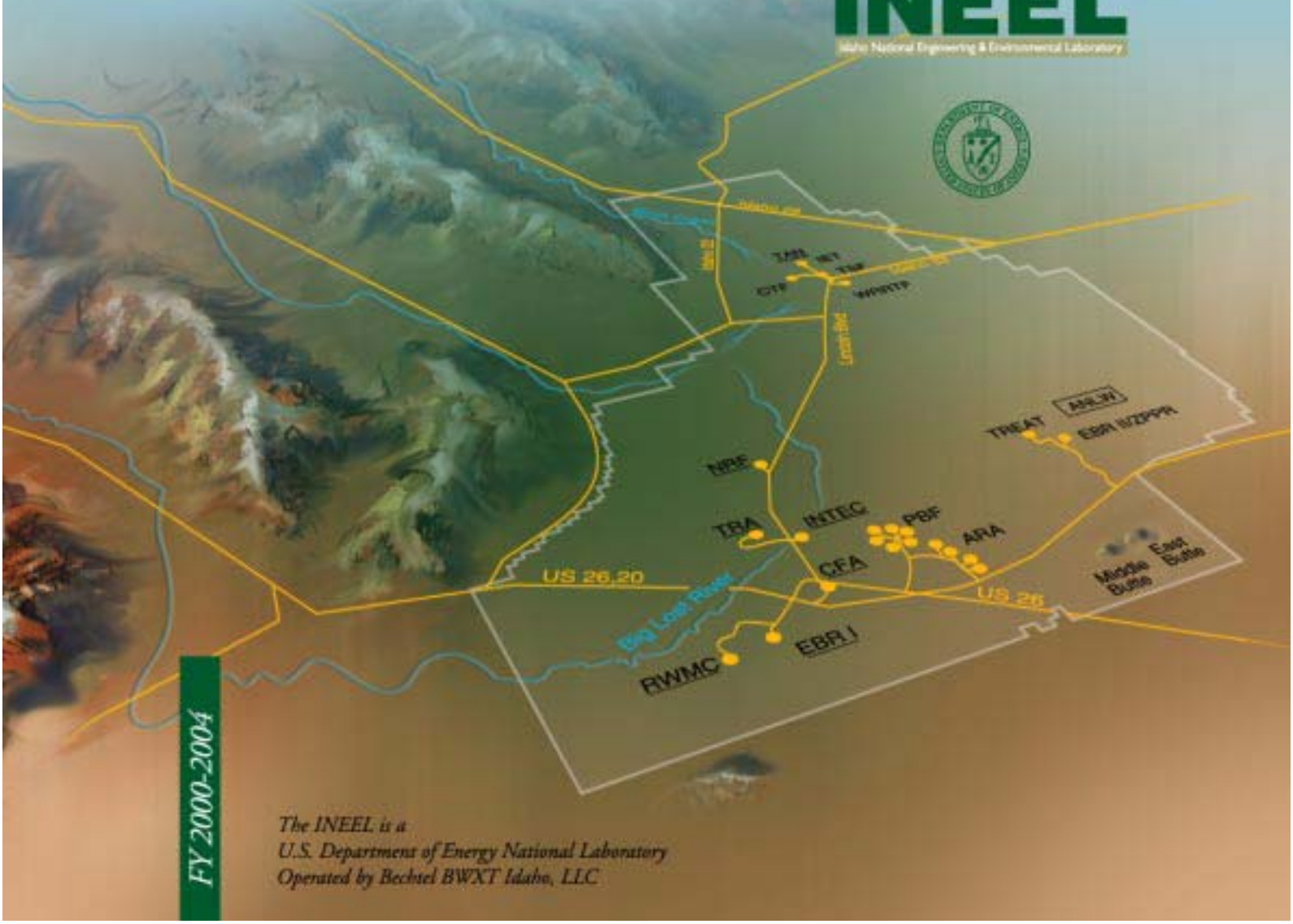
Idaho National Engineering and Environmental Laboratory

Institutional Plan

INEEL

Idaho National Engineering & Environmental Laboratory

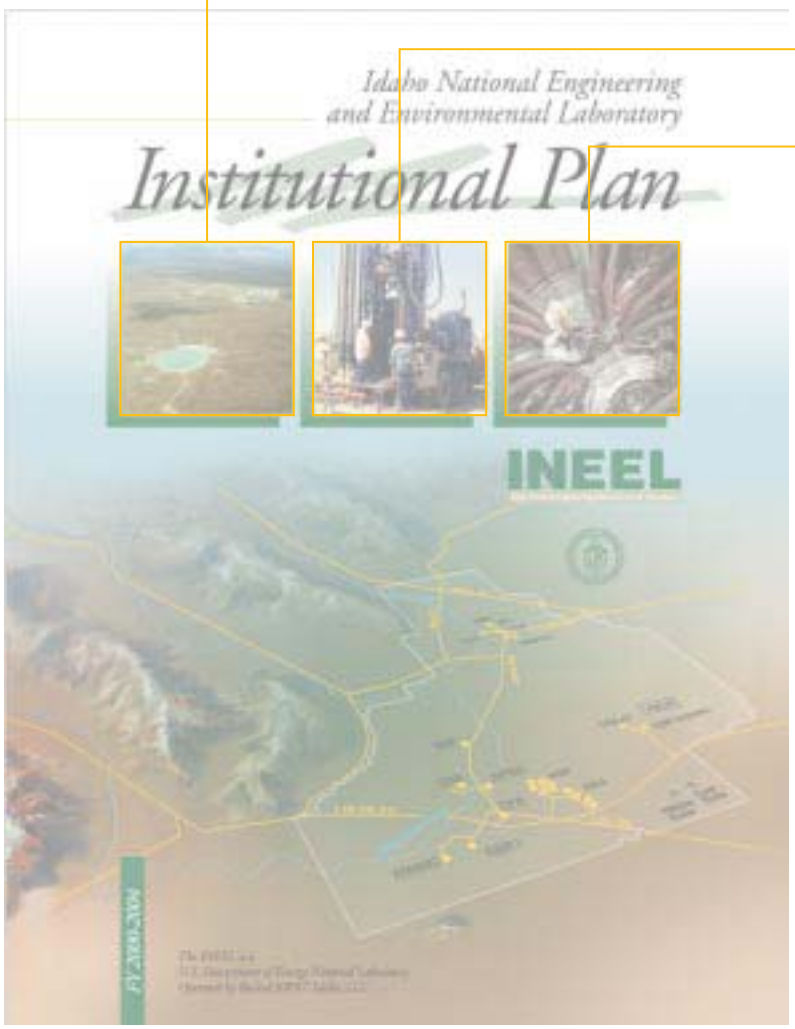


FY 2000-2004

The INEEL is a
U.S. Department of Energy National Laboratory
Operated by Bechtel BWXT Idaho, LLC

About the Cover

The Idaho National Engineering and Environmental Laboratory (INEEL) is a multiprogram Department of Energy research and development center that supports the department's missions/business lines of Environmental Quality (the INEEL's emphasis), Energy Resources, Science and Technology, and National Security. The INEEL site is located approximately 32 miles from Idaho Falls, Idaho, on an 890-square-mile government reservation.



The INEEL conducts large scale aquifer pumping and water infiltration tests to water and contaminant transport processes in the Snake River Plain.

Workers prepare drilling equipment to characterize the vadose zone beneath the INEEL site.

The INEEL's Advanced Test Reactor is one of the country's major sources of medical and industrial isotopes.

General Manager's Statement

From the outset of being awarded the Idaho National Engineering and Environmental Laboratory (INEEL) contract, Bechtel BWXT Idaho, LLC (BBWI) has stated a consistent message. This message was presented in the BBWI proposal, was voiced in public forums during transition, is stated clearly in this Institutional Plan, and will drive every action of BBWI.

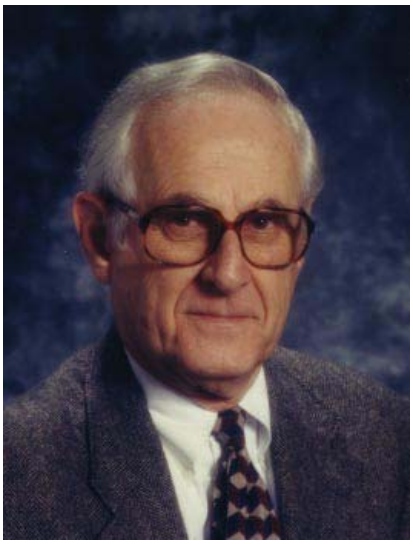
The message starts with the key strategic thrusts of BBWI in its role as management and operating contractor for the INEEL, which are to:

- Perform environmental management/operations and environmental stewardship in a safe and compliant manner
- Ensure a sound technical basis for present nuclear energy technology and provide the scientific basis for a viable nuclear energy option
- Establish the INEEL as a recognized major contributor to scientific knowledge related to innovative, environmentally safe energy systems.

Accomplishing these strategic thrusts will require the integration of research and development (R&D) and operations to form a seamless enterprise. In this enterprise, operations will define technical challenges and R&D will provide safe, practical, timely, and economical solutions to those challenges. It is BBWI's belief that synergy exists between these major groups within the INEEL and that through integration this synergy can be realized. Integrating operations and R&D will lead to expansion of the role of the INEEL within the defined mission boundaries of the Department of Energy (DOE). The present environmental management and nuclear energy roles of the INEEL will be supplemented by a role in the energy sector that links with present scientific capabilities. The strong environmental capabilities of the INEEL will be directed at all facets of the energy sector. The national need for environmentally benign energy will be addressed through application of the INEEL's capabilities. The initial effort in the area of energy will utilize INEEL capabilities in bioenergy. Further, current capabilities in the science of vadose zone analysis will be expanded and a world-class subsurface geoscience laboratory will be established to support this area.

BBWI will assist in the expansion of the INEEL's role through three unique commitments. First, BBWI will invest funds equivalent to a percentage of its earned fee to expand the INEEL's technical base. Second, BBWI will bring corporate research programs to the INEEL that match the INEEL's scientific capabilities. Finally, BBWI will ensure that the multinational customer base of its partners will be exposed to the scientific capabilities of the INEEL. These commitments are unique and will provide opportunities for strengthening the technical base of the INEEL that would not otherwise occur.

The preceding message should not sound new but it defines a challenging task. It requires seamless teamwork among all the individuals at the INEEL. The challenge requires that all INEEL personnel ***perform*** assigned tasks in a safe and compliant manner, that R&D and operations ***integrate*** their activities, and that the INEEL ***expand*** within DOE mission boundaries.



Bernard L. Meyers
President and General Manager

Bill D. Shipp
Laboratory Director and
Deputy General Manager

Executive Summary

The INEEL's vision is to maintain a high standard of operational excellence in all of its actions. To achieve this vision, it will complete the INEEL Environmental Management Program in a safe, compliant, and timely manner. Operational excellence extends to establishing an enhanced R&D capability at the INEEL. This R&D capability will be used to assist operations and facilitate an environmentally sound and economical environmental management program. An enhanced R&D capability leads to scientifically defensible solutions to critical problems and thus sound policy decisions. The enhanced R&D capability will also strengthen the INEEL's science base and provide the foundation for INEEL expansion within DOE missions. This expansion will advance regional economic development and diversify the economic base of the region. Achieving the INEEL vision requires a strong science foundation while pursuing the themes—***PERFORM, INTEGRATE***, and ***EXPAND***.

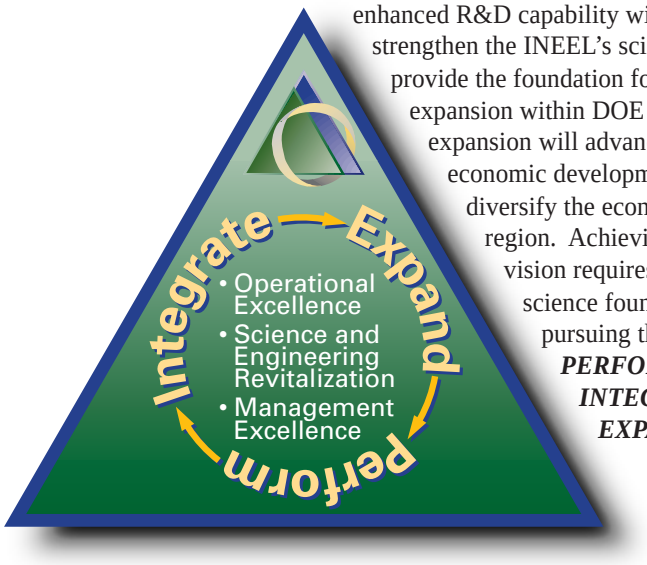


FIGURE 1. Performance, integration, and expansion are the basis of the INEEL's solutions to 21st-century energy problems.

To ***PERFORM***, the INEEL must have an intense focus on safety, zero tolerance for noncompliance, integrated life-cycle plans, and a strong science base aimed at solving real problems. Performance excellence will be achieved through establishing clear roles, responsibilities, accountabilities, and authorities (R2A2s) for every INEEL employee. A self-assessment system will be developed to measure performance against these R2A2s.

INTEGRATION means integrating R&D and operations at the INEEL. Integration calls for common tools, procedures, policies, and systems for all areas and functions, and for using the INEEL's science base to assist operations in solving its difficult challenges. Solutions to critical environmental management problems must be developed in conjunction with R&D to ensure scientific defensibility.

The INEEL's experience with the integration of R&D and operations will be made available to the DOE complex. Complexwide integration starts with a common vision, goals, and partnership with DOE-Idaho Operations Office (DOE-ID). It follows with consistent, open communication and alliances with stakeholders and regulators, and access to Bechtel and BWXT programs for DOE-Environmental Management (EM). Complexwide integration also involves broadening relationships with other national laboratories such as Pacific Northwest National Laboratory (PNNL), Argonne National Laboratory (ANL), and the National Renewable Energy Laboratory (NREL).

The INEEL will ***EXPAND*** by increasing its scientific capabilities within the envelope of DOE's missions. This expansion will occur through recruiting key personnel to meet strategic needs and retraining the INEEL work force consistent with strategic priorities. Strategic partnering with other laboratories, universities, and private industry will be developed. The INEEL will use recognized scientific leaders and peer-review teams to guide focused capability expansion. To support this expansion, strategic investment in critical equipment and facilities will be made. In addition, a Strategic Advisory Council is being established to review and validate laboratory strategic planning.

The INEEL will focus its efforts on three strategic thrusts (reflected in Sections III and IV of this plan):

- EM operations and environmental stewardship for DOE-EM
- Nuclear reactor technology for DOE-Nuclear Energy (NE)
- Energy R&D, demonstration, and deployment (initial focus on biofuels and chemicals from biomass).

The first strategic thrust focuses on meeting DOE-EM's environmental cleanup and long-term stewardship needs in a manner that is safe, cost-effective, science-based, and approved by key stakeholders. The science base at the INEEL will be further used to address a grand challenge for the INEEL and the DOE complex—the development of a fundamental scientific understanding of the migration of subsurface contaminants. The

INEEL will pursue this challenge by hiring a world-class scientist specializing in subsurface science, completing a complexwide vadose zone roadmapping plan, and building a subsurface geoscience laboratory that provides the physical facilities required for a full understanding of the related science.

The second strategic thrust is directed at DOE-NE's needs for safe, economical, waste-minimized, and proliferation-resistant nuclear technologies. As NE lead laboratories, the INEEL and ANL will pursue the following priorities: preservation and development of critical technologies and expertise, Generation Four advanced reactor concept, Nuclear Energy Research Initiative evolution, international nuclear research involvement, and development of proliferation-resistant fuel cycles as part of the International Centers for Environmental Safety (ICES).

The third strategic thrust focuses on DOE's needs for clean, efficient, and renewable energy technology. As an initial effort, the INEEL will enhance its capability in biofuels, bioprocessing, and biochemicals. The INEEL will conduct R&D and engineering to demonstrate and deploy technology that will make a variety of commodity chemicals and fuels from renewable biomass feedstock. Corporate and university partnerships will be leveraged to establish a technology applications initiative in energy. A Memorandum of Understanding regarding renewable energy will be made with the NREL. These efforts will be integrated with present capability in other renewable-energy technologies such as geothermal, hydrogen, and hydropower.

Key to the support of all these strategic thrusts is the funding of Laboratory-Directed Research and Development (LDRD). This funding enables strengthening of INEEL science and technology capabilities within the defined mission boundaries of DOE. At the present time, congressional language prevents the application of the LDRD tax to DOE-EM funding. This severely affects the INEEL because of the large percentage of funding received from DOE-EM. The LDRD portfolio is balanced among development, applied, and fundamental research. LDRD funding restrictions that prevent funding of projects critical to the strategic thrusts mean that the

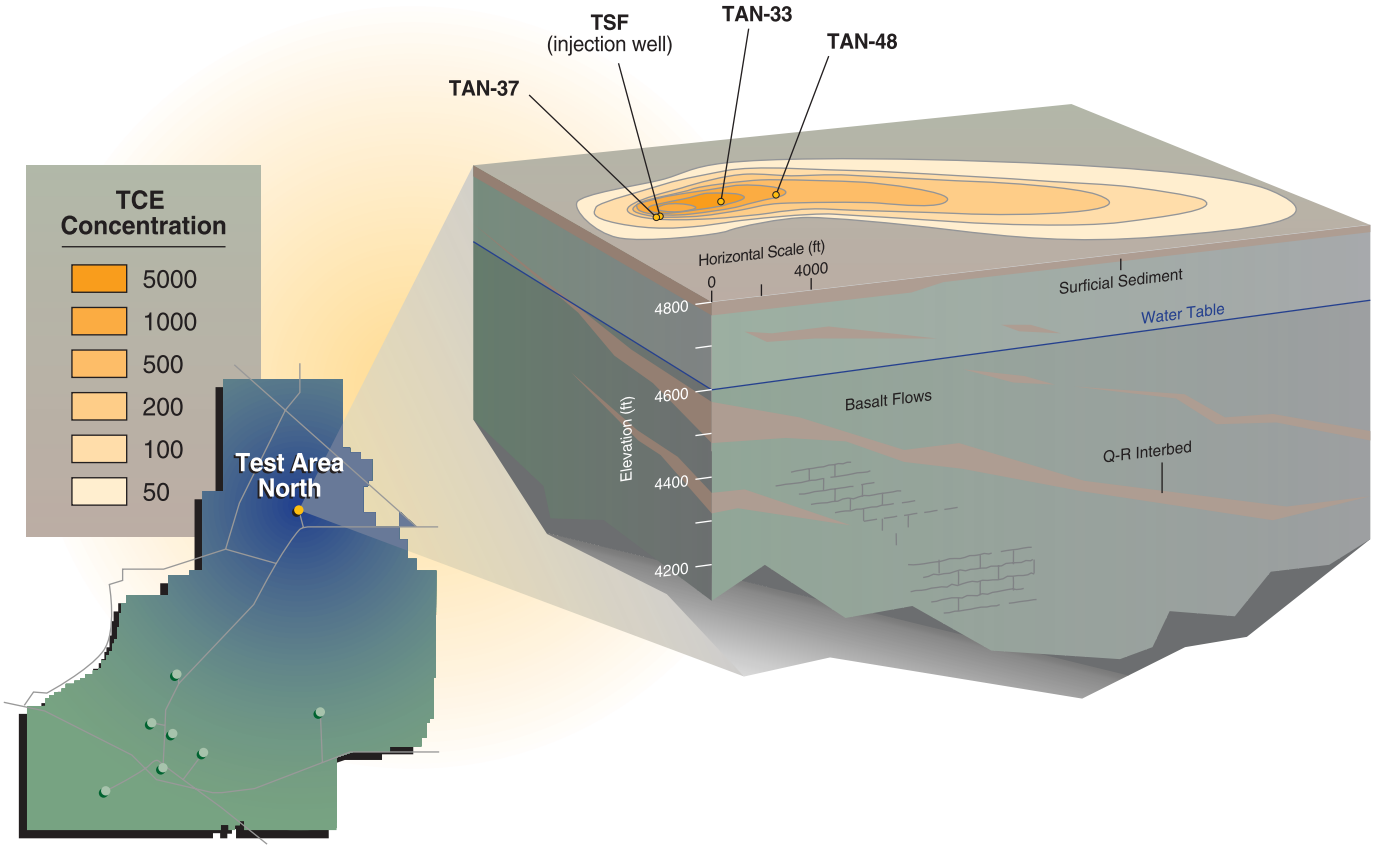


FIGURE 2. Integration of basic and applied science at the INEEL's Test Area North into the environmental cleanup program leads to one of the largest field-scale tests of enhanced in situ bioremediation of trichloroethylene (TCE) in the world. Intrinsic degradation of TCE under aerobic conditions has been convincingly demonstrated in the field using an innovative data analysis technique. By replacing pump-and-treat remediation of the TCE plume, over $5 million will be saved.

It will not be possible for the INEEL to effectively implement all elements of this plan without removal of the LDRD restrictions.

science base requested for the thrusts in this Institutional Plan cannot be fully developed. It will not be possible for the INEEL to effectively implement all elements of this plan without removal of the LDRD restrictions.

By accomplishing its three strategic thrusts, realizing its strategic objectives (discussed in Section III), and successfully implementing key initiatives (discussed in Section IV), the INEEL will achieve the following five critical outcomes:

- **Operational Excellence:** Perform work in a safe and compliant manner, within an approved technical operations basis, which includes administrative management systems, ESH&Q, Conduct of Operations, Conduct of Maintenance, etc., as required by contract.
- **Mission Accomplishment:** Position the INEEL as a modern and sustainable national laboratory by supporting and executing overall programs in target DOE mission areas within the determined cost, scope, and schedule.
- **Integrate R&D with Operations:** Demonstrate added value by integrating R&D activities to support INEEL programs and missions and subsequently translate these solutions on a national basis.
- **INEEL Revitalization:** Revitalize the INEEL's science and engineering base and facilities, assuring excellence in technical areas required by INEEL mission roles.
- **Leadership:** Provide systems, infrastructure, behavior, and vision resulting in mission accomplishment and preeminent national laboratory performance.

Note: The content of this Institutional Plan is designed to meet basic DOE requirements for content and structure and reflect the key INEEL strategic thrusts established in this executive summary. Updates to this Institutional Plan will offer additional content and resource refinements. The interrelationships of the plan are depicted in the following figure.

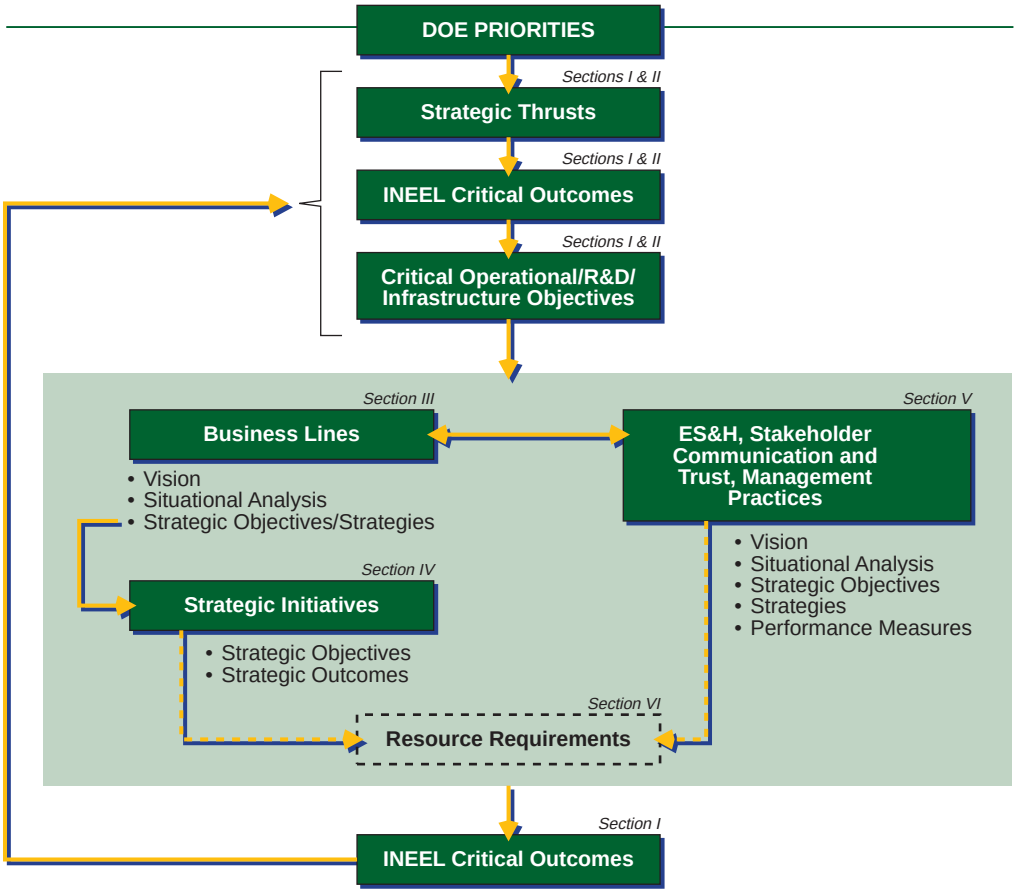


FIGURE 3. DOE priorities drive the INEEL's strategic thrusts and critical objectives (Section I and II). Strategic thrusts are supported by business line strategies (Section III), which drive strategic initiatives (Section IV). Operational infrastructure objectives are described in Section V and are supported by business lines and strategic initiatives. Section VI reflects the INEEL's resource requirements.

Contents

Acronyms

ANL	Argonne National Laboratory
ATR	Advanced Test Reactor
BBWI	Bechtel BWXT Idaho, LLC
CVZR	Complexwide Vadose Zone Roadmapping
D&D	Decontamination and decommissioning
DOE	Department of Energy
DOE-ID	DOE Idaho Operations Office
DOE-IN	DOE Office of Intelligence
DOE-NE	DOE Office of Nuclear Energy
DOE-NN	DOE Office of Nonproliferation and National Security
EM	Environmental Management
EMI	Environmental Management Integration
ESH&QA	Environment, Safety, Health, and Quality Assurance
ESPC	Energy Savings Performance Contract
ESRA	Environmental Systems Research and Analysis
GPCE	General Purpose Capital Equipment
GPP	General Plant Project
ICES	International Centers for Environmental Safety
INEEL	Idaho National Engineering and Environmental Laboratory
INRA	Inland Northwest Research Alliance
INTEC	Idaho Nuclear Technology and Engineering Center
ISMS	Integrated Safety Management System
LDRD	Laboratory-Directed Research and Development
LICP	Line-Item Construction Project
NE	Nuclear Energy
NREL	National Renewable Energy Laboratory
PNNL	Pacific Northwest National Laboratory
QAP	Quality Assurance Program
R&D	Research and development
R2A2s	Roles, responsibilities, accountabilities, and authorities
SSS	Subsurface Science
VPP	Voluntary Protection Program

Laboratory Mission and Roles

II. Laboratory Mission and Roles

DOE's four business lines of Environmental Quality, Energy Resources, National Security, and Science and Technology drive INEEL missions and roles. As required by DOE Institutional Plan guidance, INEEL mission, roles, and strategic thrusts are discussed below within the context of DOE's four business lines.

This plan focuses primarily on the INEEL's science and technology and required support infrastructure per DOE Office of Science guidance. This is not meant to decrease the emphasis on the integration of R&D and operations. To the maximum extent possible, this integration is expressed throughout the document.

A. Mission

The INEEL will complete its environmental cleanup and develop, demonstrate, and deploy sustainable environmental and energy technologies for DOE and the nation.

The INEEL will fulfill this mission through exemplary performance, integration, and capability expansion.

B. Roles

The INEEL uses its scientific capabilities, complemented by strategic partnerships, to perform its mission to support DOE and other assigned national priorities.

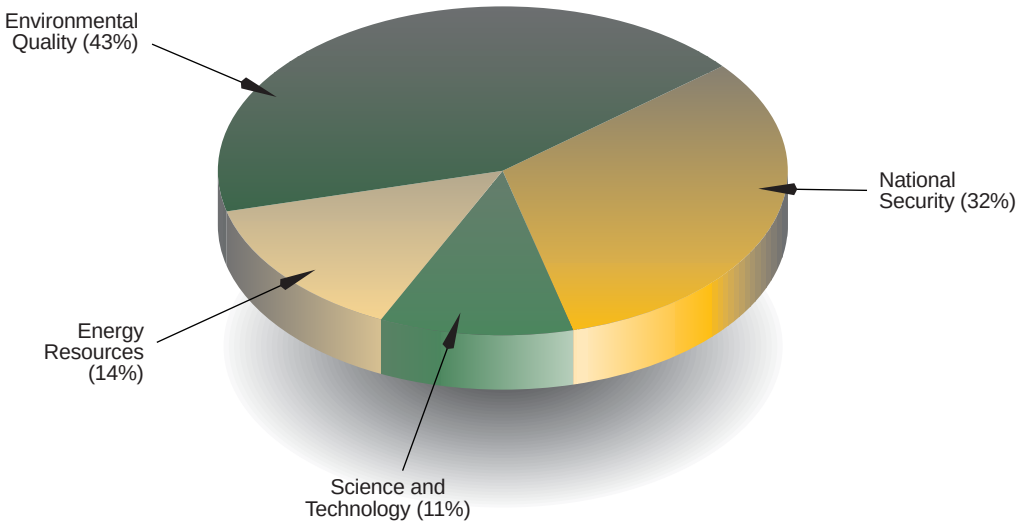


FIGURE 4. The INEEL's R&D and operations capabilities are integrated in support of DOE's missions (data from January 1999 Laboratory Profile, not including site remediation data).

The laboratory's roles as described in the 1996 *DOE Strategic Laboratory Mission Plan* include:

- Principal role in the Environmental Quality mission
- Specialized participating role in the Energy Resources mission
- Specialized participating role in the National Security mission
- Participating role in the Science and Technology mission identified in the DOE Science and Technology R&D Portfolio.

Within the context of DOE's four business lines, the INEEL will focus its efforts on three strategic thrusts:

- Performing Environmental Management operations and environmental stewardship for DOE-EM in a safe and compliant manner
- Ensuring the technical basis of nuclear technology for DOE-NE
- Firmly establishing the INEEL as a major, recognized contributor to energy R&D, demonstration, and deployment.

FIGURE 5. The INEEL is a key DOE resource for managing spent nuclear fuel. This underwater fuel storage facility at INTEC receives and stores DOE-owned spent nuclear fuel from several sources, including the U.S. Navy and the INEEL's Advanced Test Reactor.

1. Environmental Quality

The DOE mission in Environmental Quality is focused on the safe management and disposal of radioactive wastes stemming from 50 years of nuclear materials production. Significant effort is under way at DOE sites across the country to provide for the safe, timely, and cost-effective cleanup and disposal of this legacy. The INEEL has performed several roles in support of DOE missions since its establishment in 1949, including designing and testing nuclear reactors, reprocessing spent nuclear fuel to recover fissile materials, and receiving and storing spent nuclear fuel and radioactive wastes generated at other DOE sites. These efforts have resulted in significant stores of spent nuclear fuel, high-level waste, low-level waste, mixed low-level waste, and transuranic waste.

The DOE Environmental Quality business line requires scientific understanding of radioactive materials, their associated risks, and their movement in the environment; treatment and disposal technologies; and the ability to accurately model the fate of these materials over many years. As a lead laboratory assisting DOE with its Environmental Quality mission, the INEEL will continue to perform R&D; technology development, demonstration, and deployment; and systems analysis and integration. These activities will ensure a sound scientific basis for decision-making. In its leadership role, the INEEL will integrate resources across the DOE complex to address the challenges at hand. Each of the laboratories and sites brings extensive experience and scientific knowledge to assist with DOE's Environmental Quality mission.

A major initiative in subsurface science will improve the understanding of contaminant transport and fate in the subsurface environment. This will result in better decision-making and allow DOE to consider appropriate alternatives to baseline plans for cleanup, resulting in more efficient use of available resources.

Full integration of science and technology into INEEL operations and environmental management programs is an additional element of the thrust in Environmental Quality. Integration will help address uncertainties and gaps in cleanup, waste-treatment approaches, and disposition pathways for the INEEL. Research and development will focus its activities to ensure that the operational cleanup mission is fundamentally sound from a scientific and technological perspective and that solutions are provided to enable the cleanup mission.

FIGURE 6. The three pictures on this page show the deployment of the INEEL Light-Duty Utility Arm. Its deployment was a direct result of the teaming efforts of the DOE Office of Science and Technology—Tank Focus Area, INEEL Operations, INEEL Maintenance, and DOE-ID.

Since 1996, the INEEL has managed the Complexwide EM Integration (EMI) program. EMI has developed integration tools to improve the understanding of DOE's vast cleanup responsibilities, establish and enhance the waste and material disposition baseline, and overcome barriers to disposition and program inefficiencies. Application at the INEEL of the integration tools developed under EMI is one of the key elements of integrating science and technology into INEEL operations. An additional key element will be the development, demonstration, and deployment of innovative technologies at the INEEL. Innovative technologies deployed during this past year include enhanced in situ bioremediation at Test Area North and the Light-Duty Utility Arm.

The INEEL provides leadership for DOE-EM on several complexwide programs and initiatives. These include the National Spent Nuclear Fuel Program, National Low-Level Waste and Mixed Low-Level Waste Programs, National Transportation Program, National Vadose Zone Roadmap, and Complexwide EM Integration Program. The INEEL also assists DOE in preparing the Environmental Quality R&D Portfolio and Environmental Quality Science and Technology Roadmap. In addition, the INEEL provides leadership to the Mixed Waste Focus Area, Nuclear Materials Focus Area, National Analytical Management Program, EM Science Program, and Accelerated Site Technology Deployment Program. The focus areas help ensure that appropriate investments are being made in science and technology development to meet critical needs in understanding and managing mixed waste and nuclear materials.

2. Energy Resources

The INEEL plays a key role in assisting DOE in achieving its Energy Resources strategic goal to "promote secure, competitive, and environmentally responsible energy systems that serve the needs of the public." The INEEL will continue to use its capabilities to perform R&D and to demonstrate, deploy, and operate facilities for both nuclear and nonnuclear energy programs in support of DOE's Energy Resources objectives.

(a) Nuclear Energy

The second strategic INEEL thrust, nuclear reactor technology, ties in with the INEEL's

extensive history of technological development. For more than 30 years, the INEEL has played a key role in both DOE's and the Nuclear Regulatory Commission's nuclear energy research agenda. It has made many scientific contributions through test programs at facilities such as the Power Burst Facility, Loss-of-Fluid Test Facility, Advanced Test Reactor (ATR), and through programs such as the Three Mile Island accident evaluation and vessel inspection program and development of RELAP5 reactor code. The INEEL's contributions helped establish the technical basis for regulating the domestic and international nuclear energy community.

Though some of the physical capabilities no longer exist, the intellectual capabilities remain and the INEEL continues to make significant contributions. For example, the INEEL and ANL were recently designated as the NE lead laboratories for reactor technology. In support of this role, the INEEL is undertaking initiatives focused on advanced nuclear energy. The INEEL will assist DOE in defining specific needs and opportunities for the Nuclear Energy Research Initiative, Nuclear Energy Plant Optimization program, and new programs such as the Generation Four advanced reactor concept. Participation in strategic planning for nuclear programs with DOE, the Nuclear Regulatory Commission, the nuclear industry, other national laboratories, universities, and international institutions is a major element of this strategic thrust. Additionally, the INEEL will enhance utilization of DOE's ATR as a user facility for other DOE and commercial customers.

(b) Energy Efficiency, Renewables, and Fossil Energy

The third strategic thrust of the INEEL, energy systems, ties to the nonnuclear portion of DOE's Energy Resources role. The INEEL supports DOE's Energy Efficiency and Renewable Energy and Fossil Energy programs in a number of areas and is the lead laboratory for high-power, energy-storage testing; the National Hydropower Program; and the Geothermal Power Program.

In support of DOE's energy resources objectives, the INEEL is starting a major initiative, in collaboration with the NREL, focused on bioenergy. This initiative is initially focused on using biomass to produce fuels, power, and industrial chemicals.

3. National Security

The laboratory provides key technical and policy support, as well as new technology to the nonproliferation and intelligence community through DOE's Office of Nonproliferation and National Security (NN) and Office of Intelligence (IN). Intelligence and nonproliferation technologies have been recognized with five R&D 100 Awards since 1988.

FIGURE 7. The ATR is the world's premier test reactor, offering high-thermal neutron flux and large test volumes for performing irradiation services. A major spin-off is production of radioisotopes for medical, industrial, environmental, agricultural, and research applications. ATR provides half of the Ir-192 used in U.S. commercial radiography sources and high specific activity Co-60 for medical applications.

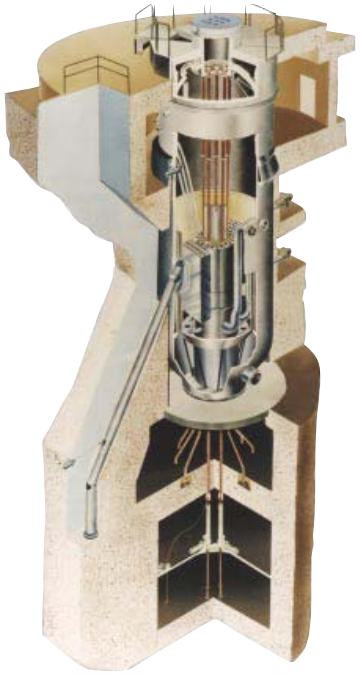


FIGURE 8. The portable isotopic neutron spectroscopy system received an R&D 100 Award in 1993. The INEEL developed the system as part of a DOE NN-20 project to support chemical weapons treaty verification. The U.S. Army routinely uses this system to nonintrusively and safely identify the contents of suspect chemical warfare munitions and containers.

The INEEL's demilitarization program is the sole developer and supplier of deployable chemical-weapons assessment systems to the U.S. Army Chemical Demilitarization Program.

Within DOE-NN's system of laboratories, a unique facility for accelerator applications, low-power nuclear, and optical physics has been established at the Idaho Accelerator Center. The facility was developed in collaboration with the State of Idaho and Idaho State University, and all national security laboratories conduct experiments at this center.

DOE-NN, DOE-IN, and DOE-DP use INEEL expertise in sensor development, engineered systems, computer security, software development and assessment, and systems modeling. The INEEL's demilitarization program is the sole developer and supplier of deployable chemical-weapons assessment systems to the U.S. Army Chemical Demilitarization Program. The systems help meet the milestones of the Chemical Weapons Convention. These programs leverage the initiatives within the INEEL's science and technology mission.

As part of DOE's focus area to counter weapons of mass destruction terrorism, the INEEL's counterterrorism and law enforcement programs fill a communication of technology role for law enforcement under Work for Others agreements with the departments of Justice, State, and Transportation. The INEEL has received the National Institute of Justice Law Enforcement Technology Innovation Award for the development of practical technologies for law enforcement officers.

The INEEL's role also encompasses information warfare defense, command and control, computer and network reliability, and communications and data protection. In addition, under Work for Others agreements, the INEEL deploys automated command and control systems with advanced cryptographic technology.

Beginning in FY 2000, the INEEL and ANL will assume a new role to foster bilateral collaboration with Russia through the newly established International Centers for Environmental Safety (ICES). ICES was formed by agreement between DOE and the Russian Ministry of Atomic Energy in recognition that we share common goals related to security and the environment.

4. Science and Technology

The INEEL uses its capabilities to support DOE's science and technology, environmental quality, energy resources, and national security business line objectives. The INEEL will provide leadership and technical infrastructure for the subsurface initiative, increase support to DOE-SC programs, provide science support to other R&D organizations, and interface with operations organizations to integrate science

FIGURE 9. INEEL scientists are using the edible mollusk Mytilus edulis, a form of mussel, to develop a bioadhesive that will stand up to underwater conditions.

into solutions for challenging technical problems. The emphasis will be on applied science, with a foundation of basic science to provide science-based solutions. The INEEL has received over 20 R&D 100 Awards over the last decade in biotechnology, surface chemistry, nuclear and radiological sciences, materials processing, and sensor systems, thus demonstrating its ability to move basic science concepts into application.

(a) Biotechnology

INEEL capabilities supporting DOE missions include biogeochemistry, subsurface biology, environmental microbiology, and extremophile biology. Research is conducted in fundamental and applied vadose and saturated zone geoscience, gas and petroleum production and processing, biobased sensors, and conversion of biomass to energy and industrial products.

(b) Chemistry and Geosciences

INEEL research in this area is focused on problems such as understanding and using chemical separations in harsh environments, including extreme temperatures, chemical reactivity, and radiation. Separations in such environments are a pervasive problem in DOE mission areas, including effectively dealing with waste. INEEL separations research includes materials synthesis, polymer and solid materials physical-property testing and evaluation, membrane/sorbent testing, and a growing effort in developing and applying supercritical fluid technology.

The INEEL integrates its biological, chemical, and geoscience capabilities through its subsurface geoscience initiative. This initiative will directly support DOE's accelerated cleanup and long-term stewardship needs. This initiative provides the scientific underpinnings necessary to meet objectives outlined in the DOE-EM R&D plan, i.e., to "identify and quantify subsurface contamination accurately, contain or stabilize leaks and buried waste hot spots in situ, remediate or destroy mobile contaminants in situ, remove hot spots not amenable to in situ treatments, and validate and verify system performance for regulators and stakeholders." The initiative improves our scientific understanding of the sources and fate of energy by-products and creates new science-based approaches to minimizing energy by-products while protecting the biosphere and human health.

(c) Physical and Materials Sciences

The INEEL performs several research functions that support DOE nuclear science and technology objectives. The INEEL has been a major contributor to thermal hydraulics research, nuclear physics measurements, and fusion-reactor safety analysis over the years. The INEEL supports the Boron Neutron Capture Therapy program by conducting analytical boron chemistry and developing patient treatment planning software, reactor- and accelerator-based neutron source design, and dosimetry measurements.

Using its strong capability in intelligent control of joining, casting (cupola operation), and coating, the INEEL also performs research functions supporting science and technology. It deploys this capability in its operational programs and contributes to improvements in the state of the art through long-term research programs funded by DOE-SC. The INEEL's research roles encompass welding, ceramic

FIGURE 10. The secondary ion mass spectroscopy system concept was developed under a DOE-Basic Energy Science project. The system is used to detect very low levels of nonvolatile chemicals on surfaces.

joining, thermal spray, and spray-forming processes. The laboratory has highly recognized capabilities in ceramics; materials aging; corrosion and its subsequent influence on structural integrity; functional gradient materials; nanocrystalline composites; plasma and thermal processing; and modeling.

The INEEL performs research functions in support of an extensive instrumentation and sensors program. Sensor capabilities are used throughout its operational programs and advance the state of the art through long-term research programs funded by DOE-SC. The INEEL has outstanding capabilities in nondestructive assay and nondestructive testing, surface chemistry instrumentation, fiber optics sensors, and integrated sensors. The INEEL is also developing its capabilities in biologically based sensors in support of national security missions.

C. Core Competencies

The INEEL has identified core competencies and capabilities as requested in the Institutional Plan guidelines. These core competencies are:

- Applied environmental science, engineering, and technology demonstration
- Processing and managing radioactive and hazardous materials
- Developing, modeling, testing, and validating engineered systems and processes
- Complex engineering/economic systems analysis and integration.

The distinctive features of these core competencies are reflected in national and international recognition, as summarized in the previous sections and presented below.

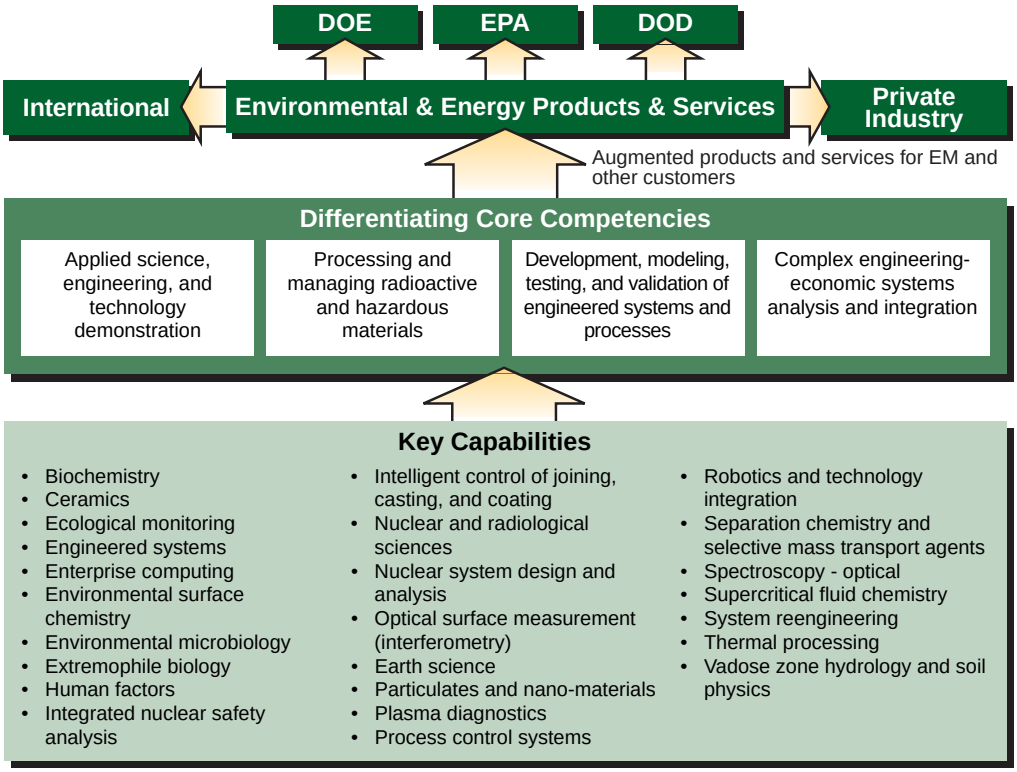


FIGURE 11. The INEEL's capabilities are integrated through multiple competencies to provide effective solutions.

1. *Applied Environmental Science, Engineering, and Technology Demonstration*

The INEEL has experienced geoscience and environmental scientists who serve DOE, the Department of Defense, and other federal agencies by providing environmental characterization, analysis, remediation, and monitoring. Backed by its sensing and diagnostic capabilities, biotechnology, geoscience, and environmental engineering, the INEEL provides innovative solutions to complex environmental challenges. By leveraging these capabilities through alliances and partnerships with the private sector, the INEEL will serve DOE and other national needs. The INEEL will develop advanced environmental analysis tools and management methods to address identified needs.

2. *Processing and Managing Radioactive and Hazardous Materials*

Since it is a major processor of DOE and Navy spent fuels, the INEEL has developed expertise in processing, handling, using, transporting, storing, and disposing of radioactive materials. These materials include low-level, high-level, transuranic, mixed, and hazardous wastes. This processing activity has generated expertise in intelligent automation of remote systems, chemistry R&D, and radiochemistry and radiochemical processing. The INEEL is a leader in anticipating potential environmental impacts and developing preventive actions—waste avoidance, reduction, and management—to forestall the need for remediation.

3. *Development, Modeling, Testing, and Validating Engineered Systems and Processes*

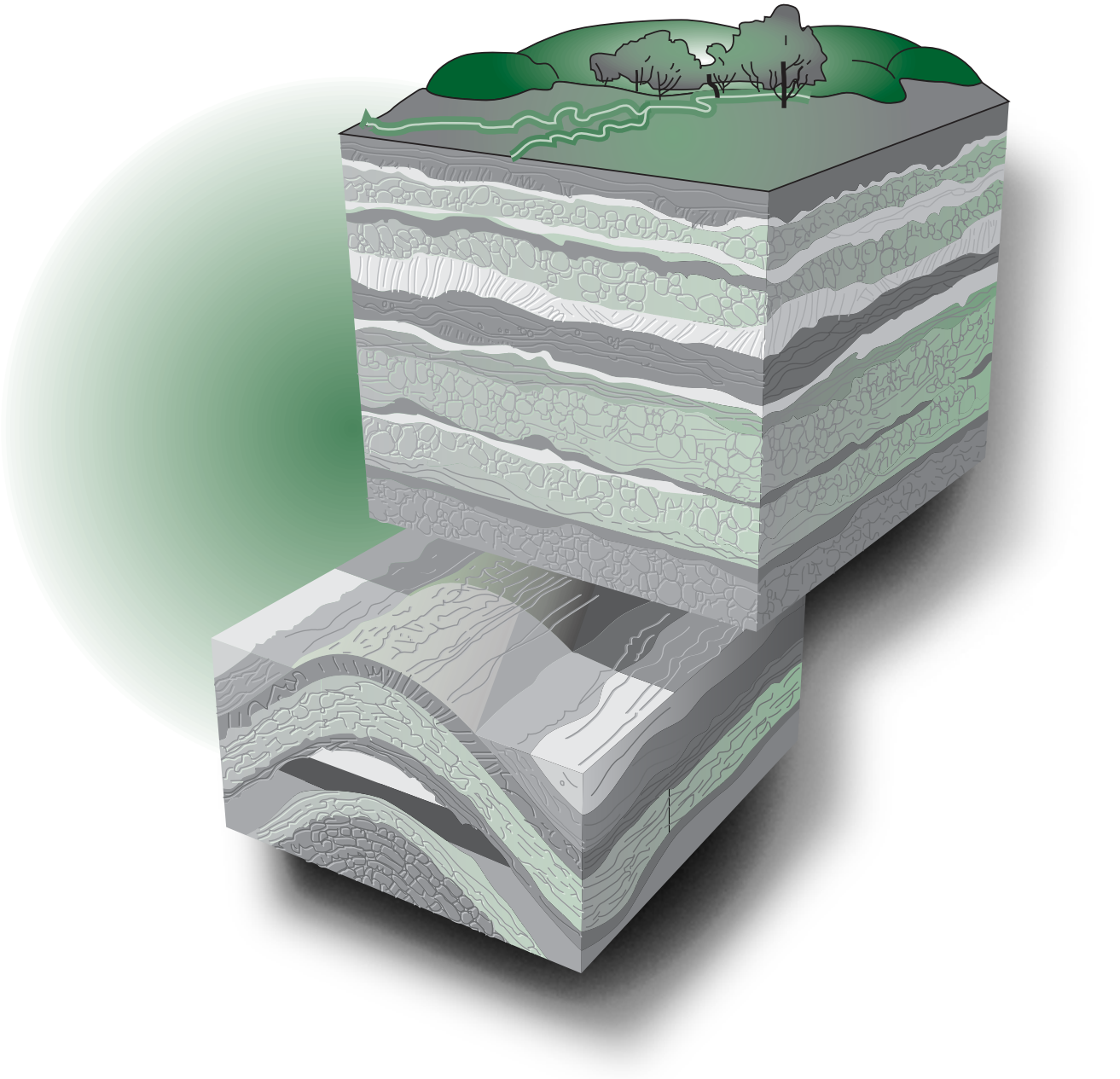
The INEEL has designed, built, and operated 52 nuclear reactors, and has long been well regarded for its expertise in testing nuclear reactors for safety verification. Modeling tools developed at the INEEL, such as the SCDAP and RELAP5 reactor codes, are used worldwide for safety- and risk-assessment for reactor facilities. Core competencies in remote sensing, nondestructive testing, thermal hydraulics, materials behavior, joining, failure analysis, and fracture mechanics provide the scientific basis for these capabilities. The INEEL uses its unique facilities, such as the ATR, for studies of U.S. Navy submarine fuels and production of isotopes. Its core competencies have been used to perform fitness for service analyses and to extend the operating lifetime of components in ATR and other nuclear reactors at the INEEL. In addition, the INEEL's expertise is being applied to environmental remediation, spent nuclear fuel management, nuclear plant life extension, development of high-burnup fuels, advanced reactor design, and fitness for service in petroleum-processing facilities and chemical plants.

The INEEL has a long history in design, construction, operation, and decommissioning of nuclear reactors, hazardous materials processing plants, and large-scale energy systems.

4. *Complex Engineering/Economic Systems Analysis and Integration*

The INEEL has a long history in design, construction, operation, and decommissioning of nuclear reactors, hazardous materials processing plants, and large-scale energy systems. This has resulted in multidisciplinary expertise that enables it to undertake and execute large systems-integration projects for DOE, such as the complexwide EMI program.

Laboratory Scientific and Technical Vision and Strategic Plan



III. Laboratory Scientific and Technical Vision and Strategic Plan

A. Introduction

As indicated in Section II, the INEEL's scientific and technical efforts are focused around three strategic thrusts:

- Performing EM operations and environmental stewardship for DOE-EM in a safe and compliant manner
- Ensuring the technical basis of nuclear technology for DOE-NE
- Firmly establishing the INEEL as a major, recognized contributor to energy R&D, demonstration, and deployment.

Each strategic thrust embraces the common goals of providing (a) scientifically defensible solutions to critical problems facing the nation and (b) the scientific and technical basis for sound national policy decisions.

The vision, situation analysis, and strategic objectives for these three strategic thrusts are discussed below in the context of DOE's four business lines of Environmental Quality, Energy Resources, National Security, and Science and Technology. The INEEL's EM operations and environmental stewardship strategic thrust is discussed in detail in the Environmental Quality business line, while the nuclear reactor technology and energy R&D strategic thrusts are discussed in the National Security and Energy Resources business lines. Crosscutting science and technology applicable to all the business lines are discussed in the Science and Technology business line.

B. Vision, Situation Analysis, and Strategic Objectives

1. Environmental Quality

Vision

The INEEL's Environmental Quality vision is to provide leadership and expertise to support the realization of the INEEL's and DOE's Environmental Quality objectives.

Situation Analysis

The technical challenges facing the DOE Environmental Quality mission, budget concerns, and interests of stakeholders mandate that DOE manage its mission with a strong science base and integrate efforts across the DOE complex. The recently published *Environmental Management R&D Program Plan* and the *Environmental Management Strategic Plan for Science and Technology* describe an integrated, cleanup-driven, solution-oriented approach to investments in science and technology. Significant additional scientific understanding is needed in many critical areas associated with DOE's Environmental Quality mission and long-term stewardship responsibilities. The expertise and experience base of all DOE laboratories will be needed to leverage opportunities and offer improved solutions. The INEEL's hands-on experience in environmental cleanup and operations; responsibilities for many key national programs and activities; technology development, demonstration, and deployment success; vision; and commitment to working closely with other DOE laboratories position the INEEL for success as a lead laboratory for DOE-EM.

Strategic Objectives

The INEEL will achieve its Environmental Quality vision by realizing five strategic objectives:

1. **Improve the science that underpins DOE's Environmental Management Program.** The INEEL will conduct a major program in subsurface science to study the transport and fate of underground contaminants. This will result in better decision-making and allow DOE to

FIGURE 12. The INEEL's scientific and technical vision is driven by DOE Headquarters' cleanup-driven, solution-oriented approach described in the recently published Environmental Management R&D Program Plan and the Environmental Management Strategic Plan for Science and Technology. The INEEL played a key role in the development of both documents.

consider alternatives to baseline plans for cleanup, resulting in more efficient use of available resources. An additional element of the project will be the completion of a national vadose zone roadmap. Experts from the DOE complex, academia, and industry will participate in developing the vadose zone roadmap and ensure that it represents the current state of scientific knowledge.

2. **Improve integration of operations and R&D.** Six primary initiatives will be pursued to bridge the gap between R&D and operations and create a model laboratory. These initiatives are **R&D/ Operations Interface Policy**—an INEEL-wide policy and a model depicting the detailed work interactions between R&D efforts, applied technology programs, and operations will be developed and issued; **Technology Work Package Planning**—technology planning will be incorporated into the process for developing EM operational baselines; **Application of Integration Tools**—tools developed under the Complexwide EM Integration Program on barrier analysis, transportation, and data analysis and visualization will be used in developing baselines; **Laboratory/ Operations Work Model**—a model that depicts the detailed work interactions between INEEL R&D efforts, applied technology programs, and operations will be used to develop specific needs and work practices; **Technology Deployment Initiative**—facilitated technology deployments and innovative solutions will be provided to operations programs; and **Project-Specific Science and Technology Roadmaps**—based upon the programmatic technical risk and uncertainties associated with completion of a specific project, science and technology roadmaps will be prepared. Technology efforts will be based on the needs of operations. The INEEL will use its internal integration capabilities to address complexwide challenges facing DOE.

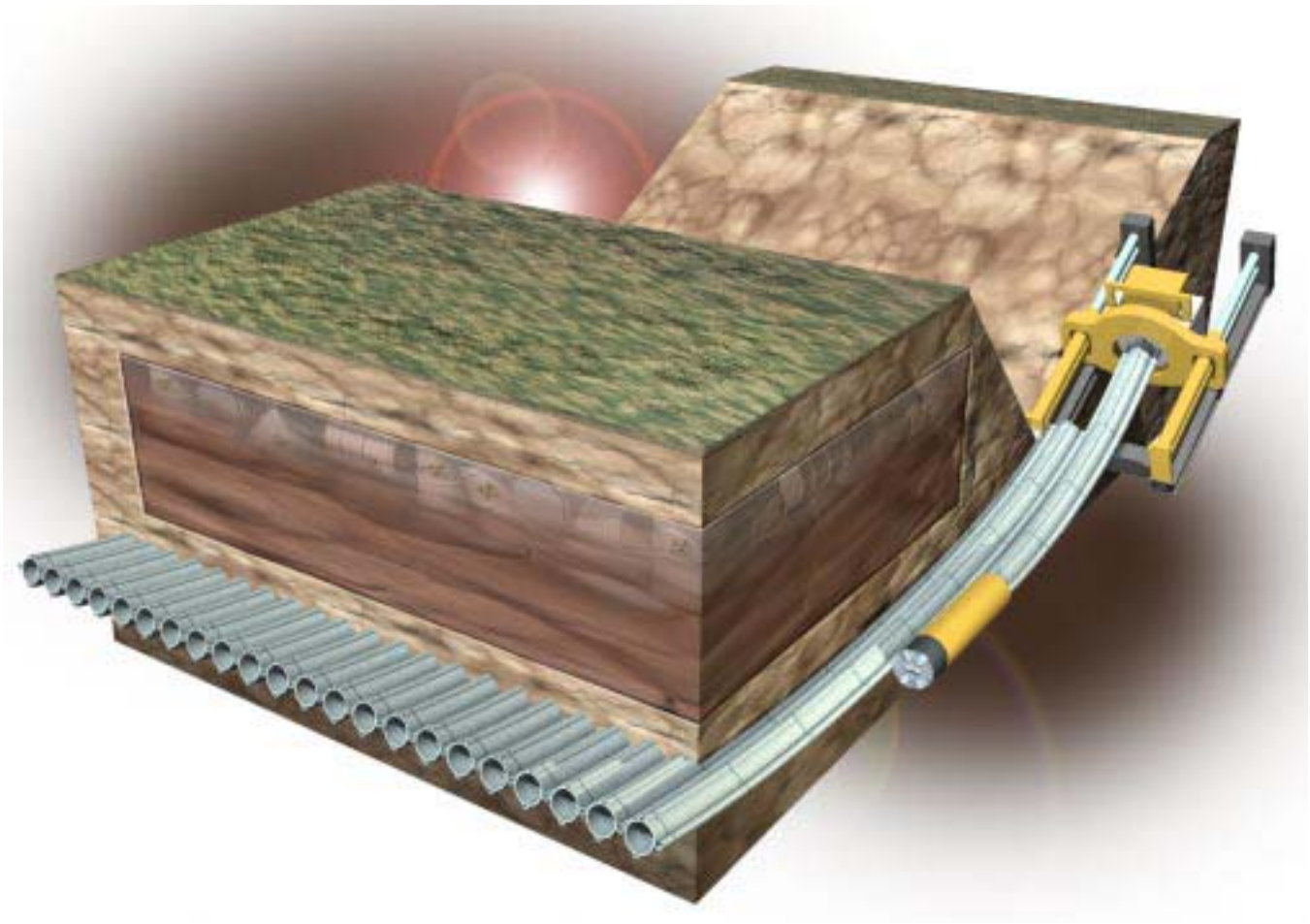


FIGURE 13. The micro-tunnel system pictured above is being developed to contain long-lived contaminants for the duration of their residual risk. This engineered controls and barriers system is one example of the innovative technologies being developed at the INEEL to benefit DOE's Environmental Management program.

3. **Provide leadership for establishing a science and technology program in long-term stewardship.** Working with the other DOE laboratories, the INEEL will assist DOE in establishing a science and technology roadmap for the long-term stewardship of DOE sites. Elements of the program will address verifying the performance of engineered barriers, providing appropriate institutional controls, evaluating land-use management, establishing long-term monitoring, and modeling contaminant fate and transport for extended periods of time.

4. **Develop, demonstrate, and deploy innovative technologies that improve program performance.** The INEEL will continue to develop, demonstrate, and deploy innovative technologies to improve the baseline performance of cleanup and operations. A guiding principle of the INEEL's technology development program is to implement INEEL site-specific technologies with a potential for application to DOE complexwide challenges. The Mixed Waste and Nuclear Materials Focus Areas and the Technology Deployment Initiative are focused on delivering improved technologies and solutions for DOE's Environmental Quality mission.

5. **Leverage the expertise and technology developed to solve additional complex environmental problems.** Many of the tools, technologies, and solutions developed to address DOE's Environmental Quality mission are of significant value for other complex environmental issues. The INEEL will continue to make its expertise available through an active and strategically focused Work for Others program and will serve as a regional technical resource. DOE will also realize benefits as these tools and solutions are further improved by these efforts.

2. Energy Resources

(a) Nuclear Energy

Vision

The INEEL's vision for nuclear energy is to provide technical leadership and expertise in support of DOE's nuclear energy objectives. This will be accomplished through operating, in concert with ANL, as the NE lead laboratory and through enhanced utilization of the ATR to solve DOE challenges.

By executing its responsibilities as an NE lead laboratory for reactor technology, the INEEL and ANL will help DOE effectively integrate its reactor technology infrastructure and focus the results from DOE's nuclear R&D activities. This will create opportunities for a national dialogue on key issues relating to nuclear energy and facilitate DOE's fulfilling its responsibility for providing leadership in the international nuclear energy community.

Enhanced use of the ATR by both domestic and international customers will support DOE in maximizing its investments in nuclear R&D. This will be done without compromising the ATR's principal purpose of supporting national security objectives. The enhanced utilization will create an environment where nuclear energy capabilities, facilities, and expertise are successfully leveraged to solve DOE-EM and -NE challenges.

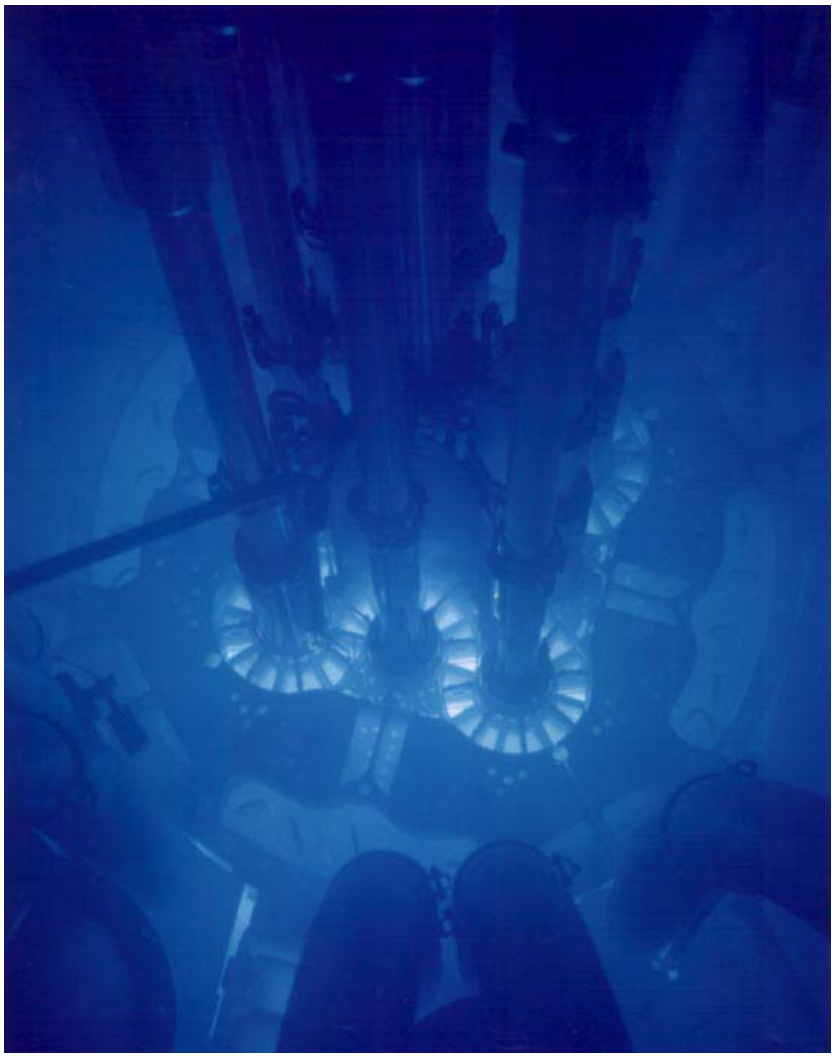


FIGURE 14. The picture above shows the core of the Advanced Test Reactor (ATR) during operation. Enhanced use of the ATR will support DOE in maximizing its nuclear investments.

Situation Analysis

The INEEL's roots are in nuclear energy and current programs include nuclear safety and regulatory technical support, reactor design and development, nuclear operations, and basic nuclear science. The world's demand for electricity is predicted to grow at an annual rate of 3% through 2015 (about 1.4% in the U.S. through 2020). Nuclear energy is a vital and strategic resource in the world's energy supply mix, providing more than 20% of the U.S. and 17% of the world's electricity. DOE has as one of its energy resources strategies to *maintain a viable nuclear energy option for the future.* In the next few years, new nuclear plants will come online in China, Korea, Taiwan, and several other industrialized nations. Some developing countries with limited natural resources are also considering installing nuclear capacity. Replacement of existing nuclear capacity with fossil fuel generation or meeting all of the projected needs through fossil fuel generation will have significant adverse environmental impact. The need exists to maintain current, safe generation capacities while creating an environment where additional nuclear capacity can be installed and accepted.

Three advanced light-water reactor designs (supported by DOE R&D) were certified by the Nuclear Regulatory Commission for construction in the U.S. These plants, which are available for export, are safer, more reliable, and more economical to construct and operate than existing reactors. With no greenhouse gas emissions, nuclear energy represents one of the few large-scale, proven technologies capable of meeting the world's aggressive carbon emission reduction goals. Nonetheless, DOE still faces issues that may

prevent it from achieving its strategic goals with respect to nuclear domestic energy. The INEEL and ANL are in position to advance DOE's domestic nuclear energy strategy. Several forums have been held to promote nuclear understanding and develop recommendations for an achievable national path forward. The *Decision-Makers' Forum*, organized and facilitated by the INEEL, was one such forum. Follow-through on these forums is still required.

The INEEL and ANL are in position to advance DOE's domestic and international nuclear energy strategy.

Strategic Objectives

To achieve the INEEL's vision for nuclear energy, the following strategic objectives will be pursued:

1. Establish the INEEL, in partnership with ANL, as the recognized leader in nuclear reactor science and technology to support NE in policy, planning, and nuclear R&D performance. Focus will be placed on the Nuclear Energy Research Initiative and Nuclear Energy Plant Optimization programs.
2. Assist NE in defining opportunities and initiatives to advance safe and economically feasible nuclear energy technology—both domestically and internationally (e.g., Generation Four nuclear reactor concept and proliferation-resistant reactor designs).
3. As an NE lead laboratory, develop and implement means of maintaining DOE and national critical capabilities in nuclear science and technology areas.

(b) Energy Efficiency, Renewables, and Fossil Energy

Vision

The INEEL's vision for nonnuclear energy is to use the INEEL's key capabilities, facilities, and infrastructure to support DOE's objectives and to provide leadership in defining energy resource

FIGURE 15. INEEL technologies improve fuel storage. The above picture shows the Maverick Tank Inspection Robot (initially developed at the INEEL) being lowered into a tank of diesel fuel to inspect the integrity of the tank floor. Automated equipment allows these inspections to be performed with little or no risk to operators and the environment.

strategies to meet emerging national needs. The INEEL will leverage its scientific capabilities to address technical areas such as CO_2 sequestration, methane hydrates, fuel cell reforming, and clean energy programs for bioenergy and hydrogen.

Situation Analysis

Three major oil disruptions in the past 23 years have caused domestic and international turmoil. By 2010, U.S. oil imports are expected to grow to 60% of domestic consumption. The Persian Gulf alone is likely to provide more than 70% of the world's oil exports, surpassing its peak of 67% during the U.S. embargo year of 1974.

Appreciation by the public and policymakers of the interrelationships between energy production and use, and their global impact on the environment and economic growth continues to increase. DOE's energy R&D is aimed at sustainable energy technologies that emphasize energy efficiency, commercialization of renewable resources, safe and economical use of nuclear energy, and the economical and clean use of fossil fuels. The nation's energy security is enhanced by developing alternative fuels and storage technologies to broaden the mix of energy sources.

Electricity restructuring has brought competition to the wholesale market under existing federal authority. There is considerable support, particularly among states with high electricity costs, for bringing competition to retail markets. This further complicates the energy scene, since it is not clear what the restructured industry will ultimately look like.

The INEEL's developed business base in energy has a heavy emphasis on infrastructure improvements, measurements, analyses, and technology development that support DOE's energy resources objectives. Specific areas are renewable and sustainable power, more efficient and environmentally clean use of power (including fuel cell research in partnership with Bechtel), environmentally responsible use of fossil fuels (liquefied natural gas, hydrocarbon processing), and energy management and conservation. The INEEL also has a program in CO_2 sequestration and methane hydrates and will begin a clean energy initiative using biomass.

Strategic Objectives

The INEEL's vision in the nonnuclear energy mission area will be realized through achieving the following three strategic objectives.

1. Be a recognized leader among national laboratories for conducting quality, science-based R&D to meet the nation's needs for long-term, sustainable alternative and clean energy production and distribution
2. Establish the INEEL as a major technical contributor in the creation and implementation of DOE's Clean Fuel for the 21st Century initiative through the creation of a Technology Application Initiative with focus in fuels and chemicals from biomass
3. Create an integrated national R&D program led by the INEEL in the areas of CO_2 sequestration and methane hydrates.

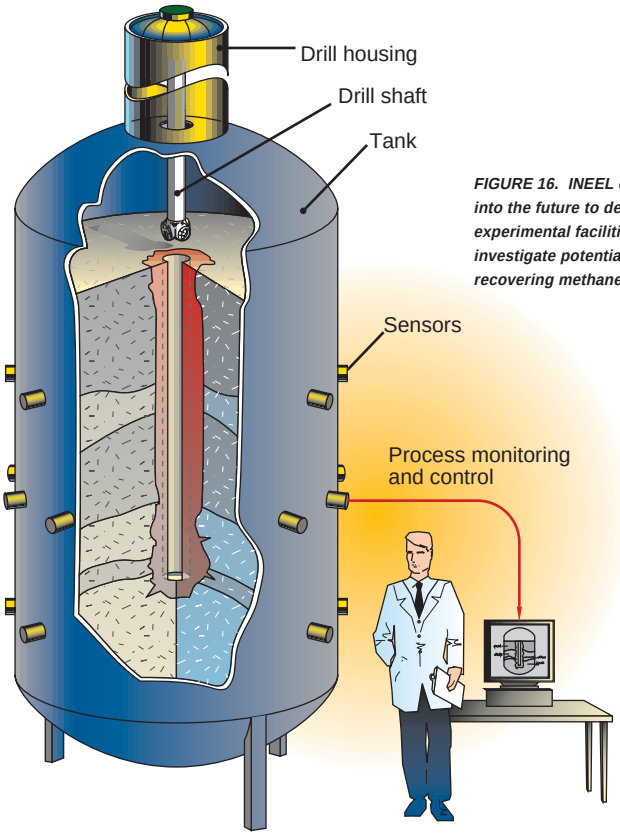


FIGURE 16. INEEL engineers are looking into the future to determine what large experimental facilities will be needed to investigate potential methods of recovering methane gas from hydrates.

3. National Security

Vision

The INEEL plays an important role in DOE's mission of countering weapons of mass destruction and terrorism by using its science and technology base to provide solutions to the threats of terrorism, proliferation, arms control, and conventional conflict.

Situation Analysis

The DOE Office of Nonproliferation and National Security (NN-20) is the largest current INEEL customer funding nonproliferation R&D. The INEEL has developed the mission of being the sole provider of M1 A1 Abrams tank armor packages. The Specific Manufacturing Capability's modeling and simulation capability and metal fabrication factory design and automation expertise are recognized national assets.

DOE's role within the federal critical infrastructure protection initiative is increasing. Within that role, the INEEL is likely to provide an increased share of the national security information technology R&D. The INEEL has enjoyed proven success and established relationships with universities (i.e., University of Idaho, Stanford University, and Idaho State University), and is establishing partnerships with industry.

The U.S. Army nonstockpile chemical demilitarization program recognizes the INEEL demilitarization program as its sole source of chemical munitions assessment technologies and systems integration expertise. The INEEL's role is expanding beyond its current program for the Army's demilitarization program. The role includes new concepts in systems integration, international chemical and conventional munitions assessment, and first responder systems for nuclear, chemical, and biological materials counterterrorism.

FIGURE 17. The International Centers for Environmental Safety is a formal collaboration with Russia and provides a mechanism to ameliorate the environmental effects of the former Soviet Union's nuclear legacy. This picture depicts damaged fuel assemblies that have fallen from their chains to the bottom of a storage pool in Building 5, Andreva Bay. Although now partially covered by concrete, intense radiation (400 mGy/h or 40 R/h) is still being measured in this area.

The INEEL has been recognized with four other national laboratories as DOE law enforcement national assets. The INEEL has a strong position as a test bed for new technologies with regional law enforcement agencies. Information technology will be a key factor in law enforcement applications through methods developed to improve information sharing across different operating systems and network infrastructures. The INEEL is leading in the application of these information technologies as part of the CRIMENET in Idaho and the Colorado Justice Information Network.

Strategic Objectives

The key INEEL National Security strategic objectives are as follows:

1. Establish ICES as a medium for technology development and transfer with Russian counterparts on globally important environmental and security issues.
2. Build upon the INEEL's capabilities for a lead role in the DOE focus area of nonproliferation and intelligence community programs.

3. Build upon the INEEL's capabilities for a lead role in the DOE focus area of countering terrorism involving weapons of mass destruction. Develop the scientific basis for first responder systems for domestic terrorism response and cyber security tools. Fill an important role in DOE's law enforcement program. Develop new survivability systems for potential terrorist targets and develop new materials and processes for armor protection systems and related survivability programs.

4. Science and Technology

Vision

The INEEL's vision for the future includes an emphasis on the scientific principles underlying its key capabilities, further development of those capabilities, close integration of science with applications, and further development of the science base.

The INEEL's vision for the future includes an emphasis on the scientific principles underlying its key capabilities, further development of those capabilities, close integration of science with applications, and further development of the science base.

The INEEL will establish a strong science base in the areas relating to the three strategic thrusts:

- In support of EM's vital mission needs—science-based information on the fate and transport of subsurface pollutants will be routinely used by policymakers and decision-makers
- In the area of nuclear technology—safe, economical, and proliferation-resistant nuclear reactor designs will be readily available and accepted by the public
- In support of DOE's renewable energy needs—affordable, zero-waste energy and materials production will be demonstrated, and key technology elements transferred to DOE programs and U.S. industry

Situation Analysis

DOE requires sound science-based decisions to support environmental stewardship, energy production, and national security. Continued success in this area requires that a collateral base of scientific and technological expertise exists and is constantly enhanced.

At the INEEL, emphasis has been on applied science with a foundation of basic science to provide a continuing flow of new concepts. The primary focus has been on the key capabilities required to support our environmental and nuclear missions. Since the technology has emphasized applications and engineering principles, INEEL products are unique because they

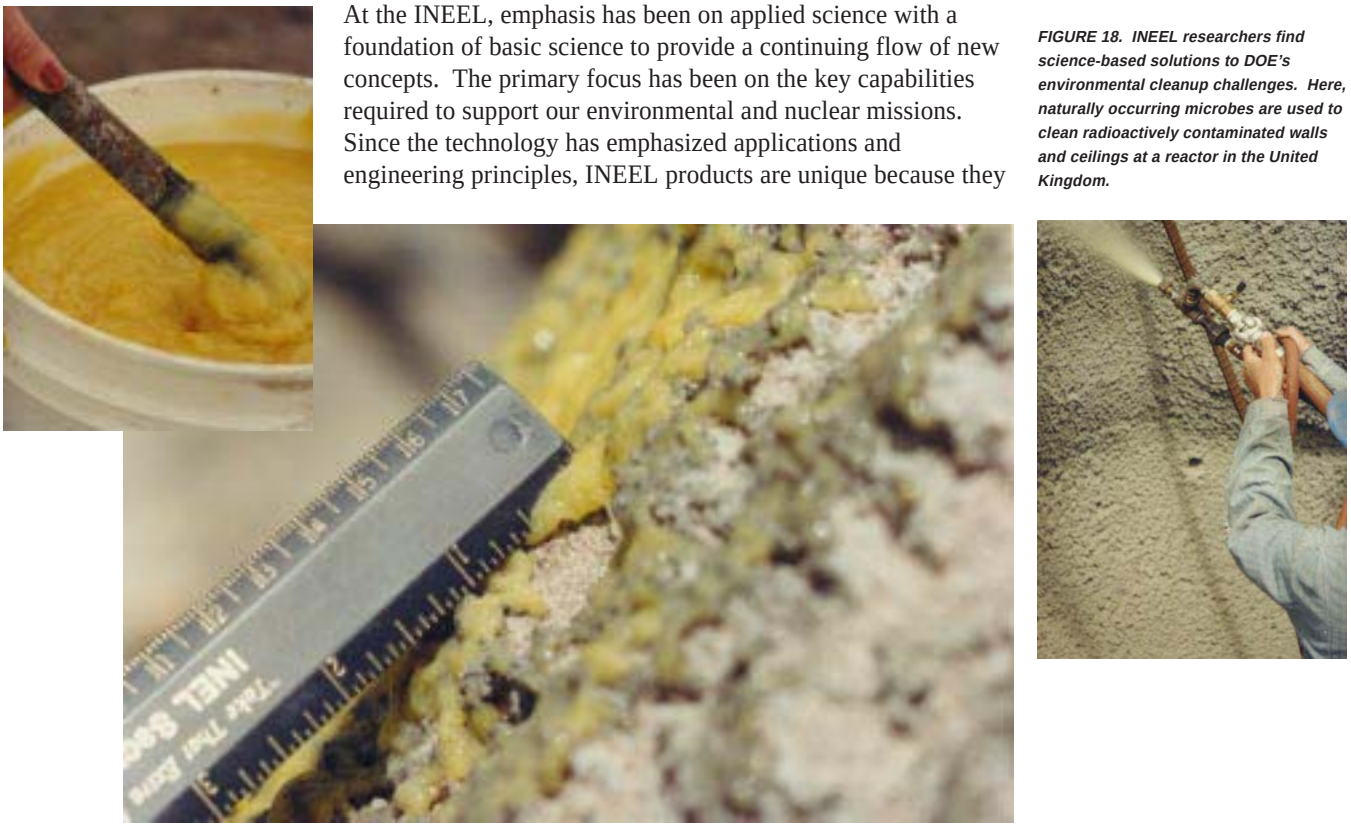


FIGURE 18. INEEL researchers find science-based solutions to DOE's environmental cleanup challenges. Here, naturally occurring microbes are used to clean radioactively contaminated walls and ceilings at a reactor in the United Kingdom.

FIGURE 19. The INEEL actively seeks to develop partnerships with universities and other national laboratories. The Idaho Accelerator Center pictured above expands Idaho State University's research capabilities and gives the INEEL and other national laboratories access to nuclear research opportunities.

cross environmental operations and stewardship, nuclear reactor technology, and energy R&D, the three strategic thrusts of the INEEL.

Existing science that supports the vision are biogeochemistry, surface chemistry, robotics and intelligent machines, nondestructive assay and nondestructive testing, structural integrity and lifetime prediction/extension, nanoscience, and integrated systems.

Strategic Objectives

1. The INEEL will focus on enhancing the basic science culture. An aggressive process for recruiting and retaining the best and brightest personnel in specific niches and improving the R&D infrastructure will be instituted. Investments in science and technology will assist the INEEL in establishing this enhanced culture.
2. The INEEL will partner with universities and other national laboratories to provide both the breakthrough technology and the steady scientific progress required for a sustained attack on the difficult national problems within the INEEL's three strategic thrusts.
3. The Scientific Simulation Initiative, which will define the state of the art in simulation and modeling of complex problems, will support the other strategic initiatives. This initiative will develop the capability to simulate a variety of complex phenomena in ways that are substantially more meaningful to scientists and decision-makers. The Scientific Simulation Initiative will radically improve the effectiveness of computer simulation related to environmental management, nuclear technology, and national security issues. This initiative will require significant advances in the methods used and the codes that embody these methods. It will also require the integration of human factors considerations into the codes and computer hardware.

5. INEEL LDRD Program

Vision

The INEEL's LDRD vision is designed to strengthen the INEEL's science and technology

capabilities within the defined mission boundaries of DOE. Three INEEL strategic thrusts are emphasized through a coordinated, comprehensive R&D portfolio balanced among fundamental, development, and applied research.

Situation Analysis

LDRD is the INEEL's R&D engine and is critical to the success of the strategic thrusts. LDRD projects have provided the complete, or partial, technical foundation for about 75% of the external R&D proposals won by the INEEL. LDRD projects have also provided the original technical foundation for about 75% of INEEL R&D 100 Awards, a key form of public recognition for laboratory technical leadership. A majority of LDRD projects have supported **both** the Environmental Quality mission and other DOE missions through science and crosscutting technologies. Such "dual-use" projects provide high leverage of limited LDRD funds and assist in developing technical staff.

FY 2000 is a year of transition to improved focus of LDRD to support DOE and INEEL strategic objectives. The success of that transition is threatened by two funding restrictions. First, the FY 2000 Energy and Water Appropriation prohibited the taxing of EM projects to generate LDRD funds. Since EM provides about 66% of the INEEL's funding, that reduces to a third the available LDRD funds for the INEEL. Second, the FY 2000 appropriation restricts LDRD to 4% of incoming funds, below the 6% allowed by DOE Order 413.2, Laboratory-Directed Research and Development. These restrictions reduce flexibility and adaptability, and prevent funding of projects critical to several initiatives in this plan.

As a consequence, the FY 2000 LDRD portfolio contains the highest-priority projects that contribute to such areas as the INEEL's role as NE lead laboratory, fossil energy, and national security.

Strategic Objectives

The INEEL will achieve its LDRD vision by realizing three strategic objectives described below:

1. **Ensure LDRD research is aligned with DOE missions and prioritized with strategic thrusts.** Periodic Calls for Proposals communicate INEEL missions, strategic thrusts, priorities, and research needs and establish the link to DOE missions. All resulting proposals are reviewed to ensure alignment and are prioritized with strategic thrusts and initiatives prior to receiving funding.
2. **Ensure LDRD research is of high technical quality.** The objective of all INEEL LDRD is to provide solutions to assist DOE in fulfilling its Environmental Quality and Energy Resources missions. Independent technical review will be incorporated to ensure high technical quality. The LDRD program will ensure full utilization of laboratory critical capabilities and assist in maintenance of the stature of the INEEL as a national laboratory.
3. **Ensure LDRD funding is adequate for its role in implementing this plan.** As noted above, FY 2000 restrictions threaten success in meeting DOE and INEEL mission objectives and must be eliminated as soon as possible. Removing the FY 2000 LDRD restrictions will allow critical R&D in key DOE mission areas such as Environmental Quality (subsurface science) and Energy Resources (Generation Four nuclear reactor, methane hydrates) to proceed. Failure to restore INEEL LDRD will severely impact the INEEL's ability to fulfill its mission and strategic thrusts.

The FY 2000 Energy and Water Appropriation prohibited the taxing of EM projects to generate LDRD funds. Since EM provides about 66% of the INEEL's funding, that reduces to a third the available LDRD funds for the INEEL.

Summary of Major Initiatives

IV. Summary of Major Initiatives

A. Introduction

This section identifies the major initiatives proposed by, or in progress at, the INEEL. These initiatives support the objectives addressed in the DOE Strategic Plan and the INEEL strategic thrusts.

NOTE: Due to the short time the new contractor has been at the INEEL, these initiatives reflect differing levels of maturity (e.g., some include schedule information and some do not). None of these initiatives' resource requirements are reflected in Section VI, Resource Projections. The INEEL Institutional Plan for 2001–2005 will include comprehensive budget information.

B. Environmental Quality

Proposed initiatives in the Environmental Quality mission area are (a) Long-term Stewardship, (b) Vadose Zone Roadmapping, and (c) Subsurface Science. The initiatives are focused on two major objectives in DOE's Strategic Plan – to reduce the most serious risk associated with the environmental cleanup of the nuclear weapons complex and to reduce the life-cycle costs of cleanup. All three of the initiatives are closely related and will be integrated under the environmental stewardship umbrella.

Critical to the success of these three initiatives is the work being performed through the Environmental Systems Research and Analysis (ESRA) Program. The ESRA program provides the ability to accomplish two types of activities. The first is the implementation of paradigm shifting processes. The primary example of this is the ongoing environmental management integration for the DOE complex. A second example is the Vadose Zone Roadmapping Initiative, which will be initiated in FY 2000. Both of these activities provide the basis for enhancing the ability of EM to make informed decisions. The second type of activity conducted through ESRA is the execution of a focused science and engineering research program that provides the foundation for reducing technical uncertainty in areas of importance to EM's Long-Term

FIGURE 20. DOE's long-term environmental stewardship effort is about maintaining an adequate level of protection against hazards posed by nuclear and/or chemical materials waste and residual contamination remaining after cleanup is completed. Working closely with DOE and other DOE laboratories, the INEEL will provide leadership to establish a science and technology development program for long-term stewardship.

Stewardship Mission. This activity has been structured to address a number of technical areas but has placed a particular emphasis on aspects of subsurface science. The ESRA program has initiated science and engineering research efforts in several of the areas described within the strategic objectives section of the Environmental Quality Portfolio. These efforts include research regarding fate, transport, and long-term monitoring of contaminants.

1. Long-Term Environmental Stewardship Initiative

Strategic Objectives

Two of the major objectives outlined in DOE's Strategic Plan are to reduce the most serious risks from the environmental legacy of the nuclear weapons complex and to reduce the life-cycle costs of cleanup. As cleanup has progressed around the complex, emerging issues surrounding the long-term stewardship of DOE sites are garnering greater attention from DOE, the Environmental Protection Agency, other federal agencies, tribal nations, states, the public, and environmental watch groups. Stewardship, defined by DOE as the "physical controls, institutions, information, and other mechanisms needed to ensure protection of people and the environment where DOE has completed or plans to complete cleanup," is of growing interest due to the number of decisions being made to leave residual contamination in place and the limited scientific understanding of the long-term effects of this approach.

Key elements of a stewardship program include site monitoring and maintenance, environmental monitoring, application and enforcement of institutional controls, and information management. The key issues associated with long-term stewardship include:

- The ability of engineering controls and barriers to maintain their performance for the duration of the residual risk from long-lived contaminants
- Limited scientific understanding of the fate and transport of contaminants in the subsurface
- The use of risk assessment methodologies that may improperly estimate risk posed by residual contamination
- Future land-use planning, particularly beyond 100 years
- Enforceability of institutional controls
- How to maintain information for up to several thousand years to support long-term stewardship.

A significant investment in science and technology is required to address many of these issues. During FY 2000, the INEEL, working closely with DOE, will provide leadership in establishing a science and technology development program for long-term stewardship. The INEEL also will reach out to the other DOE laboratories and the Grand Junction Project Office to ensure their participation in identifying the science and technology needs for long-term stewardship.

During FY 2000, the INEEL, working closely with DOE, will provide leadership in establishing a science and technology development program for long-term stewardship.

Strategic Outcomes

The long-term stewardship science and technology program will be split into three phases. Phase I will identify the science and technology needs of the long-term stewardship program. Phase II will result in a roadmap of the path forward to ensure that actions are in place to fulfill the identified needs. Phase III will monitor the progress of the science and technology programs in meeting the needs and long-term stewardship program to ensure that long-term needs are also met.

Schedule (Phase I)

- Define and obtain funding for the science and technology needs identification process by January 31, 2000
- Complete the Project Management Plan detailing the scope, schedule, cost, and deliverables for the program by March 13, 2000
- Establish the complexwide team for the needs-identification process and complete the needs identification by September 30, 2000.

2. Vadose Zone Roadmapping Initiative

Strategic Objectives

As stated in DOE's Strategic Plan, the first objective of the Science and Technology business line is to "Develop the science that underlies DOE's long-term mission." In an INEEL briefing to the DOE Under Secretary, the national vadose zone problem was summarized as follows: "Our ability to predict the fate and transport of contaminants released into the vadose zone is inadequate for making key decisions." This statement is supported by recent research and monitoring at several DOE waste disposal sites including the INEEL, Hanford, and Nevada Test Site. The results have indicated the transport of low levels of plutonium and other contaminants in ground water. Improved scientific understanding of the fate and transport of contaminants in the vadose zone is necessary to enable key decisions.

The INEEL's charter is to lead the development of a comprehensive vadose zone science and technology roadmap for the DOE complex. The stated objective of improving the science underpinning of EM's program is a key focus for this roadmap. The roadmap will identify a path forward to improve current solutions and tools that support EM decision-making. This will ultimately result in an accelerated, more cost-effective cleanup for the INEEL and the rest of the DOE complex.

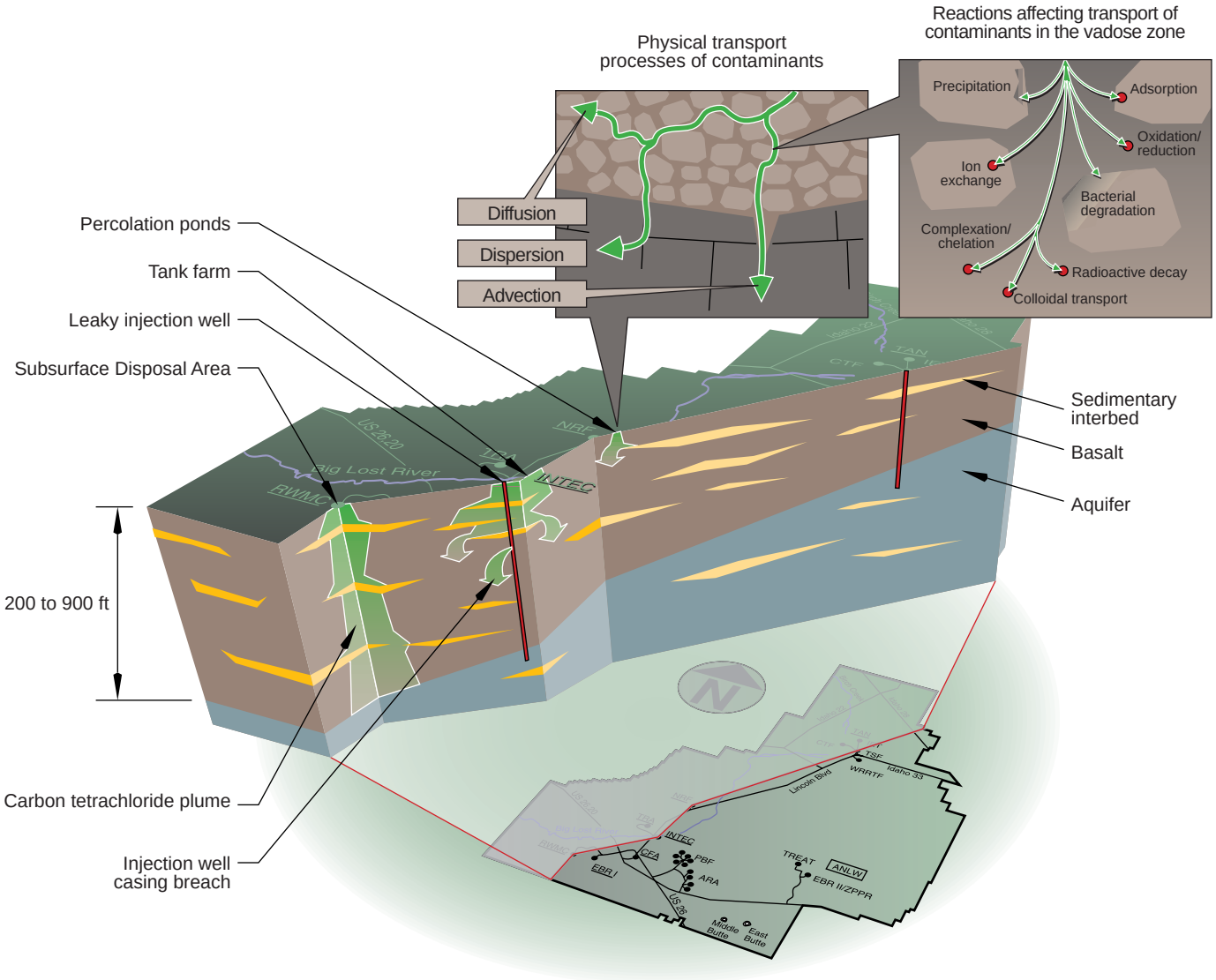


FIGURE 21. Subsurface transport of contaminants is a complex multidisciplinary issue. Understanding the ultimate fate of contaminants in the environment will require collaborative efforts from a wide range of scientific and engineering disciplines on multiple scales of observation.

Strategic Outcomes

The initiative will provide a Complexwide Vadose Zone Roadmap (CVZR). The roadmap will integrate vadose zone characterization methods, scientific understanding of subsurface contamination and vadose zone cleanup technology needs, accuracy in fate and transport prediction, and environmental compliance. It will provide scientifically grounded decision-making for DOE long-term stewardship. The problems, science gaps, and related technological solutions will be addressed in a collaborative effort involving DOE, contractors, research scientists, cleanup managers, industry, and regulators.

The *Environmental Management Research and Development Program Plan*, November 1998, provides the framework the INEEL is following to conduct the CVZR project. This document describes common goals and objectives for the R&D programs and the relationship between DOE's missions, EM-specific missions, and the three levels of roadmapping to be conducted within EM.

The extent of subsurface problems across the complex represent challenges, which are directly related to pilot research being conducted at field scale at the INEEL. CVZR addresses the known gaps in science, such as the ability to accurately define how reactive product transport occurs in variable saturated media underground.

Schedule

- A detailed Project Execution Plan was submitted to DOE-ID on November 1, 1999, and is pending approval
- The roadmap will be produced on an accelerated schedule by November 2000.

3. Subsurface Science (SSS) Initiative

This initiative will develop a multidisciplinary program to accurately model and measure properties of the earth's subsurface region to absorb, store, and retard contaminant migration. The science and technology needs identified through the Long-term Environmental Stewardship and CVZR initiatives will help define the research agenda for the SSS initiative.

Strategic Objectives

The SSS initiative will establish the INEEL as a leading laboratory in scientific research in understanding and predicting fate and transport of subsurface contaminants.

Strategic Outcomes

The SSS initiative will fill a compelling national need for a comprehensive, integrated program to nurture, develop, and focus the comprehensive science base critical to environmental challenges in the next century. It will establish the infrastructure required to study phenomena taking place at or under the earth's surface. It will directly integrate the R&D and operations of INEEL's environmental cleanup and long-term stewardship obligations consistent with the Long-term Environmental Stewardship and CVZR initiatives. Actions to be pursued are as follows:

The SSS initiative will establish the infrastructure required to study phenomena taking place at or under the earth's surface.

- Determine gaps in capabilities of existing scientific facilities
- Complete the SSS Program Plan incorporating input from the Long-term Stewardship and Vadose Zone Roadmapping initiatives, including resource projections and schedule
- Acquire the anchoring facility and infrastructure for leadership in long-term geoscience
- Partner with PNNL, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, universities, institutes, nonprofit and commercial firms to develop a fully validated predictive model for mass transport in the subsurface environment.

C. Energy Resources

The three Energy Resources initiatives discussed in this section are designed to facilitate success for the Nuclear Energy and Energy Efficiency, Renewable, and Fossil Energy strategic objectives outlined in Section III. Success in the Generation Four Nuclear Reactor and Nonproliferation Fuel-Cycle Initiatives will establish the INEEL and ANL as leaders in nuclear reactor science and technology while maintaining DOE critical capabilities. Through these initiatives, the INEEL and ANL will provide valuable assistance to DOE in achieving its strategic objectives to maintain a viable nuclear option for the future and reduce the proliferation threat.

The Clean Fuel Initiative discussed in this section supports the three Energy Efficiency, Renewable, and Fossil Energy strategic objectives discussed in Section III. This initiative is divided into three components: Biofuels and Chemicals from Biomass, the Technology Application Initiative, and the National CO_2 Sequestration/Methane Hydrates Program. Collective success in these three areas will assist in establishing the INEEL as a major technical contributor to DOE's Clean Fuel for the 21st Century initiative and bolster the INEEL's science-based R&D contributions to DOE's alternative and clean energy mission objectives.

The Clean Fuel Initiative supports the three Energy Efficiency, Renewable, and Fossil Energy strategic objectives discussed in Section III.

1. Generation Four Nuclear Reactor Initiative

The INEEL will facilitate development of the Generation Four Nuclear Reactor, which will meet U.S. and international criteria for economics, safety, proliferation resistance, and waste.

The growth of nuclear power in developing countries around the world, the concern regarding emissions related to carbon fuel cycles, and the potential for nuclear power in the U.S. and Europe strongly reinforce the need for a fourth generation commercial nuclear reactor. The first three generations (small reactors from the *Atoms for Peace* era, large boiling water and pressurized water reactors, and advanced light water reactors) will not meet future challenges of economic competitiveness, improved safety, proliferation resistance, and waste minimization.

Strategic Objectives

The major long-term goal of this initiative is to develop a DOE-NE Generation Four program starting in FY 2000 and continuing into the future. The initial efforts will focus on building the consensus for the program across a wide spectrum of national decision-makers. The INEEL, along with ANL, will manage this initiative as NE's lead laboratories for reactor technology.

Strategic Outcomes

- Receive endorsement and authorization funding from NE-1 to lead a Generation Four Workshop and follow-on activities
- Conduct Generation Four Workshop in May 2000 to solicit input from individuals and organizations representing industry, government, national laboratories, universities, and the international community that can develop requirements and attributes
- In concert with NE-1, develop a Generation Four path forward in support of future NE budget requests.

2. Nonproliferation Fuel-Cycle Initiative

In May 1999, Energy Secretary Richardson and Russian Minister of Atomic Energy Adamov signed an agreement establishing U.S. and Russian International Centers for Environmental Safety to deal with environmental cleanup and spent nuclear fuel issues of common interest and concern. The INEEL and ANL, in partnership, are the U.S. programmatic leads. This program has the potential to grow through internationally funded environmental technology development and demonstrations projects, environmental cleanup activities for contaminated nuclear sites, and spent fuel management.

Strategic Objectives

The initial focus is to design, develop, and test a nonproliferating fuel cycle capable of destroying weapons-grade plutonium consistent with U.S./Russian strategic policies.

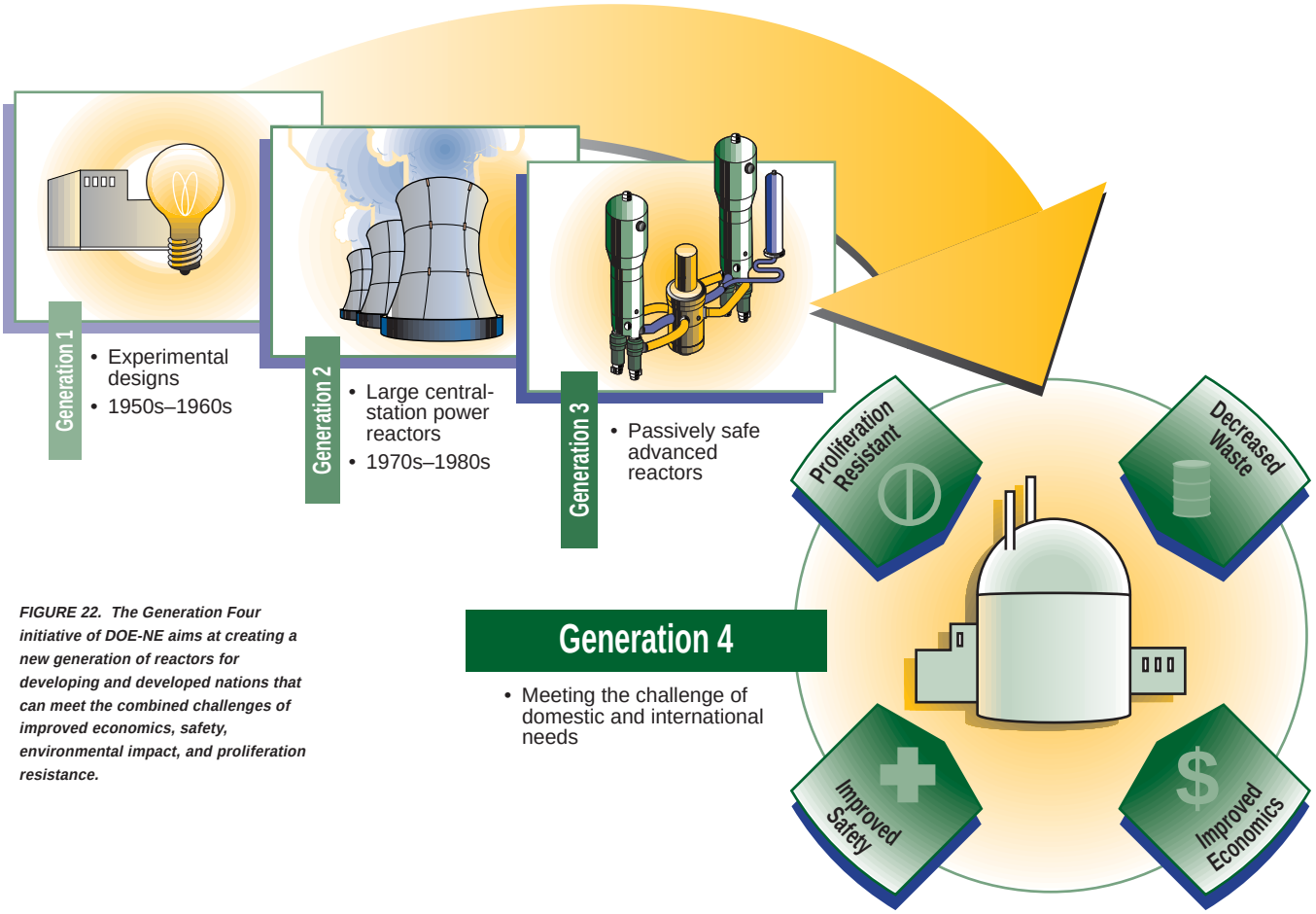


FIGURE 22. The Generation Four initiative of DOE-NE aims at creating a new generation of reactors for developing and developed nations that can meet the combined challenges of improved economics, safety, environmental impact, and proliferation resistance.

Strategic Outcomes

- Support the establishment (with National Security) of ICES as a funded international program with NE/NN sponsorship along with commitments from the U.S. and Russian decision-makers. The initial set of proposed projects under ICES have been defined and initiated
- Help create domestic and international partnerships that advance the nonproliferation fuel-cycle portion of ICES.

3. Clean Fuel Initiative

President Clinton has signed an executive order for developing and promoting bioenergy. The goal of this order is to strengthen the nation's efforts in developing energy sources and industrial and commercial products from biomass. To support this effort, the INEEL has identified its competencies and capabilities in biotechnology and has established a Clean Fuel Initiative.

(a) Biofuels and Chemicals from Biomass

The INEEL will develop biological and related processing technologies that can be used to manufacture commodity and specialty chemicals, fuels, and other value-added products from biomass-derived renewable feedstocks. This approach provides an alternative to our nation's current reliance on petroleum for the production of fuels and chemicals.

Strategic Objective

The INEEL will advance the science basis for production of fuel and chemicals based upon biological processes.

Strategic Outcomes

- Develop this initiative consistent with DOE's Clean Energy for the 21st Century initiative

- Directly support DOE's Technology Roadmap for Plant/Crop-Based Renewable Resources 2020
- Partner with key biotechnology/energy institutions, e.g., NREL, PNNL, Oak Ridge National Laboratory, and ANL.

(b) Technology Application Initiative

The INEEL will leverage corporate-funded research and development and relocate BBWI corporate R&D resources to the INEEL as seed programs for developing a Technology Application Initiative. An initial focus area for the initiative will be bioenergy. By bringing these resources together, an infrastructure is created that allows the INEEL to leverage resources in support of DOE's Clean Energy for the 21st Century initiative.

The INEEL will leverage corporate-funded research and development and relocate BBWI corporate R&D resources to the INEEL as seed programs for developing a Technology Application Initiative.

Strategic Objective

The INEEL will be the applied technology focal point within the DOE complex through the creation of an initial Technology Application Initiative focused on biofuels and chemicals from biomass.

Strategic Outcomes

- Develop focus for initial call for corporate-funded research and development
- Engage all BBWI partners in supporting the INEEL's initiative
- Develop a bioenergy business plan that induces DOE to include base funding for this INEEL initiative in FY-01.

(c) National CO_2 Sequestration and Methane Hydrates Program

Current R&D programs in extraction, distribution, and use of fuels derived from methane hydrates are scattered and not focused on providing the U.S. with viable alternative fuel sources. An overall strategy focused on key objectives is needed to determine the viability of methane hydrates to meet the nation's needs. This potential also exists to use the physical (clathrate) structure of methane hydrates to sequester CO_2. DOE has begun to address the strategy needs with a Carbon Sequestration R&D Roadmap and a National Methane Hydrates R&D Program Plan. Among other things, a fundamental understanding of methane hydrate formation can help DOE determine the viability of exploiting hydrate-forming processes in future power plants to separate carbon dioxide from other gases. Also, for methane hydrates to be a viable alternative energy source, their extraction and use must not increase greenhouse gas emissions.

Strategic Objective

The INEEL will help DOE establish an integrated CO_2 sequestration and methane hydrates program to leverage ongoing R&D, including INEEL work being performed with LDRD investment.

Strategic Outcomes

- The INEEL's proposal becomes the foundation of a renewed, integrated, national program
- The INEEL's R&D in CO_2 sequestration and methane hydrates is recognized by peers, thus gaining support for DOE's decision to allow the INEEL to lead its national program
- The INEEL provides leadership in DOE's CO_2 sequestration and methane hydrates R&D
- Partnerships among INEEL and other leading institutions facilitate execution of DOE's national program in CO_2 sequestration and methane hydrates.

D. Science and Technology

The INEEL's science and technology efforts crosscut, and are applicable to, all three of the other business lines. At this time, one science and technology initiative is being proposed, the Scientific Simulation Initiative. Initiative success will result in enhanced computer simulation and modeling capabilities directly applicable to all of the proposed INEEL initiatives discussed earlier in this section.

1. Scientific Simulation Initiative

The INEEL will undertake a major initiative to support scientific simulation in support of subsurface science, science and technology-based environmental cleanup, advanced nuclear energy, bioenergy, and environmental security. This initiative will enable the simulation of a variety of complex phenomena in ways more meaningful to scientists and decision-makers and radically improve the delivery of leading-edge science and technology at reduced costs.

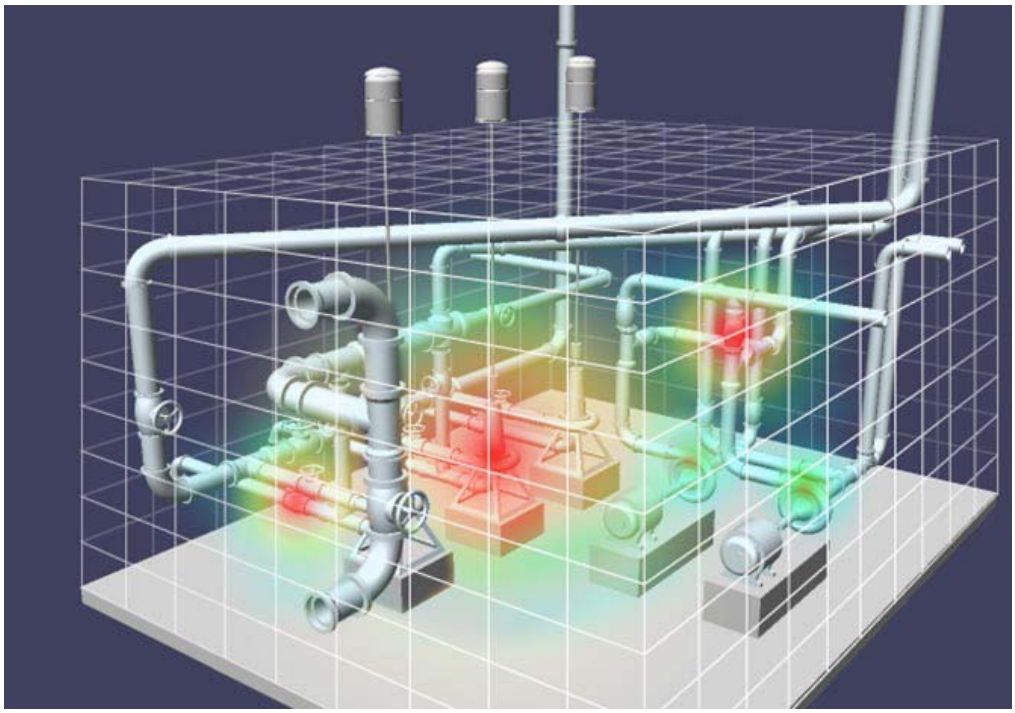
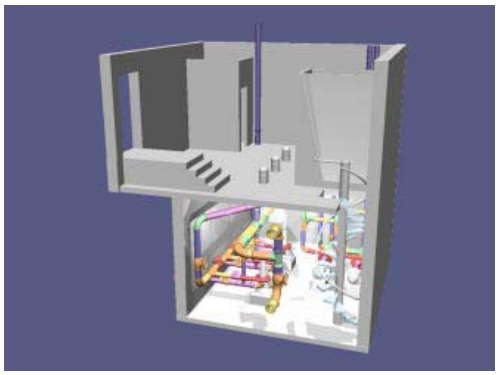


FIGURE 23. DDROPS, or Decontamination, Decommissioning, and Remediation Optimal Planning System, is an example of the INEEL's advanced simulation capabilities used to benefit DOE's EM programs. The Advanced Simulation Initiative will further enhance the INEEL's ability to simulate complex phenomena for use in a wide variety of DOE programs.



Strategic Objectives

DOE's Scientific Simulation Initiative will allow a revolution to occur in solving a variety of complex scientific problems, not only for DOE but also the nation. The INEEL is particularly well positioned to address scientific simulation in support of R&D in subsurface science, environmental cleanup, advanced nuclear energy, bioenergy, and environmental security. The INEEL will address issues associated with the human ability to process information in support of decision-making. This initiative also directly supports the DOE Office of Science's Strategic Plan on scientific simulation.

Strategic Outcomes

In support of DOE's Scientific Simulation Initiative, the INEEL's initiative will develop sophisticated modeling techniques and algorithms that will allow the simulation of complex subsurface phenomena, existing and new reactor designs, and the development of

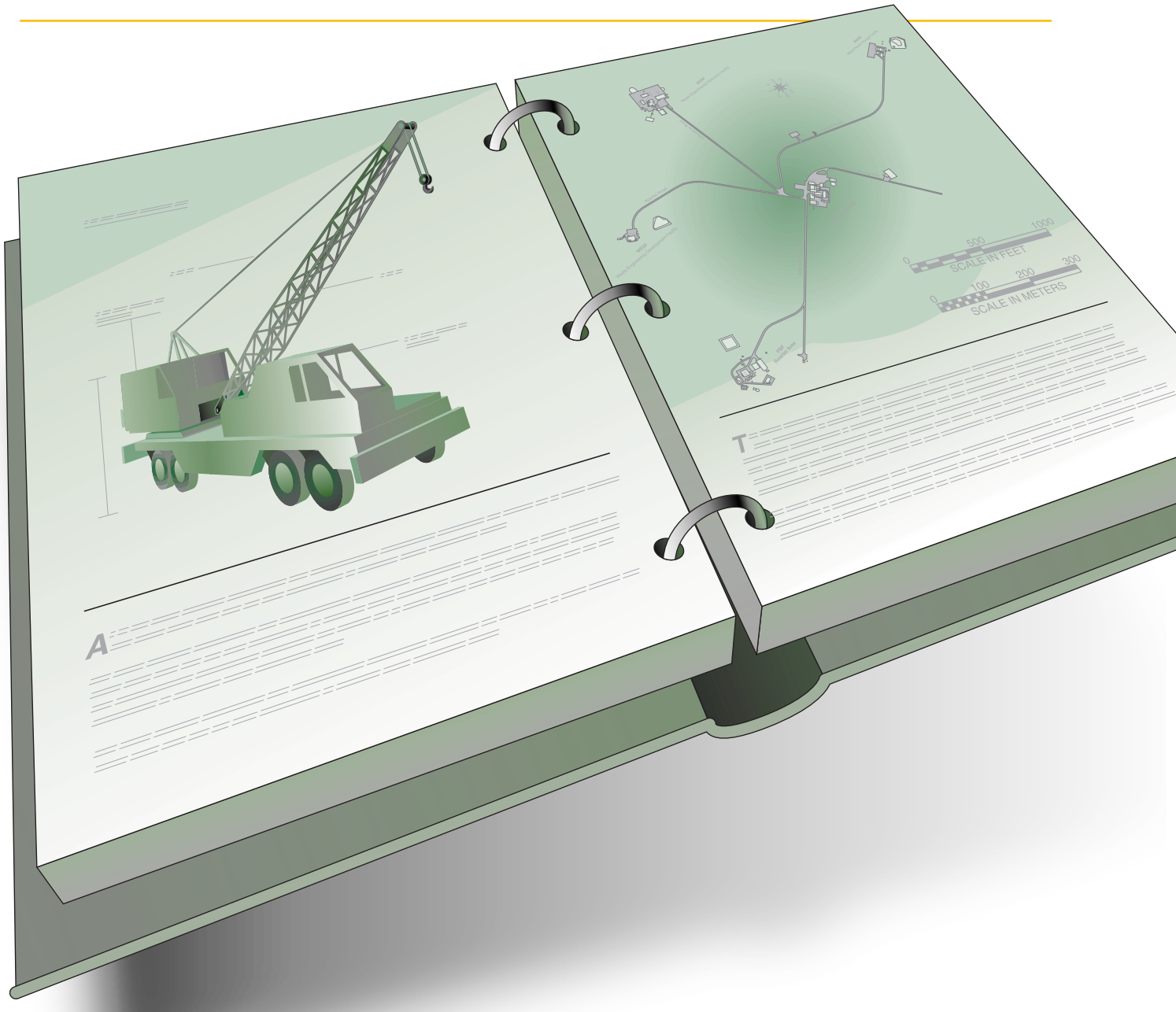
human-computer systems to support decision-making. This requires significant advances in the use of massively parallel machines and marked improvements in adapting codes and hardware to human information processing.

Cross training in the relevant sciences and computing to effectively develop the aforementioned models, algorithms, and interfaces will be conducted for staff. Initial efforts will focus on rebuilding the infrastructure at the INEEL and on building teams to begin working the complex set of problems.

Schedule

- Acquire funding in FY 2000 to begin development of new codes and interfaces to support missions in subsurface science, science and technology-based environmental cleanup, advanced nuclear energy, bioenergy, and environmental security
- Establish a laboratory scientific computing plan that accommodates the requirements for this work by April 2000
- Immediately institute a T3 connection and build networks to support connection to T3—data archival systems for local storage and large calculations, and a 10 processor crossbar-based computing system with 10 GB of physical memory
- Hire three computer specialists with appropriate technical experience in science and computing by September 2000.

Operations and Infrastructure



V. Operations and Infrastructure

BBWI is currently conducting a comprehensive review of INEEL operations and infrastructure. The review will uncover needed improvements to optimally support the INEEL's three strategic thrusts. The discussion below focuses on areas indicated as mandatory by DOE. Additional details are planned for future INEEL Institutional Plans.

A. Environment, Safety, and Health

The INEEL's environment, safety, and health program is being implemented within the framework of a comprehensive commitment to operational excellence. Operational excellence is a vision founded on the integration of Integrated Safety Management System (ISMS) concepts with Conduct of Operations and Conduct of Maintenance philosophies, and tied to achieving Voluntary Protection Program (VPP) STAR status.

Vision

Environment, safety, health, and quality assurance (ESH&QA) excellence is characterized by:

- *Leadership* that ensures worker, public, facility, and environmental safety
- *ESH&QA functional programs* that support and enable line management to successfully and safely meet program requirements
- *Comprehensive employee involvement* in ESH&QA programs and in the planning, control, and execution of work.

FIGURE 25. The VPP program is one facet of the INEEL's environmental, safety, and health program. Extensive preparation has been made to ensure that all INEEL facilities are "Star Ready" in anticipation of Star Status audits.

The ability of the INEEL to achieve this vision and demonstrate its performance is fundamental to its reputation and, therefore, to the ability of the INEEL to achieve its mission. Although funds must be provided to the INEEL for cleanup associated with legacy operations, additional work and money assigned to the INEEL will be significantly influenced by its ESH&Q reputation. ESH&QA excellence must be demonstrated in all activities: cleanup, operations, and research and development. The achievement of ESH&QA excellence is necessary for the successful and timely completion of the INEEL cleanup mission and for the full achievement of the science and technology vision.

Situation Analysis

Because of serious industrial accidents, Price Anderson fines for violations of nuclear safety and quality requirements, and State of Idaho fines for violations of environmental regulations, the INEEL has developed an unacceptable reputation for safety and compliance. Although considerable effort has been focused on these issues, the reputation of the laboratory has not yet changed. The INEEL is committed to demonstrating change through sustained, improved performance. The INEEL's ability to bring in new projects and execute its mission depends largely on successfully demonstrating improved performance.

Activities undertaken to improve safety and compliance include implementation of DOE's VPP; an ISO 14001 Environmental Management System; an effective, compliant Quality Assurance Program (QAP); and an ISMS. Significant progress has been made in implementing all four of these programs at the INEEL. Noteworthy strengths observed while implementing these programs include:

- Management commitment to successful implementation
- Employee involvement and support
- Projectization of implementation efforts
- Comprehensive involvement of ESH&QA functional managers and subject matter experts.

Challenges to successfully implementing these programs include institutionalizing the comprehensive changes required by these programs and building the necessary cultural attributes, particularly a compliance culture.

Strategic Objectives

The INEEL ESH&QA program has identified four objectives to realize its vision:

1. A VPP that satisfies criteria for STAR status (September 2000)
2. An environmental management system that satisfies criteria for ISO 14001 (June 2002)
3. An effective QAP that complies with DOE orders and regulations (FY 2000)
4. An ISMS that satisfies DOE criteria (May 2000).

Performance Measures

Measures for ESH&QA performance include successful implementation of the ISMS, VPP, QAP, and ISO 14001 by established due dates; meeting metrics associated with employee involvement, injury and illness targets (Severity Index, Lost Workday Case Rate, and Total Recordable Case Rate), and event and accident rates; environmental noncompliance and fines; and regulatory noncompliance and fines.

B. Stakeholder Communications and Trust

Vision

The long-term success of the INEEL depends on the interest and support of internal and external stakeholders. Communication, openness, and credibility are vital to the INEEL. If the INEEL is to perform its science-based missions and contribute to regional economic development and diversification, it must have the confidence of all involved parties.

FIGURE 26. The INEEL has strong ties to the community and to its elected officials, as seen here during the 50th anniversary celebration.

Situation Analysis

INEEL Public Affairs has a strong working relationship with local media, interest groups, local community organizations, the Shoshone-Bannock tribes, and Idaho elected officials. Communication activities will include quarterly editorial board meetings, community roundtables, the INEEL's employee newspaper (*i News*), and support to the Citizen Advisory Board.

The INEEL is committed to be a seamless enterprise with the integration of R&D and operations, and this will be a primary message to the public.

There is significant public confusion as to the INEEL's mission and roles. To correct this confusion, the INEEL will develop a comprehensive communications strategy. The INEEL is committed to be a seamless enterprise with the integration of R&D and operations, and this will be a primary message to the public.

Strategic Objectives

The Public Affairs office will:

1. Develop and implement a comprehensive, integrated communications strategy for the INEEL
2. Improve communications infrastructure capabilities
3. Consistently convey the integrated enterprise message for the INEEL.

Strategies

To accomplish these objectives, the following strategies will be used:

- Promote awareness and visibility for the INEEL and its scientific, engineering, and technology activities through appropriate activities
- Develop a communications program that establishes national recognition for the INEEL's critical objectives, capabilities, and R&D activities.

Performance Measures

During early FY 2000, a survey will be conducted of Idaho elected officials and citizens regarding their knowledge of the INEEL's impact on the region. A second survey will be conducted within 2 years to determine changes in public awareness of the INEEL.

C. Management Practices

Omitted from this section are the following DOE-SC-7-recommended elements: Contract Administration; Budget, Finance, and Resource Management; and Quality and Customer Focus Programs. Plans for these elements are being developed, and these topics will be addressed in the FY 2001-2005 Institutional Plan.

1. Human Resources

Vision

The INEEL seeks to achieve a higher level of recognition in the science and engineering community. The Human Resource organization plays a significant role in establishing the INEEL as a recognized national laboratory for engineering and environmental science. It is through creativity, flexibility, and personal commitment of its people that the INEEL's major thrusts and critical objectives will be achieved.

Situation Analysis

The INEEL currently experiences a low turnover rate, low rejection rate on employment offers, and excellent relationships with both internal and external customers. The INEEL also has a strong foundation on which to build a more diverse work force. However, the INEEL faces critical challenges in (a) identifying, recruiting, and retaining world-class scientific talent, (b) providing appropriate compensation, and (c) retraining employees with needed skills and expertise. There is currently a high demand in the external market for candidates from science

FIGURE 27. Science Action Teams of INEEL scientists and high school students provide the students an opportunity to participate in research conducted at the INEEL. This program is one example of how the INEEL is assisting DOE in fulfilling its objective to advance the nation's science education and literacy.

and engineering disciplines. The INEEL is establishing a program to attract quality college graduates and preeminent scientists and engineers.

Strategic Objectives

The INEEL will streamline its Human Resource function and support a strengthened science base by:

1. Stabilizing manpower levels in critical technologies key to strategic thrusts.
2. Attracting and retaining world-class talent. This will include three top-level scientists for environmental and engineering services, subsurface science, and complexwide vadose zone roadmapping. Additional recruitment efforts will be focused on experts in the areas of renewable energy from biomass, nuclear reactor technology, and other appropriate fields.
3. Developing requirements-based systems to rapidly deploy skilled, trained, and energized workers to achieve operational goals.

Strategies

The Human Resources organization will pursue the following strategies to meet its objectives:

- Complete a comprehensive review of pay, benefits, development opportunities, and infrastructure to support attracting top-level scientists. In particular, benchmark the INEEL program and practices with other world-class scientific engineering laboratories.
- Restructure the recruiting plan to emphasize campus recruiting at top-tier universities.
- Track programmatic manpower needs to projections and actively recruit personnel to fulfill identified needs.
- Expand the focus on cooperative academic exchange programs with Inland Northwest Research Alliance (INRA) schools to include a stronger focus on women and minorities.
- Partner with INRA schools to encourage high school students, particularly minority students, to enter scientific and engineering disciplines.

The Human Resources organization will complete a comprehensive review of pay, benefits, development opportunities, and infrastructure to support attracting top-level scientists.

- Recruit at colleges and universities nationwide for minorities and women, particularly masters and doctoral students.
- Formalize a company-sponsored mentoring program for high-potential employees, with particular emphasis on minorities and women.
- Annually assess pay equity for protected classes.
- Promote job rotation to enable more cross-training and increased skill sets.

Performance Measures

Techniques for measuring performance include tracking the percent of new hires by discipline, job level, and educational level.

Techniques for measuring performance include tracking the percent of new hires by discipline, job level, and educational level. Personal performance measures for scientists will include the number of peer-reviewed publications, status in professional societies, conferences attended, and invitations received to participate in panels and on national technical and scientific committees. Other measures will include:

- Tracking attrition rate and turnover statistics by scientific discipline
- Measuring cycle-time to process personnel actions
- Measuring management achievement of affirmative action goals.

2. Site and Facility Management

It is a DOE and an INEEL policy to manage all of its land and facilities as valuable national resources. The INEEL's stewardship is based on the principles of ecosystem management and sustainable development. The laboratory has integrated mission, economic, ecological, social, and cultural factors into an *INEEL Comprehensive Facility and Land-Use Plan* that guides land- and facility-use decisions. This development considers the site's regional context and reflects stakeholder participation. The INEEL uses its land and facilities to accomplish DOE's critical missions, stimulate the regional economy, and protect the environment.

The INEEL is strengthening its site and facility management processes. The emphasis is on sitewide integrated planning, budgeting, and execution of maintenance and construction projects. This will leverage the INEEL's extensive infrastructure capabilities. These

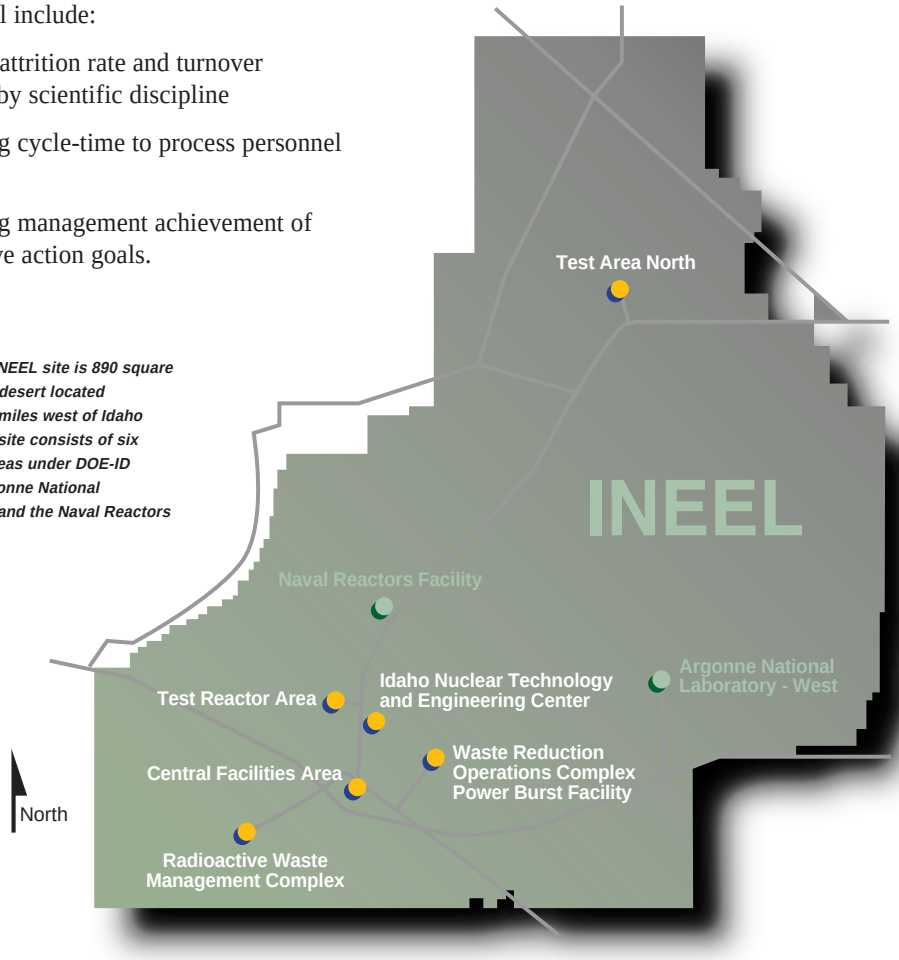


FIGURE 28. The INEEL site is 890 square miles of semiarid desert located approximately 32 miles west of Idaho Falls, Idaho. The site consists of six primary facility areas under DOE-ID purview, plus Argonne National Laboratory–West and the Naval Reactors Facility.

processes will support new INEEL missions and DOE science and research initiatives.

(a) Description of Laboratory Site and Facilities

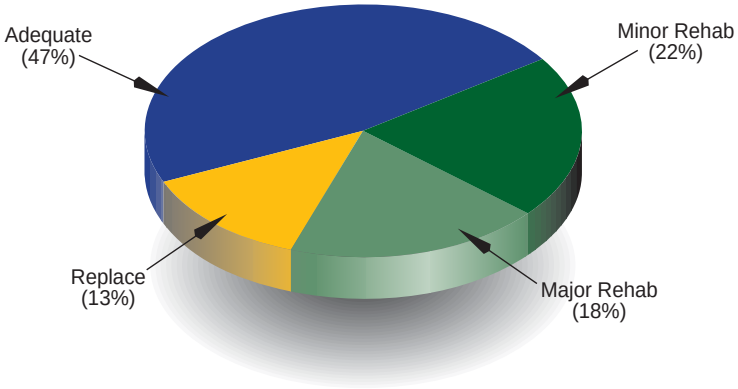
The INEEL's work is conducted in Idaho Falls and at six primary facility areas on the 889 mi^2 INEEL site. ANL and the Naval Reactors Facility are also located on the site but are managed by DOE-Chicago and Bechtel Bettis, Inc., respectively, rather than DOE-ID and are not included in this plan.

The INEEL infrastructure under DOE-ID purview comprises 527 owned laboratory, R&D, engineering, reactor, storage, maintenance, and office buildings; 17 leased laboratory, storage, and office buildings (total of 544 buildings, primarily located in Idaho Falls); and over 1,000 support structures. A full complement of utility infrastructure, a combined total of 177 miles of paved INEEL roads and public highways, 56.5 miles of electrical transmission lines, and 14 miles of railroad lines are also located on the site. The sitewide area encompasses the whole of the INEEL site, excluding land within boundaries of the primary facility areas.

The 544 INEEL buildings located at the site and in the city of Idaho Falls encompass over 5 million ft^2 of space. Of that space, 2.4 million ft^2 (47%) is considered to be in adequate and fully functional. Facilities requiring minor rehab encompass 1.1 million ft^2 (22%). This space will require routine, periodic rehabilitation. The remaining 1.6 million ft^2 (31%) may be reworked to continue to support INEEL programs, or may be determined to be surplus and deactivated and decommissioned.

INEEL facilities primarily include office, laboratory, industrial/process, reactor, computer, shop, storage, and service buildings. Charts and tables below provide a graphical representation of facility type, usage, age, and comparative facility condition.

FIGURE 29. Condition of laboratory space.



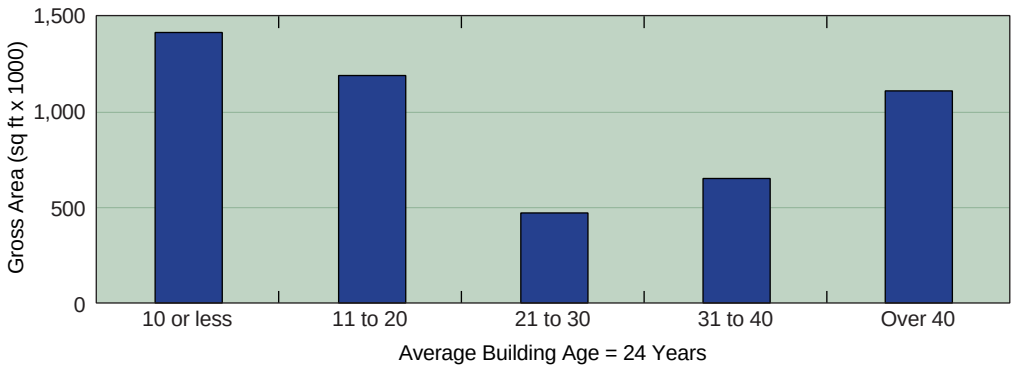


FIGURE 30. Age of laboratory buildings in years (does not include leased facilities).

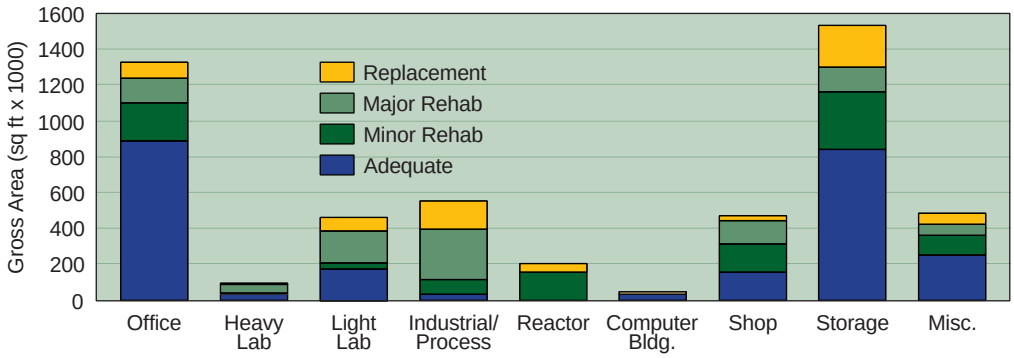


FIGURE 31. Use and condition of laboratory space.

Laboratory space distribution.

Location	Area (sq ft)
Main Site—owned	4,054,935
Idaho Falls—owned	243,841
Idaho Falls—leased	917,094
Off-Site—leased	9,376
Total	5,225,246

Facilities replacement value.

Facility Type	Replacement in Current $ in millions
Buildings	1,824
Utilities/systems	1,293
Land and improvements	5
All other	230
Total	3,352

(b) Laboratory Site and Facility Trends

Over time, the square footage of INEEL facilities has been altered through construction of new facilities, demolition and removal of old facilities, changes in leased square footage, and additions or reductions in space provided by temporary facilities such as trailers (negligible at the INEEL). The overall trend in facility space at the INEEL is a decrease in total square footage based on mission changes. INEEL infrastructure revitalization plans include upgrades to existing facilities and the addition of new facilities and systems to enhance the specific and unique infrastructure capabilities necessary to cost-effectively achieve the INEEL's missions. The following table provides a 5-year history of infrastructure trends at the INEEL, status, and a 5-year trending forecast.

INEEL infrastructure trends.

Measurement	FY-1994	FY-1999	FY-2004
Total number of INEEL buildings	597	544	468
Number of "owned" INEEL buildings	566	527	456
Number of leased INEEL square footage	31	17	12
Total INEEL square footage	5,595,563	5,071,107	4,733,149
INEEL "owned" square footage	4,522,410	4,185,524	3,949,269
INEEL leased square footage	1,073,153	885,583	783,880
Number of contaminated facilities	192	178	154
Number of surplus facilities to be excessed	–	39	71

(c) Site and Facility Plans

Overall, INEEL facility development plans are to perform any facility upgrades and establish any new facilities within the boundaries of the existing primary facility areas. No development is planned on land outside those areas, other than private development.

A key development plan at the INEEL is to establish an SSS facility to study contaminant migration underground. The facility would also develop and test efficient and cost-effective, hazardous-waste-contamination cleanup technologies for the INEEL's cleanup mission. Resource estimates in support of this facility include $4.6M in FY 2001 and $13.85M in FY 2002.

A sitewide INEEL Information Network project will replace and upgrade much of the outdated and ineffective communications system at the INEEL. The network will eliminate current risks

to the safety and security communications systems, replace dial rooms that present safety hazards, renovate remaining dial rooms to accept additional equipment, and add required transmission speed to the entire system.

The Electrical Utility System Upgrade project is nearing completion at the Idaho Nuclear Technology and Engineering Center (INTEC). The upgrade will eliminate electrical overload and safety hazards and add the electrical capacity and distribution necessary to complete specific INTEC area missions.

A new campus concept plan is being considered for the Idaho Falls area. This plan involves connecting and combining several closely located facilities in Idaho Falls. Space for use by universities and contributing agencies could be made available, either for occupancy in existing buildings or to build their own facilities. Plans include upgrades to the technical library to provide scientists ready access to the latest technical information. Facility and laboratory planners believe university and contributing agency occupation and interaction would augment and complement INEEL R&D initiatives and capabilities. Enlisting contributing outside entities would also aid in achieving INEEL mission goals and enhancing the status of the laboratory.

Some privatization projects are also under way at the INEEL. BNFL, Inc., an American subsidiary of British Nuclear Fuels, Ltd. was awarded a contract to build a private facility at the Radioactive Waste Management Complex and to operate that facility to treat the INEEL's transuranic-contaminated wastes and prepare the treated product for shipment to the Waste Isolation Pilot Plant in New Mexico. Another contract was recently awarded for the Spent Nuclear Fuel Dry Storage Facility.

Other facility upgrade plans and capital projects are focused on correcting safety and health deficiencies for aging facilities, improving research and communications capabilities, and correcting facility functional, structural, and code deficiencies.

In addition to continuing the development and completion of these and other specific projects, the INEEL will begin reevaluating planned projects and formulating new projects to support the INEEL's new missions. New or revised projects will likely be needed to support the new INEEL contractor's focus on environmental restoration and subsurface contamination technology development, nuclear reactor technology development, and energy research. More detailed information about INEEL capital projects can be found in the next section.

The land known as the sitewide area that lies outside the primary facility boundaries has historically been undeveloped and relatively undisturbed. The sitewide area serves primarily as an environment, safety, and health buffer and is used for livestock grazing (administered by the U.S. Bureau of Land Management). However, two recent initiatives have set aside some of this land for new uses.

DOE recently granted Idaho's Regional Development Alliance a special-use permit for a 42 mi^2 region located on the north end the INEEL for potential future development of a commercial spaceport. Under the agreement, the spaceport would be responsible for operational safety and environmental compliance and would not interfere with nearby DOE operations.

DOE recently granted Idaho's Regional Development Alliance a special-use permit for a 42 mi^2 region located on the north end the INEEL for potential future development of a commercial spaceport.

In July 1999, DOE, through proclamation by the Secretary of Energy, designated 73,263 acres of INEEL land as the INEEL Sagebrush Steppe Ecosystem Reserve. This land is also located on the north and west portions of the INEEL. The ecosystem reserve is considered a valuable ecological resource unique to the Intermountain West. The area has had little human contact for over 50 years. The reserve will be managed to protect plants and animals that occupy and migrate through the land. It will also provide opportunities to study ways to revitalize other ecologically unique sagebrush steppe areas in the West.

(d) Detailed General-Purpose Facility Plans and Facility Resource Requirements

The INEEL annually performs life-cycle analyses of its mission needs and determines its capital and maintenance funding requirements. Allocation amounts are historically less than needs-based requests and are not consistent from year to year.

General Purpose Capital Equipment (GPCE), General Plant Project (GPP), and Line-Item Construction Project (LICP) items are discussed in this section. GPCE funding replaces and upgrades mission-dependent equipment, including vehicles, heavy equipment, power equipment, computer and communications equipment, laboratory equipment, and safety and health equipment. GPPs are capital construction projects amounting to less than $5M each in total estimated cost that can be produced in a relatively short timeframe (24 to 30 months). LICPs are also capital construction projects, but with greater than $5M each in total estimated cost and longer timeframes from conception to completion (historically 4 or more years).

The INEEL annually performs life-cycle analyses of its mission needs and determines its capital and maintenance funding requirements. The following information reflects the INEEL's demonstrated mission-dependent needs rather than actual allocations. Allocation amounts are historically less than needs-based requests and are not consistent from year to year. A summary of the recommended GPCE and maintenance funding levels (based on life-cycle planning and resulting project identification) supporting INEEL missions from FY 2000—FY 2004 is given in the Major Construction Projects table.

Providing funding at the recommended level shown in the above table would adequately address the GPCE-, GPP- and LICP-dependent requirements. This recommended funding profile, based on compliance level rather than projected allocation, would mean an approximate average of $9.5M for GPCE, $37.4M for GPP, and $34.9M for LICPs for each of the next 5 years (FY 2000 through FY 2004). A viable infrastructure is essential to performing all mission-related work safely, effectively, and economically. GPCE, GPP, LICP, and maintenance funds are essential for the timely maintenance, upgrading, and replacement of INEEL infrastructure.

The key general-purpose facilities issue at the INEEL is maintaining the infrastructure in a safe and viable condition. There are several hundred pieces of GPCE, over 50 GPPs, and over 15 LICPs identified through FY 2004 that would address health and safety deficiencies, environmental issues, and mission-need requirements at the INEEL. Key INEEL line items include:

- Site Operations Center
- Sitewide INEEL Information Network
- Willow Creek Building buy out
- INEEL Major Roof Replacements
- Flood Control Upgrades
- INTEC Cathodic Protection System Expansion
- INTEC Fire Alarm Life Safety Upgrades
- INTEC Laboratory Replacement [602/630]
- INTEC Administrative Support Facility
- New Waste Calcining Facility maximum achievable control technology upgrades
- Waste Treatment Pilot Plant Facility
- Newly Generated Liquid Waste Treatment
- Calcined Solids Storage Facility No. 1
- Calcined Solids Storage Facility No. 8
- Test Reactor Area Electrical Utility Upgrade.

The following Major Construction Project tables reflect funding recommendations developed by the previous INEEL management and operations contractor. Resource estimates are currently being developed for proposed new initiatives that will impact major construction project estimates in the years FY 2002-2004. For this reason major construction project estimates for FY 2002-2004 are absent from this Institutional Plan but will be fully developed and included in the draft FY 2001-2005 Institutional Plan due in May 2000.

Major Construction Projects[a]

($ In thousands - New BA)

Major Construction Project Summary	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded Construction									
Line Item Construction Projects			27,936	23,875	27,191	7,719	—	—	—
General Plant Projects			17,876	25,697	25,198	25,263	—	—	—
Total Funded Construction			45,812	49,572	52,389	32,982	—	—	—
Budgeted Construction									
Line Item Construction Projects			0	0	1,206	4,962	—	—	—
General Plant Projects			0	0	0	8,973	—	—	—
Total Budgeted Construction			0	0	1,206	13,935	—	—	—
Total Funded and Budgeted[b]			45,812	49,572	53,595	46,917	—	—	—
Proposed Construction									
Line Item Construction Projects			0	0	0	5,543	—	—	—
General Plant Projects			0	0	0	34,003	—	—	—
Total Proposed Construction			0	0	0	39,546	—	—	—
Total Funded/Budgeted/Proposed			45,812	49,572	53,595	86,463	—	—	—

Privatization Construction Project Summary	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded Construction									
Advanced Mixed Waste Treatment Project		569,400		87,252	110,000	65,000	—	—	—
Spent Fuel Dry Storage Project		120,000	27,000	20,000	5,000	68,000			
Total Funded Construction			27,000	107,252	115,000	133,000	—	—	—

General Purpose Capital Equipment Summary	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded General Purpose Captial Equipment									
Funded General Purpose Captial Equipment[b]			7,798	7,365	7,670	9,647	—	—	—

[a] Represents EW/EX Major Construction Projects and General Purpose Capital Equipment Funding as outlined in the INEEL FY98-06 EM Prioritization Listing, dated 4/15/99.

[b] Included in the INEEL EM Compliance Driven Requirements Summary, as a segment of (1) Total DOE Effort and (2) General Purpose/Program Capital Equipment, General Plant Projects, General Purpose Facilities, and Program Construction.

Major Construction Projects

($ In thousands - New BA)

Sitewide Infrastructure (EW)	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded Construction									
INEEL Electrical Distribution Upgrade		10,756	2,927						
INEEL Road Rehabilitation		10,800	500	7,200	2,590				
Health Physics Instrumentation Lab (HPIL)		11,790		950	7,200	2,400	—		
SW General Plant Projects			6,643	12,508	7,731	7,924	—	—	—
Total Funded Construction			10,070	21,168	17,521	10,324	—	—	—
Budgeted Construction									
Site Operations Center (SOC)		10,800			1.206	4,362	—		
Sitewide INEEL Information Network (SIINET)		30,000				600	—	—	—
SW General Plant Projects			0	0	0	0	—	—	—
Total Budgeted Construction			0	0	1,206	4,962	—	—	—
Total Funded and Budgeted			10,070	21,168	18,727	15,286	—	—	—
Proposed Construction									
Environmental Eng. & Science Center (Emphasis Subsurface Geoscience Facility)	Yes	74,780				4,600	—	—	—
Exercise Willow Creek Building Purchase Option		19,396					—	—	
INEEL Major Roof Replacements		9,700					—	—	
Flood Control Upgrades		7,000						—	—
Purchase Land for Campus Expansion		5,000							—
SW General Plant Projects			0	0	0	28,981	—	—	—
Energy Storage Tech Lab Exp'n & Upgd (R&D)	3 of 34								
BioSafety Level III Lab Upgd (R&D)	$6M								
IF-638 Physics Lab Addition (R&D)									
Total Proposed Construction			0	0	0	33,581	—	—	—
Total Funded/Budgeted/Proposed			10,070	21,168	18,727	48,867	—	—	—

INTEC Infrastructure (EW)	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded Construction									
ICPP Security Facility Consolidation		15,100	602	485					
ICPP Electrical Utility System Upgrade		53,452	14,985	11,544	11,971				
INTEC Cathodic Protection System Expansion		6,000				500	—	—	—
INTEC Fire Alarm Life Safety Upgrades		6,729						—	—
CPP-637 Lab Replacement		13,434							—
INTEC Laboratory Replacement (602/630)		10,270						—	—
INTEC Administrative Support Facility		16,327						—	—
INTEC General Plant Projects			9,746	9,044	7,907	9,549	—	—	—
Total Funded Construction			25,333	21,073	19,878	10,049	—	—	—
Budgeted Construction									
INTEC General Plant Projects			0	0	0	0	—	—	—
Total Budgeted Construction			0	0	0	0	—	—	—
Total Funded and Budgeted			25,333	21,073	19,878	10,049	—	—	—
Proposed Construction									
INTEC General Plant Projects						5,022	—	—	—
Total Proposed Construction			0	0	0	5,022	—	—	—
Total Funded/Budgeted/Proposed			25,333	21,073	19,878	15,071	—	—	—

Major Construction Projects

($ In thousands - New BA)

High Level Waste (HLW) (EW)[c]	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded Construction									
Calcined Solids Storage Facility (CSSF) No. 8		23,998							—
New Waste Calcining Facility (NWCF) Maximum Achievable Control Technology (MACT) Upgrades		60,925						—	—
HLW General Plant Projects			0	1,194	5,891	4,610	—	—	—
Total Funded Construction			0	1,194	5,891	4,610	—	—	—
Budgeted Construction									
Liquid Waste Storage		113,785							—
Waste Treatment Pilot Plant		176,130						—	—
Calcined Solids Storage Facility (CSSF) No. 1		57,925							—
Newly Generated Liquid Waste Treatment		47,592						—	—
HLW General Plant Projects			0	0	0	0	—	—	—
Total Budgeted Construction			0	0	0	0	—	—	—
Total Funded and Budgeted			0	1,194	5,891	4,610	—	—	—
Proposed Construction									
HLW General Plant Projects			0	0	0	0	—	—	—
Total Proposed Construction			0	0	0	0	—	—	—
Total Funded/Budgeted/Proposed			0	1,194	5,891	4,610	—	—	—

Waste Management (EW)	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded Construction									
WM General Plant Projects			414	115	1,593				
Total Funded Construction			414	115	1,593	0	—	—	—
Budgeted Construction									
WM General Plant Projects						2,289	—	—	—
Total Budgeted Construction			0	0	0	2,289	—	—	—
Total Funded and Budgeted			414	115	1,593	2,289	—	—	—
Proposed Construction									
WM General Plant Projects									
Total Proposed Construction			0	0	0	0	—	—	—
Total Funded/Budgeted/Proposed			414	115	1,593	2,289	—	—	—

[c] The HLW construction funding recommendations may be impacted by the Record of Decision of the Environmental Impact Statement.

Major Construction Projects

($ In thousands - New BA)

Spent Nuclear Fuel (SNF) (EW/EX)	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded Construction									
Long Term Storage of Three Mile Island-2 (TMI-2) Fuel[d]		28,000	397	0	2,500				
SNF General Plant Projects						3,180	—	—	—
Total Funded Construction			397	0	2,500	3,180	—	—	—
Budgeted Construction									
SNF General Plant Projects						1,407			
Total Budgeted Construction			0	0	0	1,407	—	—	—
Total Funded and Budgeted			397	0	2,500	4,587	—	—	—
Proposed Construction									
SNF General Plant Projects									
Total Proposed Construction			0	0	0	0	—	—	—
Total Funded/Budgeted/Proposed			397	0	2,500	4,587	—	—	—

Nuclear Energy (AF)	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded Construction									
Test Reactor Area (TRA) Fire & Life Safety Improvements		15,446	4,425	2,345	1,500	2,580			
TRA Electrical Utility Upgrade		6,995		341	1,430	2,239	—	—	
TRA General Plant Projects			373	1,886	1,100				
Total Funded Construction			4,798	4,572	4,030	4,819	—	—	—
Budgeted Construction									
TRA General Plant Projects						1,600			
Total Budgeted Construction			0	0	0	1,600	—	—	—
Total Funded and Budgeted			4,798	4,572	4,030	6,419	—	—	—
Proposed Construction									
TRA Utility Upgrade		22,709				943	—	—	—
TRA General Plant Projects							—	—	—
Total Proposed Construction			0	0	0	943	—	—	—
Total Funded/Budgeted/Proposed			4,798	4,572	4,030	7,362	—	—	—

Naval Reactors (AJ)	R&D Specific	TEC	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Funded Construction									
Advanced Test Reactor (ATR) Secondary Coolant Refurbishment		5,000	4,100	500					
ATR General Plant Projects			700	950	976				
Total Funded Construction			4,800	1,450	976	0	—	—	—
Budgeted Construction									
ATR General Plant Projects						3,677			
Total Budgeted Construction			0	0	0	3,677	—	—	—
Total Funded and Budgeted			4,800	1,450	976	3,677	—	—	—
Proposed Construction									
ATR Plant Protective Systems (PPS) & Nuclear Instrumentation Power		6,000							—
ATR General Plant Projects							—	—	—
Total Proposed Construction			0	0	0	0	—	—	—
Total Funded/Budgeted/Proposed			4,800	1,450	976	3,677	—	—	—

[d] Does not include the May 1999 funding request of $11.5M ($10.0M Capital; $1.5M Operating) for TMI-2 for FY 2000

(e) Assets Management, Property Management, Space Management, Inactive Surplus Facilities

Space Management. The INEEL Infrastructure Program maintains a sophisticated Geographical Information System used for space allocation and personnel and equipment location. The information in this system is available to all INEEL employees on the Intranet, but is primarily used by the organizations responsible for personnel relocations and personnel services (telephone, computer networking, etc.). The personnel relocation rate at the INEEL is currently at 17% (other than when affected by circumstances such as contractor changes). This is well below industry standards for government facilities (26%).

Inactive Surplus Facilities. DOE has committed to clean up its inactive, contaminated nuclear facilities and noncontaminated support facilities at the INEEL. An established INEEL facility disposal program oversees the decontamination and decommissioning (D&D) of those facilities in accordance with DOE guidelines and within budget and schedule constraints. The D&D program reduces surplus facility risks associated with residual radioactive and/or hazardous materials through removal and/or stabilization activities. The determination of whether a building or structure will be converted to another use or undergo D&D depends on the building's level of contamination, age, condition, and need for the facility.

The INEEL D&D program has reduced mortgage costs at the INEEL by more than $177M with the removal of 130 buildings/structures, 33 component systems, nine reactor systems, 43 underground storage tanks, and the completion of three Resource Conservation and Recovery Act facility closures. Currently, there are over 100 excess facilities at the INEEL that will eventually require disposition to mitigate potential hazards. The planned funding levels, identified in the following table, will keep the excess facility number from growing. This table summarizes funding levels scheduled for remediation of radiologically contaminated and noncontaminated facilities through FY 2004.

Funding distribution for disposition of INEEL noncontaminated and contaminated facilities.

PROGRAM	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	TOTAL
Noncontaminated Facility Disposal	0	734	8,572	5,051	595	14,952
Contaminated Facility Deactivation	8,051	4,816	6,220	4,436	4,527	28,050
Contaminated Facility Disposal	3,866	6,336	10,239	12,515	17,264	50,220
Total	11,917	11,886	25,031	22,002	22,386	93,222

Details about the INEEL's Facility Disposal Initiative are contained in the Internet version of the *INEEL Excess Facility Action Plan.* A paper version of the plan is also published periodically.

(f) Energy Management

The INEEL Energy Management program is a multidiscipline, engineering function to reduce the cost and use of energy at the INEEL. DOE Order 430.2 mandates an Energy Management program and outlines numerous national energy reduction goals. The main customer is DOE-ID, with secondary customers being facility engineers and managers. Energy Management focuses on building systems that can be modified to reduce energy consumption while still maintaining existing building function as designed. Typical technologies include lighting, heating, ventilating, air conditioning, and the general building envelope. Projects for Energy Management are either direct funded from in-house energy management funds or are jointly funded efforts between the INEEL and Federal Energy Management Program (called Energy Savings Performance Contracts [ESPCs]). Current projects include two packaged projects that involve building modifications at INTEC, CFA, and in Idaho Falls. One ESPC is currently being finalized for the IRC that will provide energy savings to the INEEL of $90K

per year. A second ESPC is being developed for INTEC with potential energy savings of around $1M each year. Energy Management is anticipating additional large ESPC contracts for all of the major areas at the INEEL.

Due to extreme weather conditions, the INEEL is an excellent testing site for heat pumps. Industry has acknowledged this potential and has expressed interest in testing next-generation heat pumps at the INEEL, possibly as part of an existing ESPC. Other potential projects include performing energy system audits for buildings outside the INEEL including local government, school systems, and Yellowstone National Park.

3. Security, Intelligence, and Nonproliferation

Vision

INEEL security is devoted to protecting national security and DOE interests through successful implementation of various programs: Operations Security, Counterintelligence, Export Control, Foreign Visitor Control, Technical Security, Classified/ Sensitive Unclassified Information Control, Protective Force, and Safeguards. These programs work closely together to form an effective network that responds expertly to current threats and is vigilant in evaluating and preparing for ever-changing threats faced by a national laboratory.

INEEL's security programs work closely together to form an effective network that responds expertly to current threats and is vigilant in evaluating and preparing for ever-changing threats faced by a national laboratory

Situation Analysis

The need to protect sensitive information by controlling foreign national access to the laboratory is a top priority. Several high-profile reports have been generated recently to draw attention to, and/or correct, the concerns stemming from foreign national visits and assignments at DOE laboratories. The counterintelligence program is expanding to address the identified threat. More personnel are being hired, including an expert in cyber investigations. Program threat briefings have been expanded, the scope of the debriefing program has grown, special programs have been initiated to support foreign assignees, and required annual counterintelligence training for INEEL personnel has been authorized. The impact of new requirements and added scope of work to the Foreign Visits and Assignments Program has meant the creation of a new and significantly more involved plan for doing business.

The Safeguards and Security program at the INEEL benefits from its maturity, a tradition of strong performance, and a highly trained work force. The dichotomy of recurring Safeguard and Security budget reductions and increasing requirements and mandates is being addressed to eliminate the threat of diminishing the ability of the INEEL to protect its assets and control its classified and technological information.

Strategic Objective

Protect assets consistent with requirements at lowest cost.

Strategy

The overall INEEL protection strategy is based on the *DOE Design Basis Threat Statement*, INEEL local threat analysis, and applicable DOE orders. Protection strategies include detection, delay, and response capabilities that permit containment and/or neutralization of adversaries before they complete their objective. Recovery and recapture capabilities are also incorporated into the protection strategy. Protection measures are based on a graded approach and multiple-layer strategy. They address a variety of concerns, such as theft and diversion of special nuclear material, theft of classified and sensitive matter, and protection of property and personnel. Protection of the INEEL critical infrastructure is also taken into account. Cost-effective protection measures are established in a prioritized manner, with emphasis placed on assets with a higher value.

Performance Measures

The INEEL's Safeguards and Security Program will be measured on meeting scheduled implementation milestones and validating the effectiveness of new security requirements. A comprehensive self-assessment program will be instituted.

The following sections of Performance-Based Management, Project Management, and Matrix Management are not required but are important elements of BBWI's strategy for the INEEL. At this point, these management systems are immature and require further planning and development. The programs will be covered in more detail in the FY 2001—2005 Institutional Plan.

4. Performance-Based Management

BBWI will implement a systematic, outcome-oriented, and objective performance measurement and management system that builds a culture of customer focus. Fundamental to this success is a comprehensive performance management system that has at its core clear roles, responsibilities, authorities, and accountabilities (R2A2) for all staff. The BBWI Performance Measurement Model will be founded on clear and well-understood mission/vision and strategy planning. All performance is planned and evaluated against clearly understood and agreed upon missions and strategies.

FIGURE 32. The INEEL's performance measurement system builds a culture of customer focus.

5. Project Management

A key element of BBWI's management practices is a cost-effective project management system. Plans are currently being developed to establish a fully staffed Project Management Department with the capability of providing program managers and site area directors with fully trained project managers upon request. A centralized project management functional department will provide the INEEL with a consistent set of project execution procedures, processes, and tools. These standardized procedures, processes, and tools will be used sitewide by all deployed project managers and individuals responsible for technical oversight. Cost-effective project management is assured by implementation of a consistent set of project control tools, which are familiar to all project managers and can be assembled at any level of detail to support management oversight, rollup, and crosscut information needs of the INEEL or DOE.

Plans are currently being developed to establish a fully staffed Project Management Department with the capability of providing program managers and site area directors with fully trained project managers upon request.

Over the next 12 months, the INEEL will pursue a strategy to strengthen the functional management organizations across the site, with particular emphasis on the functional areas of operations, project management, procurement, safety, quality assurance, engineering, project controls, and document control.

6. Matrix Management

To achieve management excellence, the INEEL will establish a horizontal matrix management structure to enhance synergy between project and functional managers, and support R&D and operations integration. Over the next 12 months, the INEEL will pursue a strategy to strengthen the functional management organizations across the site, with particular emphasis on the functional areas of operations, project management, procurement, safety, quality assurance, engineering, project controls, and document control. These organizations will integrate processes, systems, procedures, and standard tools across the INEEL to achieve higher quality and increased productivity while working safely and meeting programmatic requirements. The functional managers will transfer new technology information and identify the need for new technology to ensure synergy between R&D and operations. The functional management organizations will also implement a strategy to revitalize a diverse work force, identify gaps, and ensure that the competencies needed to support INEEL missions are available. This includes recruiting personnel in selected fields, career planning and personnel development, and training to improve expertise in mission-related areas. The functional manager's scientific or technical oversight of project performance provides constant feedback for continuous process improvements and for assessing the core competencies in all disciplines.

Resource Projections

VI. Resource Projections

The following resource tables reflect extracts from the INEEL site and program baselines. Resource estimates are currently being developed for proposed new initiatives that will impact resource projections in the years FY 2002-2004. For this reason resources projections for FY 2002-2004 are absent from this Institutional Plan but will be fully developed and included in the draft FY 2001-2005 Institutional Plan due in May 2000.

NOTE: RESOURCE PROJECTION FIGURES ARE CONSERVATIVE AND DO NOT REFLECT POTENTIAL MISSION ASSIGNMENTS AND ACCOMPANYING FUNDING INCREASES.

INEEL Funding Summary

(includes the contractor and DOE-ID)

($ in Millions—BA)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
DOE Effort	664.97	726.75	740.74	735.80	—	—	—
EM Compliance Requirements	—	—	—	—	—	—	—
Other Mortgage Reduction Requirements	—	—	—	—	—	—	—
Total DOE Effort	664.97	726.75	740.74	735.80	—	—	—
Work for Others	73.37	83.38	76.73	70.27	—	—	—
Private Industry WFO	2.40	2.40	3.00	3.00	—	—	—
Total Operating	740.74	812.53	820.47	809.07	—	—	—
Program Capital Equipment[a]	5.17	9.60	(0.94)	(4.40)	—	—	—
Program Construction	12.64	20.44	16.42	0.86	—	—	—
General Purpose Facilities	19.80	14.00	14.00	4.00	—	—	—
General Plant Projects	6.02	11.80	6.73	6.75	—	—	—
General Purpose Equipment	7.90	7.40	7.50	7.50	—	—	—
TOTAL LABORATORY FUNDING	792.28	875.77	864.19	823.78	—	—	—
Proposed Construction	—	—	—	—	—	—	—
TOTAL PROJECTED FUNDING	792.28	875.77	864.19	823.78	—	—	—

a. Negative new BA in the Program Capital Equipment exists during FY 2000 and FY 2001 to maintain General Purpose Equipment at the current funding level.

Note: Target funding obtained from DOE-ID Financial Information Management System.

INEEL Personnel Summary

(includes the contractor and DOE-ID)

(Annualized FTEs)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
DIRECT							
DOE Effort	3,530	3,194	3,121	3,130	—	—	—
EM Compliance Requirements	—	—	—	—	—	—	—
Other Mortgage Reduction Requirements	—	—	—	—	—	—	—
Total DOE Effort	3,530	3,194	3,121	3,130	—	—	—
Work for Others	402	425	373	348	—	—	—
Total Operating	3,932	3,618	3,493	3,478	—	—	—
Other Direct	500	605	396	114	—	—	—
TOTAL DIRECT	4,432	4,224	3,889	3,592	—	—	—
TOTAL INDIRECT	2,864	2,730	2,514	2,322	—	—	—
TOTAL PERSONNEL	7,295	6,953	6,403	5,914	—	—	—

Note: These values are derived from new BA and do not reflect prior year carryover and associated impacts on FTE projections.

Funding by Secretarial Officer

($ in Millions - BA)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Assistant Secretary for Defense Programs (DP)							
Operating	25.33	6.34	2.40	2.40	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Assistant Secretary for Defense Programs (DP)	25.33	6.34	2.40	2.40	—	—	—
Assistant Secretary for Energy Efficiency and Renewable Energy (EE)							
Operating	47.73	49.36	50.33	45.49	—	—	—
Capital Equipment	0.30	0.34	0.36	0.20	—	—	—
Construction	0.44	—	—	—	—	—	—
Total Assistant Secretary for Energy Efficiency and Renewable Energy (EE)	48.48	49.70	50.70	45.70	—	—	—
Assistant Secretary for Environment, Safety, and Health (EH)							
Operating	2.88	2.74	2.95	2.67	—	—	—
Capital Equipment	1.22	1.16	1.25	1.13	—	—	—
Construction	—	—	—	—	—	—	—
Total Assistant Secretary for Environment, Safety, and Health (EH)	4.10	3.90	4.20	3.80	—	—	—
Assistant Secretary for Environmental Restoration and Waste Management (EM)							
Operating	450.90	442.34	464.87	493.92	—	—	—
Operating - Compliance[a]	—	—	—	—	—	—	—
Privatization	27.00	107.30	115.00	90.00	—	—	—
Capital Equipment	9.94	14.03	3.69	0.51	—	—	—
Construction	28.99	39.63	32.87	6.84	—	—	—
Construction - Compliance[a]	—	—	—	—	—	—	—
Total Assistant Secretary for Environmental Restoration and Waste Management (EM)	516.83	603.30	616.43	591.27	—	—	—
Office of Science (SC)							
Operating	9.57	7.55	5.40	5.21	—	—	—
Capital Equipment	0.26	0.28	0.13	0.13	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Science (SC)	9.82	7.83	5.53	5.34	—	—	—
Assistant Secretary for Fossil Energy (FE)							
Operating	3.75	4.03	4.00	3.90	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Assistant Secretary for Fossil Energy (FE)	3.75	4.03	4.00	3.90	—	—	—
Office of the Associate Deputy Secretary for Field Management (FM)							
Operating	17.65	18.73	—	—	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of the Associate Deputy Secretary for Field Management (FM)	17.65	18.73	—	—	—	—	—
Assistant Secretary for Human Resources and Administration (HR)							
Operating	0.26	0.30	0.10	0.10	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Assistant Secretary for Human Resources and Administration (HR)	0.26	0.30	0.10	0.10	—	—	—

a. Reflects additional costs to meet compliance-driven milestones.

Funding by Secretarial Officer (cont'd)

($ in Millions - BA)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Office of Fissile Materials Disposition (MD)							
Operating	0.02	—	—	—	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Fissile Materials Disposition (MD)	0.02	—	—	—	—	—	—
Office of Nuclear Energy (NE)							
Operating	52.77	58.93	63.84	64.75	—	—	—
Capital Equipment	0.87	0.96	0.89	0.89	—	—	—
Construction	9.04	6.61	4.28	4.77	—	—	—
Total Office of Nuclear Energy (NE)	62.68	66.50	69.01	70.41	—	—	—
Office of Nonproliferation and National Security (NN)							
Operating	6.81	6.12	5.85	4.35	—	—	—
Capital Equipment	0.48	0.24	0.24	0.24	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Nonproliferation and National Security (NN)	7.29	6.36	6.09	4.59	—	—	—
Office of Civilian Radioactive Waste Management (RW)							
Operating	(0.30)	—	—	—	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Civilian Radioactive Waste Management (RW)	(0.30)	—	—	—	—	—	—
Office of Worker and Community Transition (WT)							
Operating	—	3.00	6.00	3.00	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Worker and Community Transition (WT)	—	3.00	6.00	3.00	—	—	—
Other DOE Facilities							
Operating	20.60	20.00	20.00	20.00	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Other DOE Facilities	20.60	20.00	20.00	20.00	—	—	—
Department of Energy							
Operating	637.97	619.45	625.75	645.80	—	—	—
Operating - Compliance[a]	—	—	—	—	—	—	—
Privatization	27.00	107.30	115.00	90.00	—	—	—
Capital Equipment	13.07	17.00	6.56	3.10	—	—	—
Construction	38.47	46.24	37.15	11.61	—	—	—
Construction - Compliance[a]	—	—	—	—	—	—	—
TOTAL DEPARTMENT OF ENERGY	716.51	789.99	784.46	750.51	—	—	—

a. Reflects additional costs to meet compliance-driven milestones.

Funding by Secretarial Officer (cont'd)

($ in Millions - BA)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
WORK FOR OTHERS							
National Science Foundation	0.40	0.68	0.37	0.38	—	—	—
Nuclear Regulatory Commission	7.91	8.20	8.00	8.00	—	—	—
Department of Defense	48.54	54.76	51.63	47.05	—	—	—
Department of Health and Human Services	—	—	—	—	—	—	—
National Aeronautics & Space Administration	0.92	1.10	1.00	1.00	—	—	—
Environmental Protection Agency	1.00	1.10	1.00	1.00	—	—	—
Other Federal Agencies							
Department of the Interior	1.00	1.59	—	—	—	—	
Department of Transportation	1.14	1.40	1.40	0.50	—	—	—
Other Federal Agencies - Energy-Related Activities	2.31	2.32	1.33	1.34	—	—	—
Department of Justice	0.60	0.80	—	—	—	—	—
Private Industry[b]	2.40	2.40	3.00	3.00	—	—	—
Services (60)	5.51	8.43	8.00	8.00	—	—	—
CRADAs (65)	4.05	3.00	4.00	3.00	—	—	—
TOTAL WORK FOR OTHERS	75.77	85.78	79.73	73.27	—	—	—
TOTAL PROJECTED FUNDING	792.28	875.77	864.19	823.78	—	—	—

b. Private industry Work for Others and proposed construction are not included in field office funding projections.

Personnel by Secretarial Officer

(Annualized FTEs)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Assistant Secretary for Defense Programs (DP)							
Operating	214	52	19	18	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Assistant Secretary for Defense Programs (DP)	214	52	19	18	—	—	—
Assistant Secretary for Energy Efficiency and Renewable Energy (EE)							
Operating	40	40	39	34	—	—	—
Capital Equipment	1	1	1	1	—	—	—
Construction	1	—	—	—	—	—	—
Total Assistant Secretary for Energy Efficiency and Renewable Energy (EE)	42	41	40	34	—	—	—
Assistant Secretary for Environment, Safety, and Health (EH)							
Operating	13	11	12	10	—	—	—
Capital Equipment	1	1	1	1	—	—	—
Construction	—	—	—	—	—	—	—
Total Assistant Secretary for Environment, Safety, and Health (EH)	14	12	13	11	—	—	—

Personnel by Secretarial Officer (cont'd)

(Annualized FTEs)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Assistant Secretary for Environmental Restoration and Waste Management (EM)							
Operating	2,452	2,313	2,338	2,388	—	—	—
Operating - Compliance	—	—	—	—	—	—	—
Privatization	—	—	—	—	—	—	—
Capital Equipment	104	141	36	5	—	—	—
Construction	301	396	316	63	—	—	—
Construction - Compliance[a]	—	—	—	—	—	—	—
Total Assistant Secretary for Environmental Restoration and Waste Management (EM)	2,857	2,850	2,689	2,456	—	—	—
Office of Science (SC)							
Operating	189	143	99	91	—	—	—
Capital Equipment	2	2	1	1	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Science (SC)	191	145	100	92	—	—	—
Assistant Secretary for Fossil Energy (FE)							
Operating	16	17	16	15	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Assistant Secretary for Fossil Energy (FE)	16	17	16	15	—	—	—
Office of the Associate Deputy Secretary for Field Management (FM)							
Operating	24	25	—	—	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of the Associate Deputy Secretary for Field Management (FM)	24	25	—	—	—	—	—
Assistant Secretary for Human Resources and Administration (HR)							
Operating	2	2	1	1	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Assistant Secretary for Human Resources and Administration (HR)	2	2	1	1	—	—	—
Office of Fissile Materials Disposition (MD)							
Operating	0	—	—	—	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Fissile Materials Disposition (MD)	0	—	—	—	—	—	—
Office of Nuclear Energy (NE)							
Operating	374	402	419	408	—	—	—
Capital Equipment	5	5	5	5	—	—	—
Construction	83	58	36	39	—	—	—
Total Office of Nuclear Energy (NE)	463	466	460	452	—	—	—
Office of Nonproliferation and National Security (NN)							
Operating	45	39	36	26	—	—	—
Capital Equipment	1	0	0	0	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Nonproliferation and National Security (NN)	46	39	36	26	—	—	—

a. Reflects additional costs to meet compliance-driven milestones.

Personnel by Secretarial Officer (cont'd)

(Annualized FTEs)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Office of Civilian Radioactive Waste Management (RW)							
Operating	—	—	—	—	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Civilian Radioactive Waste Management (RW)	—	—	—	—	—	—	—
Office of Worker and Community Transition (WT)							
Operating	—	—	—	—	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Office of Worker and Community Transition (WT)	—	—	—	—	—	—	—
Other DOE Facilities (Not Including ANL & NRF)							
Operating	160	150	144	138	—	—	—
Capital Equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total Other DOE Facilities	160	150	144	138	—	—	—
Department of Energy							
Operating	3,530	3,194	3,121	3,130	—	—	—
Operating - Compliance	—	—	—	—	—	—	—
Privatization	—	—	—	—	—	—	—
Capital Equipment	114	151	44	12	—	—	—
Construction	386	454	352	102	—	—	—
Construction - Compliance	—	—	—	—	—	—	—
Total Department of Energy	4,030	3,799	3,517	3,244	—	—	—
Work For Others							
National Science Foundation	—	—	—	—	—	—	—
Nuclear Regulatory Commission	57	57	53	51	—	—	—
Department of Defense	267	290	244	230	—	—	—
Department of Health and Human Services	—	—	—	—	—	—	—
National Aeronautics & Space Administration	1	1	1	1	—	—	—
Environmental Protection Agency	1	1	1	1	—	—	—
Other Federal Agencies							
Department of the Interior	1	2	—	—	—	—	—
Department of Transportation	7	9	9	3	—	—	—
Other Federal Agencies-Energy Related Activities	17	17	9	9	—	—	—
Department of Justice	2	2	—	—	—	—	—
Private Industry	48	46	55	53	—	—	—
Total Work For Others	402	425	373	348	—	—	—
Total Program Effort	4,432	4,224	3,889	3,592	—	—	—
General Purpose Equipment (GPE)	27	25	25	20	—	—	—
General Purpose Projects (GPP)	10	18	10	9	—	—	—
General Purpose Facilities (GPF)	69	67	80	77	—	—	—
Proposed Construction	—	—	—	—	—	—	—
Total Direct Personnel	4,432	4,224	3,889	3,592	—	—	—
Total Indirect Personnel	2,864	2,730	2,514	2,322	—	—	—

Resources by Major Program

($ in Millions-BA)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
AA-Coal							
Operating	0.55	0.57	0.55	0.55	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	0.55	0.57	0.55	0.55	—	—	—
AB-Gas							
Operating	1.15	0.69	1.05	1.00	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	1.15	0.69	1.05	1.00	—	—	—
AC-Petroleum							
Operating	2.05	2.78	2.40	2.35	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	2.05	2.78	2.40	2.35	—	—	—
AF-Nuclear Energy-Research and Development							
Operating	7.38	10.64	12.78	14.38	—	—	—
Capital equipment	0.37	0.44	0.35	0.35	—	—	—
Construction	4.43	3.50	3.30	3.00	—	—	—
Total	12.18	14.57	16.43	17.73	—	—	—
AJ-Naval Reactors							
Operating	45.27	48.29	50.98	50.29	—	—	—
Capital equipment	0.50	0.52	0.54	0.54	—	—	—
Construction	4.60	3.12	0.98	1.77	—	—	—
Total	50.38	51.93	52.50	52.60	—	—	—
AT-Fusion Energy Systems							
Operating	4.12	1.98	1.60	1.60	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	4.12	1.98	1.60	1.60	—	—	—
AW-Fossil Energy Environmental Research							
Operating	—	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
CD-Uranium Programs							
Operating	0.01	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	0.01	—	—	—	—	—	—
CN-Counterintelligence							
Operating	—	0.47	0.40	0.40	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	—	0.47	0.40	0.40	—	—	—
DC-Waste Management System							
Operating	(0.30)	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	(0.30)	—	—	—	—	—	—

Resources by Major Program (cont'd)

($ in Millions-BA)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
DP-Weapons Activities							
Operating	19.33	6.34	2.40	2.40	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	19.33	6.34	2.40	2.40	—	—	—
EB-Solar & Renewable Resource Technologies							
Operating	16.26	16.08	20.47	13.85	—	—	—
Capital equipment	0.10	0.10	0.12	0.08	—	—	—
Construction	—	—	—	—	—	—	—
Total	16.36	16.18	20.59	13.93	—	—	—
ED-Industrial Sector							
Operating	24.19	24.85	21.61	26.77	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	24.19	24.85	21.61	26.77	—	—	—
EE-Transportation Sector							
Operating	4.06	4.76	4.76	2.38	—	—	—
Capital equipment	0.20	0.24	0.24	0.12	—	—	—
Construction	—	—	—	—	—	—	—
Total	4.26	5.00	5.00	2.50	—	—	—
EL-Federal Energy Management Program							
Operating	—	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
EN-Indian Energy Resources Programs							
Operating	3.22	3.67	3.50	2.50	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	3.22	3.67	3.50	2.50	—	—	—
EW-Environmental Restoration and Waste Management (Defense)							
Operating	443.80	432.31	462.00	492.06	—	—	—
Operating - Compliance[a]	—	—	—	—	—	—	—
Privatization	27.00	107.30	115.00	90.00	—	—	—
Capital equipment	9.94	14.03	3.69	0.51	—	—	—
Construction	28.59	39.63	29.37	6.84	—	—	—
Construction - Compliance[a]	—	—	—	—	—	—	—
Total	509.33	593.27	610.06	589.41	—	—	—
EX-Environmental Restoration and Waste Management (Non-Defense)							
Operating	7.10	10.03	2.87	1.86	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	0.40	—	3.50	—	—	—	—
Total	7.50	10.03	6.37	1.86	—	—	—
FA-Field Operations							
Operating	17.65	18.73	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	17.65	18.73	—	—	—	—	—

a. Reflects additional costs to meet compliance-driven milestones.

Resources by Major Program (cont'd)

($ in Millions-BA)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
GA-Fissile Materials Disposition							
Operating	0.02	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	0.02	—	—	—	—	—	—
GC-Nonproliferation and Verification Research and Development							
Operating	2.53	1.94	1.96	1.96	—	—	—
Capital equipment	0.31	0.24	0.24	0.24	—	—	—
Construction	—	—	—	—	—	—	—
Total	2.85	2.19	2.20	2.20	—	—	—
GD-Nuclear Safeguards and Security							
Operating	1.54	2.49	1.50	1.50	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	1.54	2.49	1.50	1.50	—	—	—
GG-Worker and Community Transition							
Operating	6.00	3.00	6.00	3.00	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	6.00	3.00	6.00	3.00	—	—	—
GH-Security Investigations							
Operating	0.44	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	0.44	—	—	—	—	—	—
GJ-Arms Control and Nonproliferation							
Operating	1.28	0.77	1.50	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	1.28	0.77	1.50	—	—	—	—
HC-Environment, Safety and Health (Non-Defense)							
Operating	2.88	2.74	2.95	2.67	—	—	—
Capital equipment	1.22	1.16	1.25	1.13	—	—	—
Construction	—	—	—	—	—	—	—
Total	4.10	3.90	4.20	3.80	—	—	—
IN-Intelligence							
Operating	—	0.38	0.39	0.39	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	—	0.38	0.39	0.39	—	—	—
KB-Nuclear Physics							
Operating	0.09	0.08	0.13	0.14	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	0.09	0.08	0.13	0.14	—	—	—
KC-Basic Energy Sciences							
Operating	3.21	3.45	1.49	1.49	—	—	—
Capital equipment	0.24	0.26	0.11	0.11	—	—	—
Construction	—	—	—	—	—	—	—
Total	3.46	3.71	1.60	1.60	—	—	—

Resources by Major Program (cont'd)

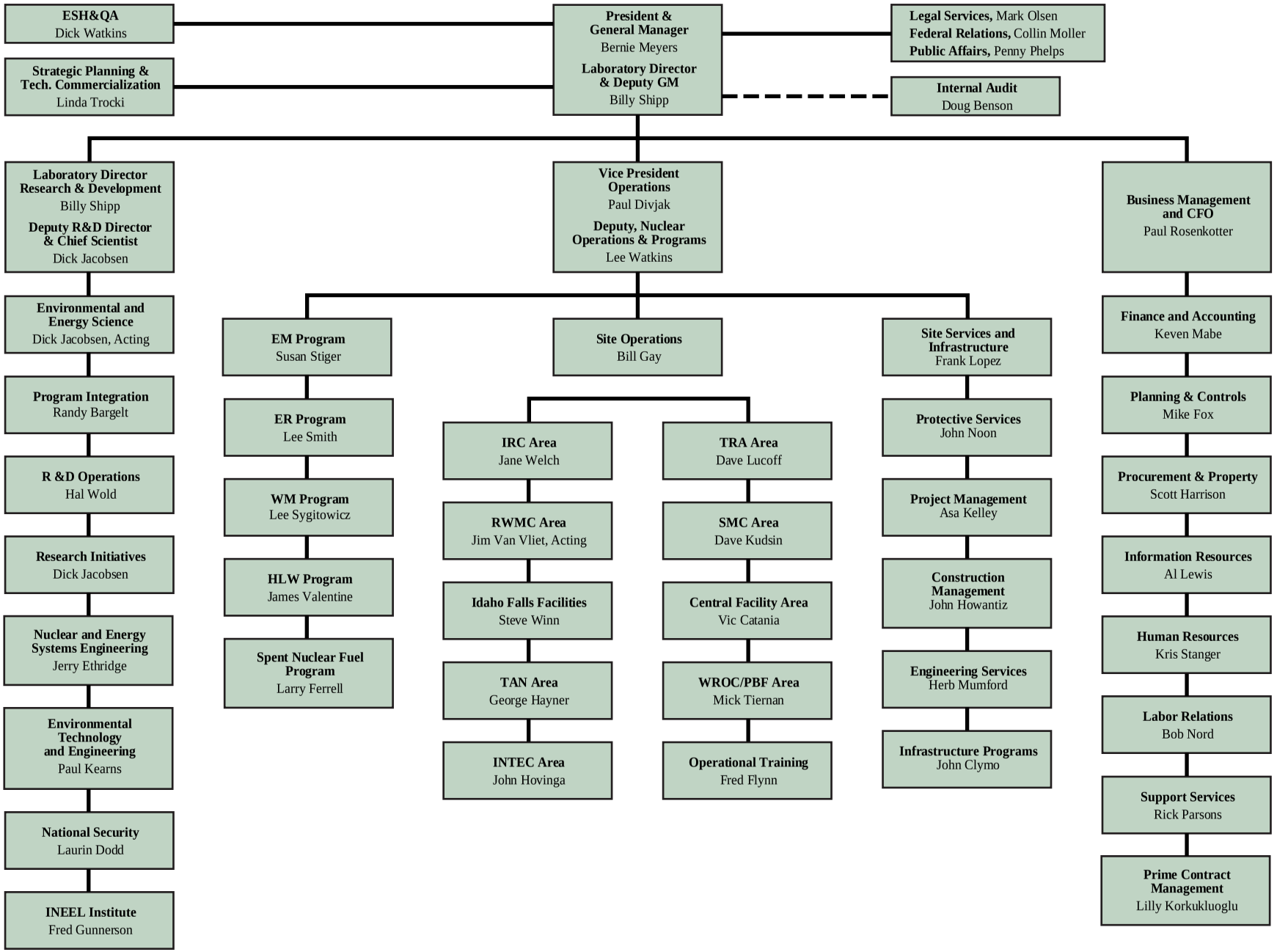
($ in Millions-BA)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
KK-Program Direction							
Operating	0.11	—	0.08	0.08	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	0.11	—	0.08	0.08	—	—	—
KP-Biological and Environmental Research							
Operating	2.14	2.04	2.18	1.98	—	—	—
Capital equipment	0.02	0.02	0.02	0.02	—	—	—
Construction	—	—	—	—	—	—	—
Total	2.16	2.06	2.20	2.00	—	—	—
NA-Misc. Nuclear Energy							
Operating	—	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
ND-Emergency Management							
Operating	—	0.08	0.10	0.10	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	—	0.08	0.10	0.10	—	—	—
NN-Nonproliferation and National Security Program Direction							
Operating	—	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—
NT-Intelligence							
Operating	1.02	—	—	—	—	—	—
Capital equipment	0.17	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	1.18	—	—	—	—	—	—
TR-Scientific and Engineering Training and Development							
Operating	0.26	0.30	0.10	0.10	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	0.26	0.30	0.10	0.10	—	—	—
WB-In House Energy Management							
Operating	—	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	0.44	—	—	—	—	—	—
Total	0.44	—	—	—	—	—	—
WH-Corporate Management Information							
Operating	0.26	—	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	0.26	—	—	—	—	—	—
WM-General Administration							
Operating	0.05	0.22	—	—	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	0.05	0.22	—	—	—	—	—

Resources by Major Program (cont'd)

($ in Millions-BA)	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
40-Other Federal Agencies							
Operating	63.80	71.95	64.73	59.27	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	63.80	71.95	64.73	59.27	—	—	—
82-Reconciling Transfers							
Operating	20.30	19.78	20.00	20.00	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	20.30	19.78	20.00	20.00	—	—	—
WPR-Work for Others (Includes Non-AFP)							
Operating	11.97	13.83	15.00	14.00	—	—	—
Capital equipment	—	—	—	—	—	—	—
Construction	—	—	—	—	—	—	—
Total	11.97	13.83	15.00	14.00	—	—	—
TOTAL FOR PROGRAMS[b]	791.84	875.77	864.19	823.78	—	—	—

Appendix

BBWI Organization



Equal Employment Opportunity.[a]

Occupational Codes		Total				Minority Total				White				Black				Hispanic				Native American				Asian/Pacific Islanders			
Gender		M		F		M		F		M		F		M		F		M		F		M		F		M		F	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Official/Manager	513	446	87	67	13	27	5	9	2	419	82	58	11	7	1	1	0	14	3	7	1	4	1	1	0	2	0	0	0
Professional																													
Scientists/ Engineers	2047	1765	86	282	14	116	6	31	2	1649	81	251	12	9	0	4	0	40	2	10	0	24	1	11	1	43	2	6	0
Management/ Admin	937	576	61	361	39	24	3	39	4	552	59	322	34	3	0	2	0	11	1	13	1	0	0	1	0	10	1	23	2
Technicians	601	451	75	150	25	22	4	28	5	429	71	122	20	3	0	3	0	8	1	18	3	6	1	5	1	5	1	2	0
Clerical	410	13	3	397	97	1	0	47	11	12	3	350	85	1	0	3	1	0	0	25	6	0	0	10	2	0	0	9	2
Craftsmen/Laborers	767	675	88	92	12	61	8	16	2	614	80	78	10	6	1	0	0	39	5	13	2	12	2	1	0	4	1	0	0
Service Workers/ Apprentices	262	217	83	45	17	12	5	6	2	205	78	39	15	1	0	1	0	10	4	2	1	0	0	2	1	1	0	1	0
Totals	5537	4143	75	1394	25	263	5	176	3	3880	70	1220	22	30	1	14	0	122	2	88	1	46	1	31	1	65	1	41	1

a. Full- and part-time permanent employees

Laboratory Staff Composition—1998

Full and Part-Time Employees	Total	Ph.D.		MS/MA		BS/BA		Other	
		#	%	#	%	#	%	#	%
Professional Staff									
Scientists	622	110	18	155	25	261	42	29	5
Engineers	1425	92	6	400	28	655	46	58	4
Management and Administrative	1450	41	3	212	15	495	34	86	6
Support Staff									
Technicians	601	0	0	2	0	44	7	114	19
All other	1439	0	0	1	0	43	3	106	7

Subcontracting and Procurement

($ in Millions Obligated)[a]	FY 1998	FY 1999	FY 2000	FY 2001
Subcontracting and procurement				
Universities	$10,468,182	$12,000,000	$12,360,000	$13,101,600
All others				
Transfers to other DOE facilities	842,077	1,470,000	1,514,100	1,604,946
Total external subcontracts and procurement	$163,259,369	$150,000,000	$154,500,000	$163,770,000

a. Total dollars obligated within each fiscal year.

Small and Disadvantaged Business Procurement

($ in Millions-BA)[a]	FY 1998	FY 1999
Procurement from S&DB	$88,056,049	$75,000,000
Percent of annual procurement	60.49%	50%

a. Total dollars obligated within each fiscal year.

Laboratory Profile

The Laboratory Profile, which appears on the following four pages, is a required element of this Institutional Plan per SC-7 guidelines. The Laboratory Profile is prepared for the Laboratory Operations Board, which uses different definitions and reporting requirements than the Institutional Plan. The major difference is that environmental restoration is not included in the Laboratory Profile. Laboratory Profile data is also updated on a predetermined schedule that does not coincide with the Institutional Plan process. Therefore, data contained in this Laboratory Profile do not reflect the information contained in the body of this Institutional Plan.

Idaho National Engineering and Environmental Laboratory

Laboratory Information

Location: Idaho Falls, Idaho
Number of Full-Time Employees: 5,477
Scientific and Technical Degrees: 276 Ph.D.'s; 2,378 Bachelor's/Master's
Contractor: Bechtel BWXT Idaho, LLC
Accountable Program Office: Environmental Management
Field Office: Idaho Operations Office
Web Site: http://www.inel.gov

Funding Sources

Environmental Management: $362.4 million
Nuclear Energy: $76.2 million
Defense Programs: $18.9 million
Science: $10.0 million
Nonproliferation and National Security: $6.9 million
Fissile Material Disposition: $5.3 million
Other DOE: $9.1 million
Non-DOE: $75.6 million

Description

The Idaho National Engineering and Environmental Laboratory is a multipurpose laboratory specializing in research into and engineering solutions for nuclear waste, environmental management, nuclear safety, and nuclear fuel cycle technology issues. Established in 1949, the Idaho Laboratory continues to be the world's focal point for nuclear safety and fuel cycle technology. The Idaho Laboratory is Environmental Management's designated national laboratory with a leading role in technology and systems for environmental stewardship, nuclear materials disposition, subsurface science, fate and transport research, complex-wide requirements integration, and the commercialization of environmentally derived technologies. The Laboratory provides energy solutions through a research and development portfolio including nuclear, fossil and renewable energy sources, and energy efficiency improvement. It is the lead laboratory in geothermal and hydropower research. The Idaho Laboratory has a role in providing solutions to national security challenges in areas such as high-density armor materials, sensors for non-proliferation and law enforcement, and in improving the security and the capability of information management systems. A science base in geophysical disciplines, biotechnology, chemistry, materials, sensors, nuclear engineering and information management underpins the Laboratory's applied research and development focus.

Distinctive Competencies and Major Facilities

In support of the Department's missions over the years, the Laboratory has developed interrelated core competencies, particularly related to environmental stewardship. These core competencies are:

– **Processing and Managing Radioactive and Hazardous Materials:** Every type of radioactive waste and hazardous material, including spent nuclear fuel, is managed from cradle to grave at the Laboratory, utilizing unique facilities such as the Waste Experimental Reduction facility, the Idaho Nuclear Technology and Engineering Center, and the Advanced Mixed Waste Treatment Facility.

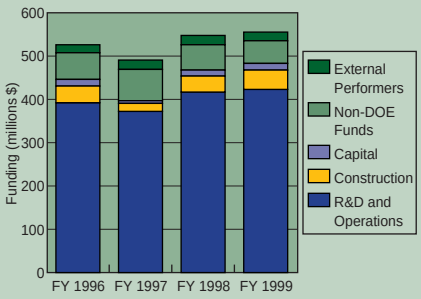
– **Engineered Systems and Processes Development, Modeling, Testing, and Validation:** Developed through having built and operated 52 reactors, this capability is exemplified today by the Laboratory's nuclear safety tools such as the SCDAP and RELAP computer codes, which are used worldwide. The Laboratory is ideally suited for testing other U.S. infrastructure components.

– **Applied Environmental Science, Engineering, and Technology Demonstration:** The Laboratory is a leader in the development and deployment of technologies required for the environmental mission, for example, the in situ technologies used for sampling and characterization of the subsurface.

– **Complex Engineering-Economic Systems Analysis and Integration:** From its reactor experience, hazardous materials processing, and large-scale energy systems, the Laboratory has multidisciplinary expertise to undertake large-scale systems engineering projects such as the complex-wide Environmental Management Integration Program.

Major Laboratory facilities that serve multiple customers include: the Research Center, a complex of multidisciplinary research and development facilities including materials science, biotechnology. chemistry, optics, robotics, nuclear science, and nondestructive evaluation, serving government and industry; and the **Advanced Test Reactor,** which is the world's largest and most versatile test reactor, used for producing isotopes and for irradiating and testing advanced materials, as for example in fuel cycle research.

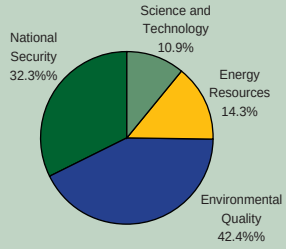
Funding by Activity



Note: Site remediation funds excluded.

DOE R&D Footprint

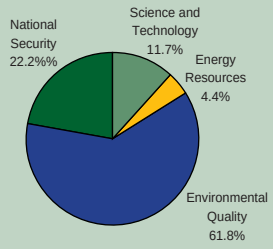
Total R&D: $231.4 million



Note: Based on FY98 funding data; contributing non-DOE funds included; site remediation funds excluded.

DOE R&D Footprint

Total Mission: $564.4 million



Note: Based on FY98 funding data; contributing non-DOE funds included; site remediation funds excluded.

Idaho National Engineering and Environmental Laboratory

Key Research and Departmental Activities

Environmental Quality Mission: The research and development devoted to environmental quality at the Laboratory supports the Department's complex-wide objectives, site-specific needs, and global and international interests. The completion of the clean up activities as laid out in the Department's Paths to Closure plan is top priority. The following key research and development programs directly support this objective:

– Mixed Waste Focus Area, research on transuranic (TRU) waste characterization, mixed waste stabilization and many other treatment technologies.

– Environmental Management's Science Program, fundamental science to support technology and processes critical to the cleanup mission.

– The Plutonium Focus Area following a systems engineering approach to guide critical research for the disposition of plutonium.

– The National Spent Nuclear Fuel Program leads research on the complete fuel cycle including characterization and long term storage.

– Biochemical research into subterranean biology, chemistry, geology, fate and transport, and the vadose zone.

– The Environmental Management Integration Program, systems engineering and collaboration to optimize environmental management processes.

Many research and development projects are more directed at supporting the Laboratory's cleanup mission while contributing to the entire Departmental complex through the development and deployment of useful technologies and processes. Examples include:

– The High-Level Waste Program performs research on waste disposition produced from reprocessing Naval and Department of Energy spent nuclear fuel.

– The Environmental Research Program performs treatability studies and develops technologies necessary for site cleanup.

– The Waste Management Program performs research to support disposition of the Laboratory's mixed low-level waste and transuranic waste.

Still other research and development efforts are sponsored to support global environmental stewardship and multinational cleanup interests; examples include:

– Agriculture sensors and information systems for productivity enhancement and reduced environmental impact and energy consumption.

– Foreign Research Reactor Spent Fuel Program develops technology for inspections of foreign spent fuel prior to shipment to the United States.

– The Natural Resources Initiative performs research on watershed management, aquatic habitat, and water quality.

– With the U.S. geological Survey, the Laboratory analyzes midlatitude glacial deposits to establish natural radioactive backgrounds and obtain climate change data.

Energy Resource Mission: From its inception as the nation's first laboratory devoted to civilian nuclear power through its development work in energy efficiency and renewable technologies, the Idaho Laboratory uses its systems engineering disciplines, applying that capability along with a relevant scientific base to focus on national and international energy challenges. Application of these capabilities is driven by the objective of energy production and use with ecosystem sustainability. Examples of key research and development activities include:

– Research on advanced nuclear fuel cycle and reactor power systems to meet nonproliferation, safety, waste volume reduction and life-cycle economics goals.

– Irradiation effects, materials science, and isotope production research.

– Nuclear Regulatory Commission assistance with risk-informed regulations and analysis of plant safety performance.

– Research and analysis of safety issues associated with fusion reactor power systems.

– Diagnostics and nondestructive evaluation for industrial processes, applied materials development and natural disaster mitigation.

– Hybrid and natural gas vehicle and infrastructure research.

– Energy storage, materials and manufacturing research for advanced transportation systems.

– Advanced welding and joining technology for metals, alloys and ceramics; functionally-gradient materials development.

– Research on new oil and gas exploration, production and processing technologies.

– Advanced hydropower and geothermal systems research and development.

– Engineering applications of reliable hydropower, solar, wind and energy storage systems.

– Energy conservation research in industrial processing, mineral extraction and processing, and agriculture production and processing.

– Biological and chemical process and technology research and development to improve industrial energy efficiency and environmental quality.

National Security Mission: The Laboratory has a long-standing role in providing solutions to national security challenges, including service to other agencies. Key examples include:

– Specific Manufacturing Capability, developing new, unique production methods for high density armor materials for the U.S. Army.

– Development of deployable chemical weapons assessment systems as sole support to the U.S. Army Chemical Demilitarization Program.

– Research and development to improve environmental surety and cost effectiveness of the nuclear material production cycle for Department's Defense Programs.

– Technology research and development for the National Institute of Justice, Office of National Drug Control Policy, U.S. Customs, and Federal Bureau of Investigation.

– Unattended terrestrial ground sensor development for the Special Operations Command.

– Communications technology and command and control systems research and development from past support of the Air Force Information Warfare Center.

Science and Technology Mission: The Laboratory's Science program is designed to extend the body of knowledge underlying current engineering practice in a variety of cross-cutting fields related to our support of the Department's missions. Examples of key activities include:

– Research on rapidly solidified materials, graded microstructures, and hard magnetic materials.

– Engineering research on materials processing, structural integrity, and nondestructive evaluation.

– Neutron physics and dosimetry research for multiple applications including boron neutron capture therapy.

In FY98, four groups of researchers received national recognition for innovation and leadership in science and technology. Some of the Laboratory's basic research is done through the Laboratory University Research Consortium, which in 1998 sponsored 35 research projects at 20 Universities on topics applicable to environmental management, pollution prevention, waste remediation, and waste management, applied engineering and systems integration, and nuclear operations and materials disposition.

Idaho National Engineering and Environmental Laboratory

Key Research and Departmental Activities

Subsurface Science (1996-present): The Laboratory has discovered extremophile microorganisms in the deep subsurface that catalyze the fixation of metals, including radionuclides, and mineralize organic pollutants. Other Laboratory firsts: characterization of microbes that produce methane hydrates from earth/ocean sources; new infrastructure technologies for liquefied natural gas transportation; new down-hole seismic array concept for oil and gas exploration; new plasma processes for maximizing conversion efficiency of methane gas to higher value products.

– Transport Phenomena in Geologic Porous Media: The advanced tensiometer developed at the Laboratory as part of this project permits measurements of the movement of fluids beneath the surface where both air and water may be present–the vadose zone and the aquifer. The break through design can take measurements at almost any depth while being left unattended for weeks. It can be used for continuous monitoring of irrigation, water recharge, hazardous waste sites, and may be used to predict surface slumps. This instrument was a 1997 R&D 100 award winner.

– Study of Natural Attenuation: The Idaho Laboratory demonstrated the occurrence of natural attenuation of chloroethenes through application of newly derived techniques to evaluate attenuation rates and mechanisms active within geochemically distinct zones of a contaminant plume. The technique demonstrates a previously unrecognized interaction between dispersion and degradation to provide a strong technical basis for regulatory review and acceptance.

– Subsurface Radiological Assay Instruments: Three different radiological assay instruments for measuring contamination in subsurface soil and groundwater were developed and demonstrated. These instruments allow higher sensitivity, in-situ measurement of beta- and alpha-emitting contaminants in subsurface soil and groundwater. The three instruments are a cylindrical triple proportional counter for Sr-90, U-238, and gross beta activity; down-hole xenon proportional counter x-ray spectrometer for actinide isotopes; and a Frisch grid ionization chamber bore-hole assay instrument for alpha-emitters such as U-234, U-235, Th-230, Pu-238, and Am-241.

Nuclear Science and Technology: The Laboratory developed and continually updates RELAP, the state-of-the-art computer code for nuclear reactor safety analysis. A leader in nuclear reactor thermal-hydraulics, the Laboratory developed analytical modeling techniques for predicting the behavior of reactors under transient and accident conditions. The wide acceptance of RELAP as the world's standard is signified by the fact that 22 countries presently use the code.

– Fusion Safety Standards: As the Department's lead laboratory for Fusion Safety, the Idaho Laboratory led the U.S.-wide effort to produce fusion safety standards on behalf of the U.S. Fusion Safety Steering Committee. The resulting two standards, safety requirements and compliance guidance, are the only Department fusion safety standards in existence. For the ITER program, the Laboratory provided the task area leader for safety standards on the U.S. Home Team and performed significant and pivotal research in issues related to ITER safety and fusion in general.

– Advanced Radiation Treatment Planning Software: The Laboratory will soon release the Simulation Environment for Radiotherapy Applications (SERA) for sophisticated dosimetry assessment for all modalities of neutron radiotherapy.

– Synthesis of Decaborane: The Laboratory has developed a new, lower-risk process for chemical synthesis of boron-10 enriched decaborane, a key precursor to several advance boron agents for neutron capture therapy treatment of brain cancer.

Nanostructured Materials for Environmental Applications: This three-year research initiative has produced tailored nanostructured materials for a range of environmental applications, e.g., catalysts, catalyst carriers, membranes, and porous electrodes. This class of materials includes nanophase particulate materials (<100 nm diameter) and dense-to-porous ceramic deposits with nanophase structures (<100 nm pore size). Potential environmental applications include catalytic destruction of pollutants in dilute waste streams, advanced separation (molecular sieves), conversion of end-products back to useful starting materials (recycling), and more environmentally-friendly methods of manufacturing catalysts. The Laboratory devised an improved method of producing nanostructured materials using a plasma synthesis scalable to high throughput production levels. It has been used to synthesize several metal oxide nanophase powders, e.g., sulfated zirconia powder with crystallite on the order of 10-20 nm in size. The powder has about 1 wt.-% sulfur incorporated into its structure and has been shown to exhibit catalytic activity consistent with its sulfur content and surface area. The powder size and phase content or crystal structure can be tailored; the crystal structure helps determine the catalytic activity. Other nanostructure Laboratory Directed Research and Development projects have produced advanced magnet materials and devitrified nanocomposite steel armor.

Biotechnology: The Laboratory's biotechnologists are decontaminating concrete structures by using microbes that naturally damage concrete. By putting the microbes on contaminated concrete and providing ideal growing conditions, the microbes produce acid and dissolve the surface concrete that also holds the contamination. The powder left over from the microbial digestion is removed, taking the contamination with it. Advantages are minimal disposable waste and human exposure.

– Bioprocessing of Gases: The Laboratory has developed the capability to treat toxic gases and vapors using biofiltration. Biofiltration employs natural microbes in a compost bed to degrade the gas or vapor and is often a lower cost alternative to other more conventional technologies. It has received an R&D 100 Award for its role in developing and commercializing the Biocube, a biofilter for the degradation of hydrocarbon vapors.

– Advanced Nanophase Biocatalysis: The Laboratory's biotechnology researchers opened to door to using enzymes as catalysts in nanoaqueous processes, a subject of major interest to the Department through its "Chemical Vision 2020" agenda. Breakthrough work with the enzyme, methane mono-oxygenase (MMO), from the micro-organism, Methylosinus trichosporium OB3b, maintains enzymatic activity in a nanoaqueous solvent at a level comparable with that seen in an aqueous environment. Whereas most enzymes only act on a few compounds, MMO catalyzes the oxidation of over 300 compounds including alkanes, alkenes, and aromatics. For example, MMO provides the key oxidation step to break down toxic trichloroethylene (TCE), a contaminant found at the Department and other sites, into non-toxic compounds. The leaders of the physiology and genome enhancement tasks received the Lockheed Martin's Nova Award, in FY 1998 and FY 1999, respectively.

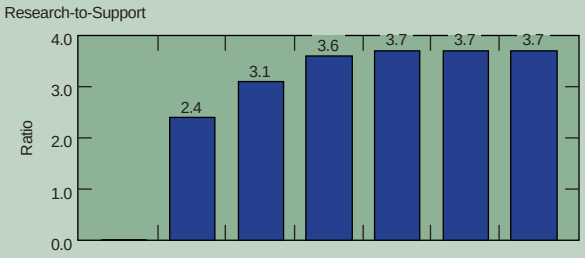
Chemical Weapons Assessment: The Laboratory develops integrated chemical weapon assessment systems for the Non-Stockpile Chemical Material Program of the U.S. Army. It has delivered the first integrated system (Mobile Munitions Assessment System) to the Army, that is currently being used in the field at Dugway Proving Ground. The second and third systems will be delivered in FY99 and FY00. Advanced sensors are constantly being developed to improve the system.

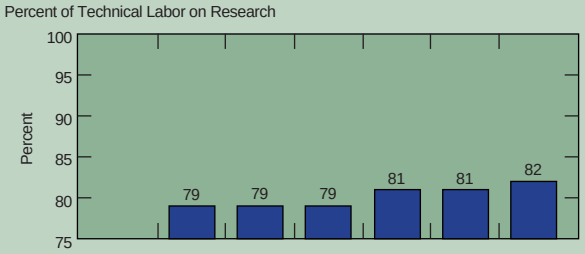
Idaho National Engineering and Environmental Laboratory

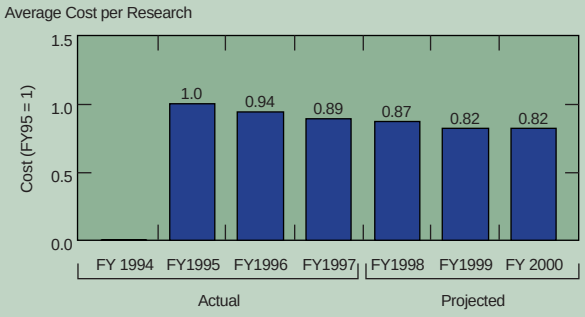
Major Partnerships, Collaborations, And Cooperative Research And Development Agreements

Category/Mission	Partner	Description
Environmental Quality	University of Idaho, PNNL, EPA, AEA (UK)	Vadose zone and biogeotechnology research, natural attenuation of contaminants, characterization and remediation of surface and subsurface.
	Canberra Industries, Envirocare, LANL, SRS	Focus Area integration in the development of TRU waste assay, mixed waste treatment, and disposition of plutonium.
	MIT, NRC, SRS, ANL, France, Japan, Russia	Technology for the development, recycle, safe storage, and regulation of spent nuclear fuel. International Criticality Evaluation Benchmark Program.
	Fernald, Parsons, BNFL TLG Services	Accelerated Site Technology Deployment and Large Scale Demonstration of advanced deactivation and decommissioning technologies.
	State of Idaho, Yellowstone Park	Natural Resource Initiative, environmental collaboration on energy, infrastructure, watershed management, aquatic habitat, and hazard mitigation.
	Greece, Russia, Korean Nuclear Society	Water treatment technology, advanced separation technologies, and waste form evaluation and materials research.
	U of Arizona, Miss. St., Utah St., Washington St.	Agriculture sensors and information systems for productivity enhancement and reduced environmental impact.
Energy Resources	MIT	Research and development of advanced nuclear fuel cycles and power systems; development of improved regulatory system for the Department's nuclear facilities.
	UK, Japan, Korea, Taiwan	Irradiation testing of materials, advanced nuclear power and nuclear regulatory technical support technology development and transfer.
	GM, Ford, Chrysler, SNL, ANL	Partnership for Next Generation Vehicle, electric/hybrid vehicle development, advanced battery research and development.
	US Army COE, Bonneville Power, ORAL	Advanced hydropower turbine development, passive fish migration survival research.
	GRI, Pacific Gas and Electric, BNL, ANL, et al	Research and development of technology for liquified natural gas fueled vehicles and supporting fueling infrastructure.
Science and Technology	20 Universities	Ongoing University Research Consortium research on topics supporting the Department's Missions for a total of $29M since 1995.
	LBNL, LLNL, ORNL, PNNL, SNL, BNL, Ames	Seven projects in the Department's Center of Excellence for the synthesis and processing of advanced materials.
	PETN - Netherlands	Boron Neutron Capture Therapy (BNCT) partnerships with European Union BNCT research programs for treatment of brain cancer.
National Security	US Army	Development of next-generation chemical weapons assessment systems to be deployed by the Technical Escort Unit.
	Idaho State University	Collaboration to establish the Idaho Accelerator Center for nuclear applications, includes nonproliferation applications.
	LANL	Development of production process evaluation tools to support sound decisions for long-term, nuclear-stockpile stewardship.
	Idaho Criminal Investigation Bureau	Partnership to establish the Northwest Testbed for drug enforcement technologies for the Office of National Drug Control Policy.

Performance Metrics







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INSTITUTIONAL PLAN

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