execute

Our Resources and our Infrastructure

Science and Engin

OBJ. 9 - Establish a robust science base with five distinctive scientific signatures Pg 11

OBJ. 10 - Maintain and enhance a strong engineering base and project management Pg 12

The Critical Enable

OBJ. 13 - Develop public trust and confidence in INL and nuclear energy Pg16

OBJ. 14 - Demonstrate world-leading safety, environmental, and operational performance Pg16

OBJ. 15 - Create three modern laboratory campuses Pg 18

The INL has developed this strategy map to provide a simple method of communicating the interdependent strategies being pursued to achieve the Laboratory vision. The Strategic Plan itself is organized according to this map.

Vision

ear Energy Laboratory with ram capabilities and partnerships

ce in Nuclear Energy"

DOE
"INL delivers on our vision"

Program Partners
"INL provides us unique, unmatched capabilities and solutions"

Nuclear Industry
"INL provides solutions that help us today and in the future"

tional Laboratory

National and Homeland Security Leadership

OBJ. 6 - Build five primary development and test capabilities and two technology platforms into leading roles in nonproliferation and critical infrastructure protection Pg 6

Energy Security S&T Portfolio

OBJ. 7 - Establish a vital energy security business Pg 9

partnerships and effective commercialization Pg 10

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OBJ. 11 - Revitalize nuclear science and engineering education and training Pg 13

OBJ. 12 - Establish and apply three resource networks Pg 14

rs of Our Strategy

OBJ. 16 - Develop, recruit, and retain a world-class workforce Pg 19

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OBJ. 18 - Establish and leverage nine research centers Pg 21

Multiprogram National Laboratory

Nuclear Energy Leadership

Nuclear energy holds enormous potential for the future and will benefit America and the world with safe, secure, environmentally responsible, and affordable energy. This potential provides the opportunity for a nuclear renaissance, a renaissance evidenced by endorsements and recognition of the need for nuclear energy from a broad spectrum of people around the globe, including prominent environmentalists. It also offers the opportunity for the United States to lead an effort that will result in better lives and living standards for people throughout the world. INL will partner with the U.S. Department of Energy (DOE) and its national laboratories, industry, universities, and the international community to provide technical and programmatic leadership by integrating key research and development to support this renaissance.

Strategic Objective 1 –

Build the Fuel Cycle of the Future

As emissions-free nuclear energy expands both domestically and internationally, new technologies to recycle nuclear fuel must be deployed in a manner that addresses waste, safety, security, and economic concerns while strengthening the nuclear non-proliferation regime internationally. The challenge of creating these systems is currently being addressed by an ambitious program in the DOE called the Global Nuclear Energy Partnership (GNEP).

INL will lead advancements in technology for GNEP with other national laboratories that will be developed and demonstrated over the next 20 years. The GNEP Technology Demonstration Program will form the technical basis for a Secretarial decision in 2008 on technologies and facilities needed for closed-fuel cycle deployment in the U.S. INL has roles in key technology areas including fuel separations, fuel development and testing, systems analysis, and modeling and simulation. INL has the lead role in developing capabilities and planning for an Advanced Fuel Cycle Facility (AFCF).

Technology demonstrations are also being contemplated by DOE for the UREX+ separations process as well as recycling key waste components in a fast reactor. UREX+ is a method of chemical separation that removes uranium, fission products, and selected actinides from used nuclear fuel, leaving a mix of plutonium and minor actinides. In addition to UREX+, which enables the recovery of most of the energy content in used nuclear fuel, separations technologies must be developed and demonstrated for components that will be recycled. For these, INL has world-class capabilities in both aqueous and pyrochemical separations.

When built, the AFCF will provide one-of-a-kind infrastructure to support the development and demonstration of advanced separations technology, actinide fuel fabrication, and safeguard demonstration. Prior to the construction of AFCF, INL's capabilities in actinide chemistry and chemical engineering will begin the early exploration of these added separations technologies for GNEP.

Troy Garn, INL researcher, tests a fuel recycle flow sheet in a centrifugal contactor pilot plant.

INL's fuel development and testing abilities are also world-class in several technical areas, including fuel development, irradiation testing, and postirradiation examination. These capabilities are being enlisted by the GNEP and other programs to improve performance of commercial

light-water reactor fuels, utilizing the Center for Nuclear Fuels and Materials, and converting research reactors worldwide to use low-enriched uranium fuel.

Systems analysis and modeling are key to INL leadership in the fuel cycle of the future. The results of systems analyses that study the behavior of future fuel cycles under various scenarios will aid decision-makers in selecting the best processes and reactor technologies and in formulating steps to deploy them. This enables rapid progress toward the long-term national goals of sustainability, proliferation resistance and physical protection, uranium resource extension, and an economical and safe closed-fuel cycle. In 2006, INL's systems analyses resulted in an authoritative technical options report that provides the Secretary of Energy with the information needed to make a decision on the need for a second geologic repository.

Strategic Objective 2 –

Lead and Deliver Advanced Nuclear Reactor Systems

The development and demonstration of advanced reactors is central to establishing the U.S. as the leader in future nuclear energy technologies. The U.S. has joined international partners in the Generation IV International Forum (GIF) to study global nuclear energy needs and identify promising nuclear energy systems that are economical, safe, sustainable, and proliferation-resistant. Consistent with U.S. priorities, INL will provide technical and programmatic leadership with other national laboratories in the development and demonstration of a fast spectrum, sodium-cooled reactor (SFR) and a very-high temperature, gas-cooled reactor (VHTR). Each will occupy a vital niche in America's nuclear future. The SFR will play an important role in nuclear materials management, fuel cycle sustainability, and electricity production. The VHTR will efficiently produce hydrogen, electricity, and high-temperature process heat for industry.

The SFR is the preferred option for GNEP because it relies on technology that has already been demonstrated. A U.S. system, based on the SFR, will demonstrate sodium-cooled, fast-spectrum reactor technologies and will use recycled actinide fuel technology. In the longer term, development and demonstration of the SFR will leverage INL's long history of fast reactor and fuel cycle development. For both, technology advances focus on innovative power system design features, the development of transmutation fuel, and better modeling and simulation capabilities to support more efficient designs and licensing processes. These advances are being explored in cooperation with our industrial, international, laboratory, and academic partners.

Kevan Weaver, INL Scientist/Engineer, explains how the ATR will be used to test advanced fuels and materials for the next generation reactors.

The VHTR system is capable of producing hydrogen for transportation uses (in the near-term through synthetic fuels, and in the long-term through fuel-cell powered cars), and this system was named the Next Generation Nuclear Plant (NGNP) and authorized by the Energy Policy Act of 2005. NGNP will provide better and more affordable energy products that will allow America to reduce both greenhouse gas emissions and reliance on foreign oil. The INL is helping establish a collaborative alliance of end users and technology developers with the aim of forming a cost-shared public-private partnerships with DOE for NGNP development and demonstration.

Phil Sharpe works at INL's Tritium Cleanup System at the Reactor Technologies Complex.

Major collaboration with laboratories, industry, universities, and international partners will leverage advanced reactor research. Specifically, NGNP will pursue fuel performance validation, materials qualification, development of design and safety methods, hydrogen production, energy transfer between the nuclear island and hydrogen plant, and high-efficiency electrical power conversion. Current work includes fuel fabrication, preparations for irradiation in the Advanced Test Reactor (ATR), testing designs for graphite irradiation structural testing facilities, testing of high-temperature alloys, development of high-performance computer code models, and laboratory and pilot-scale testing of high-temperature hydrogen production methods.

Strategic Objective 3 –

Lead the Global Nuclear Energy Agenda

INL is exercising leadership in three primary areas of the nuclear renaissance: building the GNEP, advancing international cooperation in nuclear research and development with the GIF, and supporting the revitalization of the nuclear industry in America. A nuclear energy agenda focused on these areas will allow the expanded use of nuclear energy, enable more countries to adopt and expand their use, and open opportunities for U.S. industry to successfully participate and grow in domestic and international markets.

As described above, GNEP is a bold new program focused on (1) making nuclear energy expandable for many decades to come with long-term fuel and waste management based on a closed fuel cycle, and (2) creating a new paradigm for the nations of the world to develop and use nuclear energy and reduce the threat of nuclear proliferation. INL leads the GNEP technical program for DOE by guiding and integrating the efforts of the national laboratories.

The GIF was established in 2000 to bring together the nations most active in nuclear energy research and development and that are interested in cooperating for mutual benefit. The GIF created and signed a Framework Agreement in 2005—a treaty-level document for the nations acceding to it—enabling multinational research and development cooperation on a scale not seen since the reactor safety programs of the 1980s. GIF expanded in 2006 with the addition of China and

Chinese and Russian delegates join the Generation IV International Forum in July 2006.

Russia, and now includes every major country developing civilian nuclear energy for the world.

Following the long pause in U.S. nuclear construction during the 1980s and 1990s, DOE has begun to stimulate new plant orders with its Nuclear Power 2010 (NP2010) program. While new plants are imminent, some of their technology and large components will be initially supplied by offshore nuclear industries. INL is committed to revitalizing U.S. nuclear industries–rebuilding their technology, capacity, and overall competetiveness both nationally and internationally. As referenced above, the NGNP holds the potential for nuclear energy to become a source of hydrogen, revolutionizing the transportation industry and reducing dependence on foreign oil. INL is working to build industrial participation in, and seeking federal commitment to, a project to build a prototype NGNP. As an early step toward involving industry in NGNP, in late 2006, the INL formally requested proposals from firms interested in participating in the pre-conceptual design of the plant. Successful bidders will have the opportunity to apply their vision and expertise in the earliest design phases of this flagship facility. The later detailed design and construction activities will provide additional opportunities for industrial participation on a large scale.

Strategic Objective 4 –

Power Space Exploration for the Nation

The U.S. continues to explore the solar system and plans ambitious human habitations on the moon and Mars. These missions require reliable nuclear energy systems to power scientific instruments, propel advanced spacecraft, and operate life-support systems for astronauts. INL is producing advanced radioisotope thermoelectric generator (RTG) systems (space batteries) and testing fuel for space-based reactors and rockets; it has the capabilities for demonstrating systems before deploying them into space.

On January 19, 2006, an Atlas-V rocket launched the Pluto/New Horizons observatory on its way to Pluto at the solar system's outermost edge. An RTG to power the spacecraft's systems and scientific instruments, was assembled, tested, and delivered by a dedicated INL team.

DOE has an Environmental Impact Statement underway for resuming production of plutonium-238, the radioisotope that provides the heat for the reliable space batteries. INL is studying alternatives including a new facility for these production operations as well as utilization of existing facilities and improved fabrication processes in collaboration with ORNL. The power systems team is working to establish the capability to assemble two new types of radioisotope power systems, including the one that will power the Mars Scientific Lander in 2009. Also, INL is working with other DOE laboratories and with the National Aeronautics and Space Administration (NASA) on long-term mission centers to develop a lunar surface power reactor and a nuclear rocket for the voyage to Mars.

INL provided the space battery for January's launch of the New Horizon spacecraft.

To further support space exploration, INL has established the Center for Space Nuclear Research (discussed in more detail on page 23). The Center supports collaborations between universities and INL in developing cutting edge technologies for space nuclear power and propulsion systems. In 2006, the Center hosted 14 summer interns.

Strategic Objective 5 –

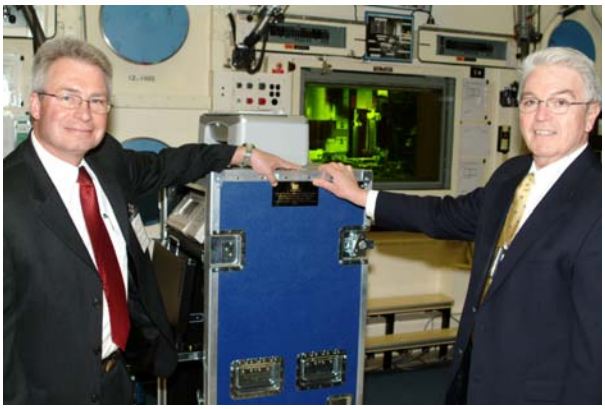
Build Strategic Relationships with Industry Organizations and Regulators

In addition to working with other national laboratories, INL is committed to forming strategic partnerships with leading nuclear industry organizations and regulators. Through expanding relationships with the Electric Power Research Institute (EPRI), the Nuclear Energy Institute, and the Institute for Nuclear Power Operations, among others, INL seeks to align with the priorities, vision, and growth strategies of the nuclear industry in the areas of technology development, federal and industry initiatives, and operational excellence. INL will facilitate development of a closer strategic relationship between the Laboratory, Nuclear Regulatory Commission (NRC), and DOE that strengthens the capability of each to meet national and international regulatory needs. Several areas are key to these efforts.

First, the development and execution of an effective U.S. nuclear energy research and development program requires an understanding of the commercial nuclear market.

Second, the partnering of the commercial nuclear industry with DOE's nuclear laboratories will accelerate the deployment of key emerging technologies to commercial nuclear power plants. These include breakthrough economic, performance, safety, and security features for the nation's fleet of operating reactors. Priority will be given to helping adapt and license the latest instrumentation and controls digital technology and advanced high-burn-up fuels in nuclear energy systems.

Third, by continuing our long history of service to the NRC, INL will help regulators work with industry to safely deploy and license innovative reactor technologies. These relationships position INL to craft a research agenda that fully reflects the perspectives of all principals in the nation's nuclear future and the collective needs of both industry and regulators.



AREVA's Tom Coleman (left) and INL's Pete Planchon show the Eddy Current Measurement System, which enhances INL's ability to examine nuclear industry fuel.

Strategic relationships and collaborations are taking shape, including the formation of an INL Utility Advisory Board. This board, comprised of leading nuclear utility executives, advises INL on research priorities, technology needs, and the special interests of the nuclear industry. Working closely with EPRI, INL has also established the Center for Nuclear Fuels and Materials Research to pursue research on commercial nuclear fuels. Other notable accomplishments include developing a joint EPRI/INL research agenda, assisting the NRC in drafting a technology-neutral licensing framework for advanced nuclear power plants, and engaging the nuclear industry in defining research required to develop digital instrumentation and control technologies for current and future nuclear power plants.

Key Milestones for Nuclear Energy Leadership –

- Approval of conceptual design activity for the AFCF 2008
- Support the Secretarial Decision on GNEP technologies and facilities 2008
- Complete Advanced Test Reactor upgrades 2010
- Grow nuclear energy programs to $250M annually 2015
- Startup of NGNP..... 2021

National and Homeland Security Leadership

Idaho National Laboratory leverages its scientific expertise, engineering discipline, and unique infrastructure to provide customers with science and engineering technologies, solutions, research, and development support. Our work continually strives to identify and defeat threats to the nation's critical infrastructures and reduce the risks of illicit proliferation of nuclear materials and technologies.

Strategic Objective 6 –

Build Five Primary Development and Test Capabilities and Two Technology Platforms into Leading Roles in Nonproliferation and Critical Infrastructure Protection

By 2015, INL will be a leading center for national and homeland security solutions. The Laboratory's objective is to build five primary development and test capabilities and two technology platforms into leading roles in critical infrastructure protection and nuclear nonproliferation.

Development and Test Capabilities

To meet this objective, INL will continue to excel and achieve significant milestones in the following five primary development and testing capabilities.

Supervisory Control and Data Acquisition/ Cyber/Power Grid Security—INL's efforts in securing supervisory control and data acquisition (SCADA) systems, process control systems, cyber and physical assets, and wireless communication systems are recognized internationally. Our Critical Infrastructure Test Range, utility-scale transmission and distribution systems, SCADA-controlled substations, and comprehensive expertise creates a unique location for real-world infrastructure testing and analysis of energy distribution and industrial control systems. Our work addresses security and reliability for control systems challenged by age, natural disasters, and terrorism. We manage the Department of Energy's National SCADA Test Bed and the Department of Homeland Security's Control Systems Security Center. INL also operates the National Nuclear Security Administration's Center of Excellence for Vulnerability Assessments.

INL researcher Jerry Shurtliff reconfigures the settings for a number of computer components inside the Laboratory's cyber security test bed.

These efforts form the foundation for creating the Center of Excellence for Critical Infrastructure Protection by 2008, to be sponsored by the Department of Homeland Security or the Department of Defense. This designation will be followed by creation of the Center of Excellence for Electric Grid Reliability in 2010.

Communications Systems and Wireless Technology— INL's infrastructure protection capabilities are enhanced by our expertise, assets, and tool development in communications systems and wireless technology. Our communications test bed, low-radio-frequency noise environment, and National Telecommunications and Information Administration experimental station designation creates a single location for protecting communications systems against unsecured interoperabilities, vulnerabilities, and physical and cyber threats. Capabilities also exist to examine the interdependencies that exist between communications equipment and other critical infrastructure sectors. The Laboratory offers

customers large-scale testing of cellular and microwave communications, land mobile radios, wireless local area networks, and satellite systems.

Nuclear Nonproliferation—In leading DOE's nuclear energy research, development, and demonstration efforts, INL works to further nuclear nonproliferation objectives. Our operations and scientific expertise extend through the nuclear fuel cycle and provide materials and process security, signatures and detection, advanced nuclear energy safeguards and policy, radiological/nuclear training and testing, and evaluation solutions and services to national and international customers. This work helps protect physical, intellectual, and operational resources and helps prevent the illicit production, acquisition, transport, and use of nuclear materials and technologies. INL provides advanced concepts and technologies to transform safeguards approaches and reduce proliferation risks in advanced nuclear energy systems. Our work will play a key role in the GNEP through the secure deployment of nuclear energy systems and proliferation-resistant fuels. This work will form the foundation for creating the Center of Excellence for Nuclear Nonproliferation Safeguards and Security by 2009.

Mitch Meyer, INL scientist, explains the process used to produce uranium-bearing fuel plates for making proliferation-resistant nuclear fuels.

Explosives Detection and Testing—INL scientists are expert in ion mobility and active neutron interrogation for trace and bulk explosives detection, respectively. We perform explosive forensic analysis, design improved sensors, and develop detection testing protocols and standards. We have the capabilities to detect and test a wide range of explosives threats, measure their effects on structures and protective barriers, evaluate the effectiveness of potential counter-measures, and conduct in-depth vulnerability assessments of critical infrastructure facilities.

The award-winning Idaho Explosives Detection System uses a neutron interrogation technique to scan cargo trucks for smuggled explosives. Pictured (left to right): Jeff Klinger (program manager), Ed Reber (technical lead), Larry Blackwood, and Ann Eggers.

Unmanned Aerial and Ground Vehicles (UAV/UGV)—INL's remote location and controlled boundaries offer a unique environment for unmanned aerial and ground vehicle testing and sensors development. INL's UAV/UGV programs focus, in part, on operational support and unique missions as they relate to critical infrastructure protection and radiation detection. Our expertise, testing facilities, and research and development experience assist customers looking for cost-effective, affordable, field-deployable technologies that can be integrated with advanced sensors for providing detailed information about remote and hazardous locations.

Technology Platforms

In addition to specific development and testing capabilities, INL will focus on two primary technology platforms: materials applications and process controls.

Materials Applications—With a successful history in analyzing and testing materials in aggressive and harsh environments, INL will direct the development and application of materials in many areas. These include innovative sensors, defense materials with superb performance, nuclear fuels with improved nonproliferation characteristics, and light armor development and manufacturing capability. The latter is unique within the national laboratory system.

Henry Chu inspects two pressureless sintered silicon carbide armor plates developed for body armor applications.

Process Controls—INL has had great success in the design, development, prototyping, testing, and demonstration of complex engineered systems including nuclear reactors, reprocessing and waste handling, and special defense command and control systems. Building on this success, INL will help improve process controls technology to protect the nation's critical SCADA, data control systems, and programmable logic controllers, among others.

Accomplishments towards our strategic objectives include:

- Received a SCADA Leadership Award from the Systems Administration Audit Network Security (SANS) Institute and California Congressman Dan Lungren, chairman of the House Homeland Security Committee on Economic Security, Infrastructure Protection, and Cybersecurity
- Completed initial vulnerability assessments and providing security recommendations on four next-generation utility vendor systems, which will make up nearly 80% of the U.S. power grid
- Received the honor of having two INL researchers selected as Department of Homeland Security Thrust Area Coordinators to assist in research, development, and detection methods for countering the threat of improvised explosive devices
- Developed concealed weapons detectors that have been installed at Department of Corrections' facilities in New Jersey and Maryland
- Received the Christopher Columbus Fellowship Award for Homeland and Border Security Innovation
- Earned an R&D 100 award for the Hazmat Cam Wireless Video System.

Kevin Young displays his R&D 100 award-winning Visual First Responder wireless video camera.

Key Milestones for National and Homeland Security Leadership –

- Develop a DHS/DOD Center of Excellence for Critical Infrastructure Protection 2008
- Develop a Center of Excellence for Nuclear Nonproliferation Safeguards and Security 2009
- Develop a Center of Excellence for Electric Grid Reliability 2010
- Grow national and homeland security programs to $205M annually 2015

Science and Technology for an Energy Security Portfolio

Energy security is a global challenge. INL will be distinguished by contributing to scientific research and innovations in science and technology that address America's current and future energy security.

INL provides integrated science and technology solutions that address the production, protection, distribution and use, and environmental challenges associated with energy security.

Strategic Objective 7 –
Establish a Vital Energy Security Business

INL will address the nation's energy production need with technology for the efficient use and transportation of fossil fuels and for renewable-energy sources such as geothermal, biomass, and hydropower. The substitution of alternative fuels, including hydrogen, will be especially important to achieving the revolution in modern transportation systems required to reduce the nation's reliance on petroleum-based fuels for vehicles. INL is already working on technologies (e.g., diesel reforming, fuel cells, and advanced batteries) to produce more efficient fuel sources for current transportation applications in both civilian and military environments. In 2007, INL will initiate a new lab-wide initiative in energy security that will significantly broaden the scope and increase the number and integration of research projects addressing energy security. Aided by this initiative, the Laboratory will form new and grow existing partnerships with industry and government to achieve competitive research awards valued at $50 million or more by 2010.

INL will also contribute to advancing the diversity, efficiency, and affordability of domestic energy sources. Key research efforts will focus on improving energy efficiency and ensuring that energy production, delivery, and use are environmentally and economically practical. For example, INL is involved in DOE's national effort, known as the Big Sky Carbon Sequestration Partnership, to demonstrate effective ways to manage carbon dioxide releases to the atmosphere. In addition, INL will continue to provide innovative solutions to long-term environmental stewardship and waste management challenges, with particular emphasis on understanding the links between energy production and water-resource use.

Key Milestones for the Energy Security S&T Portfolio –

- Compete for and earn a cumulative $50M in research grants 2010
- Grow energy security programs to $120M annually 2015
- Develop hydrogen production technology for large-scale transportation needs..... ~2020

Partnerships: A Common Objective

Industrial partnerships support all areas of the multiprogram laboratory, including nuclear energy, national and homeland security, and science and technology.

Jack Lance (left) welcomes Jeffrey Parker, Canadian Consultant General, and a 45-member Canadian delegation to INL to discuss areas of collaboration, joint research, and transfer/commercialization of INL technologies to the marketplace.

Strategic Objective 8 –

Deliver Innovative Technology through Strategic Partnerships and Effective Commercialization

U.S. competitiveness in the global technologies market requires strong partnerships and business agreements between commercial industry and the Laboratory. With a vigorous business approach, these industrial partnerships will mobilize the development and testing of new innovations and effectively commercialize technology. Several areas present opportunities:

- The broad range of energy technologies in the energy security portfolio
- Nuclear fuels and materials research supporting current and future generation reactors founded on a new Center for Nuclear Fuels and Materials Research in 2005, with operations at the Materials and Fuels Complex (MFC) and offices in the Center for Advanced Energy Studies (CAES)
- Irradiation testing and development of advanced fuels and materials in ATR
- INL is advancing medical radioisotope technologies using the ATR and radiochemical capabilities in partnership with medical products companies.

To maximize these partnerships, there is a need to support mission-critical industry work with commercial business terms and improved investment conditions. A model for the commercial agreements could be a *Use Permit*, which is a contractual framework that will allow the Laboratory to serve commercial customers more directly and effectively. Currently, industry funding is acquired through Work-for-Others (WFO) and Cooperative Research and Development Agreements (CRADAs). Improved investments in R&D from private sources could be implemented through privately funded technology transfer.

WFO and CRADAs enable INL to support industry and other government agencies on various research efforts including renewable energy sources (advanced wind turbine deployments, automotive engine configurations, battery technologies, fuel cell components, etc.).

Science and Engineering Capabilities

Science and engineering must be strengthened to support INL's nuclear energy and national and homeland security leadership and our energy security portfolio. This will be accomplished by establishing five laboratory-wide, distinctive scientific signatures; revitalizing U.S. nuclear science and engineering education and training; and creating resource networks among industry, academia, and national laboratories to bring to INL the talent and resources needed for major projects and scientific advances. These will support crosscutting needs of the INL mission areas.

Strategic Objective 9 –

Establish a Robust Science Base with Five Distinctive Scientific Signatures

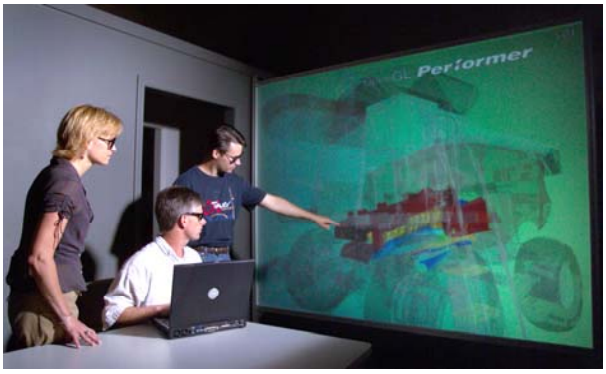
After more than a half century as an engineering laboratory, INL is expanding its science base by developing five distinctive scientific signatures. These scientific signatures are the foundation for advances in nuclear, fossil, and renewable energy; environmental systems research; and national security testing and demonstration.

This past year the Laboratory developed roadmaps and established advisory committees for each distinctive signature. A key objective is hiring nationally and internationally recognized scientists to lead the signature areas.

The decade-long transformation to a robust science and technology portfolio will produce scientific discoveries and support the application of scientific advances to the Laboratory's missions. This, along with INL's distinctive signatures, will attract additional preeminent researchers, foster new program opportunities, transform our culture toward scientific inquiry, and promote INL's reputation for unique scientific and technical careers. The following paragraphs describe our five distinctive scientific signatures.

Advanced Materials and Nuclear Fuel Science integrates physical understanding of the processing, structure, and properties of materials under demanding conditions, with in situ validation of performance models to deliver energy systems with advanced performance and reliability. A prognostics philosophy enables this technology development. The approach integrates thorough knowledge of structure/property relationships with real-time performance validation and multi-scale lifetime prediction models. While this advanced materials and fuel signature focuses on nuclear energy, it crosscuts other energy systems, hydrogen generation and storage, and national security.

Theory, Modeling, and Simulation encompasses the tools to advance the theory of basic processes and the design of complex energy systems using advanced numerical modeling and computer simulations. This signature is based in the Center for Advanced Modeling and Simulation (discussed on page 23). It will enable a suite of modeling and computing capabilities and link to leadership-class computing at other laboratories.

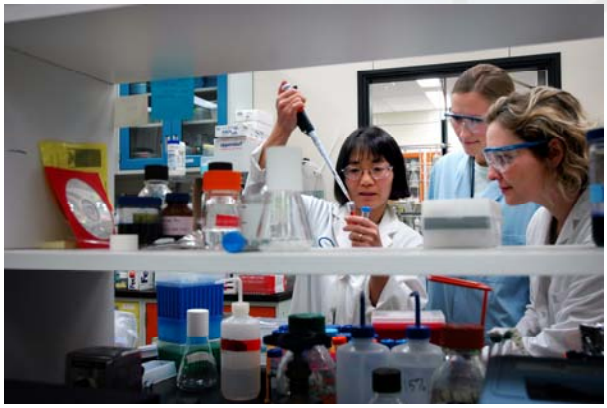


Engineers use advanced computing to simulate and model virtual mechanical systems that will hasten the viability of a new agricultural bioenergy industry.

Separations and Actinide Science integrates and expands capabilities for basic and applied research to underpin the economical development of an advanced fuel cycle. In addition, this signature supports development of inherently safe high-temperature fuels, eliminates the potential production of nuclear weapons through reprocessing spent fuel, and delivers advanced waste forms. This signature will be based in the AFCF.

Microbiological and Geological Systems Science provides the ability to assess, understand, predict, and control complex microbiological processes within the context of their environment.

This signature will focus initially on developing the microbial metabolic pathway models that are at the forefront of predictive biology. The modeling capability will drive fundamental and applied research from small to large scales of observation. Future applications for biological and geophysical systems include energy production, resource recovery and use, water quality and quantity, and environmental remediation.



Microbiologists study microorganisms to understand, predict, and control microbiological processes in complex environments.

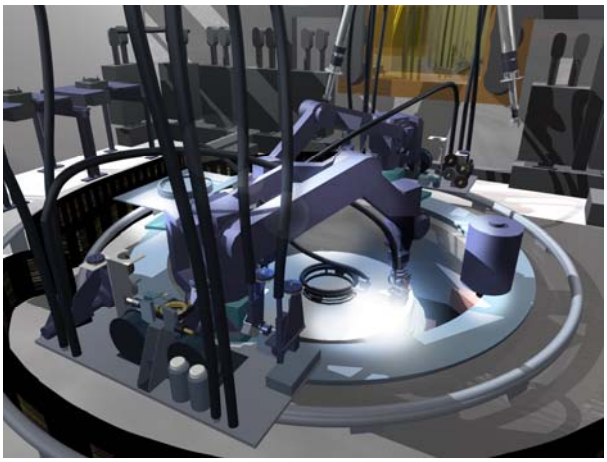
Instrumentation, Control, and Intelligent Systems addresses intelligent systems theory and algorithm development, control theory and algorithm development (with an emphasis on system stability and survivability), and human factors research (with an emphasis on human/machine interactions). Research addresses recognized fundamental issues, and is supported by relationships with university and industrial partners.

Strategic Objective 10 –

Maintain and Enhance a Strong Engineering Base and Project Management

For more than five decades, the Laboratory has undertaken projects that turn science into engineered systems, earning national and international recognition in the field of nuclear energy. Reinvigoration of that engineering base, including major project/program management, will be necessary to deliver new technology demonstration projects. Expertise will be enhanced in multiple disciplines, especially nuclear engineering, advanced modeling and simulation, process/separations, intelligent systems, and materials engineering.

Also important are INL's new strategic partnerships with AREVA and Burns and Roe. These partnerships, as well as others being formed with leading commercial nuclear engineering companies, can support projects such as the GNEP and NGNP. In return, the projects will attract talent from world-class engineering institutions that seek INL's experience in prototype testing and field-proven technologies.



INL is designing, developing, and demonstrating a one-of-a-kind remote welding system to close and seal spent nuclear fuel and high-level waste packages for the Yucca Mountain project.

Strategic Objective 11 –

Revitalize Nuclear Science and Engineering Education and Training

Future nuclear science and technology requires vibrant educational, research, and training institutions—institutions that prepare talented young people and enable significant professional growth for scientists and engineers. INL's engaging research opportunities, internships, mentoring, and close connectivity with researchers will reach out and inspire young people to choose careers in nuclear research and related fields.

INL cosponsored the first World Nuclear University (WNU) Summer Institute in 2005 for more than 75 World Nuclear University Fellows from 33 countries. WNU is aimed at building global leadership in nuclear science and technology.

Revitalizing U.S. nuclear science and engineering education and research is a challenging objective that will require a sustained commitment. Given its leadership role, INL, in partnership with DOE's Office of Nuclear Energy, will guide and support this effort. Universities will be closely involved in INL research and development activities, thus building the relationships between the Laboratory and universities. While the challenge is substantial, the benefits to INL are significant and will be key to reaching preeminence among peer institutions.

To meet this challenge, INL has established two university consortia—The National University Consortium (NUC) with five leading university partners, and the Idaho University Consortium (IUC) with three Idaho universities. These collaborations build university involvement in the research, educational, and outreach activities of the Laboratory. An important consortia activity is the development of Academic Centers of Excellence (ACE) on member campuses. Research, joint appointments, campus user

NUC/IUC member universities.

facilities, and other collaborations are beginning at each ACE to meet the nation's need to expand the nuclear science and engineering base. In this way, state-of-the-art integrated educational resources, academic partnerships, and programs will connect university faculty and students, nuclear industry professionals, and precollege teachers to INL researchers and facilities.

During 2006, five ACEs were established at the NUC campuses, as follows:

University	Academic Center of Excellence
Massachusetts Institute of Technology	Advanced reactor fuels and materials technology
North Carolina State University	Simulation and modeling
Ohio State University	Instrumentation and controls/safety
Oregon State University	Thermal hydraulics/ safety
University of New Mexico	Nuclear nonproliferation science and technology

Additionally, a nuclear fuel cycle ACE was established among University of Idaho, Idaho State University (ISU), and Boise State University, our IUC affiliates.

The Laboratory can lead a nuclear energy renaissance only if talented and bright people are attracted to nuclear energy careers. Working with the NUC, degree programs will be revitalized. Working with the IUC, the Laboratory will stimulate nuclear science and engineering degree programs at all levels. For example, the Laboratory is working with ISU as it gains accreditation for its Nuclear Engineering degree program.

During 2006, the Laboratory established the Faculty/Staff Exchange and Joint Appointment programs, which support and enhance laboratory and university research collaborations. INL conducted national workshops, which brought experts together at the university and K–12 grade levels. The programs, workshops, and new research collaborations have increased the involvement of faculty in research at INL. This has invigorated laboratory programs, while helping to fill the educational pipeline with the engineers and scientists needed for tomorrow.

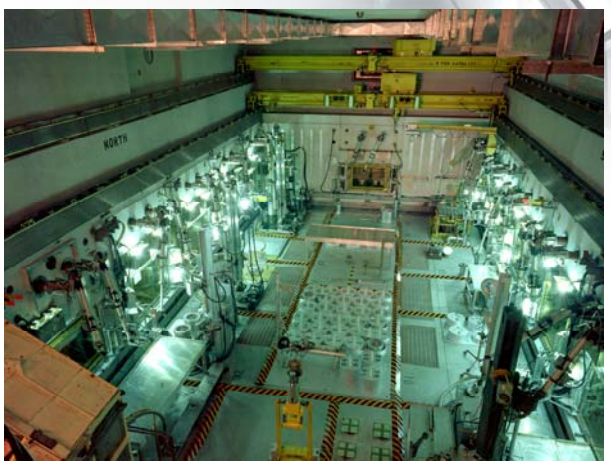
Strategic Objective 12 –

Establish and Apply Three Resource Networks

INL is energizing networks to share resources–researchers, technology, and capabilities–from academia, industry, and the national laboratories that will advance nuclear science and engineering technology. These efforts create collaborations that leverage the human capital, intellectual property, and the research, test, and demonstration capabilities of our partners. These networks are vital to delivering large-scale projects.

The networks use major INL facilities or projects as a center or *hub*. The Center for Advanced Energy Studies (CAES), discussed on page 22, is the hub of an emerging academic network that has begun using NUC's five national nodes plus the IUC's three regional nodes.

The industry network is centered around the ATR, which we will promote as a national user facility to improve its accessibility to our partners. This network began when the EPRI Fuel Reliability Program was collocated at INL in 2005. With a hub, based on fuel irradiations in ATR and fuel examination in the Hot Fuel Examination Facility (HFEF), the network is expanding into advanced fuel technology development with industry. Other national and international nodes also focus on the ATR, including BWXT's Lynchburg operations, the joint INL/EPRI Center for Nuclear Fuels and Materials Research (CNFMR), and research facilities in other countries such as France and the United Kingdom.



In partnership with industry, the Hot Fuels Examination Facility(HFEF) supports commercial fuel development. The HFEF examines and tests irradiated fuels or materials.

The network of national laboratories is focused on future projects for the GNEP fuel cycle facilities and Generation IV reactors. Already active with broad collaborations in the GNEP and Generation IV, this hub will expand as large demonstration projects require delivery systems for key components, integrated subsystems, and enabling technologies.

Key Milestones for Science and Engineering Capabilities –

- Develop NUC Academic Centers of Excellence based on campus facilities 2007
- Advance ATR as a National User Facility 2010
- Fully implement the distinctive scientific signatures' roadmaps 2010
- Grow science and technology programs to $70M annually 2015

Critical Enablers

The foundation for successfully implementing INL's Strategic Plan rests on a set of critical enablers (public confidence; safety, environmental, and operational performance; revitalized infrastructure; and research centers) that crosscut organizational boundaries and pace the transformation to a world-class laboratory. The Laboratory's infrastructure itself consists of four major elements: human capital, workplace facilities and environment, management systems, and information technology.

Each year, INL hosts a state-wide scholastic tournament to encourage high school students in the pursuit of math, science, and technology careers.

Strategic Objective 13 –

Develop Public Trust and Confidence in INL and Nuclear Energy

Delivering solutions that impact America's energy security challenges will advance INL's positive public image and global reputation. A recent independent survey throughout Idaho documented significant trust and confidence in INL with an awareness rating of nearly 70% and a confident/favorable impression rating near the same level. Significantly increased face-to-face communications, a stronger community presence, and expanded media coverage of INL activities are intended to sustain these high ratings, while creating a deeper, more thorough understanding of the Laboratory and nuclear energy. Chronicling simultaneous excellence in operational and safety performance, technical achievements, and community service, along with recognized contributions to energy security, will continue to build public trust and confidence in nuclear energy and INL.

Strategic Objective 14 –

Demonstrate World-Leading Safety, Environmental, and Operational Performance

Revitalizating nuclear energy requires the highest levels of safety, quality, environmental protection, and operational performance. These, in turn, require that each INL employee embrace the performance objectives listed on the following page and demonstrate world-leading behavior.

The INL will create a culture that promotes actively caring among our employees, i.e., "We all share responsibility for our mutual safety and well being, with openness and accountability in all we do." This *just culture*, supported by management

processes which promote collaboration, objective critical assessment, and accountability, and reinforced by behaviors which value diversity, honest communication, teamwork, and mission accomplishment will enable the INL to sustain an environment of continuous improvement and ultimately achieve world-class status as a laboratory.

By 2015, INL will be recognized for integrated human performance and behavior-based safety processes resulting in continuous improvement and a 50% improvement in injury/illness rates over the FY 2004 baseline. External reviews and certifications of our Voluntary Protection Program, ISO 14001, Integrated Safety Management System, publications, leadership in international forums, and acclaimed reactor technology and safety courses will validate INL's progress in safety, environmental, and operational performance—mileposts on our road to becoming a world-class laboratory.

INL's objectives for world-leading performance:

- Exhibit highest standards of performance in every aspect of laboratory operations
- Maintain and improve ISMS to perform work safely
- Improve safety performance continuously by viewing all injuries as preventable with a vision of zero injuries
- Demonstrate responsible and proactive environmental stewardship through an effective environmental management system
- Maintain and improve an integrated quality assurance program that enhances safety and assures quality.

Achievements toward this end include the following:

- INL was recertified as a DOE Voluntary Protection Program Star Site
- INL workforce was trained in human performance fundamentals, behavior-based safety concepts and principles, and the Safety Observations Achieve Results (SOAR) observation process in FY-06
- Environmental Management Certification was maintained through continued ISO 14001 registration
- The Specific Manufacturing Capability project completed 2.7 million man-hours without a day-away injury case.

The SOAR process provides an actively caring, peer-to-peer observation process, empowering employees to improve colleagues' safety, as well as their own.

Strategic Objective 15 –

Create Three Modern Laboratory Campuses

INL is developing three modern research and development campuses, with new facilities and the renovation of some existing facilities. Space optimization and reduced maintenance are key goals.

Transforming our facilities will provide INL with state-of-the-art science and technology facilities to support key research initiatives and growth, plus attract and retain strategic and critical staff. Over a 10-year period, initiatives will include:

- Consolidating from eight facility areas to three campuses, comprising a modern Reactor Technology Complex (RTC), Materials and Fuels Complex (MFC), and Science and Technology Campus (STC)
- Eliminating 1.1 million square feet of antiquated facilities
- Constructing at least 400,000 square feet of modern, efficient R&D facilities
- Acquiring new funding alternatives such as Institutional General Plant Project (IGPP) funding, third-party financing, and industrial and academic partnerships
- Receiving DOE approval for a visionary Ten-Year Site Plan that reflects substantial needs for nuclear facilities to support GNEP and NGNP.

Key accomplishments toward achieving these initiatives include:

- Receiving DOE approval of the mission need for:
  - RTC engineering building, radiological measurement laboratory, operations facility, and utility corridor
  - STC facilities
- Eliminating 50,000 square feet of facility footprint through deactivation and/or demolition in FY 2006.

The core of INL's facilities are three mission-driven laboratory campuses, two on the INL site and the S&T campus in Idaho Falls (shown above).

Strategic Objective 16 –

Develop, Recruit, and Retain a World-Class Workforce

Achieving the extraordinary mission of INL requires a human capital infrastructure capability of enabling and sustaining the development, recruitment, and retention of a world-class workforce. This infrastructure is supported by transforming the work environment to serve as a catalyst for innovation, productivity, and safety.

INL must be able to develop, recruit, and retain a world-class workforce, establishing a foundation by providing a world-class workplace.

The Human Resources and Diversity vision is for INL to become a recognized leader in innovative human resources and development services. In addition to attractive compensation and benefits, INL will invest in employee development programs to include mentoring, formal training and education, and experiential training through job assignments designed to develop and apply skills. Succession planning and critical skills retention programs will assist in defining specific mentoring and leadership and management initiatives.

Growing world-class laboratory research and development capabilities requires an innovative and diverse workforce. INL will proactively recruit diverse candidates, with special emphasis on *strategic hires* in research and development. Our goal is to attract and retain strategic and critical hires in support of programmatic missions. Additionally, INL will provide competitive intern programs, in cooperation with CAES and academic/educational institutions to encourage, recruit, and develop long-term opportunities and careers with INL for high school and college students.

For 18 years, INL has been the major force behind the Hispanic Youth Symposium, which brings together about 300 Idaho Latino teens (the state's largest minority group) annually to participate in workshops and vie for college scholarships.

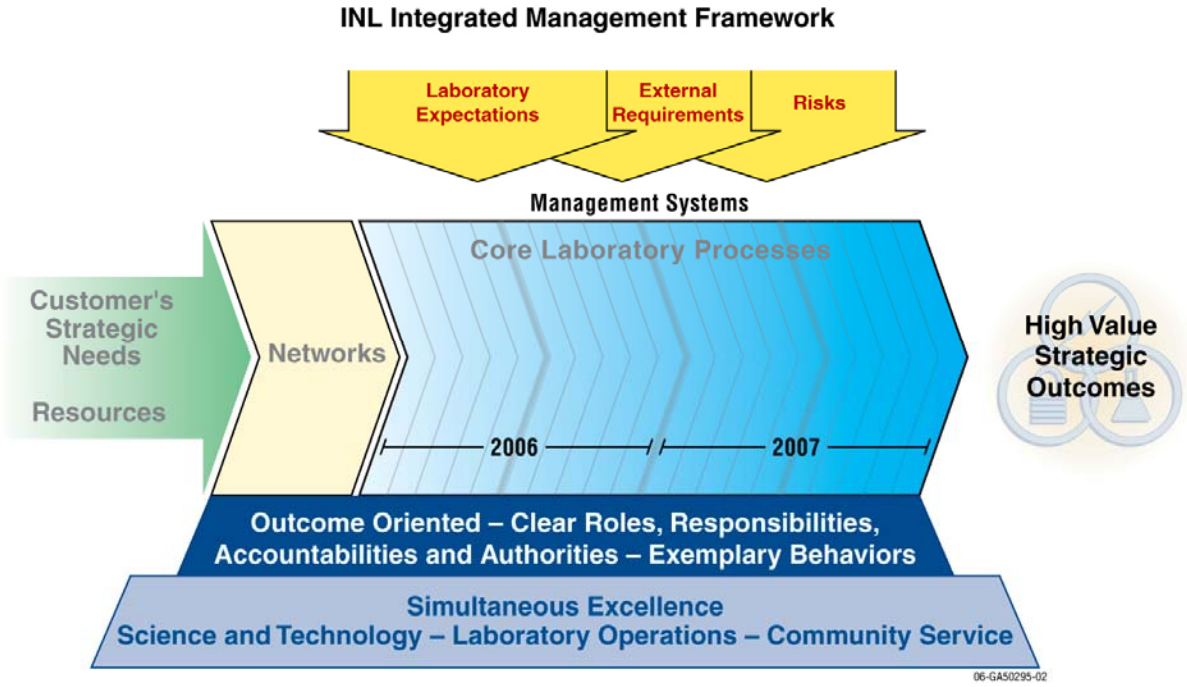
Toward these objectives, INL has:

- Implemented a recruiting strategy to proactively identify and attract talent
- Attracted eleven strategic hires to build our research and development capabilities

- Implemented a Diversity Program to increase the recruitment and retention of diverse talent
- Designed and implemented Leadership/ Management Skills Training
- Aligned the Employee Management Plan, Staffing Plan, Diversity Plan, and Affirmative Action Plan with INL strategic objectives
- Implemented a succession planning process for senior management
- Consolidated benefit plans and completed an electronic enrollment process.

Strategic Objective 17 –
Adopt Best-in-Class Laboratory Management Systems and Information Technology

A world-class laboratory must have efficient, effective, and on-demand management systems and information technologies. The foundation for best-in-class laboratory systems will be established within an INL Integrated Management Framework (see figure below). This comprehensive approach to laboratory management enhances, aligns, and streamlines INL processes. Additionally, Information Technologies will implement a standards-based enterprise architecture to further integrate processes and provide vendor independence through technology standardization.



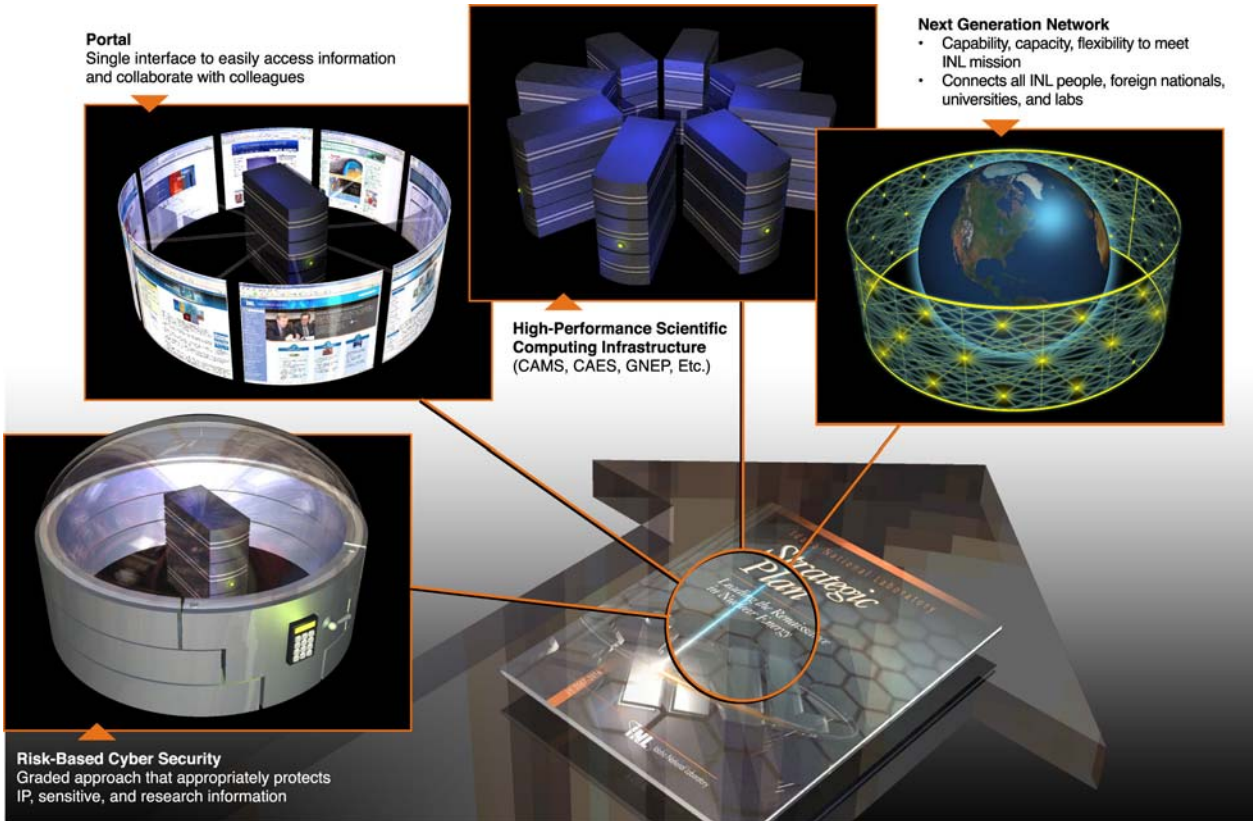
INL Integrated Management Framework is a comprehensive approach reflecting key inputs, drivers, processes, and the foundation necessary to achieve high-value strategic outcomes.

Our objective is to deliver integrated management systems and an enabling information technology that provide:

- Policies and standards of performance that drive expectations and outcomes
- Processes and procedures aligned to enable successful operations
- Technology that enables the Laboratory's core businesses to deliver high-value strategic outcomes

- Rapid application development
- Enterprise architecture with technology advancements for optimum integration and laboratory performance
- Portal and web management for integrated and simplified information.

Key management systems will be redesigned in the transformation. During 2006, Systems Integrating Management, Project Management, Work Management, Applied Engineering, and Integrated Performance Management and Assurance were initiated. Schedules for the remaining management systems have been developed.



INL portal technology functionally aligns business processes, simplifying compliance, reducing redundancy, and facilitating organizational collaboration.

Strategic Objective 18 –

Establish and Leverage Nine Research Centers or Centers of Excellence

Several research centers or centers of excellence have been (see checkmarks below) or will be created at INL. All of these share common goals—pursuing national and international research priorities, developing and enhancing capabilities, advancing the Laboratory's reputation and recognition, growing robust programs and portfolios, and forging and leveraging collaborative partnerships to accomplish these goals. There are nine planned research centers (listed below). The discussion that follows will focus on three: the Center for Advanced Energy Studies, the Center for Space Nuclear Research, and the Center for Advanced Modeling and Simulation.

- ☑ 2005—Center for Nuclear Fuel and Materials Research (CNFMR)

- ☑ 2005—Center for Space Nuclear Research (CSNR)
- ☑ 2006—Center for Nuclear Systems Design and Analysis (CNSDA)
- ☑ 2006—Center for Advanced Modeling and Simulation (CAMS)
- ☐ 2008—Center for Advanced Energy Studies (CAES) building completion
- ☐ 2008—Center of Excellence for Critical Infrastructure Protection
- ☐ 2009—Center of Excellence for Nonproliferation Safeguards and Security
- ☐ 2010—Center of Excellence for Electric Grid Reliability
- ☐ 2016—Advanced Fuel Cycle Facility (AFCF) initial hot operation.

The Center for Advanced Energy Studies (CAES) will operate as a joint institute to harness the unique technical talents of its member institutions and focus their collective efforts on addressing the energy-related challenges of the world, nation, and intermountain region. By 2015, CAES will be recognized as a world-class, advanced-energy organization for its contributions to energy research and energy policy studies. It will benefit nuclear education and revitalize and provide energy workforce training.

CAES is comprised of four member institutions: the Battelle Energy Alliance, University of Idaho, Boise State University (BSU), and Idaho State University. Additional affiliates comprised of national universities, industrial partners, and international organizations will actively participate.

A number of significant accomplishments have been completed towards the CAES vision.

- The core management of CAES has been established, including a senior leadership team comprised of INL, University of Idaho, Boise State University, and Idaho State University professionals
- Idaho's educational opportunities expanded since CAES and its university network has been established—the CAES Energy Policy Institute in partnership with BSU, will address a wide spectrum of energy policy issues and foster dialogue on energy topics
- INL established a joint appointment program with universities to improve recruitment and retention of outstanding researchers and faculty
- CAES, INL, its university partners, and DOE successfully hosted the first World Nuclear University Summer Institute during the summer of 2005 in which 77 fellows from 33 countries attended

- The CAES Strategic Plan was completed in 2006.

The Center for Space Nuclear Research (CSNR) will support the space nuclear research and educational mission needs of INL and will reinvigorate research and education in space nuclear engineering within U.S. universities. To establish CSNR, INL has teamed with the Universities Space Research Association, University of New Mexico (Institute for Space and Nuclear Power Studies), and General Atomics.

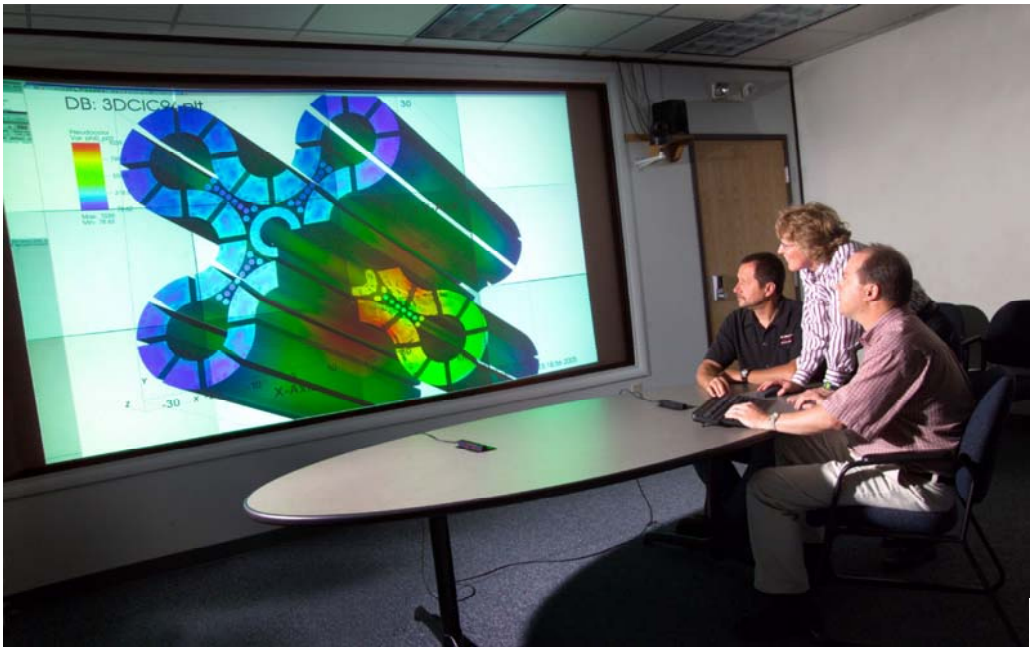
To achieve its mission, CSNR will:

- Be a focus for engaging university scientists in the research and development of advanced space nuclear systems including space power and propulsion systems and radioisotope power generators
- Establish and conduct a multidisciplinary education program in studies of space nuclear systems and related scientific and technical areas that uses a mix of classroom and research activities to inspire students to enter math and science
- Set up a public outreach program that supports an awareness of the policies and public perceptions relating to the use of nuclear energy for space exploration and development.

In the past year, CSNR has accomplished the following:

- The Director participated in NASA program definition for Nuclear Thermal Rocket and Surface Nuclear Power
- Established a 2006 CSNR Summer Fellowship.

The Center for Advanced Modeling and Simulation (CAMS) was established to ensure that INL will have the computational resources (people, hardware, software, communication, collaborations, and infrastructure) needed to achieve its vision.



Scientists access world-class computational capabilities in INL's Center for Advanced Modeling and Simulation to view results of complex 3D modeling.

Initially, CAMS is focusing on three computational themes:

- Three-dimensional transport modeling, which includes fluid flow, heat transport, photon transport, neutron transport, and chemical transport
- Materials behavior with an emphasis on the behavior of solid and fluid materials under extreme conditions and nuclear fuels
- Instrumentation and controls including the design of instrumentation and control systems.

These themes were selected because of their importance to INL's nuclear energy mission and because of their support to objectives in both National and Homeland Security and in Science and Technology. While CAMS focuses on these three themes, its purpose is to build INL computing infrastructure base to benefit all INL science and engineering programs. CAMS is also developing programs in computational chemistry to support research in separations and actinide science and complement computational materials physics and engineering programs.

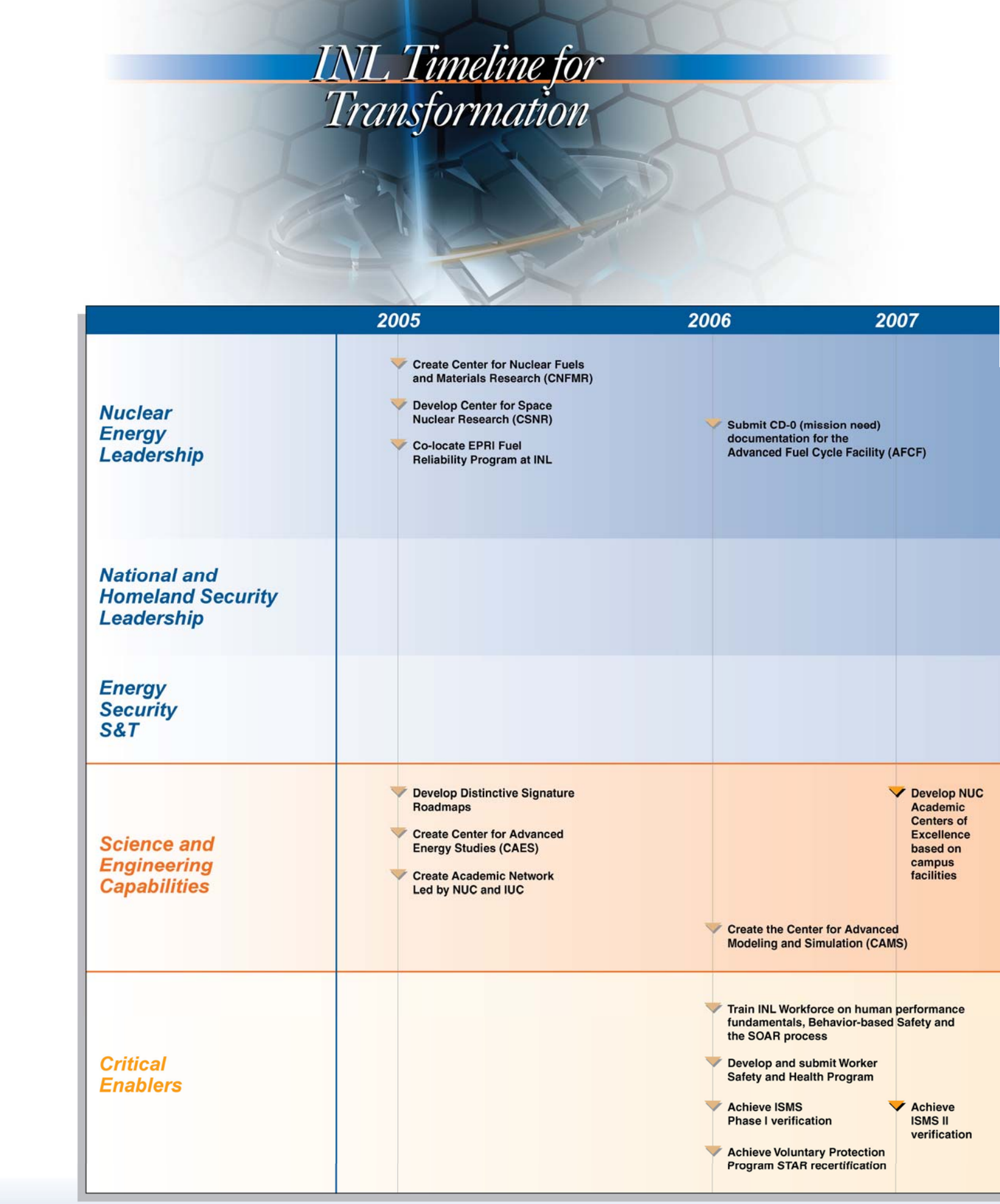
When fully developed, CAMS will support the full spectrum of INL's computationally-based research programs through its High-Performance Computing Group and Experts Group, which will include both computational and computer scientists.

During its first six months, CAMS has initiated a successful seminar series, established a board of advisors, carried out a survey of high-performance computing needs, developed specifications for a new high performance computer, and organized a workshop on high-end computing for nuclear fission science and engineering.

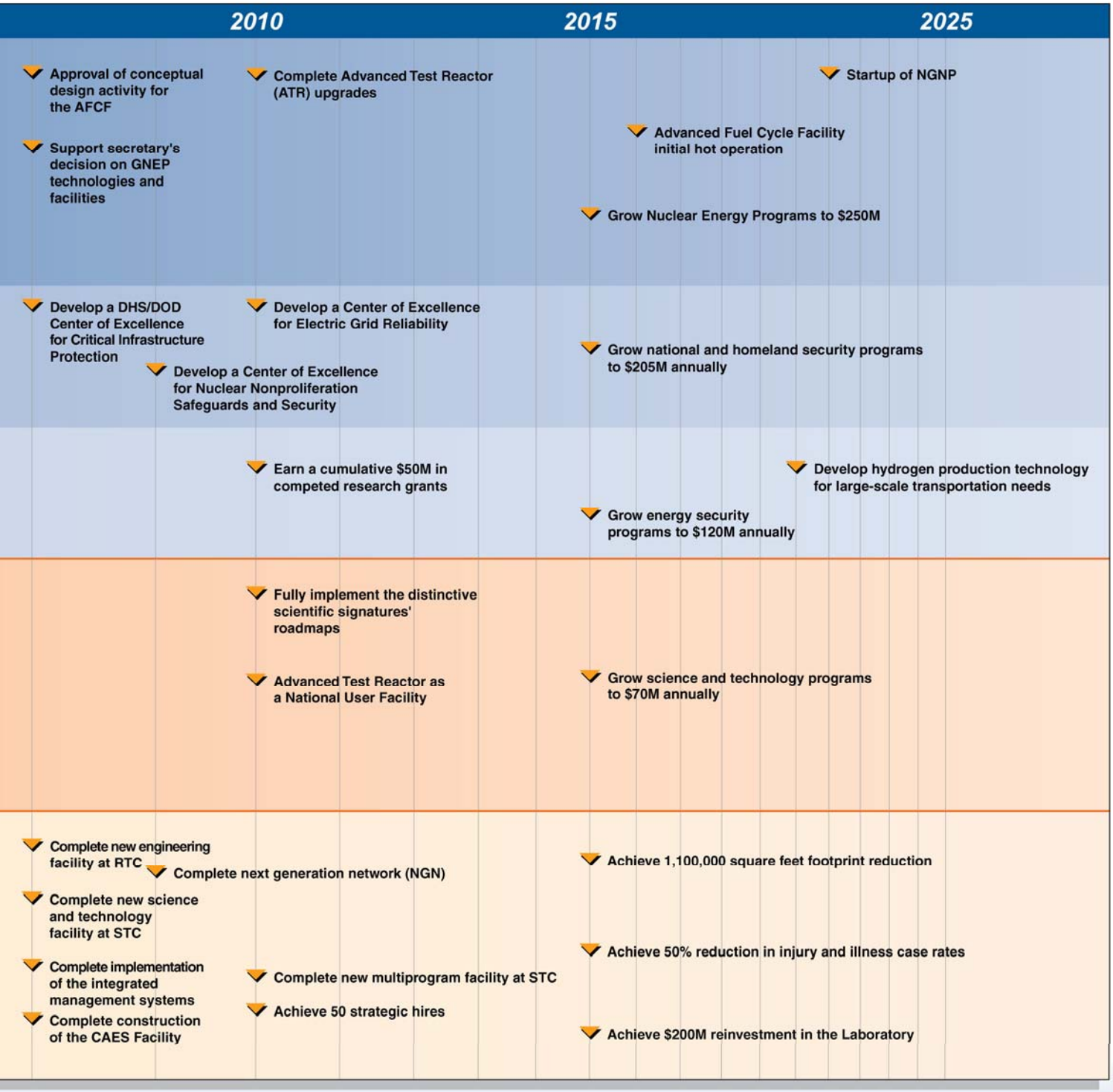
Key Milestones to Enable the INL Strategy –

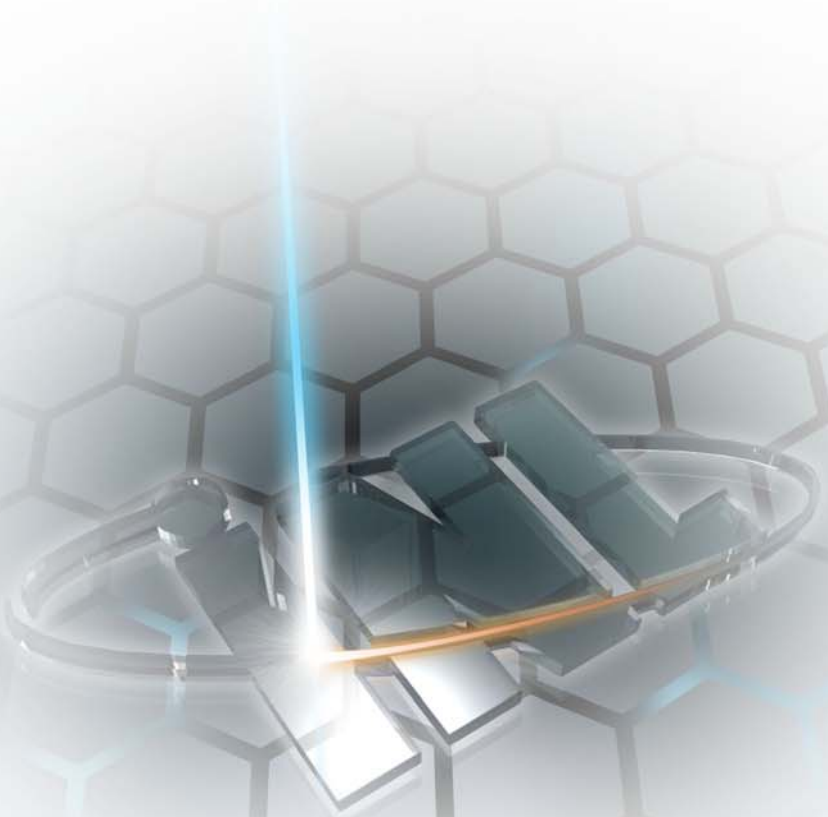
- Achieve ISMS II verification 2007
- Complete new engineering facility at RTC 2008
- Complete new science and technology facility at STC 2008
- Complete implementation of integrated management systems 2008
- Complete construction of the CAES facility 2008
- Complete next generation network (NGN) 2009
- Complete new multiprogram facility at STC 2010
- Achieve 50 strategic hires 2010
- Achieve 1,100,000 square feet footprint reduction 2015
- Achieve 50% reduction in injury and illness case rates 2015
- Achieve $200M reinvestment in the Laboratory 2015

INL Timeline for Transformation



This timeline highlights key milestones planned for the next 10 years and beyond. Accomplishment of these milestones will help ensure that DOE's vision for the INL is achieved.





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