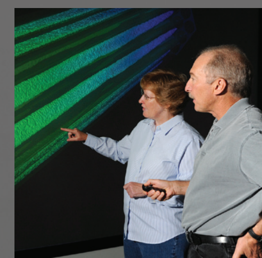
DOE/ID-11474
Final

Idaho National Laboratory

2014-2023 TEN-YEAR SITE PLAN





DOE-NE's National Nuclear Capability—Developing and Maintaining the INL Infrastructure

June 2012

INL Idaho National Laboratory

The **Energy Systems Laboratory** (ESL), slated for completion this year, will be a state-of-the-art laboratory with high-bay lab space where leading bioenergy feedstock processing, advanced battery testing, and hybrid energy systems integration research will be conducted.

Sustainable INL continues to exceed DOE goals for reduction in the use of petroleum fuels – running its entire bus fleet on biodiesel while converting 75% of its light-duty fleet to E85 fuel.

The **Advanced Test Reactor** is the world's most advanced nuclear research capability – crucial to (1) the ongoing development of safe, efficient U.S. Navy nuclear reactors and fuels; (2) materials and fuels for commercial power production; and (3) medical isotope production.

At the **Materials and Fuels Complex**, INL scientists research the materials and fuels that will be necessary for future generations of nuclear reactors to continuously improve safety and efficiency.

The new **Irradiated Materials Characterization Laboratory** (IMCL) at INL supports crucial research and analysis of potential new reactor materials and fuels, and is a prototype facility for informing the Department of Energy of future postirradiation examination needs with regard to construction, safety, and performance.

At INL's **High-Performance Computing Facility**, the Fission supercomputer uses the Multiphysics Object-Oriented Simulation Environment (MOOSE), a computer simulation framework that advances the process for predicting behaviors of complex systems.

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Idaho National Laboratory

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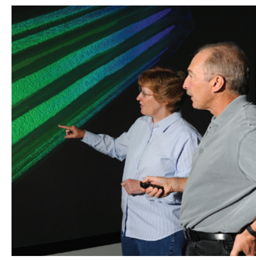


DOE-NE's National Nuclear Capability—Developing and Maintaining the INL Infrastructure

June 2012

Idaho National Laboratory

APPROVALS

Idaho National Laboratory

John J. Grossenbacher
Laboratory Director
Idaho National Laboratory
President and Chief Executive Officer
Battelle Energy Alliance, LLC

U.S. Department of Energy
Idaho Operations Office

Rick Provencher
Manager
Idaho Operations Office
U.S. Department of Energy

U.S. Department of Energy

Tracey Bishop
Acting Deputy Assistant Secretary
for Nuclear Facility Operations
U.S. Department of Energy

INL-AT-A-GLANCE

Location:
Idaho Falls, Idaho

Type:
Nuclear Energy and National and Homeland Security Multiprogram Laboratory

Lead Program Secretarial Office:
U.S. Department of Energy Office of Nuclear Energy

Contractor:
Battelle Energy Alliance

Responsible Site Office:
U.S. Department of Energy Idaho Operations Office

Website:
http://www.inl.gov/

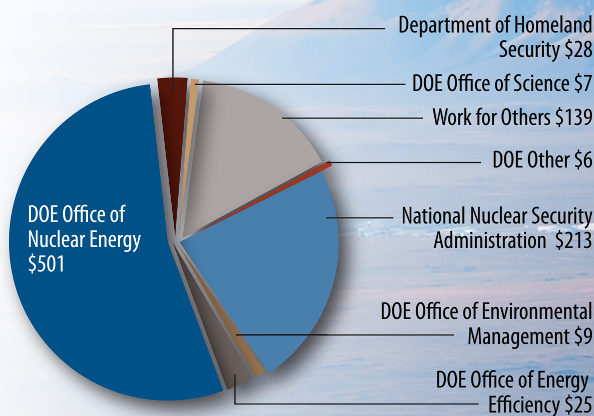
Physical Assets (operating and shutdown, owned and leased):

- Land Area: 569,135 acres
- 322 Buildings and Trailers, 3,234K Gross Square Feet
- 262 Other Structures and Facilities
- Replacement Plant Value: $4,793M
- Deferred Maintenance: $125M
- Asset Condition Index:
  - Mission Critical: 0.998
  - Mission Dependent: 0.969
  - Non Mission Dependent: 0.951

Human Capital:

- 4,125 Full-Time Equivalent Employees
- 62 National Scientific User Facility Participants
- 22 Postdoctoral Researchers
- 68 Graduate Student Interns
- 143 Undergraduate Student Interns

FY 2011 NEW FUNDING BY SOURCE ($M):



MESSAGE FROM THE DEPUTY LABORATORY DIRECTOR

The Idaho National Laboratory (INL) Ten-Year Site Plan for Fiscal Year 2014 outlines the vision, strategy, and progress toward delivering and sustaining world-leading capabilities needed for the core mission of the laboratory — nuclear energy research, development and demonstration (RD&D) and multi-program missions in energy security and national and homeland security. With the largest concentration of operating reactor and fuel cycle research facilities in the country, INL is the only national laboratory dedicated to civilian nuclear energy and the only national laboratory owned by the Department of Energy (DOE) Office of Nuclear Energy (DOE-NE).

When INL was launched in 2005, the first priority was to stabilize the existing infrastructure and jump start the revitalization of the Advanced Test Reactor, accomplished by enhancing experimental capabilities, transitioning to a user facility, and by investment in continued safe and reliable operation. This was enabled by DOE investment and Battelle Energy Alliance partner commitments. The next priority was to create a world-leading research complex at the Materials and Fuels Complex where researchers and engineers could develop and test new fuels and materials, demonstrate advanced separations technologies, and assemble and test radioisotope power systems. Moving forward with a science-based approach to RD&D, which combines modeling and simulation with small-scale experimentation, is another significant step forward for the laboratory. This requires near-term investment in new tools and instruments and a few new facilities for long-term gain in the way research is performed, reducing the total cost of developing new technologies and the time that it takes for development.

While we are well on the road to achieving the vision established in 2005, there is still more to do. Even with revitalization efforts completed, there is a continuing need to repair, replace, revitalize, or enhance capabilities for mission support.

While the vision and strategy remain the same, the details of implementation (i.e., priority, schedule, and approach) will evolve as progress is made and as we balance the needs of the DOE-NE research programs against annual budgets. We will apply the full range of investment tools and approaches to achieve the vision, including the Idaho Facilities Management Program, which is used to further the mission of DOE-NE by ensuring the availability of facilities, including strategic investments in capabilities that cross all nuclear energy research programs, direct investment by research programs to meet their specific needs, and indirect investment. We will continue to invest in multiprogram capabilities as opportunities arise to do so. The challenge ahead is to achieve the vision in the most efficient and cost-effective manner possible, ensuring that the capabilities required are in place and operational to support the research needs of DOE-NE and the broader nuclear energy enterprise.

David Hill
Deputy Laboratory Director,
Science and Technology

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Appendices

ACRONYMS

ACI	asset condition index
AL	Analytical Laboratory
AMWTP	Advanced Mixed Waste Treatment Project
ARP	Accelerated Retrieval Project
ARRA	American Recovery and Reinvestment Act
ASME	American Society of Mechanical Engineers
ATR	Advanced Test Reactor
ATRC	Advanced Test Reactor Critical (Facility)
AUI	asset utilization index
BCTC	Bonneville County Technology Center
BEA	Battelle Energy Alliance, LLC
BOGR	Box Opening Gantry Robot
BTP	bagless transfer port
CAES	Center for Advanced Energy Studies
CAIS	Condition Assessment Information System
CAM	continuous air monitor
CD	critical decision
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESB	Contaminated Equipment Storage Building
CFA	Central Facilities Area
CFI	Conventional Facility Indicator
CITRC	Critical Infrastructure Test Range Complex
CSO	Cognizant Secretarial Office
CSSF	Calcine Solid Storage Facility
CWI	CH2M-WG Idaho
D&D	decommissioning and demolition
DCS	distributed control system
DHS	Department of Homeland Security
DM	deferred maintenance
DOD	Department of Defense
DOE	Department of Energy
DOE-EERE	Department of Energy Office of Energy Efficiency and Renewable Energy
DOE-EM	Department of Energy Office of Environmental Management
DOE-HQ	Department of Energy Headquarters
DOE-ID	Department of Energy Idaho Operations Office
DOE-NE	Department of Energy Office of Nuclear Energy
DRR	domestic research reactors
DSA	Documented Safety Analysis
DU	depleted uranium
EBR-II	Experimental Breeder Reactor-II
ECM	energy conservation measure
ECS	Emergency Communication System
EDL	Engineering Development Laboratory
EE	Energy and Environment
EFCOG	Energy Facility Contractors Group
EFF	Experimental Fuels Facility (formerly the Contaminated Equipment Storage Building [CESB])
EML	Electron Microscopy Laboratory
EO	Executive Order
EPRI	Electric Power Research Institute
EROB	Engineering Research Office Building
ESL	Energy Systems Laboratory
ESPC	Energy Savings Performance Contract
EU	enriched uranium
FASB	Fuels and Applied Science Building
FAST	Fluorinel Dissolution Process and Fuel Storage
FCF	Fuel Conditioning Facility

FCRD	Fuel Cycle Research and Development
FDP	Fluorinel Dissolution Process
FFTF	Fast Flux Test Facility
FIB	focused ion beam
FIMS	Facility Information Management System
FMF	Fuel Manufacturing Facility
FPR	Fuel Processing Restoration
FRR	foreign research reactors
FSV	Fort St. Vrain
FTE	full-time equivalent
FY	fiscal year
GHG	greenhouse gas
GPP	General Plant Project
GSA	General Services Administration
GSF	gross square feet
HEU	highly enriched uranium
HEPA	high-efficiency particulate air (filter)
HFEF	Hot Fuel Examination Facility
HPC	High-Performance Computing
HPSB	High Performance Sustainable Building
HVAC	heating, ventilation, and air conditioning
IAB	INL Administration Building
IASCC	Irradiation Assisted Stress Corrosion Cracking
ICDF	Idaho CERCLA Disposal Facility
ICP	Idaho Cleanup Project
IFM	Idaho Facilities Management
IFSF	Irradiated Fuel Storage Facility
IGPCE	Institutional General Purpose Capital Equipment
IGPP	Institutional General Plant Project
IM	Information Management
IMCL	Irradiated Materials Characterization Laboratory
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IORC	Information Operations and Research Center
IRC	INL Research Center
ISFSI	Independent Spent Fuel Storage Installation
ISU	Idaho State University
IWTU	Integrated Waste Treatment Unit
LDRD	laboratory-directed research and development
LED	light-emitting diode
LEED	Leadership in Energy and Environmental Design
LET&D	Liquid Effluent Treatment and Disposal
LEU	low-enriched uranium
LGWDCS	Liquid/Gaseous Waste Distributed Control System
LICP	Line-Item Construction Project
LL/LLM	low-level/low-level mixed
LLW	low-level waste
LNG	liquefied natural gas
LP	Laboratory Protection
LWR	light water reactor
M&O	management and operating
M&R	maintenance and repair
MaCS	Microscopy and Characterization Suite
MC	mission-critical (one of three FIMS Mission Dependency categories)
MD	mission-dependent, not critical (one of three FIMS Mission Dependency categories)
MFC	Materials and Fuels Complex
MII	Maintenance Investment Index
MLLW	mixed low-level waste
MR&R	major repair and replacement
MSM	master-slave manipulator

MTHM	metric tons of heavy metal
N&HS	National and Homeland Security
NASA	National Aeronautics and Space Administration
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NGNP	Next Generation Nuclear Plant
NNSA	National Nuclear Security Administration
NOO	Notice of Opportunity
NR	Naval Reactors
NRAD	Neutron Radiography Reactor
NRC	Nuclear Regulatory Commission
NRF	Naval Reactors Facility
NSUF	National Scientific User Facility
NTB	near-term baseline
OOS	out of service
ORNL	Oak Ridge National Laboratory
OSF	other structure and facility (one of four FIMS categories of real property)
OU	operable unit
PAR	programmable and remote (manipulator)
PBF	Power Burst Facility
PED	project engineering and design
PIE	postirradiation examination
PINS	portable isotopic neutron spectroscopy
PSO	Program Secretarial Office
R&D	research and development
RAL	Remote Analytical Laboratory
RAM	radiation air monitor
RAMP	Roof Asset Management Program
RAP	Radiological Assessment Program
RCIMS	Radiological Control Information Management System
RCL	Radiochemistry Laboratory
RCRA	Resource Conservation and Recovery Act
RD&D	research, development, and demonstration
REC	Research and Education Campus
REL	Research Education Laboratory
RERTR	Reduced Enrichment for Research and Test Reactor
RESL	Radiological and Environmental Science Laboratory
ROD	Record of Decision
ROM	rough order of magnitude
RPV	replacement plant value
RTR	Real Time Radiography
RWMC	Radioactive Waste Management Complex
S&S	safeguards and security
SBW	sodium bearing waste
SCMS	Sodium Component Maintenance Shop
SDA	Subsurface Disposal Facility
SEM	scanning electron microscope
SMC	Specific Manufacturing Capability
SNM	special nuclear material
SPO	Sustainability Performance Office
SSP	Site Sustainability Plan
SSPP	Strategic Sustainability Performance Plan
SSPSF	Space and Security Power Systems Facility
SSSTF	Staging, Storing, Sizing and Treatment Facility
SW	sitewide
TAN	Test Area North
TEC	total estimated cost

TEM	transmission electron microscope
TLD	thermoluminescent dosimeter
TMI	Three-Mile Island
TPC	total project cost
TRA	Test Reactor Area (legacy building number prefix)
TREAT	Transient Reactor Experiment and Test Facility
TRIGA	Training, Research, Isotopes, General Atomics
TRU	transuranic
TSB	Technical Support Building
TTAF	Test-Train Assembly Facility
TYSP	Ten-Year Site Plan
UESC	Utility Energy Savings Contract
UNF	used nuclear fuel
UREP	Utilities Replacement Enhancement Project
VACCO	Vacuum and Air Components Company of America
VCO	Voluntary Consent Order
VFD	variable frequency drive
WCB	Willow Creek Building
WFO	work-for-others
WIPP	Waste Isolation Pilot Plant
WMD	weapons of mass destruction
ZPPR	Zero Power Physics Reactor

1. INTRODUCTION

This Idaho National Laboratory (INL) Ten-Year Site Plan (TYSP) describes the strategy for accomplishing the long-term objective of sustaining the INL infrastructure to meet the Department of Energy Office of Nuclear Energy (DOE-NE) mission: to advance nuclear power as a resource capable of making major contributions in meeting the nation's energy supply, environmental, and energy security needs.

As the DOE-NE national nuclear laboratory, INL serves a unique role in civilian nuclear energy research. With a 60-year history in reactor and fuel-cycle technology research, development, and demonstration (RD&D) and as steward to the majority of the Department of Energy (DOE) infrastructure for nuclear energy development, INL assists DOE-NE by leading, coordinating, and participating in RD&D performed by national laboratories, U.S. universities, and collaborating international research institutions.

INL is also a multiprogram laboratory. While nuclear energy is the core mission, INL missions encompass National and Homeland Security (N&HS), energy development, and environmental stewardship. The customer base is broad, supporting missions of DOE, other federal agencies, and industry where INL has distinctive competencies. INL also serves a unique role in the Intermountain West Region as a technical resource and "honest broker" on local and regional issues related to the future direction of energy production and distribution in the region.

INL supports other federal agencies, including the National Aeronautics and Space Administration (NASA); Department of Defense (DOD), Department of Homeland Security (DHS), Nuclear Regulatory Commission (NRC), and Department of Interior through a Work-for-Others (WFO) Program. Some of this work involves application of INL's nuclear energy capabilities (e.g., nuclear forensics, nuclear nonproliferation, and radioisotope power systems assembly and testing), while other work is an extension of its capabilities and expertise in systems engineering, analysis, and testing in areas such as critical infrastructure protection, clean energy system testing, energy storage, and related enabling technologies.

INL works closely with the nuclear industry on DOE's research initiatives in order to bring the perspective of industry to the research and development (R&D) efforts, as well as to meet the specific needs of industry. INL provides engineering and applied research support to industry partners in

Mission

Advance nuclear power as a resource capable of making major contributions in meeting the nation's energy supply, environmental, and energy security needs. Serve as a multiprogram laboratory with competencies that are extended beyond nuclear energy to other energy, environmental, and N&HS challenges.

DOE Vision for INL

- *Enhance the Nation's energy security by becoming the preeminent, internationally recognized nuclear energy RD&D laboratory within 10 years.*
- *Establish itself as a major center for national security technology development and demonstration.*
- *Be a multiprogram national laboratory with world-class capabilities.*
- *Foster academic, industry, government, and international collaborations to produce the investment, programs, and expertise that ensure this vision is realized.*

other segments of the energy sector as well as the automobile industry, agribusiness, and other industries.

The TYSP builds on information provided in the *Nuclear Energy Research and Development Roadmap (*DOE 2010; DOE-NE Roadmap), annual DOE-NE program guidance, and reports such as the "Facilities for the Future of Nuclear Energy Research: A Twenty-Year Outlook" (DOE-NE 2009). In addition, the TYSP incorporates the 2008 recommendations of the National Academy of Sciences (NAS 2008), which recognized the need for DOE to invest in research capabilities and develop a process for prioritizing, evaluating, and obtaining capabilities.

While many research activities underway at INL are consistent with the *Report to the Secretary of Energy, Blue Ribbon Commission on America's Nuclear Future* (BRC 2012), it is anticipated that the government's response to the Blue Ribbon Commission could impact the future direction of research, and consequently, impact investment in the research infrastructure.

INL's mission, established in management and operating (M&O) contract No. DE-AC07-05ID14517 with Battelle Energy Alliance, LLC (BEA), is that INL will "…advance nuclear power as a resource capable of making major contributions in meeting the nation's energy supply; environmental and energy security needs; and serve as a multiprogram laboratory with competencies that are extended beyond nuclear energy to other energy, environmental, and national and homeland security challenges."

The goal of the INL TYSP is to provide the strategy for INL to accomplish its mission by: (1) linking R&D mission goals and INL core capabilities with infrastructure requirements (single and multiprogram); (2) establishing a ten-year end-state vision for INL facility complexes; (3) identifying and prioritizing infrastructure needs and capability gaps; (4) establishing maintenance and repair strategies that allow for sustainment of mission-critical (MC) facilities; and (5) considering each decision and action through the lens of sustainability.

The TYSP is the basis for documenting and justifying infrastructure investments proposed as part of the budget formulation process, including the development of budget documents such as the Integrated Facilities and Infrastructure Crosscut. It also provides a summary of investments, such as Institutional General Plant Projects (IGPPs) and Institutional General Purpose Capital Equipment (IGPCE). The TYSP serves as the infrastructure-planning baseline for INL; and, though budget formulation documents are informed by the TYSP, it is not itself a budget document.

The remainder of Section 1 of the TYSP describes the missions and capabilities of INL, planning assumptions, how INL will be transformed into a user facility model, and how the ten-year end state vision will be delivered. Section 2 describes the ten-year end state vision for INL and includes the campus and land-use plan for INL. It identifies key facilities that support DOE-NE and multiprogram mission accomplishment as well as facilities that are under construction. Section 3 provides additional detail on core capabilities and plans to mature them to meet mission requirements. Section 4 provides detail on the supporting infrastructure. Section 5 addresses the infrastructure investment strategy, including INL's strategy for closing significant infrastructure gaps that exist today. Concluding information on INL infrastructure and strategic investments is included in Section 6. Appendix A details INL's real property asset management; Appendix B identifies detailed prioritized resource needs, Appendix C describes the programs of INL tenant organizations; and Appendix D addresses strategic sustainability for INL.

1.1 National Nuclear Capabilities: Nuclear Energy Mission Accomplishment

INL's primary mission is to advance nuclear energy by supporting DOE-NE in achieving its objectives. This section describes DOE-NE's objectives and INL's role in accomplishing them, followed by a description of the nuclear capabilities INL is deploying in support of those objectives.

1.2 DOE-NE Objectives for Nuclear Energy Research

In the 2010 DOE-NE Roadmap (DOE 2010), DOE-NE identified four research objectives it is pursuing to accomplish its mission of advancing nuclear energy:

1. Develop technologies and other solutions that can improve reliability, sustain the safety, and extend the life of current reactors
2. Develop improvements in the affordability of new reactors to enable nuclear energy to help meet the Administration's energy security and climate change goals
3. Manage nuclear waste and develop sustainable nuclear fuel cycles
4. Understand and minimize the risks of nuclear proliferation and terrorism.

1.2.1 Objective 1—Develop Technologies and Other Solutions That Can Improve the Reliability, Sustain the Safety, and Extend the Life of Current Reactors

This objective, pursued in cost-shared cooperation with industry, focuses on evaluating and addressing technical issues related to long-term, safe, and economical operation of the current fleet of nuclear power plants by using the unique capabilities of the national laboratory system. The R&D focus is on aging phenomena and material degradation, advanced light water reactor (LWR) nuclear fuels, advanced instrumentation and control systems, and risk informed safety margin characterization. As a multi-year R&D program, the results of this research are expected to inform industry component refurbishment and replacement strategies, performance enhancements, plant license extensions, and age-related regulatory oversight decisions made over the next 15 years. INL provides technical leadership to the LWR Sustainability Program,[a] leads several of the research pathway areas, including advanced LWR nuclear fuels, advanced instrumentation and control, and risk-informed safety margin characterization; and is a participant on all the research pathways.

1.2.2 Objective 2—Develop Improvements in the Affordability of New Reactors to Enable Nuclear Energy to Help Meet Energy Security and Climate Change Goals

Objective 2 is aimed at addressing barriers associated with deploying new nuclear power plants, including advanced designs such as small modular, fast spectrum, and high-temperature reactors. While DOE is pursuing a range of issues associated with various advanced concepts, emphasis on advanced concepts includes liquid metal fast reactors for actinide management, very high-temperature reactors for process heat, and liquid fluoride salt-cooled reactors. DOE is also pursuing R&D of systems that could provide wide benefits to all advanced reactor concepts, such as developing advanced energy conversion technologies.

DOE also sponsors crosscutting R&D that directly supports and enables development of new and advanced reactor and fuel cycle technologies, including modeling and simulation, advanced materials, instrumentation and controls, and manufacturing technologies needed to guarantee the safety and security of nuclear systems.

a *Light Water Reactor Sustainability Program, Integrated Program Plan, INL/EXT-11-23452, Revision 1.*

INL leads the development and qualification of fuel and materials for an advanced high-temperature gas reactor, an ongoing campaign that should be finished by the end of the decade. INL also leads interactions with NRC on developing a licensing framework for the Next Generation Nuclear Plant (NGNP). Furthermore, INL is a major partner in the Center for Advanced Simulation and Modeling — one of the Secretary of Energy's energy innovation hubs — and is investing in state-of-the-art modeling, simulation, validation, and research capabilities needed to support development of crosscutting technologies.

1.2.3 Objective 3—Develop Sustainable Fuel Cycles

The DOE Fuel Cycle Research and Development (FCRD) program is focused on a suite of technology options that will enable decision makers to decide how best to manage nuclear waste and spent (used) nuclear fuel (UNF) from commercial nuclear power plants. The FCRD also focuses on storage, transportation, and disposal of UNF. The program employs a science-based approach to foster development of innovative, transformational technologies. Long-term technology development activities include:

- Development of technologies for storing, transporting, and disposing of UNF, and assessment of the performance of waste forms in storage and disposal environments
- Development of next generation LWR fuels with enhanced accident tolerance
- Investigation of fuel forms, reactors, and fuel/waste management approaches that, if cost effective, could significantly increase utilization of fuel resources and reduce the quantity of long-lived radiotoxic elements in UNF
- Development of cost effective and low proliferation risk technologies that will enable long-lived actinide elements to be repeatedly recycled.

Managing UNF, developing fuel cycle technologies, and conducting associated R&D are primarily the responsibility of the U.S. Government. In discharging these responsibilities, INL assists DOE in the FCRD program by integrating R&D across multiple national laboratories and with universities and international collaborating organizations. INL leads several of the technical focus areas for FCRD, including fuel development, separations and waste form development, and systems analysis. FCRD efforts are also informed by input from industry and NRC. Both are key stakeholders in efforts to understand the behavior of UNF in extended storage and in any future efforts to license and commercialize new fuels and fuel cycle technologies.

1.2.4 Objective 4—Understand and Minimize Risk of Nuclear Proliferation and Terrorism

This objective seeks to ensure that access to the benefits of nuclear energy can be enabled without increasing nuclear proliferation and security risks. It incorporates concurrent development of nuclear fuel cycle technology, safeguards and security (S&S) approaches, technologies and systems, new proliferation risk assessment tools, and nonproliferation frameworks and protocols. INL fuel cycle facilities (e.g., the Fuel Conditioning Facility [FCF]) will support development of approaches and testing of process control instrumentation and new sampling systems that provide near real-time accountability.

1.3 National Nuclear Capability

The DOE-NE Roadmap calls for increased coupling of theory with fundamental phenomenological testing, and modeling and simulation to accomplish DOE research objectives. This approach does not obviate the need for future larger-scale testing; however, it enables a broader range of technology options to be explored before having to prepare and invest in larger scale testing.

Having the capability to perform the experiments necessary to explore new technologies requires that DOE-NE have access to a broad range of capabilities — from small-scale laboratory experiments to larger scale prototypic demonstrations. The INL's capabilities to support DOE-NE on its full spectrum of needs are described in this section.

INL is furthering the DOE-NE mission and maintains and operates the majority of DOE-NE's essential nuclear energy R&D capabilities, representing and retaining the core of the federal government's national nuclear energy R&D infrastructure. Core capabilities are those that are unique to nuclear energy R&D, typically enable handling of highly radioactive materials, or are expensive to build/operate. Test reactors, hot cells, and shielded enclosures are at the top of the hierarchy of facilities in degree of complexity, offering the ability to handle highly radioactive materials. They are followed by smaller-scale radiological facilities, specialty engineering facilities, and nonradiological laboratories.

As one of the few laboratories that will sustain the capability to handle Safeguards Category I materials and as the DOE-NE lead laboratory, INL has the unique ability to support research using fissile and highly radioactive fuels and materials. Under the Settlement Agreement between the State of Idaho, DOE, and U.S. Navy (State of Idaho 1995), INL can receive research quantities of UNF. INL also provides the capabilities of its nuclear energy research infrastructure for use by DOE-NE researchers and the broader nuclear energy research enterprise. This enables INL to support the needs of industry and DOE in developing and qualification of new fuels, including fuels with enhanced accident tolerance, to support research associated with existing and advanced reactor and fuel cycle technologies.

To support this mission, INL operates core capabilities that are unique to nuclear energy R&D, including:

- Neutron irradiation in the Advanced Test Reactor (ATR), Advanced Test Reactor Critical (ATRC) Facility, and potentially the Transient Reactor Experiment and Test Facility (TREAT) (which is currently in cold standby)
- Postirradiation examination (PIE), testing, and characterization in the Hot Fuel Examination Facility (HFEF), Analytical Laboratory (AL), Electron Microscopy Laboratory (EML), Fuels and Applied Science Building (FASB), Center for Advanced Energy Studies (CAES), and Irradiated Materials Characterization Laboratory (IMCL), which is currently under construction
- Experimental fuel development (fabrication process development) in the Fuel Manufacturing Facility (FMF), FCF, Experimental Fuels Facility (EFF) (formerly the Contaminated Equipment Storage Building [CESB], HFEF, and FASB)
- Separations and waste form development in the Radiochemistry Laboratory (RCL), Central Facilities Area (CFA), Bonneville County Technology Center (BCTC), FASB, and FCF/HFEF
- Other specialized testing capabilities (e.g., nuclear facilities, hot cells, and shielded enclosures dedicated to radioisotope power-source assembly [the Space and Security Power Systems Facility {SSPSF}], testing, and other specialized tests such as those associated with testing UNF in storage configurations and tests in highly radioactive environments).

These nuclear core capabilities complement specialized laboratories and glovebox lines in the DOE complex and at universities that are capable of handling relatively lower-hazard materials. DOE-NE capabilities also support activities such as integral scale testing and severe accident, thermal hydraulics, and seismic analyses.

To support the DOE-NE mission, INL opens its facilities to laboratories and universities participating in DOE research, as well as user facilities to the broader nuclear energy research community. The specialized capabilities that qualify INL to conduct nuclear energy R&D are also available to help other federal agencies, industry, and regional partners meet their mission needs. These include core competencies in reactor technologies, fuel cycle development, and systems engineering, as well as a remote location with the safeguards, security, and safety infrastructure to manage radiological and nuclear materials and testing under normal and abnormal conditions.

While national laboratories do not compete with industry, they retain unique capabilities that are generally complex and expensive to maintain and operate. Research conducted by other agencies and industry that requires access to DOE national laboratory capabilities is generally of national importance and is conducted in cost-shared cooperation between DOE and an agency or DOE and industry (e.g., the radioisotope power system and the LWR sustainability programs). INL also provides direct contracted technical support to industry. In this instance, the research is often conducted under a Cooperative Research and Development Agreement and the research results are often proprietary to the customer.

Table 1-1 summarizes INL core capabilities that are operational, in progress, or planned, as well as the DOE-NE Roadmap objectives that would require these capabilities and current or potential other customers for these services.

Table 1-1. Idaho National Laboratory nuclear energy research and development core capabilities – operational, in progress, or planned.

		DOE-NE Objectives (1-4)				Other Users[c]			
Core Capabilities/Functionality[a]	INL Facilities[b]	1	2	3	4	NNSA	Univ.	Other Fed.	Intl. Coop
Irradiation/Capabilities									
Thermal-spectrum irradiation	ATR/ATRC	●	●	●	●	●	●	●	●
Transient irradiation	TREAT (cold standby)	●	●			●	●	●	●
PIE and Fresh Fuel Characterization Capabilities									
Receipt of irradiated fuels/materials	HFEF	●	●	●		●	●	●	●
Nondestructive examinations (physical dimensions, photography, gamma scanning, neutron radiography, eddy current evaluation, etc.)	HFEF	●	●	●		●	●	●	●
Destructive initial analysis (pin puncturing, gas pressure, fission gas sampling and analysis, void volume)	HFEF	●	●	●		●	●	●	●
Destructive examinations (cutting/sectioning, sample mounting, grinding/polishing/etching, optical microscopy)	HFEF	●	●	●		●	●	●	●
Mechanical testing of highly radioactive materials (sample preparation/machining/punching, high temperature mechanical properties; fatigue and crack growth; tensile, hardness, impact testing, etc.)	HFEF/FASB	●	●	●	●	●	●	●	●

Table 1-1. Idaho National Laboratory nuclear energy research and development core capabilities – operational, in progress, or planned.

		DOE-NE Objectives (1-4)				Other Users[c]			
Core Capabilities/Functionality[a]	INL Facilities[b]	1	2	3	4	NNSA	Univ.	Other Fed.	Intl. Coop
Destructive analyses (chemical and isotopic analysis, material characterization, fuel density, fission gas retention, crack growth rate, electro-optical examination, including SEM, TEM, FIB, etc.)	HFEF/AL/EML/FASB/CAES/IMCL (Under construction)	●	●	●		●	●	●	●
Thermal testing and microanalysis and nanoanalysis	Planned	●	●	●		●	●	●	●
Experimental Fuel Fabrication Capabilities (Glovebox lines co-located with irradiation facilities)									
Fuel containing plutonium and minor actinides that can be contact handled (ceramic, metal); small rods and targets up to dose limits	FMF	●	●	●		Material Storage[d]	●	●	●
Fuel that must be fabricated in a shielded facility, pin/rod scale	FCF/HFEF	●		●			●	●	●
HEU, LEU, thorium in small quantities (pin/plate), and characterization (irradiation assisted stress corrosion cracking capability)	FASB	●		●		●	●	●	●
LEU in larger quantities; larger scale fabrication equipment such as extrusion presses and rolling mills	EFF (formerly CESB)	●		●		●	●	●	●
Advanced Separations and Waste Forms (Hot cells and radiochemistry laboratories)									
Aqueous separations and pretreatment technologies	RCL, FASB, CFA, BCTC			●	●	●	●		●
Electrochemical separations and waste form (engineering scale)	FCF/HFEF			●	●	●	●		●
Specialized Laboratory Facilities									
Radioisotope power system assembly and test	SSPSF							●	

a. Section 1.3 provides more information about INL capabilities supporting the DOE-NE mission.

b. Facilities are operational and DOE-NE-owned unless otherwise identified.

c. Capabilities related to fuel fabrication, irradiation, fresh fuel characterization, and PIE are also available to support industry users.

d. The RERTR Program uses FMF for storage of LEU fuel.

1.4 National and Homeland Security Missions and Capabilities

INL provides unique capabilities, facilities, and expertise in N&HS that complement the nuclear mission of INL. The N&HS mission focuses on four areas:

1. Protecting U.S. critical infrastructure
2. Advancing nonproliferation technologies
3. Providing prevention, detection, mitigation, and response-readiness technologies to defeat chemical/radiological/nuclear/explosive threats

4. Manufacturing armor packages for the U.S. Army and supplying R&D and manufacturing capabilities for other national security needs.

Nuclear nonproliferation and critical infrastructure protection missions take place in facilities located across INL.

The critical infrastructure protection mission focuses on reducing cyber, wireless, and physical security risks across the nation's 18 critical infrastructure sectors (NIPP 2009). INL has unique capabilities in industrial control systems cyber security, wireless communications, electric power, infrastructure modeling, and armor and explosives technologies, which it provides to national security customers and industrial customers within the energy sector, including the nuclear energy industry. These capabilities include assessment of vulnerabilities from attacks, natural disasters, and aging infrastructure; and research, development, testing, evaluation, and implementation of protective solutions that address prevention, intrusion detection, system resiliency, and event recovery.

Each of these areas — the control systems cyber security area in particular — is relevant to advancing nuclear energy as a resource capable of meeting energy, environmental, and national security needs. The nuclear energy industry is poised to take a significant technological step from legacy analog technology to resilient digital systems in both new reactors and retrofits to the existing fleet. This migration will require significant R&D to resolve technical barriers and provide high assurance that the digital technologies employed are adequately protected against cyber attacks. Building on its extensive experience working with the energy sector, INL is a technical resource for the Nuclear Energy Institute (NEI) and NRC in security issues related to nuclear plants. Critical infrastructure protection efforts at INL have had a direct impact on the nation's energy security, and continue to be increasingly important to public and private sector asset owners.

Nuclear nonproliferation S&S provide capabilities that support multiple U.S. Government organizations, including DOE-NE and the National Nuclear Security Administration (NNSA), with direct relevance to DOE-NE Roadmap Research Objective 4 (Understand and Minimize Proliferation Risk). INL capabilities support, or can support, R&D in a number of nonproliferation areas, such as fuels that reduce proliferation risk, safeguard approaches and technologies using INL fuel cycle facilities and expertise, risk management approaches to security, and signatures and observables of proliferation activities.

INL provides lead program assistance and nuclear fuels expertise in support of the Global Threat Reduction Initiative. This program involves the removal of nuclear materials from less secure locations in the former Soviet Union and other global locations, and the conversion of reactor fuels from highly enriched uranium (HEU) to low-enriched uranium (LEU). Fuel fabrication and postirradiation capabilities at the Materials and Fuels Complex (MFC) and the irradiation capabilities of the ATR are central to the success of this initiative.

INL has world-leading capabilities in the detection of, and response to, threats involving chemical, biological, nuclear, and radiological materials, and explosives that are accessed by DOD, DHS, and NNSA for many facets of defense against weapons of mass destruction (WMD). These capabilities include:

- Research quantities of nuclear and radiological materials that are increasingly difficult to access elsewhere in the United States

- Facilities and equipment that support nuclear and radiological forensics, such as the HFEF, AL, and the mass spectrometers capable of ultratrace detection
- A large-scale explosive-test range
- An expansive site that supports testing, evaluation, training, and exercises for many of the nation's WMD response teams
- Active detection technologies developed at INL that enable the detection of illicit transport of shielded nuclear materials, and that are being developed to support new safeguards and treaty verification efforts essential to enabling the safe and secure global growth of nuclear energy.

The Specific Manufacturing Capability (SMC) Program provides facilities, equipment, and trained personnel to manufacture armor packages for the U.S. Army's Abrams main battle tank. Current plans call for the program to continue this mission with the Army until Fiscal Year (FY) 2016. Beyond FY 2016, the Army has expressed an interest in using the specialized facilities and workforce expertise at SMC for their future survivability requirements.

The use of the INL National Security Range to conduct materials and systems tests of both classified and unclassified designs is important to accomplishing the SMC Program's various missions.

1.5 Energy and Environment Mission and Capabilities

The energy and environmental stewardship mission of INL grew out of its core competencies in nuclear energy research and engineering, including capabilities in chemical, mechanical, and electrical engineering; systems engineering; and environmental science. INL applies its science and engineering capabilities to expand energy supply, improve energy efficiency, and address the environmental consequences of energy production and use. Specific areas of emphasis where INL has capabilities that are being used by DOE, DOD, and industry include energy systems development and testing; energy storage and advanced vehicle testing; advanced manufacturing and material; serving as lead laboratory for the DOE Office of Environmental Management (DOE-EM) UNF and high level waste; and assessing the environmental consequences of energy operations.

INL's energy and environmental mission is conducted in laboratories located at the INL Research Center (IRC) and other facilities within the Research and Education Campus (REC). The research infrastructure consists largely of thematically located laboratories and laboratory suites that are focused on discipline-based research activities (e.g., chemistry, biology, materials) and larger scale testing capabilities, such as the capabilities for battery testing and biomass R&D.

In the mission area of energy systems development and testing, INL supports key DOE, DOD, and industry needs associated with the renewable energy supply, primarily from the standpoint of engineering design and assessment and prototype development and testing. INL's focus is on bioenergy, specifically biofuel feedstock production and biopower applications; geothermal; novel wind; and hybrid energy systems. INL's role is to address technical barriers associated with expanding the supply of clean electricity, converting fossil carbon to energy products in an environmentally responsible manner, and creating sustainable options for production of alternative transportation fuels. INL also provides technical assistance in evaluating and addressing grid-integration challenges associated with integration of energy technologies, including grid stability and load balance, energy conversion optimization, and related issues. INL capabilities lie in systems engineering, prototype development and construction, and process simulation and controls.

On behalf of the DOE Office of Energy Efficiency and Renewable Energy (DOE-EERE), INL retains key capabilities for R&D associated with production of biomass as a feedstock for biofuels and other value added products. These capabilities support the mission of DOE-EERE as well as industry. Realizing national biofuel production goals requires development of feedstock supply systems that can provide biomass to biorefineries sustainably and cost effectively. INL's Bioenergy Program developed an engineering design, analysis model, and conceptual strategy for a feedstock supply system that can provide uniform-format lignocellolosic biomass at a commodity scale within national cost targets. Four major INL laboratories are employed for RD&D activities:

1. Biomaterials deconstruction and flowability
2. Computational engineering and simulation
3. Biomass stabilizing and upgrading
4. Feedstock process demonstration unit.

DOE-EERE recently made a significant investment in equipment for INL's bioenergy laboratories. The new equipment, along with existing tools and instruments, will be housed in the Energy Systems Laboratory (ESL), a new leased facility expected to be ready for occupancy by the end of the fiscal year.

In the mission area of energy storage and advanced vehicle testing, INL is the lead DOE laboratory for field performance and life testing of advanced vehicles and batteries. In this capacity, INL provides benchmark data to DOE for technology modeling, simulations, and R&D, as well as to fleet managers and other vehicle purchasers for informed purchase, operations, and infrastructure decisions. Functionally, INL provides testing and evaluation capabilities that help industry reduce risks associated with use of advanced systems. In addition, INL is coordinating plug-in demonstration projects with private companies and city, country, port, and environmental entities — on-board data loggers, cellular modems, and global positioning systems will be used to transmit information from vehicles to INL researchers. Applied battery research and diagnostic testing is a rapidly growing area of research within INL.

In the mission area of advanced manufacturing and materials, INL applies its DOE-NE research capabilities for advanced materials development and performance, process design, chemical separations, and advanced controls to develop new industrial processes and approaches for extracting and recycling critical materials, such as rare earth metals and platinum group metals. INL capabilities for materials and process chemistry are also being applied to develop substitutions to these critical materials. INL performs materials research focused on understanding material performance in harsh environments indicative of fossil and nuclear energy conversion systems and chemical plants. INL also applies its engineering capabilities to develop intelligent systems and controls methods used in a variety of industrial processes and energy conversion industries.

As affirmed in the 1995 Settlement Agreement between the State of Idaho, DOE, and U.S. Navy (State of Idaho 1995), INL is the lead laboratory for DOE's UNF management. In this role, INL conducts R&D and testing of treatment, shipment, and disposal technologies for all DOE-owned UNF. This role was later expanded to include DOE high-level waste. In this capacity, INL supports DOE efforts to solve technical issues associated with packaging, storage, transportation, and disposition of these materials. Research includes work to establish the technical foundation for acceptance of materials at a future repository or storage system, developing disposition pathways for challenging materials, materials testing, and nondestructive evaluation of cask and system performance. With this history, INL retains unique infrastructure and physical assets and research capabilities, including instrumented casks for demonstrations involving storage of UNF. This expertise also supports DOE-NE efforts to establish the technical basis for long-term storage of UNF within the fuel-cycle research area (DOE-NE Roadmap Research Objective 3).

INL has the only cold crucible melter prototype in North America in an integrated testbed. This technology is being used successfully to evaluate technologies for vitrifying high-level waste streams and low-activity waste streams produced at the Savannah River Site and the Hanford Reservation. This system may also be used in the future to evaluate vitrification of radioactive waste streams at INL.

Maintaining and enhancing the capability to assess the environmental consequences of energy production and use is essential to the safe management of INL operations, and provides industry and decision makers with the means to understand and mitigate associated consequences. INL maintains capabilities associated with wide area monitoring, subsurface geoscience, radiological and chemical systems (trace to bulk) monitoring and analyses, and others. These capabilities and associated physical assets are necessary for present operations and long-term stewardship of the laboratory; however, they are also applied to other programs of national significance. Ecosystem and regional-level analysis tools based on Geospatial Information Systems and system-dynamics modeling techniques are being developed to analyze energy and natural resource development and use. Key capabilities that support INL operations include low-level radiochemistry and chemical systems laboratories and low-level radiation measurements and detection. These assets support the multiprogram missions of INL (e.g., Environmental Protection Agency, N&HS, and DOD). For example, researchers are developing advanced environmental forensics capabilities to detect trace levels of specific chemicals and other small changes in the environment.

1.6 Idaho Cleanup Project

The Idaho Cleanup Project (ICP) ensures the safe, informed, and judicious use of the INL Site by multiple generations following remediation through decisions and actions that: (1) protect human health and the environment from residual contamination; (2) conserve ecological and cultural resources; and (3) respond to regulatory, political, and technological changes.

The project involves the safe environmental cleanup of the INL Site, which was contaminated by conventional weapons testing, government-owned research and defense reactors, laboratory research, and defense missions at other DOE sites.

The 7-year, $2.9 billion cleanup project, funded through DOE-EM, focuses on: (1) reducing risks to workers, the public, and the environment; and (2) protecting the Snake River Plain Aquifer, the sole drinking water source for more than 300,000 residents of eastern Idaho. Appendix C discusses this project in detail.

1.7 Assumptions

INL has based its master planning effort on capabilities necessary to achieve the desired ten-year end state. The following planning assumptions apply to this TYSP:

1. INL will continue to manage its infrastructure as a shared national resource and expand the user facility concept to encompass broader capabilities beyond fuels, materials, and irradiation test and examination services.

2. The number of uncleared, onsite visitors and collaborative partners will grow, increasing the need for unrestricted access to experimental capabilities in an open campus environment as much as possible within the REC (e.g., CAES, ESL, and the planned Research and Education Laboratory [REL]).
3. A key strategic focus for INL is the acquisition of advanced instruments and tools to enable a better understanding of nuclear fuels and materials performance in their nuclear environment at the nanoscale and lower. The science-based approach to nuclear energy development is critical to the development of innovative fuels and materials required for tomorrow's nuclear energy technologies.
4. Contingent on the availability of funding, INL will accelerate completing the disposition of fast reactor fuel using electrochemical processing to enable greater access by DOE-NE to FCF and HFEF.
5. INL will continue operating SSPSF for final assembly and testing of radioisotope power systems. DOE will focus on using existing facilities, including ATR, to support Plutonium-238 (Pu-238) production. Program-specific National Environmental Policy Act (NEPA) documentation and decisions may be required.
6. INL will continue its enduring role of providing its expansive site and facilities that support testing, evaluation, training, and exercises for many of the nation's WMD response teams and critical government national security programs.
7. Federal program decisions (e.g., resumption of transient testing, advanced PIE capabilities, and nuclear material consolidation) will be made through the NEPA process. NEPA analyses initiated by other INL tenants may require additional infrastructure projects not yet identified in this plan.

1.8 Transforming INL Capabilities to be User Facilities

INL views its unique nuclear R&D capabilities and infrastructure as national assets available to universities, industry, national laboratories, international research organizations, and other federal agencies. DOE-NE seeks to involve the best experts from across the nuclear energy community in its research, including national and international partners from the government as well as private and education sectors. INL seeks to offer its capabilities and related nuclear science and engineering infrastructure to these experts to advance DOE-NE research goals.

Through the National Scientific User Facility (NSUF), INL offers outstanding irradiation and PIE capabilities to help researchers explore and understand the complex behavior of fuels and materials. In 2007, DOE designated ATR and associated PIE capabilities at MFC as user facilities that provide universities, national laboratories, industry, other federal agencies, and international research institutions with greater access. The NSUF also includes educational initiatives aimed at preparing nuclear science and engineering students to conduct nuclear energy research and experimentation. As a program, it also encourages teaming among universities, industry, and national laboratories.

NSUF grants university-led scientific groups access to ATR, ATRC, the sample library, and facilities with PIE capabilities for work on major projects. In addition, NSUF allows access to any researcher for small-scale, rapid turnaround projects and provides competitive pricing for industry groups and other federal agencies.

The research sponsored and funded by NSUF links directly to DOE-NE mission accomplishments, as well as to the Nuclear Energy University Program, which is administered by CAES. In addition, working through a Cooperative Research and Development Agreement with the Electric Power Research Institute (EPRI), the NSUF is enabling industry to use INL capabilities. The NSUF Program, located within the CAES building, is prototyping the laboratory of the future, serving as a gateway to INL and expanding opportunities for access to its broader capabilities.

To achieve this vision of a laboratory-wide user facility, INL proposes specific steps to enhance the accessibility of INL capabilities to outside users. These include creating new laboratory space within the in-town REL, a leased facility planned for completion by 2014. This facility will enable visiting researchers to collaborate with research underway at MFC and gain firsthand experience with advanced instruments using nonradioactive research materials. Targeted enhancements will also build on existing capabilities.

In FY 2012, management and funding of the NSUF was transferred from the Idaho Facilities Management (IFM) Program to the DOE Nuclear Energy Enabling Technologies Program.

1.9 Delivering the Ten-Year Vision

INL seeks to meet the needs of DOE-NE cost effectively and efficiently, and to make its capabilities available for national and international nuclear energy development. Science-based research primarily supporting the DOE-NE mission is the focus of INL nuclear capabilities; however, these capabilities are also relevant to the other mission areas (e.g., nuclear and energy security). The infrastructure investment strategy to deliver the ten-year vision is focused on:

- Creating a sustainable future by employing a comprehensive strategy to provide high-performance, sustainable facilities while enhancing INL capabilities.
- Sustaining existing distinctive capabilities by investing in advanced instruments and tools, replacing obsolete equipment, and maintaining and repairing existing capabilities to sustain their operability.
- Building on core and enabling capabilities to create world-leading capabilities supplemented with national and international partnerships. Pursuing new capabilities while using as much of the existing research infrastructure as possible before new infrastructure is proposed, based on a realistic assessment of needs, costs, and options.
- Transitioning INL to a user facility model and open campus environment, strengthening collaboration and the ability of INL to develop and demonstrate innovative energy technologies.

This strategy will require investment in revitalization and sustainment of existing research capabilities and supporting infrastructure, as well as the acquisition of several new capabilities and facilities. Other capabilities and facilities have been approved, as necessary, for mission accomplishment, with alternatives analysis underway to inform the acquisition strategy. Figure 1-1 provides a summary of the timeline for significant new capabilities and facilities envisioned over the next 10 years.

Infrastructure improvements or capability enhancements that support DOE-NE mission accomplishment are funded by direct programmatic funds, by indirect investment (e.g., IGPP and IGPCE), or by the IFM Program. For non DOE-NE customers (i.e., the SMC Program), improvements and enhancements are funded by the customer or indirectly, with cost recovery.

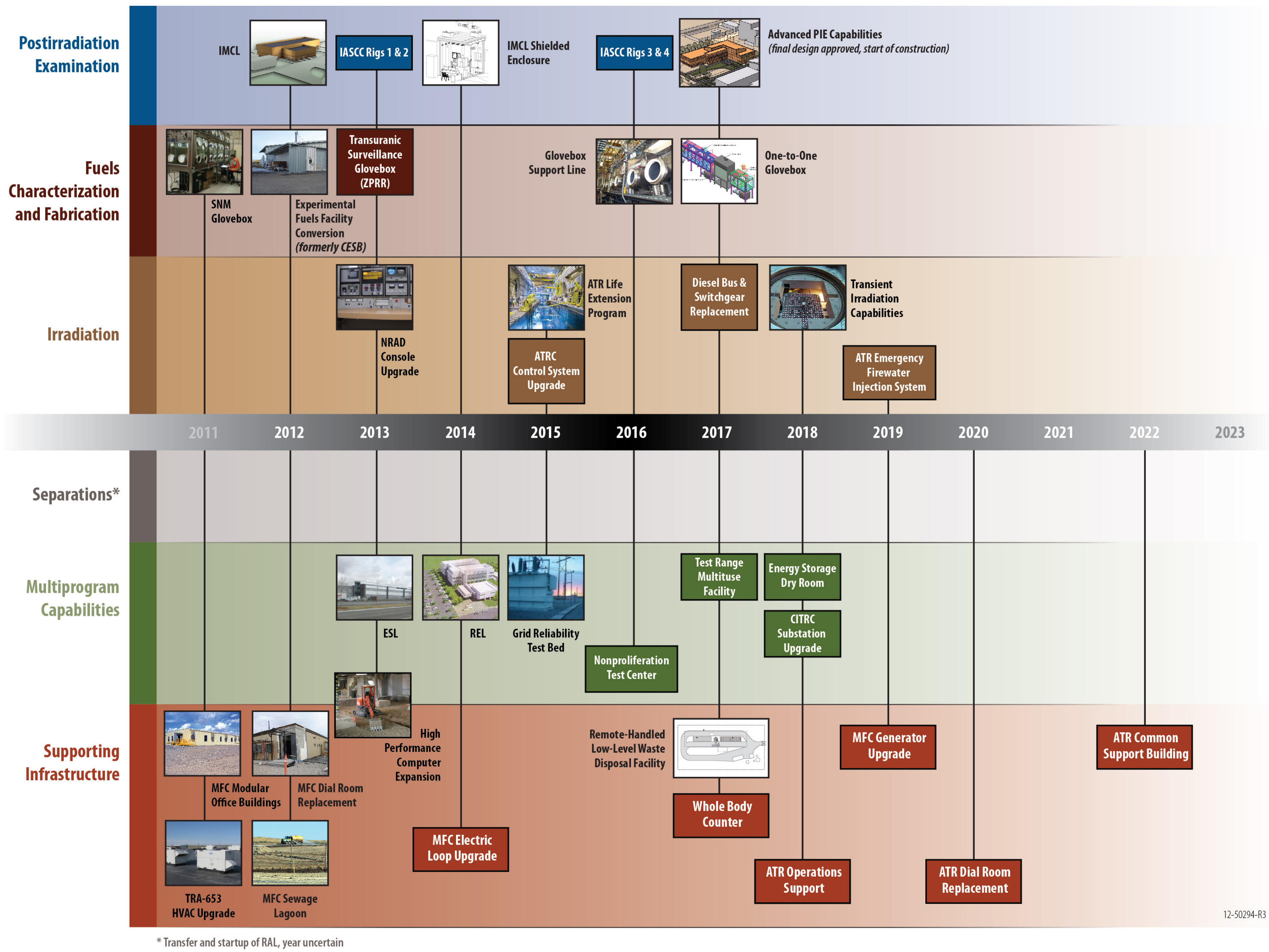

Figure 1-1. Proposed timeline for establishing the new end-state core capabilities.

2. TEN-YEAR END-STATE

The proximity of the ATR to INL PIE and characterization capabilities, co-located glovebox lines for experimental fuel development, and co-located separations research facilities provide the foundation for national nuclear energy research at INL. With targeted investments, these facilities, along with other facilities supporting (or capable of supporting) future needs for scale-up testing and demonstrations, should meet the needs of DOE-NE and nuclear energy R&D for years to come.

For more than 5 years, INL has advanced its research capabilities, beginning with ATR and continuing with MFC. There is major emphasis at MFC on purchasing state-of-the-art PIE equipment and fresh fuel-characterization equipment, and making modifications to FMF for ceramic fuel fabrication work. The resulting suite of capabilities will provide DOE, industry, other federal agencies, and researchers with the tools required to support nuclear energy development for expansion of nuclear energy as a critical baseload power source and to support N&HS needs.

INL: The National Nuclear Laboratory Ten-Year End-State

- *ATR meeting the neutron irradiation needs of the nation*
- *World-class fuel fabrication and characterization capabilities*
- *World-leading PIE capabilities*
- *Meeting transient testing needs of the United States and international research community*
- *Laboratory and integrated laboratory-scale testing of other advanced separations technologies, with planning for engineering-scale demonstration*
- *Continued engineering-scale electrochemical separations and waste-form development*
- *Optimized user facility infrastructure to support resident and visiting researchers.*

2.1 Land and Space Planning

INL land and space planning is a critical strategic function for achieving the long-term objective of transforming INL to meet DOE national nuclear R&D goals. The major objective for land and space utilization is to consolidate and collocate like activities and forecast future mission needs. The guiding principles for campus planning are to provide: (1) a collaborative environment to foster scientific innovation, (2) flexible and modern facilities that are reconfigurable to meet changing research needs, and (3) environmentally and operationally sustainable facilities.

INL space is managed as a strategic institutional asset and not as a collection of assets that belong to individual organizations. Strategic planning builds on campus strengths. Investments are being made to modernize; improve aesthetics; enhance campus environments; attract and retain researchers; and foster collaboration, communication, and connectivity both internally and with outside experts.

2.2 Idaho National Laboratory Campuses

Activities associated with nuclear energy security and other energy security missions take place at several locations at INL. Nuclear energy R&D capabilities are consolidated around three main campuses: REC, ATR Complex, and MFC (Figure 2-1).

Each campus supports specific missions based on capabilities and functions. For instance, the ATR Complex provides thermal irradiation capabilities;

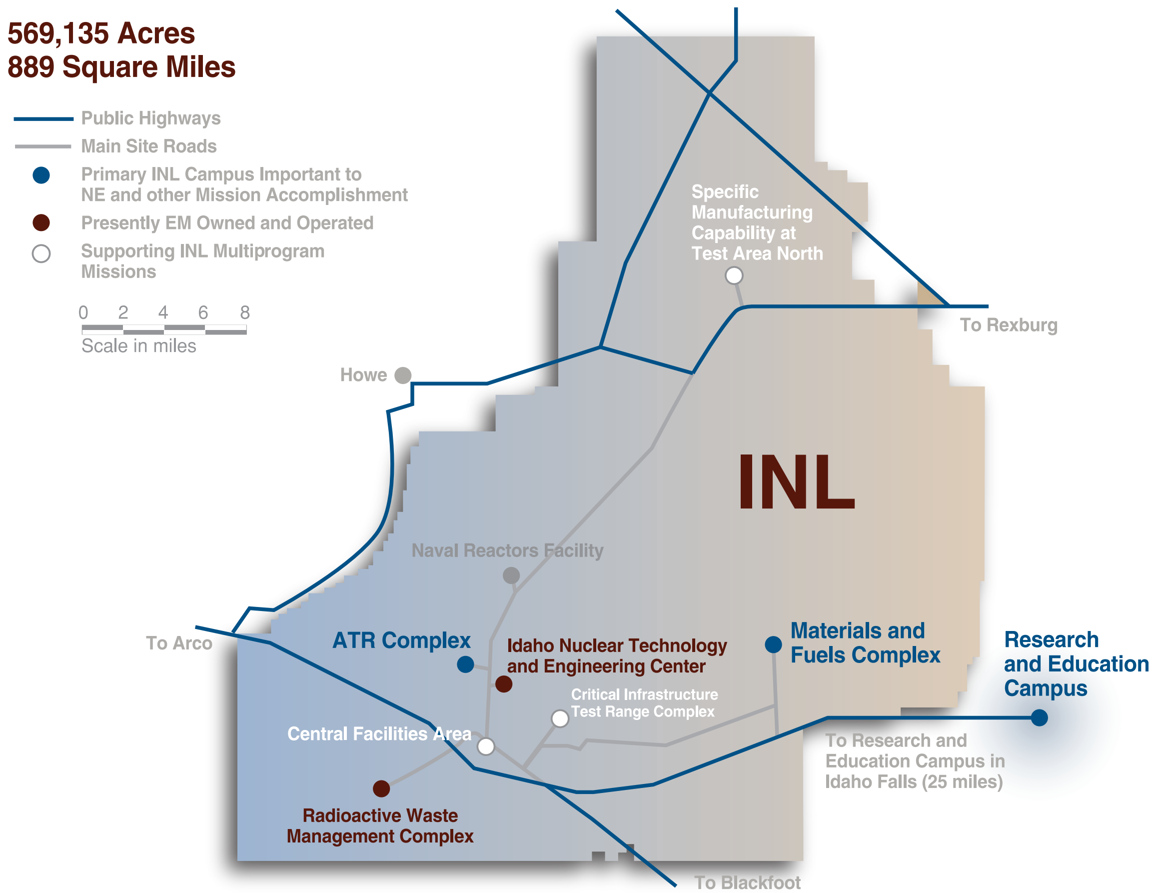

Figure 2-1. Idaho National Laboratory campuses.

MFC provides shielded hot cells for handling highly irradiated materials and glove boxes for handling special nuclear material (SNM); and REC provides non-radiological laboratories and administrative facilities. N&HS has test ranges on INL, and REC focuses on clean energy systems development and environmental stewardship research, as well as secure spaces to support N&HS programs.

2.2.1 REC

The REC campus (Figure 2-2) is the gateway to INL and includes diverse laboratories supporting research in nuclear energy, N&HS, and energy and environment. Through strategic campus planning efforts, INL has redefined the look of the REC campus to be more conducive to collaboration with business and university partners while providing the latest in laboratory and office efficiencies. Since 2005, the campus has undergone a transformation. The REC has been zoned and buildings repurposed to affect the consolidation and collocation of activities from outlying and substandard leased spaces to the main REC campus area.

The REC is home to a range of research capabilities and facilities as well as INL administrative functions. The Engineering Research Office Building (EROB) is one of the main office buildings. It also houses the INL High-Performance Computing (HPC) Data Center (3,700 ft^2). Built in 2007, the data center provides an essential capability for modeling and simulation that supports multiple program missions. The current data center

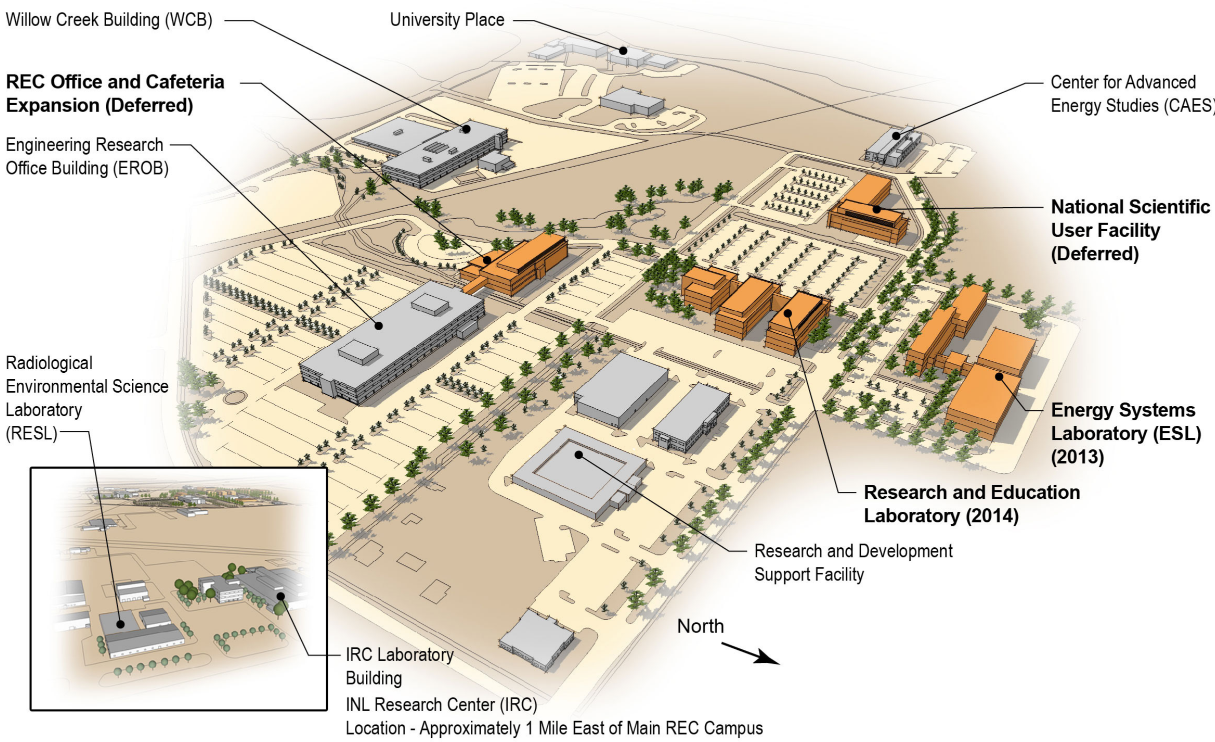

Figure 2-2. Research and Education Campus.

is running at 90% capacity. In 2011, INL installed a supercomputer known as "Fission." With the rapid advancements in supercomputing technology, INL anticipates the need to further enhance its capabilities by 2014, and is considering a 6,000-ft^2 expansion to provide space for the anticipated increase in demand.

This data center also hosts the Idaho Computing Consortium, composed of INL, Boise State University, Idaho State University (ISU), and the University of Idaho — all of whom are partners in the CAES. As part of the agreement, Boise State University recently installed a new supercomputing resource. The University of Idaho and ISU are also expected to install systems in the near future.

The REL (148,000 ft^2), currently under construction, will be the energy research and NSUF high-performance gateway to INL. It will offer state-of-the-art laboratory and office space for INL scientists and engineers, as well as an auditorium. This facility will consolidate laboratories and functions and provide opportunities to centralize key research functions at REC. Developed under a third-party lease arrangement, REL is planned for occupancy and operation in FY 2014.

NSUF will obtain dedicated laboratory and office space within REL earlier than originally planned rather than waiting for the envisioned NSUF stand-alone facility. INL deferred the decision to pursue a stand-alone NSUF facility because REL will provide many of the necessary NSUF capabilities. Expansion of the REC office and cafeteria, near EROB, is deferred as well.

REC also includes IRC (280,000 ft^2), a collection of laboratories that support advanced research, process development, and applied engineering in biology, chemistry, metallurgy, robotics, materials characterization, modeling and computational science, physics, and high-temperature electrolysis production of hydrogen for nuclear and non-nuclear energy applications. Its large footprint, including high-bay areas for small-scale pilot plant research, enables INL to advance basic research and bench scale concepts into viable, integrated systems (e.g., hybrid energy systems) for DOE-NE and other customers.

The ESL, a new 91,000-ft^2 laboratory and office facility, is slated for occupancy and operation in FY 2013 and will complement and expand current capabilities at IRC. Built under a third-party lease arrangement, this new facility will be the largest new research facility since construction of IRC in the mid-1980s. It will house expanded capabilities needed to support growth in bio-energy feedstock processing, advanced battery testing, and hybrid energy systems-integration research. Several of the research laboratories located at and around IRC will be relocated to ESL. Vacated IRC laboratory and office space will be repurposed based on mission priorities.

The CAES (55,000 ft^2), a $17 million research facility partially funded by the State of Idaho, opened in 2008. A collaborative partnership between Idaho's public universities and INL, CAES (along with the NSUF Program) serves as a gateway to research capabilities of INL and a center for cross-organizational and peer-to-peer technical collaboration. CAES houses both laboratory and office space, including state of-the-art materials science laboratories, imaging equipment featuring an Atom Probe, and a four-wall computer-assisted immersive virtual environment. In addition, other laboratories are dedicated to actinide sciences, analytical chemistry, and carbon management. These capabilities are made available to the CAES partners through collaborative research activities in nuclear science and engineering, bio-energy, carbon management, energy efficiency, and advanced materials.

The REC also includes three facilities dedicated to the INL N&HS mission, acquired since 2005 to house researchers and program capabilities requiring secure locations for RD&D. Several other REC facilities, including EROB, also support this mission.

The DOE has also completed a new Radiological and Environmental Science Laboratory (RESL) located at IRC. It is a critical resource for DOE and the Office of Health, Safety, and Security. INL's focus at RESL is primarily in analytical chemistry, radiation protection, and as a reference laboratory for numerous Performance Evaluation Programs. The RESL provides technical support and quality assurance metrology, which is directly traceable to the National Institute of Standards and Technology.

2.2.2 ATR Complex

Located 45 miles west of Idaho Falls, ATR is one of the world's most advanced materials test reactors (Figure 2-3). A low-temperature, pressurized, water-cooled reactor for steady-state irradiation, ATR is fully subscribed meeting the needs of DOE-NE, Naval Reactors (NR), NNSA, and many other research users. Other facilities in the complex include the associated ATRC, Test-Train Assembly Facility (TTAF), Radioanalytical Chemistry Laboratory, and Radiation Measurements Laboratory.

The ATR has historically supported fuel development for the Navy's nuclear propulsion program. Over the last decade, its use has expanded into other mission areas that include particle fuel and graphite materials development for the high-temperature gas reactor, minor actinide-bearing fuel development, and low-enriched fuel for the NNSA Reduced Enrichment for Research and Test Reactor (RERTR)

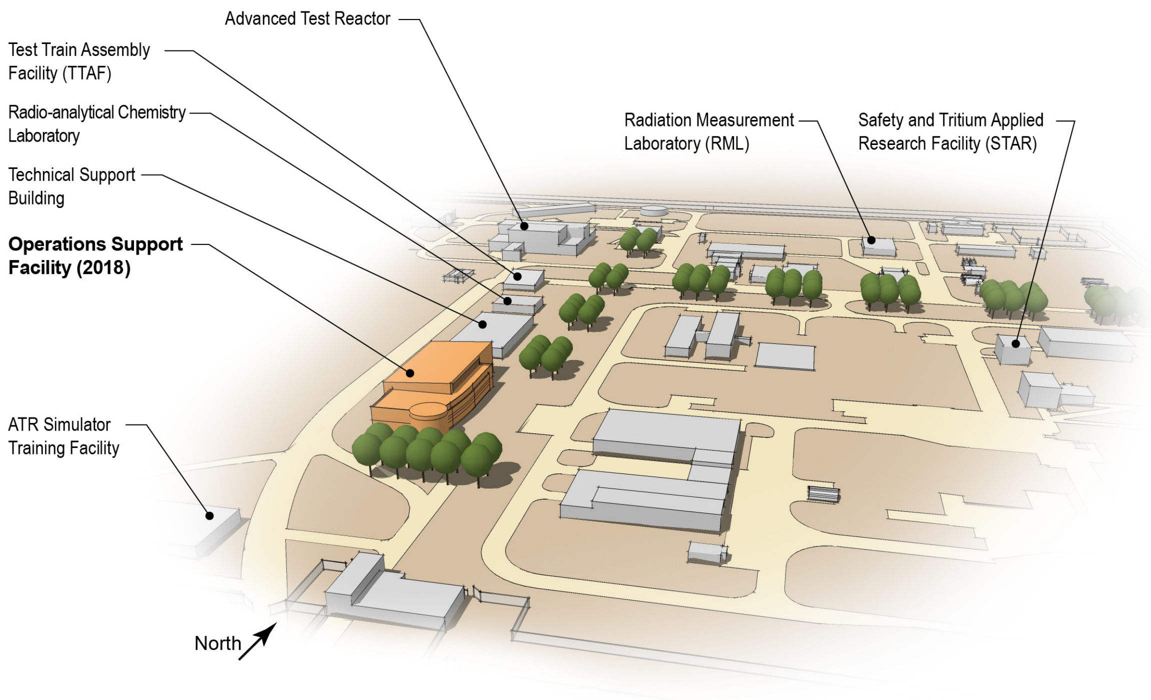

Figure 2-3. Advanced Test Reactor Complex.

Program, which is part of the Global Threat Reduction Initiative. The ATR is also one of two test reactors suitable for future production of Pu-238.

In 2008, the ATR Life Extension Program completed the assessments necessary to improve the material condition and reliability of ATR. The ATR Life Extension Program is now pursuing those previously identified activities that will provide ATR with long-term sustainability while substantively improving its operational reliability. The Life Extension Program is a 10-year initiative aimed at making specific improvements to ATR. The ATR will continue to implement ongoing maintenance and repair activities and the core internals change-out that occurs approximately every 10 years. The next core internals change-out is planned for FY 2015.

Decontamination and decommissioning of the Materials Test Reactor helped facilitate the transformation of the ATR Complex. With the removal of this reactor and ancillary facilities, INL completed the new Technical Support Building (TSB; 16,400 ft^2) in 2009, which provides essential office space for ATR engineers and support staff.

Also in 2009, INL completed both the TTAF (4,483 ft^2), containing high precision equipment for experiment test-train assembly, and the replacement Radiation Measurement Laboratory (6,929 ft^2). A replacement Radioanalytical Chemistry Laboratory (4,600 ft^2) began operation in FY 2010. A second operational support facility is proposed for 2018.

2.2.3 MFC

The MFC, located 28 miles west of Idaho Falls, is the center of fuel fabrication, transient testing, and PIE testing at INL (Figure 2-4). It is home to the TREAT facility (currently in cold standby); the Neutron Radiography Reactor (NRAD), a Training, Research, Isotopes, General Atomics (TRIGA) reactor used for neutron radiography; and hot cell facilities used for PIE and advanced separations and waste form research such as HFEF, FCF, and FASB. MFC also houses analytical laboratories and an EML for isotopic and chemical analyses and nanometer-scale analysis of material samples from its research facilities and collocated fuel fabrication glovebox lines (e.g., FMF and FASB). The MFC operates SSPSF for final assembly and testing of radioisotope power systems.

In FY 2010, INL brought online the new RCL (8,200 ft^2) at MFC to support the growing need for radiological research space.

In FY 2011, INL completed a 13,500-ft^2 modular office building to provide interim space and is now evaluating office space needs at MFC over the next 5 to 10 years. INL has deferred its planned TSB project due to the potential decline in near-term space demand. Alternatives to constructing TSB have recently emerged with the opening of space at REC and the potential to add offices if an advanced PIE capability were to be built. New office space continues to be considered as a future need in the MFC campus plan.

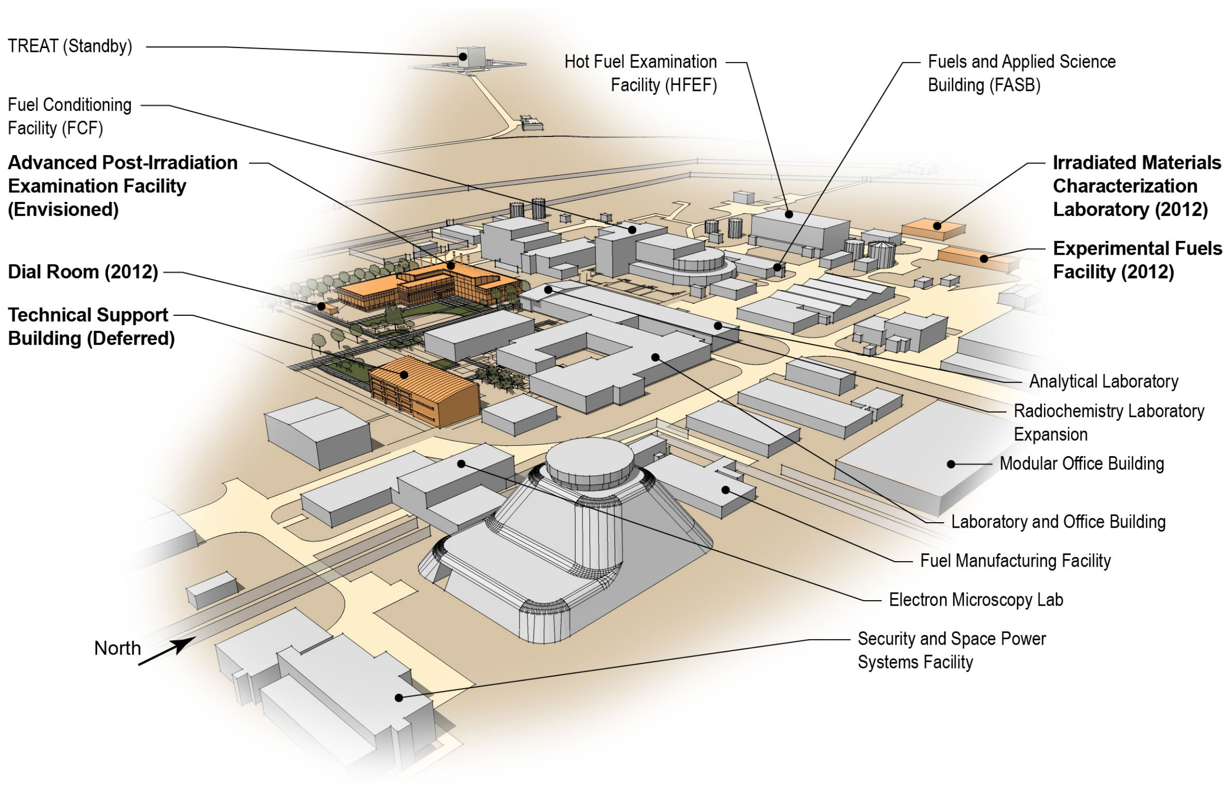

Figure 2-4. Materials and Fuels Complex.

INL will complete construction of IMCL (12,000 ft^2) for fuels and materials characterization in FY 2012. IMCL will be a prototype laboratory that will inform decisions about future PIE needs. It will be a Hazard Category 2 nuclear facility that is flexible and reconfigurable, and designed and constructed to support a broad range of research in irradiated and nonirradiated materials.

Also in 2012, INL renovated EFF (formerly CESB) to house scientific R&D instruments dedicated to fuel fabrication R&D.

INL is considering an addition to SSPSF to enhance storage capabilities for radioisotope power system units for both NASA and national security customers. This addition would complement facility upgrades completed in 2012, which include a new power system fueling glovebox, the multipurpose fueling glovebox, and the second thermal vacuum test chamber equipped with a liquid nitrogen cooling capability. These upgrades will provide greater flexibility and surge capacity for fueling multiple units in a short timeframe.

Completion of the new MFC Dial Room Equipment Replacement Project in 2012 established continuity and reliability of service with new telecommunications hardware and software. INL also initiated an electrical power upgrade project, the first of several power upgrades to MFC. The MFC Sewage Lagoons Upgrade Project will also be completed in FY 2012.

Several years ago, MFC sustainment activities focused on implementing the upgraded Documented Safety Analyses (DSAs). It will continue with materials condition assessments targeting nuclear facility systems and critical infrastructure support systems. The assessments will support ongoing maintenance and repair activities associated with MFC facilities and equipment.

2.3 Balance of Site

Eight facility areas are located on the INL Site, which occupies a 569,135-acre expanse of otherwise undeveloped, high-desert terrain. Buildings and structures are clustered within these facility areas, which are typically less than a few square miles in size and separated by miles of open land. The CFA, located centrally on the INL Site, is the main site-wide services and support area for the two main DOE-NE R&D campuses located on the desert. The primary non-DOE-NE facility areas include the Idaho Nuclear Technology and Engineering Center (INTEC), Radioactive Waste Management Complex (RWMC), and Naval Reactors Facility (NRF). Other, smaller areas include the Critical Infrastructure Test Range Complex (CITRC) and SMC.

INL depends on the DOE-EM owned and operated RWMC for disposal of remote-handled low-level waste (LLW) from continuing operations. This is expected to continue until the Subsurface Disposal Area (SDA) at RWMC is full or until it must be closed in preparation for final remediation, approximately at the end of FY 2017.

INL is constructing a replacement remote-handled LLW disposal facility, consisting of up to 400 below-grade precast concrete vaults. The Remote-Handled LLW Disposal Facility is planned as a Hazard Category 2 nuclear facility designed to emplace and dispose of INL remote-handled LLW for a minimum of 20 years. Critical Decision (CD)-1 for the project was granted July 13, 2011. Following close coordination with the Department of Energy Idaho Operations Office (DOE-ID), a design-build-operate Request for Proposal and performance specification was issued January 12, 2012. Startup of this facility is planned for FY 2018. Contact-handled LLW is disposed of offsite.

2.3.1 CFA

Sitewide area infrastructure consists primarily of roads, railroads, power distribution systems, communication systems, and utility systems that serve and connect facility areas. Support services provided from CFA include medical, fire suppression, transportation, security, communications, electrical power, craft support, warehousing, and instrument calibration (Figure 2-5). A small and steadily increasing amount of space at CFA supports R&D for N&HS, and housing test-bed support facilities and materials testing laboratories.

While some N&HS work takes place at REC, capabilities also exist at CFA and other locations on the INL Site, which have advantages such as remoteness and a desirable, quiet radiofrequency spectrum. These characteristics provide the basis for supporting a NSUF for wireless test bed capabilities.

INL is developing a consolidation and revitalization plan for CFA to provide support space for the N&HS missions. It will also promote space-management and land-use initiatives directed toward improving space utilization and reducing cost by consolidating and co-locating office and laboratory space.

2.3.2 CITRC Area

The CITRC area supports INL N&HS missions, including program and project testing (i.e., critical infrastructure resilience and nonproliferation testing and demonstration). Activities that take place at the CITRC area include wireless test-bed operations, power line and grid testing, unmanned aerial vehicle testing, accelerator testing, explosives detection, and radiological counter-terrorism emergency-response training. A future electric-grid test bed is planned at INL near the CFA/CITRC area, including a new reconfigurable test substation and several miles of transmission and distribution lines.

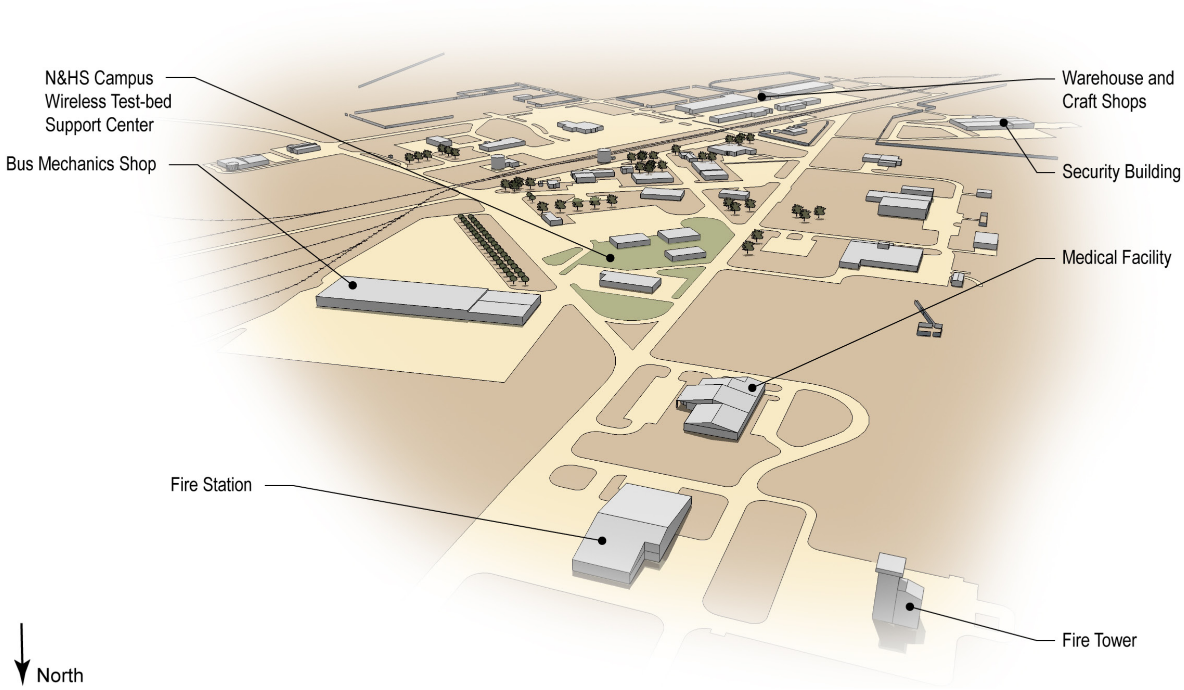

Figure 2-5. Central Facilities Area.

2.3.3 SMC

Since 1984, SMC has been the lead manufacturer of armor packages for the U.S. Army's Abrams main battle tank. Located at the north end of the 890-mi² INL Site, this 25-acre armor manufacturing complex provides 320,000 ft² of secure floor space, complete with state-of-the-art equipment and a knowledgeable and security-cleared workforce. Capabilities at the SMC complex include light and heavy metal rolling, metal fabrication equipment, in-house engineering and quality departments, a state-of-the-art metallurgical laboratory, and experienced manufacturing support crafts (e.g., electrical, mechanical, and landlord).

With these extensive resources, SMC can provide independent technical evaluations and solutions to manufacturing, engineering, and material science challenges for a variety of programs and customers.

2.3.4 INTEC

Currently owned and operated by DOE-EM, INTEC operated until 1992 to recover HEU from UNF from government reactors and convert the resulting liquid high-level waste into a more stable, solid granular material suitable for long-term storage (Figure 2-6). Today, with environmental cleanup of INTEC nearing completion, most of these facilities are, or will be, surplus to ICP and the DOE-EM mission.

INL is refurbishing the Material Security and Consolidation Facility (CPP-651), previously known as the Unirradiated Fuel Storage Building, and several surrounding buildings for the relocation of LEU disposition product from a sodium-bonded spent nuclear fuel campaign. While several of the other INTEC facilities are candidates for reuse to support DOE-NE and/or the multiprogram mission needs

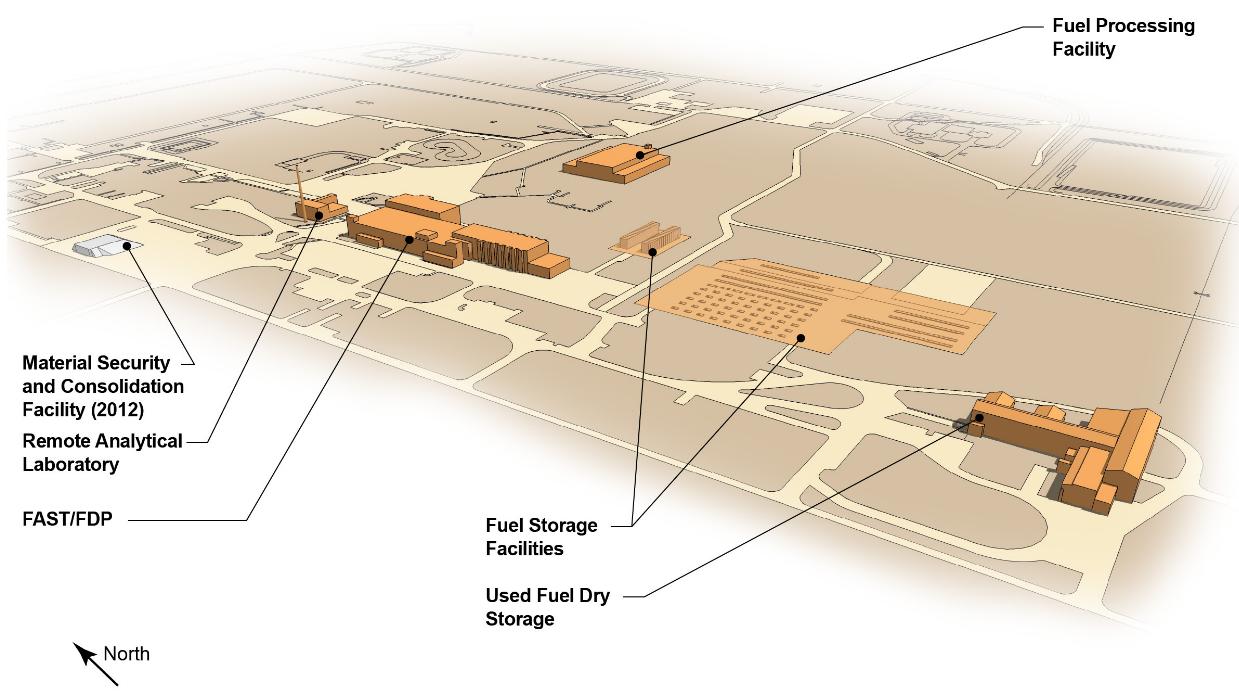

Figure 2-6. Idaho Nuclear Technology and Engineering Center.

of INL, recommendations to transfer facilities from DOE-EM to DOE-NE will necessitate the development of a business case analysis that considers utilization and life cycle costs to help inform a future decision.

For example, a business case analysis currently underway could inform a decision on the Remote Analytical Laboratory (RAL), a 13,000 ft^2 facility designed for a wide range of organic, inorganic, and radio-analytical capabilities, and one of the most modern hot cells in the DOE complex. The RAL potentially offers versatility to meet near-term and continuing needs for radiochemistry work and longer-term needs for laboratory and bench-scale testing of separations technologies. It previously served as a test bed for high-level waste centrifugal technology development. The RAL is a conventional chemical laboratory with an air atmosphere analytical hot cell with a waste load-out cell.

Another capability located at INTEC that may be considered for future reuse by INL is the UNF pool at the Fluorinel Dissolution Process and Fuel Storage (CPP-666) Facility, which is needed for storage of ATR UNF. Along with fuel storage, the Fuel Dissolution Process Cell provides shielded capabilities with manipulators that could be used in the future to investigate and test advanced separations technologies, conduct used fuel storage studies, and develop unique monitoring and inspection systems for used fuel storage. Finally, the CPP-603 facility and the 2707 pad would allow capability to extract fuels, reseal casks, and store casks for extended storage studies.

2.4 Idaho National Laboratory Strategic Sustainability

INL has institutionalized a program to implement sustainable practices in facility design and operation, procurement, and program operations that meet the requirements of Executive Order (EO) 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*; EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*; the *DOE Strategic Sustainability Performance Plan* (SSPP; DOE 2011); and the *FY 2012 INL Site Sustainability Plan* (SSP; DOE ID 2012).

The INL Sustainability Program seeks to achieve measurable and verifiable energy, water, and greenhouse gas reductions; responsible use and disposal of materials and resources; and cost-effective facilities, services, and program management. The goal of the INL Sustainability Program is to promote economic, environmental, and social sustainability for INL, helping to ensure its long-term success and viability as a premier DOE national laboratory.

The sustainability program strategy is focused on leadership to reduce greenhouse gas emissions by changing how and what resources are consumed (e.g., energy, water, fuel, electronics, and other consumables) and, thereby, achieve DOE's sustainability goals for INL. The strategy focuses on:

- Changing behaviors as consumers
- Investing in internal R&D to deploy innovative solutions to sustainability
- Leveraging third-party investments to adopt new and/or proven sustainable technologies and to recapitalize infrastructure
- Partnering to demonstrate and deploy innovative sustainable practices, leveraging scientific expertise from CAES
- Committing to sustainable technologies in purchasing and acquisition decisions.

Adapted from the private sector, INL strategic leadership focuses on four key sustainability lenses:

1. Balance — Developing solutions that effectively address competing interests
2. Efficiency — Using resources as efficiently as possible to save money and respect our planet's limits
3. Connection — Understanding the big picture and the interrelationships between issues
4. Generational — Anticipating how future generations will view the actions we take (or don't take) today.

INL has a detailed strategy and plan captured in the SSP, which was developed in accordance with DOE Orders and the SSPP. A full description of the INL Sustainability and Energy Management Program, and its associated goals, progress, and requirements, including additional details on how INL plans to implement the Sustainability Program, are found in the SSP (DOE-ID 2012). The annual update to the SSP is prepared in accordance with DOE Order 436.1, *Departmental Sustainability*. INL continues to mature its comprehensive leadership strategy to address the execution gaps identified in Appendix D by refining the investments needed to meet its goals.

3. IDAHO NATIONAL LABORATORY CORE CAPABILITIES

INL maintains core nuclear energy R&D capabilities in irradiation testing, PIE, fuel fabrication, advanced separations, waste form development, and final assembly and testing of radioisotope power systems. These capabilities require the use of reactors, hot cells, and other specialized laboratory facilities that are able to support research using highly radioactive materials; they are essential to DOE-NE research and accessible to the broader nuclear energy R&D community. Therefore, INL is proposing a strategy of incremental investments, building on the substantial past investments in research facilities with advanced tools and instruments that are unique to DOE-NE R&D and that distinguish INL as a national center for reactor and fuel cycle R&D.

Part of this strategy is to retain space and capabilities within the new CAES facility to enable INL and visiting researchers to collaborate more effectively with research taking place at MFC. INL also maintains capabilities in critical infrastructure protection; nuclear nonproliferation; energy, environment, and fundamental research; and engineering.

This section identifies existing MC capabilities and plans to enhance, revitalize, or sustain capabilities over the next decade. Capability gaps and planned activities to close gaps are addressed in Section 5.

3.1 Steady-State Irradiation

3.1.1 Thermal-Spectrum Irradiation

The ATR is a material test reactor with thermal neutron fluxes of 1×10^{15} neutron/cm^2-sec and maximum fast (E>0.1 MeV) neutron fluxes of 5×10^{14} neutrons/cm^2-sec. These fluxes, combined with its 77 irradiation positions, make ATR a versatile and unique thermal irradiation facility.

The reactor accommodates static, sealed capsule tests with passive instrumentation, tests with active instrumentation for measurement and control of specific testing parameters, and pressurized water loops. A hydraulic shuttle irradiation system installed in FY 2008 allows for short-duration irradiation tests. A TTAF (4,200 ft^2) that opened in FY 2009 supports the precision work associated with experiment assembly for insertion in the reactor.

The ATRC, located in an extension of the ATR canal, is used to evaluate prototypical experiments before they take place so that researchers can understand the effects on ATR core reactivity. The ATRC is a full-size, low-power, pool-type nuclear replica of ATR. Its normal operating power level is approximately 100 W, with a maximum power rating of 5 kW. INL plans a maintenance upgrade to the instrument and control system of this low-power reactor.

Improving ATR capabilities and operational reliability has been an INL priority since the beginning of the current M&O contract. In FY 2011, in response to the Fukushima nuclear plant accident, DOE allocated additional funds to accelerate planned defense-in-depth retrofits related to the primary coolant system, heat exchanger supports, and auxiliary canal fill system.

Establishing the ATR NSUF brought a sustained focus on enabling high-quality experiments through improved experiment design, control, and instrumentation to achieve capabilities that compare to, if not exceed, top test reactors worldwide. Improved instrumentation is a key aspect of this capability, and the continual deployment of new sensors at ATR enables better experimental control and data acquisition from important scientific investigations, such as embrittlement behavior of pressure vessel steels, irradiation effects on the degradation of core structural materials, and demanding tests on fuel performance limits. INL is developing these new instrumentation capabilities in conjunction with new test capabilities (e.g., an additional pressurized water loop).

The current phase of in-core instrumentation work will conclude within 5 years. At that point, instrumentation research will evolve to a more innovative program that considers advanced technologies for higher resolution data capable of detecting changes in microstructure during irradiation. A newly installed pressurized water loop (2A) will be ready to support LWR sustainability research in 2012.

These capabilities will be used by DOE-NE, universities, other national laboratories, federal agencies, and industry. In addition, by 2015, the ATR Life Extension Program will be completed, and reactor major repair and replacement (MR&R) activities will support continued long-term availability of ATR. Because the internal components of ATR are periodically replaced, it remains a valuable research and test machine capable of decades of service.

3.1.2 Separate-Effects Testing and Nuclear Data

The DOE-NE Roadmap (DOE 2010) calls for development of predictive modeling tools that are informed and guided by small-scale, phenomenon-specific experiments for evaluating a broad set of advanced fuel designs and concepts. These advanced tools must potentially incorporate all of the relevant physics and chemistry, spanning phenomena from the mesoscale to the microstructural level and over a large range of reactor variables, such as heat, pressure, and radiation. Small-scale, separate-effects experiments can effectively provide foundational physical information about the early dynamics of fuel in an environment that while similar, is much less complicated to model than a reactor core.

ISU, with INL support, acquired and is using a 4.5-MV Tandem Pelletron accelerator to establish a separate-effects, out-of-pile testing capability. This capability is proposed for use in materials and fuels development and for development of advanced instrumentation for in-core use. ISU expects to have the separate effects testing capability in place within the next 5 years, and supporting capabilities to produce engineered test samples (i.e., advanced fuel fabrication) for separate effects testing in place by FY 2013.

3.2 Transient Irradiation

DOE-NE approved the mission need for the Resumption of Transient Testing of Nuclear Fuels Project in December 2010. Transient testing capability is needed in approximately 2018 to support the DOE-NE R&D mission. Transient testing will help establish an understanding of fuel performance phenomenology at the millisecond-to-second time scales.

Transient testing capabilities will meet the need to screen advanced fuel concepts, including accident tolerant fuels, by allowing for early identification of the limits of fuel performance. Transient testing will help focus fuel development on a range of viable options, ultimately reducing the time and cost required to develop new fuels. Transient testing supports Research Objectives 1 through 3 of the DOE-NE Roadmap, which involve understanding and predicting LWR performance, developing innovative fuel designs for existing LWRs and advanced reactors, and developing advanced transuranic (TRU)-bearing fuels for the Fuel Cycle R&D Program. Testing fuel behavior in this manner, in prototypic, time-resolved conditions, is also essential to guiding the development and validation of time-resolved computer models of fuels and the core behavior across atomistic, mesoscale, and integrated-behavior scales.

The United States has not performed transient testing for over a decade but has retained a capability to do so with the TREAT reactor, currently in cold standby. TREAT is the only transient test facility in the world that can conduct tests on full-size fast reactor fuel and 36-in. segments of LWR fuel. During previous missions, TREAT performed 6,604 startups and 2,885 transient irradiations. The capabilities of TREAT and the co-location of PIE capabilities at INL make restart of TREAT an attractive option for meeting U.S. transient testing needs. In addition to domestic users from national laboratories, international entities and U.S. universities and industry have expressed interest in using TREAT to meet their transient testing needs.

Full-capability transient testing and analysis, advanced instrumentation, and PIE of experimental fuels are essential to completing the suite of examinations needed to improve the science-based understanding of the behavior of nuclear fuels and materials. Many of the PIE facilities and capabilities needed to perform this work are located and operated at MFC. INL is also pursuing enhancements to these capabilities.

DOE-NE, through the NEPA process, will assess the potential impacts of resuming transient testing in the United States, informed by an options analysis scheduled for completion in FY 2012. DOE proposes to initiate detailed plans to resume transient testing capabilities in FY 2013, pending outcome of the options analysis.

Given the slower nature of transients in gas reactors, transient testing of gas reactor fuel began in 2010 using furnaces installed in HFEF and in a furnace at Oak Ridge National Laboratory (ORNL).

3.3 Fresh Fuel Characterization and Postirradiation Examination

3.3.1 Existing Capabilities

Current characterization and PIE capabilities at MFC include the use of equipment in HFEF, AL, EML, and FASB. In addition, the CAES Microscopy and Characterization Suite (MaCS) is located in an NRC-licensed facility that focuses on nano- and atomic-level characterization where exams can be completed using microgram or nanogram quantities of irradiated material specimens downsized and prepared at MFC. MaCS is operational, and its equipment includes a local electrode atom probe, a focused ion beam (FIB), a transmission electron microscope (TEM), an atomic force microscope, and a scanning electron microscope (SEM). The NSUF has a portal for national and international research teams to perform research in MaCS. Collectively, these capabilities are adequate to serve basic needs for fuel examination, material handling, and waste disposal and to provide the foundation for establishing world-leading PIE capabilities.

Handling large quantities of irradiated fuel at the assembly scale presents a significant radiological hazard. This work must be carefully controlled and conducted in heavily shielded hot cell facilities on a protected site, which is the case with capabilities already in place and proposed for MFC. On the other end of the spectrum, it can be beneficial to conduct basic studies on small, low-hazard radiological specimens in a radiological laboratory environment rather than in a nuclear facility. Results allow for prediction of fuel performance based on sound scientific principles, and collaboration with visiting scientists is more productive in terms of discovery. The most effective research capabilities couple heavily shielded nuclear facilities with radiological characterization laboratories that contain high-end research equipment.

Thus, INL is equipping the CAES facility with high-end equipment and is developing sample analysis capabilities that will ultimately be transferred to MFC to be used under highly radioactive conditions.

Sustaining world-leading capabilities for the next 40 to 60 years will require full utilization and sustainment of current facilities and construction of two new facilities. The following sections describe current PIE resources at MFC, planned equipment purchases and receipts, and construction of two new facilities. Over the last several years, more than $20 million has been spent on new, state-of-the-art fresh fuel characterization and PIE equipment, some of which will be relocated to and/or installed in IMCL.

3.3.1.1 HFEF

The HFEF is a heavily shielded nuclear facility designed to be the front-end of the PIE capability. It can receive and handle kilograms to hundreds of kilograms of nuclear fuel and material in almost any type of cask, including full-size commercial LWR fuel. The mission of HFEF is to receive material, conduct nondestructive and destructive examinations, and prepare material specimens for transfer to characterization laboratories for detailed analysis. HFEF also houses limited mechanical testing equipment, as well as the NRAD 250-kW TRIGA reactor for neutron radiography and bench-scale electrochemical separations testing capabilities, and engineering-scale waste-form development capabilities to support operations in FCF.

Examples of material preparation for further examination include sectioning fuel rods to produce cross-section specimens on the pellet scale; preparing cladding sections for mechanical testing and micro-structural analysis; sorting, packaging, and cataloging hundreds to thousands of material test specimens from test reactor irradiations; and machining large pieces of in-core structural materials mined from decommissioned power reactors into test specimens.

Upgrades to current HFEF characterization equipment will support continued nondestructive and destructive examination of a variety of fuel specimens required for DOE-NE, NNSA, and industry programs. In addition, INL will pursue specialized capabilities (e.g., a consolidated fuel-examination machine and a fuel-rod refabrication rig) to support ongoing DOE-NE research.

3.3.1.2 EML

The EML houses a TEM, a dual-beam FIB fitted with electron backscatter diffraction and micro-chemical analysis capabilities, and a state-of-the-art SEM fitted with a Wavelength Dispersive Spectrometer with software that allows semi-quantitative analysis of heavy actinides. The EML will continue to function in this capacity until IMCL is fully functional. It had also functioned in this capacity for the new imaging suite — a microscopy laboratory recently installed at CAES — which recently became fully functional. The EML will be evaluated in FY 2015 for transition to providing needed general-purpose radiological laboratory space.

3.3.1.3 AL

The AL focuses on chemical and isotopic characterization of unirradiated and irradiated fuels and materials. It receives small quantities of irradiated material from HFEF, performing dissolution and dilution in a series of analytical hot cells, followed by analysis of the diluted materials using instrumentation equipped with hoods or gloveboxes for radiological control. The AL houses many advanced instruments, including the state-of-the-art Inductively Coupled Plasma Mass Spectrometer, two Thermal Ionization Mass Spectrometers, and instruments for determining the fundamental thermodynamic properties of actinide-bearing materials. The AL will continue its current mission with regular upgrades.

3.3.1.4 FASB

The FASB has three missions:

1. Fuel development
2. Materials characterization
3. Irradiated materials testing.

Its east wing has been redeveloped as a low-level, thermophysical properties laboratory, outfitted with equipment for sample preparation, optical microscopy, electron microscopy, and thermodynamic properties determination. A laboratory in the west wing has been equipped with a suite of lead-shielded gamma cells to conduct environmental crack-growth-rate and fracture-toughness testing on irradiated materials. FASB will continue to transition out of a fuel development mission to a radiological characterization and mechanical testing capability.

3.3.2 Future Planned and Proposed Capabilities

As articulated in the INL Strategic Plan for World-Leading PIE Capabilities (INL 2009), INL will establish two modern facilities, each of which will be unique in the world with respect to comprehensive characterization and analysis of nuclear fuels and materials; more specifically, nuclear fuels and highly activated nonfuel materials such as cladding. These facilities will provide operational flexibility and streamlined workflow processes that can be reconfigured to meet evolving mission requirements. Facility design will incorporate modularization to facilitate equipment-specific shielding and flexibility for future equipment development, configuration alteration, and ease of replacement.

3.3.2.1 IMCL

The IMCL is designed to be a multipurpose facility suitable for many different missions over its projected 40-year life. The IMCL will initially house modern, state-of-the-art PIE instrumentation and will be the first facility of its type in the United States designed specifically for advanced instrumentation and equipment, serving as a prototype to inform future PIE needs. Nonreactor nuclear facilities in the United States were state-of-the-art when they were constructed; however, these facilities were not designed to accommodate advanced microstructural characterization equipment, rendering them obsolete for this purpose. The IMCL will contain space for installation of instruments and equipment within shielding structures that can be redesigned and refitted whenever necessary. The IMCL will have mechanical systems that tightly control temperature, electrical and magnetic noise, and vibration to the standards required for advanced analytical equipment.

The IMCL will routinely handle and perform microscale and nanoscale characterization of material specimens and irradiated fuel samples in the mass range of tens of grams down to micrograms. Its capabilities will include an Electron Probe Micro Analyzer, micro-x-ray diffraction, dual-beam FIB, field-emission-gun scanning TEM, SEM, scanning laser thermal diffusivity, limited mechanical testing capability, and sample preparation capability. The facility design will allow easy routine maintenance of the instruments.

Coupled with the CAES, this suite of instruments will provide DOE-NE with some of the powerful, state-of-the-art characterization tools used successfully to overcome material performance limitations in other branches of materials science. In preparation for constructing and operating a line-item advanced PIE facility, which will further expand U.S. nuclear energy research capabilities, IMCL will also serve as a test-bed for developing the infrastructure and protocols required for remote operation of advanced research equipment by INL and its research partners.

The IMCL, a General Plant Project (GPP) approved by DOE-ID in August 2009 (PLN-3128), is expected to complete construction in 2012.

3.3.2.2 *Advanced PIE Capability*

Although the IMCL prototype facility represents a significant advance over current U.S. nuclear energy research and development capabilities, the transition to a full-spectrum nuclear research capability will require further expansion into a new multiprogram line-item facility capable of handling much larger samples. As the project matures and the capability expands over the next 6 to 10 years, some of the capabilities demonstrated in IMCL may transition to the new facility. This would be consistent with the useful lifetime of such research equipment and would provide the newer facility with state-of-the-art instrumentation. The line-item facility will be a third-generation PIE analytical laboratory that will further consolidate and expand capabilities that function on the micro, nano, and atomic scale. Options for locating this facility within MFC are under review. DOE-NE approved the Justification of Mission Need (CD-0) for the Advanced PIE Capability in January 2011, with CD-1 activities commencing in FY 2012.

The facility will be designed with cooperative R&D at the core of its mission, with information technology infrastructure that allows remote operation and monitoring of equipment from in-town and off-site locations[b]. Two workshops were held in 2011 to obtain input from U.S. and international research communities on the need for advanced PIE capabilities and to help inform the detailed design features of such a capability.

b Letter from Peter B. Lyons to NE-32, Advanced Post Irradiation Examination (PIE) Capability Project Approval of Critical Decision (CD-0), Approve Mission Need, Jan 31, 2011.

As IMCL micro-structural characterization capabilities transition to the new facility, INL will use IMCL to consolidate mechanical testing capabilities from FASB, HFEF, and IMCL into one location. Should DOE move forward with an advanced PIE capability, the remaining capabilities of EML may be moved to FASB to allow EML to be used as a general-purpose radiological facility.

3.3.2.3 *NSUF*

As the national hub for nuclear energy research, INL relies heavily on the intellectual capacity of the entire nation, and the world, to make breakthroughs in nuclear energy technology. Therefore, INL must invest in the development of an operational strategy that allows outside customers to routinely and effectively access the national capability present at INL. This strategy must encompass facility access, material transfers, equipment operation by visitors and INL users, release of data, visitor office space, visitor computer networking, access for non-U.S. visitors, remote operation of equipment, and research equipment staffing.

In conjunction with the current CAES building, the new REL would house office and laboratory space for NSUF for use by visiting researchers. The CAES will continue to house high-end PIE instruments that are accessible to visiting user facility researchers, enabling them to collaborate in DOE-NE research programs. By design, the CAES research facility operates in the same manner as universities; in the case of low-risk radiological research, this approach provides a cost-effective, innovative, and productive environment for exploring fundamental science questions and executing basic research complementary to research at INL facilities. The NRC license that CAES holds through ISU has material quantity limits sufficient for handling low-activity specimens. These factors make CAES an ideal location for state-of-the-art research equipment. These research tools will be of sufficient quality to position CAES as a major regional center for materials characterization that can support innovative material science studies related to many technical areas, including, but not limited to, nuclear energy.

As mentioned in Section 3.3.1, CAES capabilities focus on nanoscale and atomic-level characterization, where examinations can be completed using micrograms or nanograms of irradiated specimens prepared at MFC. The combined available NSUF analytical capabilities at REC include:

- Atom probe (Local Electron Atom Probe)
- Aberration-corrected Field Emission Gun Scanning TEM, dual-beam FIB
- SEM, as well as a Nano Secondary Ion Mass Spectrometer and a chemical characterization tool with parts-per-billion detection limits and 30-nanometer spatial resolution.

Other capabilities will include small-sample testing, nanoindentation, Raman spectroscopy, Auger Electron Spectroscopy, and atomic force microscopy.

As new capabilities are created by the scientific community, NSUF and CAES will be the entry point for bringing new analysis technologies to INL. Providing access through NSUF to advanced computational capability through the Center for Advanced Modeling and Simulation will allow national research teams to supplement their irradiation experimentation and analysis with modern calculation capability. Finally, the addition of this suite of modern instrumentation will better support INL researchers in their ability to engage in fundamental research through the Office of Science.

3.4 Experimental Fuel Fabrication and Process Development

INL has extensive metallic-fuel fabrication expertise and is completing the capabilities needed for basic ceramic-fuel development. Additional capacity is needed to produce larger batch sizes of experimental ceramic fuel and develop ceramic fuel fabrication processes that use various combinations of uranium, plutonium, neptunium, americium, and, potentially, thorium.

Much of the existing MFC equipment and supporting infrastructure for metal fuel development is applicable and is used for fabricating and characterizing ceramic fuels, including glovebox lines at FMF, AL, and EML. Building on existing infrastructure to establish a fabrication capability for multiple fuel forms creates the best synergy with current characterization capabilities and eliminates increased duplication cost.

Implementing complete capabilities for ceramic fuel fabrication involves three independent but coordinated projects:

1. A one-to-one replacement of a glovebox and fume hood to support near-term activities
2. Installation of a new glovebox line for powder processing, pellet pressing, sintering, and pellet encapsulation and welding into fuel pins
3. Installation of a glovebox support line.

The support line will allow multifunction and multiprogram research through flexible “plug-and-play architecture” that can be readily changed out, replaced, and reused, which will also make it possible to extend the fabrication process to composite fuels.

In addition, INL operates uranium glovebox lines in FASB, primarily to develop new fuel types that will be used to convert research and test reactors from HEU to LEU fuel. The facility also supports development of fuel for other programs, such as prototyping of transmutation fuel fabrication processes for fuel cycle R&D. The FASB houses unique uranium fabrication capabilities such as a hot isostatic press, friction stir welding systems, rolling mills, annealing furnaces, and inert welding capabilities. The FASB also has a suite of instrumentation and testing equipment dedicated to characterization of fresh uranium fuel.

Because FASB is at capacity, some of its bench-scale fuel fabrication capabilities have been moved to EFF to allow installation of stress corrosion-cracking testing capabilities. The EFF will support fuel fabrication R&D for oxides, nitrides, carbides, silicides, and composite fuels — all forms that may offer advantages over current commercial fuel technologies. It houses equipment such as a hot isostatic press, electrodischarge machining, and experiment specific machining. This shift to EFF, along with electrical power and utility upgrades necessary for EFF, was completed and operations commenced in FY 2012.

3.5 Separations and Waste Form Research

Fuel cycle research focuses on addressing the challenges associated with multiple fuel cycle strategies. The research is designed to be flexible enough to support development of whatever fuel cycle is eventually selected by U.S. policy makers. Implementation of closed fuel cycle strategies will require fuel management activities ranging from some fuel conditioning to extensive separations. These activities could range from conditioning of high burn-up fuel after discharge to removing fertile materials and deep burn of nonfertile materials to a fully closed fuel cycle using advanced separations technologies.

Over the last decade, DOE sponsored research on two broad categories of technologies for group separation of actinides: (1) advanced aqueous processes, and (2) molten salt electrochemical techniques. For aqueous processes, a suite of advanced flow sheets was demonstrated at the laboratory and bench scale. Electrochemical processing is currently used to disposition fast reactor fuels and to conduct research on group separation of actinides. Waste form R&D is also conducted in close coordination with the separations processes at the bench and laboratory scale, and in the case of electrochemical processing, at the engineering scale.

Some separations research will explore technologies that offer the potential for high payoff in terms of economics or performance; however, much of it will focus on developing a science-based understanding of separations technologies. This will be accomplished through tools and models developed over the next few years and validated with small-scale experiments. The specific suite of technologies explored will depend on, and will have to be integrated with, fuel development, as well as an understanding of potential waste form requirements. The full range of separations and waste forms research planning is described in the *INL Advanced Separations and Waste Forms RD&D Capabilities Strategic Plan* (INL 2011).

After 2020, DOE-NE expects to focus on continued development of specific technologies, including conceptual design for engineering-scale testing of operations and integrated processes — an essential step toward full-scale industrialization.

3.5.1 Existing Capabilities for Aqueous and Electrochemical Separations

INL has extensive research and operations experience with processing technologies at all scales. In the 1980s, INL built and operated the only U.S. second-generation aqueous reprocessing plant. INL has broad experience processing various UNF types, including aluminum, zirconium, stainless steel, and graphite fuels. INL also operates engineering-scale electrochemical separations and conducts related R&D, with existing capabilities in aqueous separations and electrochemical capabilities.

3.5.1.1 *Aqueous Separations*

Cold laboratory-scale testing for aqueous systems takes place at IRC. Engineering/pilot-scale cold surrogate testing for aqueous systems is conducted in Idaho Falls at the BCTC contractor laboratory. Warm (radiotracers and glovebox work) laboratory/bench-scale testing and analytical capabilities exist at CFA and the MFC AL and RCL. Additionally, a state-of-the-art Cobalt-60 (Co-60) gamma irradiator with a radiolysis/hydrolysis test loop is located at FASB. DOE's progression to integrated laboratory-scale testing will require a larger hot cell facility, waste management support systems, and enhanced S&S measures. The RAL at INTEC, one of the newest hot cells in the nation with many of the design features needed, has been proposed as a candidate to support the DOE-NE mission as well as other missions. INL will submit a business case analysis this year to inform a decision on the reuse of the RAL facility.

To advance the state of aqueous separations technologies, INL must have integrated, shielded, wet-chemistry capabilities at both laboratory and engineering scales, as well as warm engineering-scale capabilities to allow for testing with natural/depleted uranium and/or radiotracers. The RAL facility, located at INTEC, is well suited for these missions, as well other DOE and INL missions. This facility is particularly suited for laboratory/bench-scale testing with surrogate radioactive materials and, eventually, actual fuel. A 24-stage, 2-cm centrifugal contactor setup currently exists in the RAL hot cell. This equipment has been used in the past to support flow sheet development with actual waste solutions. With refurbishment of the contactors, the equipment will be able to support DOE's planned progression to integrated, laboratory-scale capabilities at INL and could transition to a reconfigurable facility for separations experiments.

Future processing programs will make it possible to treat waste as it is made by minimizing the generation of liquid waste requiring a tank farm storage system, which will reduce cost and environmental risk. Engineering-scale system tests will incorporate waste treatment to demonstrate a fully integrated operation. Should DOE choose to pursue engineering-scale demonstration of advanced aqueous processes, INL has other potentially useful capabilities at INTEC. The Fuel Dissolution Process and Fuel Processing Facility (CPP-691) has been identified as a facility that could support engineering-scale, aqueous separations demonstration, and materials disposition capability in the future. Such demonstrations are critical to creating sustainable fuel cycles and achieving proliferation resistance. In addition, these capabilities could support the consolidation and treatment of a wide variety of legacy, complex-wide DOE nuclear material.

3.5.1.2 *Electrochemical Capabilities*

The electrochemical separations process was originally designed to recycle short-cooled, high-fissile content fuel in a compact, remotely operated facility adjacent to reactors in a tightly coupled system, thereby avoiding extensive storage and off-site transportation. The process, often described as pyro-processing, uses electrochemical and metallurgical techniques at elevated temperature in the absence of water and other neutron-moderators, enabling processing of highly fissile materials without extreme dilution. The intent is recovery of uranium and group actinides and conditioning of the fission products into stable waste forms.

Used sodium-bonded Experimental Breeder Reactor II (EBR-II) and Fast Flux Test Facility (FFTF) fuel is being prepared for processing and disposition in engineering-scale equipment installed in FCF at MFC, with additional waste from equipment planned for installation in HFEF.

Three small cells are available in inert atmosphere gloveboxes for electrochemical experiments with a range of materials: one in a nonradiological laboratory for investigations with surrogate materials, one in FASB for experiments with low-activity materials (i.e., depleted uranium or thorium), and a third in HFEF for experiments with irradiated materials. Capabilities for research beyond simple gram-scale electrochemistry (i.e., other process operations in electrochemical recycling) are not available. Improving and adapting this process requires more than simple, stand-alone electrochemical experiments at the gram scale.

Strategic to the future success of electrochemical separations technology is an ability to investigate processes and phenomena at laboratory-scale, both individually and as an integrated process, first with unirradiated materials and then with irradiated materials. This capability exists internationally but does not currently exist in the DOE complex. The fact that INL has an operating engineering-scale facility with significant operations and infrastructure costs but no laboratory-scale support structure in which to develop improvements is somewhat unusual. As a result, process improvements can only be investigated in the larger-scale facility, which means that they are expensive and can be implemented only in minor increments to limit risk to operations.

World-leading electrochemical recycling research requires the capability to test the range of fundamental and applied science associated with the entire process, as well as the ability to validate the development of fundamental and integrated process models. This suite of tools would include laboratory scale versions of the set of operations in beginning-to-end integrated process testing with uranium and small quantities of transuranics. It would also include a parallel, laboratory-scale capability in a hot cell, allowing research and demonstration with used fuel and irradiated materials.

These capabilities are necessary to improve the knowledge of individual process steps and to understand the coupled, dependent effects between process operations, which are generally the dominant technical limitations. These capabilities are also necessary to develop and demonstrate an adaptation to the process for aluminum-clad fuels and to develop the modifications needed to recycle uranium product for use in the commercial market. Finally, these capabilities support development of safeguards approaches to electrochemical processes, a challenge area recognized by NNSA. Preconceptual design studies will begin within the next fiscal year to evaluate options for modifying an existing radiological-capable location (e.g., available rooms on the main floor of FCF, the third floor of HFEF, or other locations) to house these capabilities.

3.6 Used Fuel Storage and Transportation Research, Development, and Demonstration

UNF may need to reside in dry storage for 100 years or longer, pending implementation of a final disposition pathway. NRC licenses dry storage for only 60 years, based upon a very limited set of data for fuel of moderate burn-up. More recently, industry has transitioned to higher burn-up fuels, which stress the fuel and cladding to greater levels than in the past 50 years. While the NRC allows dry storage of high-burn-up fuel to occur, additional data are needed to inform future studies of dry storage of high burn-up fuels.

Established in 2009, the DOE Used Fuel Disposition Technical Focus Area, under the Fuel Cycle R&D program seeks to address the technical, safety, and S&S issues related to UNF storage, transportation, and disposal. This focus area is in the early stages of determining the type of data needed and how those data might be obtained to develop the case for long-term dry storage. It is envisioned that testing on UNF will be performed, storage technologies will be evaluated and tested, and an overall integrated system will need to be defined. Its performance will be verified and validated, and predictive models will be needed to demonstrate that the integrated system is safe and secure for 100+ years. The material will need to be transported for final disposition at the end of that storage period. INL is the only DOE laboratory that has sufficient infrastructure to perform this mission, and it is the only laboratory currently able to bring UNF to its research campuses for RD&D purposes.

3.6.1 Existing Capabilities for Used Fuel Storage and Transportation RD&D

This focus area has two proposed approaches to gathering the data needed to demonstrate the safety case for UNF storage and transportation. One approach is to gather specific fuel types and conduct assembly-level tests. These tests would be conducted on both pressurized water loop and boiling water reactor fuel within a large hot cell. The assemblies would be placed within controlled atmosphere test heaters to simulate dry storage cask environments. Monitoring would be conducted in-cell and samples would be routinely taken to determine if changes were occurring. Conducting the tests within a hot cell would mean that PIE, mechanical properties testing, and analytical chemistry functions would be conveniently located nearby.

Another possible approach would be to assemble tests in full-sized storage casks using many metric tons of UNF, place those casks on a storage pad, and sample/examine those casks every few years to evaluate changes in the fuel and cask materials. INL believes that conducting tests of this type, performed in place at vendor/utility sites, would be most appropriate for confirmatory purposes. However, should preliminary testing indicate the need to transition to large-scale tests that could be conducted at a vendor/utility site, INL is the only DOE site with an NRC-licensed storage facility and pad, which is located at INTEC (Building 603).

It is expected that INL will be conducting tests on new higher burn-up UNF within 10 years, to support the examination of a technical basis for extended dry storage of UNF. This work will benefit from increased R&D capabilities within MFC, including continued development of the AL, utilization of IMCL and advanced PIE future capabilities, and development of mechanical properties testing capabilities for highly radioactive materials. The work will support development of advanced modeling and simulation codes that will describe the way UNF ages over time (e.g., multiphysics modeling and simulation and uncertain quotient modeling).

During the next 10 years, INL will evolve its overall capabilities with respect to UNF disposition to meet the emerging needs of next-generation fuel cycles. This will include establishing the technical foundation for accepting materials at future repositories or storage systems, developing disposition pathways for challenging materials, developing approaches for S&S, total system performance modeling for repository systems, materials testing, and nondestructive evaluation of cask and system performance. Innovative treatment options for nuclear materials will place an emphasis on waste minimization, and proliferation resistance will be developed and demonstrated. Existing models for melt dynamics and melter and off-gas control for cold crucible induction-melting systems will be designed and demonstrated to facilitate the production of advanced ceramic/glass waste form systems at commercial scale to support next generation fuel cycles.

3.7 Radioisotope Power Systems

DOE-NE commissioned SSPSF in FY 2004 for final assembly and testing of radioisotope power systems. This facility provides one-of-a-kind capabilities and is operational and fully staffed for fueling, testing, and delivering radioisotope power systems. It houses a total of three fueling glove-box lines, including one equipped to meet NASA planetary protection protocols. It also houses a vibration test apparatus to simulate launch pad scenarios, a magnetic moment measuring device, and a mass property measuring device. Finally, there are two thermal vacuum chambers, one equipped to employ liquid nitrogen cooling for simulating space environments and one for assessing power output. Its full delivery system is comprised of two specially equipped trailers and three type B shipping containers for delivering the final power systems to the customer's location. DOE-NE and NASA are evaluating how Pu-238 production can be reestablished, and how to best maintain or replace aging infrastructure within the DOE complex to meet customer needs. INL is among the sites under consideration.

3.8 Multiprogram Capabilities

3.8.1 National and Homeland Security

As INL provides solutions to many significant national security challenges (e.g., Global Threat Reduction Initiative, National Infrastructure Protection Plan), N&HS will continue to use and enhance INL expertise, facilities, and equipment to accomplish its missions. N&HS current and future capabilities reside in unclassified and secured offices and laboratories and include broad use of INL facilities, test ranges, and the full-scale infrastructure for training and technology RD&D. Unclassified and classified RD&D will occur in facilities equipped with communication and network connectivity for onsite and remote command and control, computer modeling and simulation, and real-time testing and demonstration. All facility and equipment investments are directed towards developing and enhancing specific INL capabilities consistent with the nonproliferation and critical infrastructure protection mission.

Critical infrastructure protection RD&D uses offices, including secured space, within REC, CFA, and CITRC. Programmatic RD&D occurs in laboratories and test facilities within REC, CFA, the INL Site field-testing areas for the Next Generation Wireless Test Bed, the Unmanned Arial Vehicle Runway, and the National Security Test Range. Critical infrastructure protection electrical power-grid testing routinely uses part of the INL operating power grid for full-scale testing. Other field-testing activities use facilities and areas across the INL Site, as available, at CFA, MFC, Test Area North (TAN), and INTEC.

Nonproliferation RD&D uses offices, including secured space, within REC and MFC. Programmatic RD&D occurs in laboratories and test facilities within dedicated laboratories in REC facilities, shared field-testing areas at CITRC and CFA, and in collaboration with nuclear facilities at MFC and ATR.

Developed and maintained by the U.S. Army at the INL Site, SMC is a state-of-the-art facility with extensive capabilities in unique material fabrication and processing. Capabilities that the SMC Program contributes to INL-wide expertise include a full range of product development and manufacturing skills specific to survivability systems and threat defeat mechanisms. These include material process development, classified computer networks, prototype manufacturing, mechanical testing and evaluation, and full-scale fabrication of heavy and light armor systems.

3.8.2 Energy and Environment

3.8.2.1 Clean Energy Systems

INL maintains a large number of engineering development laboratories that support energy systems prototype development and testing. These include large, high-bay space housing prototype biomass conversion equipment, liquid metal hydrogen generation systems, complete biomass processing units, grinders, thermal treatment units, chemical treatment and extraction systems, densification systems, synthesis gas generation and process integration test stands with associated controls and data acquisition systems, and high-temperature test chambers for heat exchangers and other devices. Numerous analysis laboratories support these programs, including those that assess physical, chemical, rheological, and structural characteristics of biomass. INL also operates fleet renewable energy asset characterization systems, including anemometers, weather stations, and associated data logging and telemetry systems. INL will need to expand its energy component and systems analysis capability in the ESL and Site locations, principally focused on a high-energy power converter and a thermal energy/fluid source, to test hybrid system configurations.

3.8.2.2 Advanced Transportation Systems

INL maintains a suite of advanced vehicle and energy storage testing capabilities that are used to assist DOE and the private sector in deploying advanced vehicles as an alternative to fossil fueled vehicles. INL's primary role as a test and evaluation center for these systems relies on infrastructure, including over 15,000 ft^2 of laboratory space that houses over 650 battery test channels, environmental chambers, a shake table, and related battery testing equipment and test vehicle platforms. INL infrastructure supports development of materials and process chemistry for advanced energy storage devices, and accommodates testing of research-sized coin cells through full vehicle systems.

3.8.2.3 Chemical and Materials Process Capabilities

INL maintains a large number of laboratories and equipment that serve chemical analysis; chemical separations, materials development and materials testing functions for the nuclear energy research mission; and advanced manufacturing, energy storage, and advanced process development for industry. INL maintains, and will need to invest further in, laboratory space and equipment upgrades supporting the development of new chemical production processes (i.e., heterogeneous and homogeneous catalysts, electrosynthesis, nanomaterials production, polymer synthesis) and chemical separations systems (i.e., chemical extraction systems, membrane-based separation of liquid and gas mixture, water treatment approaches, and supercritical fluid extraction systems). Future equipment upgrades may include new nuclear magnetic resonance, thermogravimetric analysis, gas chromatography/mass spectroscopy, and liquid chromatography/mass spectroscopy systems.

Materials characterization infrastructure at INL supports non-nuclear materials development and evaluation for DOE-NE and will require maintenance and upgrade of laser acoustic, x-ray and tomographic, ultrasonic, and eddy current non-destructive assay systems; creep and fatigue testing equipment with associated environmental chambers for destructive testing; and maintenance of a suite of analytical tools, including Gleeble testing laboratory, x-ray photoelectron spectroscopy, auger, SEM, TEM, and x-ray diffraction systems. The laboratories also house plasma and spray-forming materials processing equipment, associated precision tooling, mills, and other equipment to develop and test materials processes.

Commissioning of REL will significantly enhance the chemical processes capability base of INL. This will allow INL to maintain capabilities needed to support nuclear fuel cycle research, site stewardship, research involving industrial processes, and advanced energy generation.

3.8.2.4 *Environmental Systems Capabilities*

INL maintains core capabilities to monitor, assess, and mitigate environmental consequences and risks associated with INL operations, and deploys these capabilities to national challenges related to energy-consequent activities such as fossil energy extraction. These capabilities include environmental monitoring and sampling, range management, water and soil sampling and analyses, biological systems analyses, geoscience, subsurface fate and transport simulation and prediction, low-level chemical assay, and low-level radiological assay. Critical infrastructure supporting these capabilities includes geochemistry and mechanics laboratories (including a geocentrifuge), chemical and radiological assay laboratories at the ATR complex, and chemical assay laboratories at REC in Idaho Falls. Key assets that will need to be enhanced include trace chemical and radiological analysis infrastructure, wide-area monitoring, and related assets.

3.9 Computational Capabilities

Advances in scientific computing over the last 40 years have made it possible to simulate scientific systems at a scale from smallest to largest, and to a much greater degree of fidelity than previously possible. Modeling and simulation is a powerful tool that can be combined with experimental data to reduce design and testing time, uncertainties associated with models, and the burden on infrastructure.

U.S. capabilities in HPC are evolving rapidly, and numerous computers are available at INL to support modeling and simulation. INL will seek access to additional, leading-edge capabilities, as needed. The INL strategy is to continue to apply and invest in trailing-edge scientific computing capabilities (i.e., computers that are among the top 100 in the world in computational speed for modeling, simulation, and visualization). The INL HPC Data Center, located in EROB, supports INL fuel development and other reactor development needs, including those of other national laboratories and users.

4. IDAHO NATIONAL LABORATORY ENABLING CAPABILITIES

INL maintains four enabling capabilities that support mission-driven core capabilities and allow them to function most effectively:

1. Utilities and supporting infrastructure
2. Nuclear materials management
3. Information management
4. Laboratory protection services.

4.1 Utilities and Supporting Infrastructure Capabilities

Supporting infrastructure consists primarily of real property assets (e.g., buildings, trailers, utility systems, roads, etc.) that maintain INL's core R&D capabilities and MC facilities. INL real property infrastructure includes 584 DOE-NE-owned and operating real property assets. These assets include 309 operating buildings[c] totaling 3.1 million ft^2 with a total Facility Information Management System (FIMS) replacement value of $2.6 billion, and 229 other structures and facilities (OSFs) that have a total FIMS replacement value of $792 million. OSFs include real property assets that are: (1) not buildings (e.g., bridges, communications towers, roads, railroads, etc.); and (2) site utility systems that collect or distribute utility services (e.g., steam, electricity, compressed gases, liquid waste streams, natural gas, and water).

As part of the ten-year vision for sustainment, INL is committed to implementing a proactive, mission-driven, risk-based approach to sustain INL infrastructure in a manner that ensures mission-supporting infrastructure is in a mission-ready state. The INL sustainment strategy focuses on (1) maximizing asset service life, (2) revitalizing assets at the optimum time in their life cycle, and (3) upgrading assets to support the mission needs of the R&D programs.

c The term "operating buildings" includes all operating buildings and trailers that have a FIMS status of operating (status codes 1, 2, and 6).

The following are key elements of INL's strategy for sustaining INL utilities and supporting infrastructure:

- Effective management of the capabilities provided by enduring assets
- Investment in new supporting infrastructure to continue to reliably support current missions and make new mission capabilities possible
- Implementation of sustainability concepts into enduring and new infrastructure assets to enhance energy and water efficiency and improve employee health and productivity
- Efficient and timely disposition of nonenduring assets.

The ability to transport nuclear materials on Site roads from INTEC, NRF, and ATR Complex to nuclear programs and operations at MFC is a key element of the INL nuclear material management strategy. A new 13-mile, single-lane onsite gravel road between paved roads at MFC (Taylor Blvd.) and CITRC (Jefferson Ave.) now provides this transportation capability. This road is on government land, avoiding the problems associated with transportation of these materials on public highways. This project was managed by DOE-EM and funded under the American Recovery and Reinvestment Act (ARRA).

4.1.1 Management of Enduring Assets

Enduring assets include support buildings and utilities that serve the long-term needs of INL missions. INL applies a risk-based approach to evaluate and prioritize investments based on the role and importance of each asset in achieving INL missions.

Also critical to successful and efficient implementation of this approach is the application of engineering and facility management principles toward ensuring a full understanding and mitigation of the risk that an unplanned equipment failure could have on worker safety, environmental protection, and mission accomplishment. The strategy for managing enduring assets is:

- **Sustain** assets in good working order by performing preventive maintenance, condition monitoring, condition assessment surveys, proactive replacement of aging equipment at the optimum time, incorporation of sustainable design principles, and timely repair if an unexpected failure occurs.
- **Revitalize** assets so that they remain relevant to mission needs and are reliable, modern, sustainable, and cost-effective to operate and sustain throughout their life cycle.
- **Enhance** existing assets to incorporate sustainability principles, support expansion of existing capabilities, and develop new sustainable capabilities to support changing missions. Appendix D describes the INL strategy for achieving DOE goals for enhancing the sustainability of INL utilities and supporting infrastructure.

4.1.2 Investment in New Supporting Infrastructure

This TYSP identifies the capabilities needed to accomplish the ten-year vision of INL and the supporting infrastructure resources required to enable the new capabilities. For example, establishing world-leading PIE capabilities at INL will require revitalization and expansion of the underlying utilities (e.g., electrical supply, sewage collection, and data transmission) and support facilities (e.g., office and relevant laboratory space) at MFC. Appendix A, *Real Property Asset Management*, describes the key elements and recent achievement of the INL Real Property Asset Management program. Appendix B, *Prioritized Resource Needs*, lists the specific infrastructure investments needed to achieve the vision identified in the TYSP.

4.2 Nuclear Material Management Capability

The INL mission requires access to a variety of SNM. Responsible management of these materials is fundamental to ensuring the availability of nuclear material needed. This requires appropriate facilities and the S&S capabilities to store and handle Safeguards Category I quantities of SNM. These facilities and capabilities are unique assets that not only enable INL to perform its missions but also to attract other R&D organizations.

The overall nuclear material management strategy of INL is to obtain/retain and make accessible materials needed to support R&D, dispose of unneeded materials to reduce liabilities, and ensure the safe and efficient handling and storage of nuclear materials. The following facilities and capabilities are key elements of this strategy.

4.2.1 FMF SNM Glovebox and New Multipurpose Uranium Gloveboxes

INL is developing capabilities (e.g., gloveboxes and process equipment) to treat a significant portion of its surplus of unirradiated enriched uranium materials, including sodium-containing materials, for reuse or recycle. Installation of the new SNM Glovebox in FMF, and the corresponding readiness activities, were completed in December 2011.

A new multimission glovebox is in the conceptual phase. It will provide the capability to perform maintenance and recertification of the Neptunium Oxide containers for shipment in support of the

Pu-238 production mission, as well as additional uranium breakout capabilities to replace the Uranium Handling Glovebox.

4.2.2 Zero Power Physics Reactor Transuranic Surveillance Gloveboxes

INL is designing, fabricating, and installing two clean inspection gloveboxes separated by an exhaust hood to replace the existing North Hood in the Zero Power Physics Reactor (ZPPR) workroom. This new configuration will support cladding integrity inspections of clad ZPPR plates and inspection of items removed from the ZPPR vault.

4.2.3 Materials Security and Consolidation Facility

Efforts are underway to establish robust consolidated storage at INTEC for LEU currently stored at MFC, which resulted from the irradiated sodium-bonded fuel disposition campaign. INL is refurbishing the 4,600-ft^2 Materials Security and Consolidation Facility (formerly the Unirradiated Fuel Storage Building [CPP-651]) at INTEC in FY 2012 under an NNSA line-item project. This facility, which previously stored similar amounts of SNM, is considered an ideal location for storage of the LEU disposition product. The facility, along with surrounding buildings that could be used as construction staging areas or for material storage, will be isolated from the rest of INTEC by a fence.

4.2.4 Remote-Handled LLW Disposal Facility

INL is working to establish remote-handled LLW disposal capability by the end of FY 2017 to replace the current disposal operations in the SDA located at RWMC. The new Remote-Handled LLW Disposal Facility, a Hazard Category 2 nuclear facility, received CD-1 approval in July 2011. The facility will consist of an in-ground vault area with supporting infrastructure (i.e., roads, security and access control structures, administrative building, maintenance building, and fire suppression).

Completion of the Remote-Handled LLW Facility, a $95-million congressional line item/capital asset project, joint-funded by DOE-NE and NR, will yield the following benefits:

- Provide remote-handled LLW disposal capability, thereby minimizing potential impacts on existing INL and NRF operations
- Allow continued processing of Navy fuels at NRF in accordance with the Idaho Settlement Agreement (State of Idaho 1995; State of Idaho 2008)
- Provide remote-handled LLW management and disposal consistent with DOE Order 435.1, *Radioactive Waste Management*
- Provide a consistent, site-wide waste management system, reducing requirements to identify and implement cost-effective waste management options.

4.3 Information Management Capability

Information Management (IM) in 2020 will be characterized as follows:

- Agile operations, dynamically optimizing the match of supply with demand
- Collaborative socialization of predictive information to enable effective decision making
- Environmentally and fiscally responsible use of technology, balancing use of internal and external resources
- Risk-based cyber security, enabling transparent collaboration with key partners regardless of physical or organizational boundaries.

Therefore, IM will continue to serve a role in enabling the laboratory mission by establishing and sustaining communications, collaboration capabilities, and other sustaining operations that are routinely conducted in support of INL (e.g., HPC, business computing, and network infrastructure, including fiber and dial rooms). As such, INL has vision and needs for: (1) IM infrastructure and capabilities directly supporting the INL mission, and (2) facilities and capabilities directly supporting IM management and support services.

The growth in INL missions and users of INL capabilities is creating a need for enhanced communication infrastructure and telecommunications. The increased demand will require a strong fiber backbone with advanced campus network infrastructures to enhance connectivity. It includes reliable communication and collaboration capabilities that provide the breadth and depth of communication channels needed to support technological capabilities identified in this plan. Key IM strategies will result in reducing the footprint for unclassified server capabilities, and increasing the footprint for classified central computing capabilities. It also provides for leading functional facilities, such as the HPC data center, business data center, research library and public reading area, and disaster recovery/backup/development facility.

As an enabling capability, IM is optimizing activities to support daily INL operations. To increase organizational efficiency, work space and general office space for positions where direct customer interaction is not required will be co-located. Where direct daily interface with customers is required, IM staff will reside in the field (e.g., at ATR, MFC, CFA, or SMC) with space to perform their functions.

4.4 Idaho National Laboratory Protection Services

Laboratory Protection (LP) is essential to maintain a secure environment to perform critical national RD&D. LP includes S&S, which protects the nuclear facility infrastructure and enables multiple R&D program missions. LP also protects DOE-owned nuclear materials, classified and unclassified matter, property, personnel, and other vital assets from theft, diversion, sabotage, espionage, unauthorized access, compromise, and other hostile acts that may cause unacceptable impacts on national security; program continuity; or the health and safety of employees, the public, or the environment.

LP at INL also deploys a suite of emergency service capabilities to protect laboratory missions, personnel, property, and the environment. Capabilities include emergency management and fire department services. LP relies upon hazards surveys and assessments, plans and procedures, and ensures a trained and qualified Emergency Response Organization is present. Resources are deployed through the INL Emergency Operations Center in Idaho Falls and four emergency control centers located at INL. Fire department emergency response functions are deployed through three fire stations that provide emergency response services to all missions conducted on the INL Site, as well as ensuring emergency response capability for the transportation corridors that pass through INL.

Occupational Medicine operates five dispensaries sitewide. Services provided include drug screening; medical and psychological evaluations; and emergency medical and psychological care with advanced cardiac life support, chelation therapy, a decontamination facility, and x-ray capability at two locations.

The one whole body counter at INL must be relocated. It is currently located in the old CFA RESL, which is otherwise unoccupied and scheduled for demolition.

5. INVESTMENT STRATEGIES

Developing a modern infrastructure with attributes that promote collaboration, modernization, flexibility, and sustainability requires an investment strategy that enhances INL capabilities, builds upon existing infrastructure, and limits major new capital investments to achieve maximum impact. INL bases its investment strategy on a business case that recognizes the economy and efficiency of investing in existing capabilities relevant to the DOE-NE mission and to the multiprogram nuclear and energy security mission.

By implementing this investment strategy, INL is making progress towards meeting its infrastructure goals. In the past several years, three analytical laboratories were built at ATR and MFC, specifically the Radioanalytical Chemistry Laboratory, Radiation Measurements Laboratory, and RCL. INL also added 80 office spaces at MFC with the new Modular Office Building, and built a new RESL at IRC. In FY 2012, INL will complete several construction projects at MFC; IMCL, the EFF conversion, new Dial Room, and the Sewage Lagoon replacements.

5.1 Defining Investment Needs

As discussed in Sections 3 and 4, INL retains a set of core nuclear energy and multiprogram capabilities dedicated to accomplishing R&D mission goals. INL continually assesses, identifies, and prioritizes infrastructure investment needs that are focused on enhancing, revitalizing, and sustaining its core capabilities. Table 5-1 summarizes the MC infrastructure strategy, and describes the gaps between current conditions and the essential capabilities needed to achieve mission goals.

INL's highest priorities with respect to the research infrastructure are to support DOE options analyses related to resumption of transient testing and to establish the next generation of advanced PIE and fuel fabrication capabilities. Strategies over the next 10 years for PIE, fuel fabrication, advanced separations and waste forms research, and UNF storage research include identifying gaps and developing strategies to close the gaps, with emphasis on using existing capabilities and infrastructure, or, if not possible, constructing new infrastructure.

INL will sustain existing irradiation, fuel development, and examination capabilities through proactive maintenance and repair and replacement of critical equipment and components.

With respect to INL ancillary missions, the infrastructure needs identified for N&HS align strategically with INL's nuclear energy mission. It provides the proving grounds and equipment, along with the classified and secure offices and laboratories, needed for performing the RD&D to enhance the security and efficiency of critical U.S. infrastructure, including energy systems, nuclear reactors, and transportation systems. INL also provides a similar infrastructure to support nuclear nonproliferation by securing and protecting nuclear and radiological activities and materials.

INL is also performing RD&D in support of a secure energy future, including RD&D on hybrid energy systems, and addressing challenges of energy demands associated with water and environmental sustainability. This mission relies on a number of facilities at REC. INL is consolidating capabilities and addressing growth issues by leasing two new facilities, ESL and REL. The mission strategy identifies these two facilities along with the R&D equipment needed to establish essential capabilities.

Table 5-1. Idaho National Laboratory mission-critical project and equipment acquisition strategy.

Current	Future	Gaps	Status
Irradiation			
ATR – Steady-state thermal spectrum irradiation facilities within ATR: - Static capsule - Instrumented-lead test capability - Flux trap.	Comprehensive fuels and materials irradiation – Using additional in-pile tubes, high fast-to-thermal neutron ratios, and instruments/capabilities extended to both simpler and more complex irradiation facilities. Full-loop test capability with transient testing, sophisticated in-pile instrumentation.	Reactivation of Loop 2A – Additional loops that can simulate boiling-water and fast reactor operating conditions. Additional sophisticated instrumentation or a wider variety of tests.	Complete installation in FY 2012 and begin operation of ATR Loop 2A with enhanced instrumentation and fuel ramp capability to support advanced fuel and material testing experiments.
ATR maintenance and repair, and sustainment.	Sustainment of ATR reliability through maintaining material condition – Provide continuing support of ATR reliability through timely replace/refresh of aging systems and components.	Enhancements for improving reliability and responding to severe accident analyses are under consideration.	ATR Life Extension Program concludes at end of FY 2015. Planning activities toward conversion to 100% commercial power, primary coolant pump and motor replacement, and emergency fire water injection system replacement
TREAT – Air-cooled, thermal, heterogeneous test facility, with a 1.2-m core height, designed to subject reactor fuels and structural materials to conditions simulating transient overpower and undercooling representative reactor situations; currently in standby mode.	Transient testing – To establish U.S. leadership in transient nuclear fuel testing/experimentation. Includes full service experiment services, including loops for multiple test configurations/state-of-the-art instrumentation and in-situ characterization.	Domestic transient testing capability to further nuclear fuel and reactor component R&D, Pending outcome of options studies, refurbish / restart systems, including HFEF support infrastructure/R&D for in-situ measurements: – TREAT control system/data acquisition – Upgrade hodoscope temporal resolution – Design/build new test loops – Upgrade transient testing analyses capabilities.	Obtained CD-0 for the Transient Testing Capability Project. Completing the transient fuel testing resumption capabilities alternatives analysis in FY 2013.
HFEF – Nuclear facility, cask receipt, front-end PIE, NDE (NRAD), size reduction, mechanical testing, and disassembly. Some equipment could be used in HFEF to prepare transient tests using irradiated fuels, but it has been unused for some time.	Consolidated test preparation/PIE capabilities – Comprehensive fuel/material PIE characterization and analytical capabilities, including nuclear, radiological, and nonradiological environments (see PIE capabilities) complemented by capabilities to prepare tests for experiments using preirradiated fuel.	Obtain equipment needed to handle pre/post-test assembly/disassembly of transient experiments in HFEF. Other PIE services, as discussed under PIE Capability.	Dependent on the outcome of the capabilities alternatives analysis in FY 2012 for transient testing capabilities.

Table 5-1. Idaho National Laboratory mission-critical project and equipment acquisition strategy.

Current	Future	Gaps	Status
PIE and Characterization			
HFEF Hazard Category 2 nuclear facility – Cask receipt, experiment disassembly, NDE, size reduction for shipment, and mechanical testing. EML – Radiological characterization facility housing basic sample preparation capability and electron-beam microscopes AL Hazard Category 3 Nuclear Facility – Chemical/isotopic analysis, and thermal characterization of irradiated and unirradiated materials. FASB – Fuels fabrication laboratory that also houses basic characterization/testing tools. EFF (formerly CESB) – Radiological facility for lab-scale fuel fabrication R&D/characterization. CAES MaCS – High-end equipment for characterization of low-level and nonradioactive materials. Nucleus of advanced capabilities. PIE instruments – Basic and state-of-the-art equipment installed in available lab space that is not suitable for routine examination of high activity materials. Aging, need to be replaced.	Consolidated national PIE capabilities – Complete characterization comparable to major research university, but for irradiated fuels/materials. Facilities for modern analytical equipment for use by a wide range of users. Integrate and consolidate characterization capabilities. Advanced PIE capabilities to improve understanding of nuclear fuels and material performance at the micro-, nano-, and atomic scales.	Unique analytical instruments and technology – Access to innovative tools that are able to handle highly radioactive fuels/materials. New facilities – Purpose-built, to house sensitive analytical instrumentation. Nuclear facility housing core characterization capability in shielded cells for full-spectrum analysis of irradiated fuels/materials. Micro/nanoscale R&D with limited mechanical testing. Nuclear facility R&D hub expands and further consolidates advanced PIE capability: – Advanced fuel and nuclear material characterization – Bench through laboratory-scale process demonstration – Reconfigurable to meet DOE needs for next 40 years. Front-end for the NSUF gateway expanding upon CAES ability to house high-end PIE instruments that mimic capabilities at MFC and link to MFC facilities to allow remote analysis. Accessible to visiting researchers. Transition to a laboratory-scale radiological characterization/testing laboratory. After IMCL is operational, transition to a bench-scale radiological characterization/testing laboratory. Replace old characterization equipment with state-of-the-art characterization equipment. Obtain equipment for complete characterization.	HFEF – Retrofitting equipment to state-of-the-art status for baseline PIE capabilities. IMCL is under construction; to be complete by the end of Calendar Year 2012. Installation of IMCL first equipment scheduled in FY 2013. IMCL will be a prototype laboratory that will inform decisions about future PIE needs. Advanced PIE – Initiate alternatives analysis in FY 2012. NSUF capabilities being incorporated into redefinition of REL with completion planned for 2014. FASB – Underway; several pieces of RERTR equipment have been relocated to the EFF (formerly CESB). EFF Conversion Project completed June 2012.

Table 5-1. Idaho National Laboratory mission-critical project and equipment acquisition strategy.

Current	Future	Gaps	Status
Nuclear Fuel Development			
CAES – DU ceramic fuel fabrication at laboratory/bench-scale (in development). EFF (formerly CESB) – Radiological facility for laboratory-scale fuel fabrication R&D/ characterization FASB – Radiological facility, basic DU/EU metallic and dispersion fuel fabrication, and characterization at laboratory/bench-scale (mostly plate design). FMF – Hazard Category II facility, basic contact-handled TRU metallic/ceramic fuel fabrication at laboratory scale (pin design). AL – Nuclear facility, contact-handled TRU metallic fuel fabrication (pin design) within the casting laboratory glovebox.	Complete, consolidated fuel fabrication capabilities – Comprehensive fuel development capabilities for most types, scales, and hazard levels of nuclear fuel. EFF – Fuels development supporting ceramic fuel strategy. Fundamental process testing/fabrication of uranium fuels. FMF – Flexible and reconfigurable shielded SNM glovebox capability for laboratory/bench-scale ceramic/metallic fuel development.	Enriched uranium capability for all fuels – Consolidate and expand EU/DU fabrication/ characterization capabilities in FASB (laboratory- scale) and EFF (bench-scale) for all fuels. Contact-handled TRU ceramic/metallic fuels – Expand FMF flexible and reconfigurable shielded glovebox capabilities to include laboratory/bench-scale for ceramic and metallic. Expand AL bench-scale characterization capabilities. Remote/contact-handled TRU ceramic/ metallic fuels – Hot cells with capabilities to fabricate/ characterize ceramic/metallic fuels remotely at laboratory/bench-scale, including capability to refabricate fuel specimens for continued irradiation experiments. Remote/ contact-handled TRU ceramic/ metallic fuels – Hot cells with capabilities to remotely fabricate/ characterize ceramic/ metallic fuels at engineering and lead test assemblies.	SNM glovebox installed in FMF. Completed readiness activities and became operational the first quarter of FY 2012. EFF (formerly CESB) conversion completed in FY 2012.
Electrochemical Separations			
FCF (engineering scale separations) – First generation electrochemical equipment for treatment of used sodium-bonded EBR-II and FFTF fuel. HFEF – Single, small electrochemical cell with limited access. FASB – Single, small electrochemical cell for radiological testing with limited quantities of radioactive materials. Engineering Development Laboratory – Single, small electrochemical cell for cold surrogate work.	Complete treatment capability for multiple fuels – The ability to completely disposition used EBR-II and FFTF fuel, as well as the ability to disposition-limited quantities of other fuels–such as small quantities of fuel brought in for PIE and other programs. The ability to return recovered uranium to the commercial market is also a key future capability. Lab-scale cold, warm/TRU R&D capabilities. Integrated/enhanced engineering-scale capabilities. Develop integrated modeling/simulation expertise.	Electrochemical technology development capabilities –Additional warm/hot laboratory scale testing capabilities are necessary to test adaptations to first generation process for additional fuels. Improved uranium product – Modifications to the first generation process equipment are necessary to achieve form and purity required for commercial uranium market. Inert gloveboxes installed in radiological facilities.	EDL - Construction of a second electrochemical cell for cold surrogate work is in progress to be completed in 2013. HFEF - The design of kg-scale equipment for warm/ hot operations is underway and scheduled to be completed in 2014. A scoping activity is underway with potential commercial recipients of EBR-II and FFTF uranium in order to identify high-priority equipment or process modifications to be completed in 2012.

Table 5-1. Idaho National Laboratory mission-critical project and equipment acquisition strategy.

Current	Future	Gaps	Status
Aqueous Separations			
REC Laboratory and BCTC – Cold surrogate work in Idaho Falls. RCL/MFC, FASB, CFA-625 – Warm, radiological R&D.	Integrated advanced aqueous capabilities – Laboratory/engineering-scale capabilities via radiological/ nuclear facilities dedicated to separations. Integrated engineering-scale capabilities with surrogates/nuclear materials. Ability to perform integrated process demonstrations at engineering-scale and process SNM. Integrated modeling/simulation expertise. Science-based research capability closely coupled with R&D experiments.	Hot cell integrated and shielded R&D separations capability at laboratory/bench-scale and engineering-scale. Business case analysis for other mission needs for RAL. RAL proposed for mission related work requiring analytical laboratories including separations, N&HS, and other missions.	Request made to transfer RAL from DOE-EM to DOE-NE. Performing a business case analysis to examine facility utilization and cost to inform a future decision.
Waste Form Development			
HFEF – Warm/TRU, hot R&D, and processing capabilities. MFC – Metal waste form equipment and some ceramic waste form equipment to treat used sodium-bonded fuel at MFC. HIP and Cold Crucible Induction Melting.	Waste form development capabilities – Unified/ consolidated capabilities, techniques/expertise in waste forms that can be leveraged for multiple programs: - Integrated modeling/simulation expertise - Hot engineering/pilot-scale R&D capabilities at INL - Maintain HIP capabilities.	Facility space and equipment dedicated to Waste Form R&D (furnaces, melters, dissolution apparatus, and analytical equipment).	HFEF - Designed and installed the first full-scale furnace, currently in "hot" operations. The first engineering-scale hot metal waste form has been produced. Sampling and analysis expected to be complete in 2013. HIP equipment is being placed in safe and/or standby mode within HFEF. Ceramic waste form equipment is being or has been placed in safe and/or standby mode in MFC-789 EDL and MFC-768 Turbine Deck.
Nuclear Energy Science and Technology Gateway			
CAES – Provides office/laboratory space for visiting scientists with primary focus on the Idaho universities.	Comprehensive fuel/material characterization and analytical capabilities, including nuclear, radiological, and nonradiological environments. Unique facilities for conducting nuclear physics experiments. Space for high-energy experiments. Gateway for visitors – Portal for hosting visitors, collaborating, analyzing nonradioactive/lightly radioactive materials, and conducting nuclear physics measurements.	High-end PIE instruments that parallel capabilities at MFC, unique space for nuclear physics and high-energy experiments, access for visiting researchers, and collaboration space.	REL under construction (occupancy planned for FY 2014).

Table 5-1. Idaho National Laboratory mission-critical project and equipment acquisition strategy.

Current	Future	Gaps	Status
Radioisotope Power Systems Fueling, Testing, and Transportation Systems			
SSPSF – Complete fueling, testing, and transportation system for radioisotope power systems to support NASA and national security customers.	Support an increasing number of missions from NASA and national security customers with a variety of new and more efficient power conversion systems. Provide support for the re-establishment of domestic production of Pu-238 for the first time since the 1980s.	An annex to the SSPSF to increase storage capability for the radioisotope power systems. Additional shielded glovebox capability to package and ship the neptunium oxide currently stored in FMF in support of the re-establishment of domestic production of Pu-238.	Addressing additional infrastructure needs with DOE and customers.
Critical Infrastructure Protection			
Operational Site Electric Grid – With limited adaptability for full-scale testing and capabilities for developmental technology insertion. Includes High Fidelity grid simulators and infrastructure analysis tools for customer specific analysis. Wireless Communications – Open range, field-scale cellular system test bed and network operations center; client training, system maintenance and staff supported with various facilities at CITRC and CFA. REC classified/unclassified offices and shared laboratories.	Full-scale, isolatable, reconfigurable, and instrumented power grid – Able to meet high impact DOD, DOE, and DHS missions and industry R&D needs; a unique national asset for national verification and validation of infrastructure technology resilience and integration. Expanded high-fidelity grid simulators and infrastructure modeling tools – To support operator training, reliability/resiliency/cyber security modeling; smart grid and renewable energy technology insertion models; and high priority national security mission planning and exercises. Wireless Control Center Facility at CFA supporting staff, training, laboratories, testing operations, and system upgrades. R&D laboratories supporting foundational cyber research of critical systems, bench-scale prototyping, anechoic chamber signal analysis, and indoor radio frequency characterization. Robust unclassified and classified connectivity supporting data access and repositories, networks integrating Idaho Falls communication laboratories, INL range testing and sensor systems, and off-site experimental access.	Phased grid enhancements: reconfigurable substation, Smart Grid infrastructure components and monitoring systems, generation/ energy storage sources, additional distribution lines, adjustable loads, data/communications and grid control systems (fiber, wireless), experimental sensors, data networks, and test support areas. Additional grid simulators/ infrastructure modeling tools, classified HPC, and additional secure data communications connectivity. Wireless Control Center Facility at CFA supporting staff, training, laboratories, testing operations, and system upgrades. R&D laboratories supporting foundational cyber research of critical systems, bench-scale prototyping, anechoic chamber signal analysis, and indoor radio frequency characterization. Robust unclassified and classified connectivity supporting data access and repositories, networks integrating Idaho Falls communication laboratories, INL range testing and sensor systems, and off-site experimental access.	Developing and implementing investment strategy for grid enhancements. Pursuing designation as a NSUF and developing investment plan.

Table 5-1. Idaho National Laboratory mission-critical project and equipment acquisition strategy.

Current	Future	Gaps	Status
Nuclear Nonproliferation S&S			
Nuclear and Radiological Training and Testing in Support of Emergency Response – Classroom, laboratory, and field training and testing at CITRC and TREAT using INL nuclear/ radiological materials.	Integrated training, demonstration, and exercise Nuclear and Radiological Complex for emergency responders.	Dedicated testing and training facility for emergency response training and technology evaluation, with ready access to nuclear and radiological materials.	Currently evaluating requirements and options.
Material and Survivability Support to the DOD			
National Security Test Range – Live-fire ballistics testing with no permanent infrastructure/facilities to accommodate data collection/observation.	Comprehensive National Security Test Range – Includes infrastructure/facilities that allow for conference rooms, work areas, live fire testing observation, video and data collection, and special access programs.	Work is being performed in a primitive work environment which requires improvement to adequately conduct the current mission.	INL Test Range Multi-Use Facility – Project need identified and planned for FY 2017, as estimated in this TYSP.
Nuclear Material - Treatment Capabilities to Enable Disposition of Surplus Unirradiated Materials			
SNM Glovebox – Treat a large portion of surplus unirradiated EU materials, including sodium-bonded materials. Materials Breakout Glovebox – Size and distribute SNM. ZPPR Workroom Hoods with Enhanced PPE Controls – Limited inspection of ZPPR plates.	Modern integrated SNM containment systems to survey, treat, handle, size, and distribute SNM including LEU, EU, and TRU: - SNM Glovebox - Transuranic Surveillance Box – to inspect PU plates for disposition, and programmatic work for N&HS and others in ZPPR research cell - Material Breakout Box to breakout materials and size for distribution.	End-of-life materials breakout glovebox needs to be replaced with modern capabilities and adequate engineering controls to perform today's transuranic work.	SNM Glovebox – Operational in FY 2012. Transuranic Glovebox – CD-1 approved in FY 2012. Minimal TRU work being performed until new glovebox is installed. Material Breakout Glovebox – Working with NE-75 to fund uranium breakout glovebox and hood.
Energy Systems Design, Analyses, and Testing			
Established modeling and experimental tools for design/analysis of processes involving kinetics and heat and mass transfer. System dynamic modeling of mass flows for complex systems.	Expanded experimental systems and measurement capabilities for model verification/ development. Modeling/verification of non-steady-state systems. System dynamic modeling with linked geographical components and energy and economic feedback relationships.	Fully instrumented testing lab to validate advanced dynamic models. Sufficient computer resources to perform real-time multiphysics based process simulation.	ESL is under construction and will complete in FY 2012. Teaming with ICIS on the test bed infrastructure for advanced monitoring/control technology development. Integrating with Center for Advanced Modeling and Simulation to leverage computing/ visualization systems/capabilities.

Table 5-1. Idaho National Laboratory mission-critical project and equipment acquisition strategy.

Current	Future	Gaps	Status
Energy Conversion, Storage and Transmission Technology			
Established laboratory-scale test bed assets for developing hydrogen generation, heat exchanger evaluation, real-time digital simulator, small-scale battery testing, and grid testing.	Integrated energy testbed based on hybrid systems simulator, including simulated thermal/ electrical and intermediate hydrogen generation, small-large battery testing, and resilient grid control. Large-scale hybrid user test facility.	Variable energy generation device(s); virtual conventional power generation device(s); grid simulator/ related infrastructure, dry room (small battery test) and grid-scale battery test capability associated with ESL.	Integrating Energy System Demonstration test bed with complementary capabilities at other national laboratories (e.g. NREL). Preparing to install new energy storage testing equipment in ESL.
Chemical Conversion, Separations, and Processes			
Steady state catalysis, thermal and nonthermal plasma processing, extremophilic organisms capable of performing chemistries in harsh environments, supercritical fluid chemistry, and targeted chemical separations.	Expanded expertise in nanosized catalytic materials, alternate catalytic materials to replace platinum, rare earth catalysts, high-temperature polymer and membrane materials to replace energy intensive separations and perform selective separations in harsh environments, electrocatalysts for use of carbon dioxide and low waste production of unique chemical compounds, separation strategies for recycling/ recovery of rare earths and other materials.	Enhanced equipment and laboratory space for analytical and synthesis chemistry, catalysis, and polymeric materials.	Synthesis Workflow System to evaluate chemical synthesis/catalyst development is on IGPCE list. A 12T Fourier Transform Mass Spectrometer for molecular characterization at very low concentrations and high mass resolution is on IGPCE list. REL is under construction and will be completed in FY 2014.

Appendix A contains an assessment of the INL Real Property Infrastructure, an enabling capability to accomplish the INL ten-year vision. The appendix provides a description and discussion of INL's strategy for managing utilities and supporting infrastructure capabilities, and the approach to proactively sustain real property assets. The assessment evaluates the deferred maintenance (DM) backlog, replacement plant value (RPV), and ACI for the MC and mission-dependent buildings and OSFs, and identifies the funding needed to meet the DOE goals for the ACI and enable the INL mission.

5.2 Investment Approach

INL is leveraging its available investment resources to address the infrastructure requirements essential for laboratory mission priorities. Based on the budget outlook of the next few years, the infrastructure investment strategy has been adjusted to reflect a more conservative funding profile. A multifaceted investment strategy will be needed to enable any acceleration to the adjusted project profile.

INL has dedicated a large percentage of its strategic investments resources to benefit INL through capital investments and other strategic investments. A small percentage of INL funds (< 3%) are dedicated to Laboratory Directed Research and Development (LDRD). Since FY 2011, INL has set aside strategic investment funds and applied this limited and valuable resource to most effectively support national mission needs. Mission priorities are established at the Executive Leadership Level and infrastructure investments are made accordingly. Despite a reduced INL financial base, these strategic funds remain a steady source for strategic infrastructure investment.

Figure 5-1 illustrates the laboratory infrastructure funding needs.

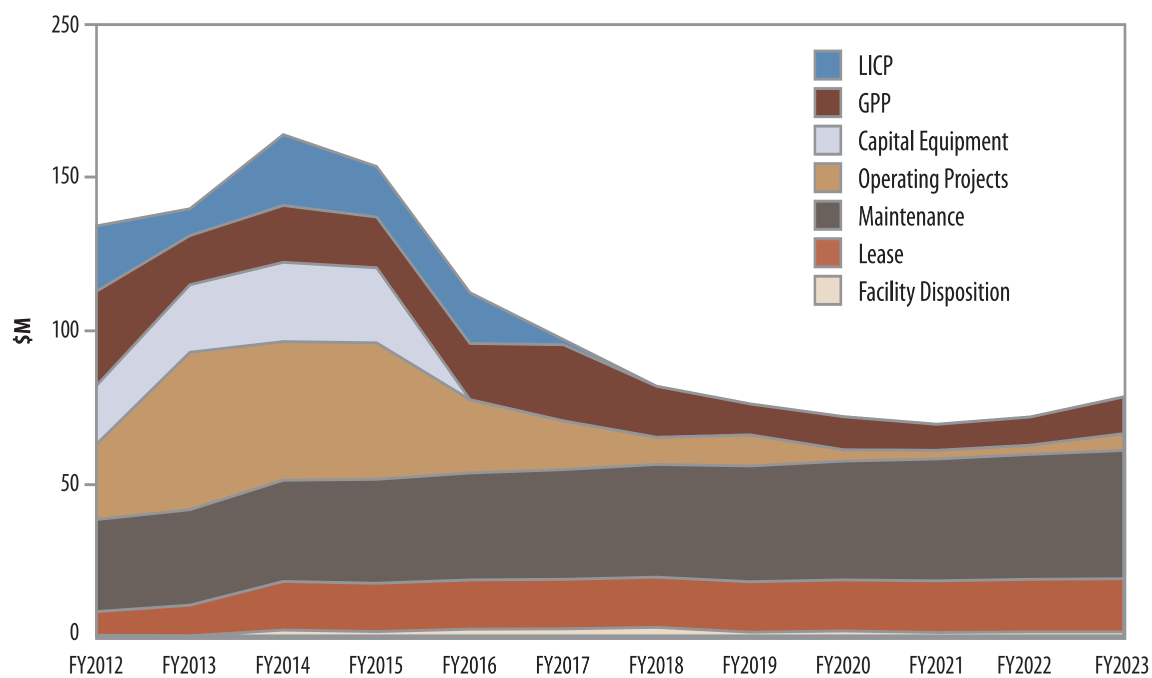

Figure 5-1. Idaho National Laboratory facilities, maintenance, equipment, and disposition needs.

Table 5-2. Investment types comprising the investment bands in Figure 5-1.

Need Profile	Reference / Comment
Line-Item Construction Projects	
Remote-Handled LLW Disposal Project	Table B-5 – DOE-NE portion only. Project is co-funded by DOE-NE and NR.
Advanced PIE Capabilities Project	Table B-5 – Project engineering and design only; follow-on construction costs not included.
Materials Security and Consolidation Project	Table B-5
General Plant Projects	
IGPPs	Table B-1
Programmatic GPPs	Table B-2
Capital Equipment	
Institutional General Purpose Capital Equipment	Table B-3
Programmatic Capital Equipment	Table B-4
Operating Projects	
ATR major repair and replacement activities	Table B-6
ATR Life Extension Program	Not otherwise included in the TYSP.
Operating-funded projects	Table B-2
Sustainability	Table D-1
Leasehold improvements	Table B-6
Maintenance	
DOE-NE Direct M&R	Baseline maintenance funding – not otherwise included in the TYSP.
NR Direct M&R	Baseline maintenance funding – not otherwise included in the TYSP.
DOD Direct M&R	Baseline maintenance funding – not otherwise included in the TYSP.
Indirect M&R	Baseline maintenance funding – not otherwise included in the TYSP.
Leases	
Facility Leases	Table A-4
Facility Disposition	
Footprint Reduction	Table B-6

The profile includes maintenance needs from Appendix A, *Real Property Asset Management*; capital asset acquisition, upgrade, and disposition needs from Appendix B, *Prioritized Resource Needs*; and sustainability needs from Appendix D, *Strategic Sustainability*. It also reflects additional, yet to be formulated, activities (i.e., MR&R at ATR and MFC). To be consistent with FIMS and Integrated Facilities and Infrastructure crosscut data, Figure 5-1 does not include FIMS Series 3000 capital asset-related activities.

Table 5-2 identifies investment needs that comprise the investment bands in Figure 5-1, and links the graph data series to the specific sections of the TYSP. Appendix B outlines the projects and activities planned for the next 10 years.

5.2.1 Program Investments

- **Infrastructure Facility Management** – The IFM Program activities provide the critical infrastructure, unique capabilities, and highly trained workforce to enable and facilitate INL core mission outcomes such as essential nuclear RD&D activities. The strategic priorities for use of this funding are to: (1) sustain core capabilities, (2) strengthen core and enabling capabilities, (3) build world-leading capabilities, and (4) enable INL "user facility" and "open campus" environments.

  The IFM budget primarily supports compliance-based maintenance and repair of nuclear facilities with limited closure of gaps to excellence, funding for nuclear facility sustainment, and limited funding for assessing and developing new or replacement capabilities. New/replacement capabilities include a remote-handled LLW disposal capability, transient testing, and advanced PIE capability. IFM sustainment activities support ATR initiatives to replace the diesel generator sets, replace obsolete electrical distribution equipment, transition ATR to 100% commercial power, replace primary coolant pumps and motors, and replace the emergency firewater injections system.

Program specific investments are aligning their funding resources to their strategic plans and enhancing or establishing capabilities needed to achieve RD&D solutions toward INL mission-directed need. INL continues to integrate its infrastructure investment strategy and continues to encourage programmatic capital investments to provide MC capability.

5.2.2 Other INL Strategic Investments

Other INL strategic investment options include:

- **Strategic Investment Funds (primarily IGPP)** support institutional projects, both technical and support facilities and infrastructure, as required to advance mission capabilities. To further this goal, INL increased these funds by 40% from FY 2011 to FY 2012. In the next 3 to 5 years, the investment strategy focuses primarily on enhancing mission and support capabilities at MFC, particularly PIE and fuels R&D as well as basic utility enhancements (e.g., sewer, power, and communication). It also supports the mission-critical need for additional office and laboratory capabilities at REC, specifically the acquisition of ESL and REL.
- **IGPCE**, similar to IGPP, is a strategic investment allocation. IGPCE investments primarily support MC R&D equipment and supporting capability equipment needs.

- **WFO** provides opportunity for infrastructure investment at INL, most notably by the NR Program, which provides a portion of the maintenance and repair funding for ATR; and DOD, which provides the maintenance and repair funding for SMC.
- **LDRD** develops new capabilities through R&D and plays a small infrastructure investment role. Annual investment in LDRD has grown to more than 3% of the total business volume. LDRD funding supports joint appointments, graduate fellowships, intern programs at INL, and development of capabilities (including equipment).
- **Alternatively Funded Projects** are the primary method to fund sustainability and efficiency projects, and savings are reinvested into new efficiency projects. Site sustainability goals will be met if alternatively funded projects (e.g., Energy Savings Performance Contracts [ESPCs]) are completed, as well as additional efficiency projects, as listed in Table D-1.

INL continues to seek efficiencies in space management to ease the infrastructure demand for space. Telecommuting pilots and revised strategies for space management and laboratory utilization directly support space optimization objectives.

6. CONCLUSION

Through the TYSP, INL continues to implement a strategy that links infrastructure requirements to R&D mission goals and INL core capabilities. The TYSP highlights the infrastructure investments that will provide the best return for INL and its customers, and identifies how such investments can be accomplished. By implementing the TYSP, INL will assure continued availability of its unique nuclear R&D capabilities and infrastructure assets as valuable resources to universities, industry, national laboratories, international research organizations, and other federal agencies.

In spite of national economic challenges, INL strategic investments have increased 40% over this past year. Strategic investments are vital resources for achieving the INL ten-year vision. However, these resources are limited, and INL will continue to pursue a range of approaches to increase its investment portfolio. Building repurposing (e.g., EFF), lease arrangements (e.g., ESL and REL), a limited number of line items (e.g., the Remote-Handled LLW Project), and program-specific infrastructure resources will all be pursued to enhance INL's broad portfolio of investments.

INL has focused its infrastructure development plans in the TYSP to those that have been reviewed or are under active review by DOE. Future revisions to the TYSP will capture the further development of these plans as they progress. For example, as the UNF disposition strategy and business case regarding INTEC infrastructure matures, the TYSP will be revised accordingly. As a result, the TYSP will continue to provide an effective and systematic means of communicating INL's capabilities, goals, and plans for sustaining INL infrastructure and meeting the mission needs of its customers.

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APPENDIX A






Real Property Asset Management

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APPENDIX A
REAL PROPERTY ASSET MANAGEMENT

Over the last 2 years, DOE-NE and INL have aligned data and established a solid planning baseline for real property asset management. As a result, the accuracy of the FIMS RPV and DM backlog, and therefore, the ACI, have improved.

INL has also invested leadership and subject matter expertise to review and improve the risk basis for multiyear forecasting of MR&R activities needed to keep real property assets ready and available. A critical part of improving the condition and sustainability of INL buildings is the use of the DOE NNSA Roof Asset Management Program (RAMP) to replace almost 100,000 ft^2 of deteriorated roofs with "Cool Roof" technology over the next 3 years.

A-1. SUMMARY OF REAL PROPERTY

A-1.1 Real Property Inventory

DOE is responsible for 915 real property assets (owned and leased, operating, and shutdown) located on the INL Site and 78 assets located in the City of Idaho Falls (i.e., the REC). The 993 DOE-owned and contractor-leased assets (including 38 NRF assets) have a FIMS RPV of \$7.4 billion and include 545 buildings and real property trailers totaling 6.1 million ft^2.

DOE-NE, as the lead program secretarial office for INL, manages 584 (59%) of the 993 INL real property assets reported in the FIMS. These assets have an estimated RPV of \$5.1 billion and include 322 buildings and real property trailers totaling 3.2 million ft^2. The remaining 262 assets are OSFs[a] that support these buildings.

A-1.2 Asset Condition Index

The ACI for DOE-NE assets continues to improve due to investments in maintenance and continued improvement in the quality of FIMS RPV and DM data.

Table A-1 breaks down the DOE-NE building square feet, DM, and RPV for owned and operating[b] assets[c] in each of the three mission dependency categories. Table A-1 also illustrates that the average ACI of DOE-NE assets exceeds the ACI target in each FIMS mission dependency category.

Additionally, the ACI for each of the 21 DOE-NE MC assets exceeds the 0.980 target.

a Other structures and facilities include any fixed real property improvements to land that are not classified as a building (e.g., bridges, towers, roads, and fences). They also include site utility systems used to generate or distribute any services such as heat, electricity, sewage, gas, and water.

b Operating assets are those with a FIMS status code of 1, 2, or 6.

c The ACI is not applicable to FIMS 3000 series OSFs. Therefore, these OSFs are not included in the ACI discussion above. FIMS 3000-series OSFs at INL are the ATR, its cooling tower, and the TREAT.

Table A-1. Summary of Department of Energy Office of Nuclear Energy owned and operating nonprogrammatic asset data.

FIMS Mission Dependent Category	Number of Assets	DM (\$M)	RPV (\$M)	GSF (million ft^2)	ACI	Target
Mission Critical	21	3.5	1,819	0.8	0.998	0.980
Mission Dependent	344	42.3	1,360	1.9	0.969	0.930
Not Mission Dependent	170	7.7	165	0.4	0.954	0.920
TOTAL	535	53	3,345	3.1	0.984	0.950

Figure A-1 presents additional detail concerning the ACI for owned and operating DOE-NE assets by property type (e.g., building, trailer, or OSF). It provides a breakdown of the ACI target, the average ACI for all assets, the ACI for buildings and trailers, and the ACI for OSFs in each mission dependency category.

A-1.3 Asset Utilization Index

The asset utilization index (AUI) for INL DOE-NE assets is summarized in Table A-2. Overall, the INL AUI decreased by 3% when compared to FY 2011. However, the AUI for the primary INL campuses (i.e., ATR Complex, MFC, and REC) remained essentially stable with a slight (1%) improvement at the REC and ATR Complex.

The reduction in the overall INL AUI was due to relocating staff and activities out of, and consolidating activities within, the CFA. As a result, the FIMS status for 52,000 ft^2 of space changed from operating to shutdown status. Demolition of this excess space is included in the disposition proposal discussed in Section A-2.5.

Table A-2. Idaho National Laboratory asset utilization index.

Site Area	Owned Facilities (GSF)[a]	AUI[b]	Rating
MFC	594,656	0.95	Good
ATR Complex	393,216	0.98	Excellent
REC	1,121,101	0.95	Good
Balance of INL	1,110,472	0.86	Fair
All INL Facilities	3,219,446	0.92	Adequate

a. Based on 03/29/2012 data.

b. AUI Rating Levels (DOE O 430.1B):

1.00 ≥ 0.98 = Excellent

0.98 ≥ 0.95 = Good

0.95 ≥ 0.90 = Adequate

0.90 ≥ 0.75 = Fair

< 0.75 = Poor

A-2. REAL PROPERTY ASSET MANAGEMENT

The key elements of the INL real property asset management program include condition assessment, capital investment in new and revitalized infrastructure, space utilization, sustainment, disposition of excess real property, and management of real property data.

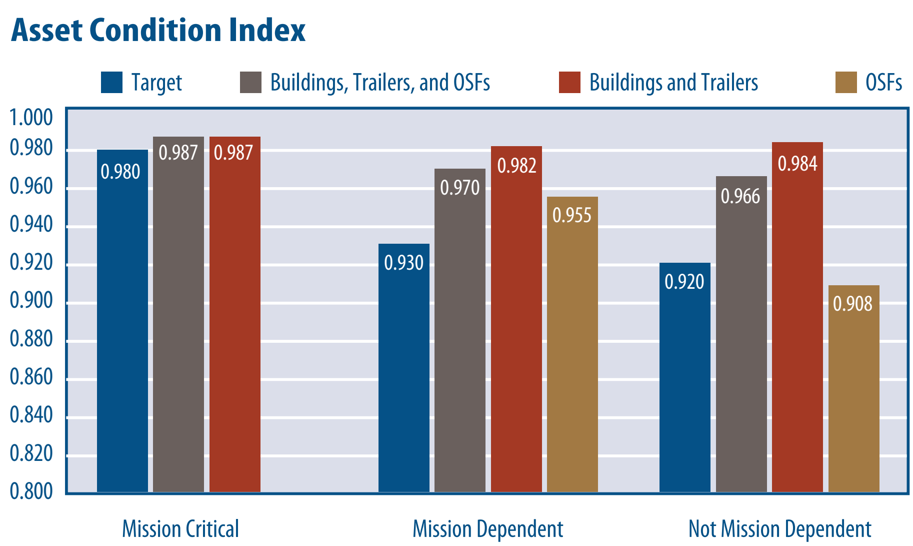


Figure A-1. Asset condition index by mission dependency and property type.

A-2.1 Condition Assessment

The INL Condition Assessment Program fulfills the requirements of DOE Order 430.1B, *Real Property Asset Management*. INL employs experienced inspectors and third-party contractors to inspect all DOE-NE real property assets at least every 5 years. Primary roads are inspected under contract with the Idaho Transportation Department using modern, vehicle-mounted inspection equipment. Bridge inspections are performed under subcontract to a qualified bridge inspector. Roof assets are inspected by the roof asset management contractor under contract to the NNSA RAMP. The remainder of INL assets and non-roof building components are inspected by INL inspectors.

INL bases its DM backlog on the deficiencies identified during these condition assessment surveys. Condition information from facility professionals, which is based on feedback from building occupants and their own operating and maintenance experience, contributes to identification of DM. These deficiencies are recorded in the DOE Condition Assessment Information System (CAIS) database and submitted for execution to the INL computerized maintenance management system. The CAIS data are the source of DM uploaded to FIMS during the annual FIMS update cycle.

A-2.2 Capital Investments in Infrastructure

Ongoing capital investment in new construction, expansion, and revitalization is providing needed R&D space and support infrastructure capacity. Appendix B, *Prioritized Resource Needs*, lists the specific infrastructure investments planned to achieve the vision identified in this TYSP. The more significant capital investments currently underway include:

- A new 12,000-ft^2 IMCL at the MFC will fill the critical need for the postirradiation materials examination capability.
- The ESL in Idaho Falls will provide more than 50,000 ft^2 of modern R&D space for energy and environmental science research.
- The REL in Idaho Falls will provide 132,000 ft^2 of modern R&D and office space and support user facility and other critical research activities.
- Replacement and expansion of the MFC sewage lagoons to provide the necessary sewage treatment capacity for the future of MFC.
- Replacement and expansion of the MFC Dial Room to provide the necessary communication capacity for the future of MFC.
- MFC Electrical Distribution System expansion to increase electrical capacity for future expansion to the north end of MFC, including the IMCL.

A-2.3 Space Utilization

A-2.3.1 Space Planning Principles, Standards, and Criteria

The INL goal is to ensure employees are provided a modern, collaborative, and sustainable work environment that is flexible by design and can be configured to meet specific program and/or project needs without major renovation and investment. INL has updated its office standards and provided a variety of office and workspace types and sizes based on job code and function, privacy, and work style needs.

Consistent with industry practices, these types of spaces are trending to a smaller individual footprint within well laid out neighborhoods that provide open, multiuse areas and invite groups together for team based work.

These spaces include the traditional conference rooms plus huddle areas that allow small groups to find convenient private locations for impromptu meetings and open areas that include space for casual meetings, shared storage, equipment areas, and break rooms. This open office environment encourages team collaboration supporting today's researchers and staff members' work styles based on modern technology options.

The combination of the assigned office space, office support areas, and collaboration space results in an average total workspace allocation of 200 ft^2 per person (see Figure A-2). This standard is being applied to new buildings and modernized space, as funding allows. Existing buildings have a space allocation goal of 230 ft^2 per occupant. Figure A-3 illustrates the area per occupant at the INL campuses for FY 2012 and, for comparison, FY 2011. CFA footprint consolidation efforts in FY 2011 reduced the area per occupant for this area. The FY 2011 SMC reduction in force increased the area per occupant at the SMC.

A-2.3.2 Space Utilization Surveys

In FY 2011, INL conducted a utilization survey of office and laboratory space. Each office space, including conference rooms, copy/fax areas, and other shared support space, was walked-down with a facility representative. Detailed notes (with photographs for record) were taken during the walk-down of each space and the current condition and utilization of laboratory and office spaces were assessed. This data assisted in developing laboratory and office standards. These standards will enable INL to more effectively use existing space and plan efficient new facilities, as needed. Utilization efficiency was determined by assessing the current space occupied by each office and workstation and comparing that to the appropriate space that would be allocated using the Office Space Size by Labor category.

In general, utilization is appropriate for the types of laboratories at INL. Some high bay space may be less than optimally allocated; however, the need to maintain unique capabilities drives this situation.

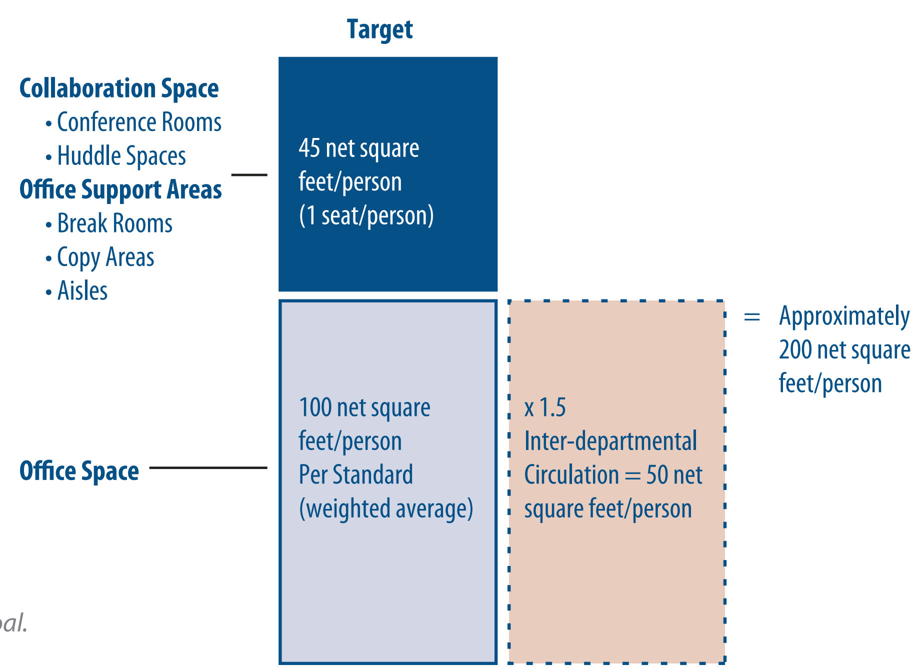


Figure A-2. Office allocation goal.

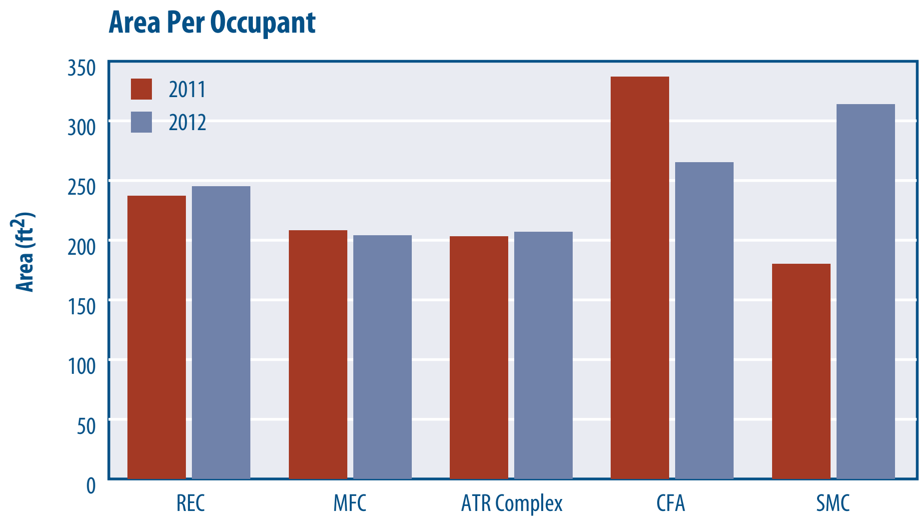


Figure A-3. Idaho National Laboratory area per occupant, FY 2011 and FY 2012.

The condition of the offices varies. The large office complexes are generally in average condition, while some of the smaller facilities on the INL Site are in less desirable condition. Individual space utilization, when comparing actual space assignments to the draft space standards, is below the targeted utilization in all buildings. However, when comparing collaborating space to industry metrics, available conference space in the two larger buildings (EROB and Willow Creek) is approximately half of what would typically be provided.

A-2.4 Sustainment of Enduring Assets

INL maintenance budgets are expected to remain flat or decrease over the 5-year sustainment planning horizon. Therefore, the INL sustainment strategy will continue to focus on corrective maintenance and cost-effective preventive maintenance and predictive monitoring that is based on the principles of reliability centered maintenance.

INL continues to invest planning resources in defining the appropriate level of proactive MR&R and improving the risk basis of MR&R forecasting. For example, in FY 2011, over $40 million (56%) of the $73 million of MR&R activities forecast for FY 2011 through FY 2020 were screened out as low risk activities. Additionally, $27 million in DM backlog was cancelled by applying a more risk-based approach to determining if a sustainment activity was past due for completion.

INL has used the NNSA RAMP for roof condition assessments, condition data management, and planned roof repair and replacement activities since FY 2010. Use of the NNSA RAMP has resulted in the replacement of 83,000 ft^2 of roof area with "Cool Roof" technology. An additional 21,450 ft^2 of cool roof area will be installed during the FY 2012 RAMP project.

Table A-1 shows that the INL ACI for assets in the three FIMS mission dependency categories is currently above target. Additionally, the ACI for each of the 21 individual MC assets is also above the 0.980 ACI target. Therefore, INL has not instituted a DM reduction program.

A-2.5 Disposition of Excess Real Property Assets

The INL demolished eight DOE-NE excess buildings and trailers totaling 5,265 ft^2 in FY 2011 and the first quarter of FY 2012. This brings the total square footage reduction since inception of the Battelle Energy Alliance, LLC (BEA) INL contract in February 2005 to 369,512 ft^2.

INL real property inventory includes 47 excess real property assets[d] that are managed in a safe and stable condition until funding is allocated to accomplish planning and disposition. Table A-3 provides a summary of this inventory and the estimated cost of disposition.

The principle drivers used to develop the INL excess building disposition plan are based on the need to:

- Reduce the cost, hazards, risk of continued asset deterioration, and visual impact associated with maintaining an excess asset in the inventory for an extended period after the asset has been declared to be excess
- Improve the work environment and operational efficiency as part of campus planning activities
- Clear land area to provide for expansion or construction of new buildings
- "Bank" demolished square footage to offset expansion or construction of new square footage.

Figure A-4 illustrates INL's proposal (cost and schedule) for dispositioning the remaining excess buildings and additional buildings that are anticipated to become excess by the end of 2021. Accomplishing this would result in dispositioning 695,700 ft^2 of excess footprint since February 2005.

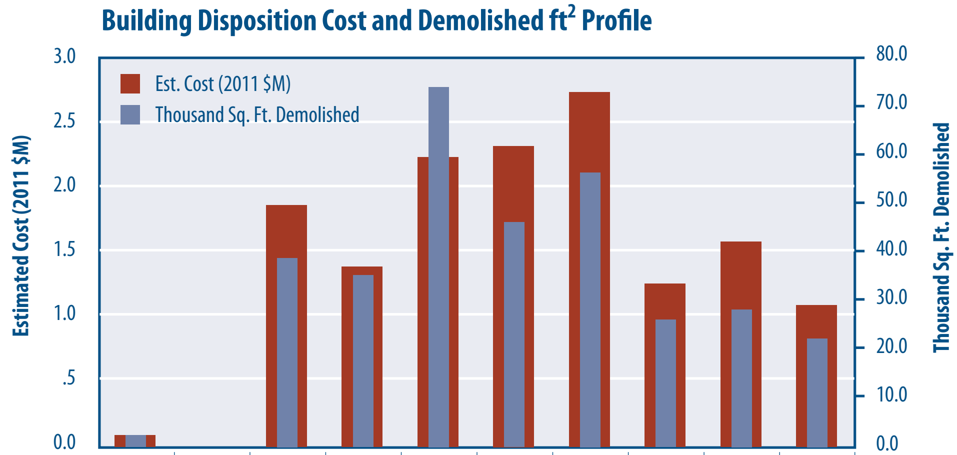
A-2.6 Management of Real Property Data

INL captures real property data in the FIMS, and efforts to improve the quality of the FIMS data have been documented in the last two TYSPs. Recent activities include developing a comprehensive FIMS data quality assurance plan and the $500,000 DOE-NE funded initiative to improve the accuracy of the FIMS RPV for approximately 80 MC and mission dependent, not critical (MD) assets. Implementation of these new RPVs was completed in February 2012. Part of this implementation included applying a FIMS Conventional

Table A-3. Summary of excess real property asset inventory and estimated disposition cost.

Excess Property Type	Inventory	GSF	Estimated Disposition Cost ($M)
Buildings - Historic	6	33,097	5.6
Buildings - Non Historic	7	100,836	5.1
Other Structures and Facilities	34	N/A	4.0
Total	**47**	**133,933**	**14.7**

d *Excess assets include those with a shutdown related FIMS status codes for buildings, trailers, and OSFs (FIMS status codes 3, 4, 5, 11, and 12).*



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Est. Cost (2011$M)	0.1	0.0	1.9	1.4	2.2	2.3	2.8	1.2	1.6	1.1	14.6
Thousand Sq. Ft. Demolished	1.1	0.0	38.9	35.5	74.1	45.9	56.5	25.4	27.8	22.0	327.3

Figure A-4. Building disposition cost and schedule projection.

Facility Indicator (CFI).[e] These investments, in the improvement of RPVs and implementation of the CFI, have resulted in a significant improvement in the accuracy of the ACI and the Maintenance Investment Index (MII; target is 2% to 4% of site RPV) for DOE-NE assets at INL.

Data improvement activities will continue and will focus on appropriate assurance activities and understanding and addressing the causes for individual ACIs that are below target.

A-3. LEASING OF FACILITIES

INL leases 24 buildings (Table A-4) totaling 823,189 gross square feet (GSF) with an annual rent of $7.5 million. All but one of these buildings (the Boise, Idaho Outreach Office) are located at REC in Idaho Falls, Idaho. The lease rates for the two primary INL office buildings in Idaho Falls (Willow Creek Building [IF-616] and EROB [IF-654]) are extremely favorable. These two buildings provide 500,000 ft^2 at an average rate of $5.25/ft^2 annually. Although INL intends to occupy government-owned buildings whenever possible, facility leasing will continue to be an important and cost-effective component in INL's facility management strategy.

Our strategy employs facility leasing when it is in the best interest of the government and the INL mission (functionally and financially) as a tool to optimize the facility inventory. This strategy is focused on consolidating and collocating the REC Campus at IRC and University Boulevard buildings, which allows for termination of outlying and sub-standard leased facilities.

Considering that much of the available property within and around the REC campus is privately owned, long-term leases are the optimal means of acquiring essential space for a consolidated campus.

e The CFI is a FIMS approved process for applying a percentage factor, the CFI, to the asset RPV prior to the RPV being used in calculation of the site Maintenance Investment Index (MII; target is 2% to 4% of site RPV). The factor reflects the fraction of the asset RPV that is considered "conventional" and is used to exclude those assets, or the portions of asset, that are unique programmatic assets and therefore not within the basis of the MII measure.

Table A-4. Current Idaho National Laboratory Department of Energy Office of Nuclear Energy leased building information.

FIMS Property ID	Property Name	Usage Code Description	Leased ft^2	Lease Expiration Date	Annual Rent ($)	Total Occ.	Planned Action Year	Planned Action
B60-606	Boise Outreach Office #2	101 Office	2,390	08/31/2013	44,813	0	2013	Renew
IF-606	IAB	101 Office	65,550	07/31/2013	491,494	211	2013	TBD[b]
IF-606A	RAP Addition to IAB (IF-606)	401 Programmatic General Storage	2,176	07/31/2013	1,419	0	2013	TBD[b]
IF-613	North Boulevard Annex	703 Applied Science Lab	14,077	11/30/2014	97,536	15	2014	Terminate
IF-616	Willow Creek Building	101 Office	272,309	05/31/2014	1,132,880	737	2014	Renew
IF-617	Willow Creek Mechanical Building	694 Other Service Buildings	7,767	05/31/2014	Included in IF-616 rent	1	2014	Renew
IF-618	University Place	290 Library	12,094	02/28/2014	157,343	2	2014	Terminate
IF-639	North Holmes Laboratory	611 Machine Shops	22,030	04/30/2013	183,793	26	2013	TBD[b]
IF-651	North Yellowstone Laboratory	791 Laboratories, General (Non-nuclear)	8,000	10/31/2016	45,600	4	2014	Terminate[b]
IF-654	EROB	101 Office	243,063	01/31/2018	1,422,259	831	2018	Renew
IF-654A	EROB Mechanical Building Annex	694 Other Service Buildings	1,083	01/31/2018	Included in IF-654 rent	0	2018	Renew
IF-665	CAES	703 Applied Science Laboratory	38,611	03/05/2028	850,104	69	2028	Renew
IF-670-A	BCTC Bay # 1	791 Laboratories, General (Non-nuclear)	2,255	09/30/2014	16,240	0	2014	Renew
IF-670-B	BCTC Bay # 2	791 Laboratories, General (Non-nuclear)	2,182	09/30/2014	16,464	0	2014	Renew
IF-670-C	BCTC Bay # 3	791 Laboratories, General (Non-nuclear)	2,180	09/30/2017	16,380	0	2017	Renew
IF-670-D	BCTC Bay # 5	791 Laboratories, General (Non-nuclear)	2,300	09/30/2014	15,823	0	2014	Renew
IF-670-E	BCTC Bay # 9	791 Laboratories, General (Non-nuclear)	2,234	11/30/2014	16,164	1	2014	TBD[b]
IF-670-F	BCTC Bays 6, 7, & 8	791 Laboratories, General (Non-nuclear)	7,222	05/17/2015	47,366	1	2015	TBD[a, b]
IF-670-G	BCTC Bay # 4	791 Laboratories, General (Non-nuclear)	2,094	01/31/2015	16,149	0	2015	TBD[a]
IF-675	PINS Laboratory	792 Laboratories, General (Nuclear)	6,500	03/31/2014	50,375	1	2014	TBD[b]
IF-680	University Boulevard #1 (UB1)	101 Office	7,649	08/31/2018	185,673	35	2018	Renew
IF-681	University Boulevard #2 (UB2)	101 Office	33,145	07/31/2018	1,338,289	49	2018	Renew
IF-682	University Boulevard #3 (UB3)	541 Fabrication Facility	34,118	07/31/2018	790,873	17	2018	Renew

Table A-4. Current Idaho National Laboratory Department of Energy Office of Nuclear Energy leased building information.

FIMS Property ID	Property Name	Usage Code Description	Leased ft^2	Lease Expiration Date	Annual Rent ($)	Total Occ.	Planned Action Year	Planned Action
IF-684	University Boulevard #4	731 Electrical/Electronics Laboratory	32,160	02/28/2020	585,876	80	2020	Renew
		Totals	**823,189**		**7,515,628**	**2,150**		

a. INL will evaluate terminating the leases for IF-670F and IF-670G in 2015 and relocating the activities to the REL or ESL.

b. Terminate outlying and sub-standard leased facilities. Consolidate and collocate within REC campus at IRC and University Boulevard.

Table A-5. Planned Idaho National Laboratory Department of Energy Office of Nuclear Energy leased building information.

Property ID	Property Name	Mission/Core Competency Requirement	Usage Code Description	Lease (ft2)	Contributes to HPSB Guiding Principles? (Y/N)	Number of Occupants Accommodated	Planned Action Year	Planned Action
IF-685	ESL	Energy Security	791 Laboratories, General (Non-nuclear)	56,600	Yes (LEED Gold)	40	2012	Occupy[a]
IF-688	REL	Multiprogram	791 Laboratories, General (Non-nuclear)	132,000	Yes (LEED Gold)	150	2013	Occupy[a]
			Total	**188,600**		**190**		

a. The leases for ESL and REL have already been initiated and construction is in progress. The next action is to accept the buildings and occupy them in the year indicated for each.

INL has entered into agreements for construction of two new long-term leased buildings, ESL and REL, on University Boulevard. These buildings will be ready for occupancy in 2012 and 2013, respectively (Table A-5), will support consolidation of staff and equipment, and enhance the research capability of the REC campus. Additionally, these buildings will be certified Leadership in Energy and Environmental Design (LEED) Gold and contribute to achieving DOE targets for High Performance Sustainable Buildings (HPSBs).

Populating the new ESL and REL will make space available at IRC facilities and enable relocating staff and equipment from the North Boulevard Annex (IF-613) and North Yellowstone Laboratory (IF-651) to the IRC. The underutilized International Way Building (IF-674) was vacated in the second quarter of FY 2012 and consolidated into the University Boulevard #4 Building (IF-684) and Modular Office Trailer (CF-1610). The planned relocation of the INL Research Library (IF-618) into EROB (IF-654) in FY 2013 will further reduce leased facilities.

Vacating the remaining outlying facilities, the Portable Isotopic Neutron Spectroscopy (PINS) Laboratory (IF-675) and North Holmes Laboratory (IF-639), will require acquisition of new facilities to consolidate them into the REC campus.

The INL design standard for new and build-to-suit leased facilities is that they will be constructed to achieve LEED-Gold certification. INL includes provisions in new leases for existing buildings to evaluate the facility prior to occupancy for energy efficiency and the ability of the building systems to provide the appropriate indoor environmental quality. Cost-effective updates are incorporated into new/renegotiated leases for existing buildings to maximize energy efficiency and employee productivity by incorporating the guiding principles for HPSBs.

On the INL Site, leasing is practiced only as an option for temporary structures (e.g., construction and short-term office trailers). Capital investment (GPP and IGPP) is preferred for satisfying long-term space needs.

A-4. MANAGEMENT AND PRESERVATION OF HISTORIC PROPERTIES AT IDAHO NATIONAL LABORATORY

Cultural resources are found within INL boundaries that represent over 13,000 years of human land use. They include an estimated 70,000 prehistoric archaeological sites dating from the early prehistoric period; thousands of historic archaeological sites dating back to the early 1800s; hundreds of historic buildings, other structures, and artifacts related to World War II and the early pioneering era; historic data (i.e., technical reports, photographic negatives, and engineering drawings); and places, objects, plants, and animals of significance to the Shoshone-Bannock Tribes and others.

INL includes two properties that are national historic landmarks: (1) the Experimental Breeder Reactor I (Figure A-5) and (2) the Aviator's Cave (Figure A-6). INL also includes 138 assets that fall into the National Historic Register eligible category of historical property.

The management of INL cultural resources is driven and guided by various federal laws, regulations, executive orders, DOE directives, and supplementary State of Idaho statutes. These requirements have been tailored to the unique needs of INL through the *INL Cultural Resource Management Plan* (DOE-ID 2011), as legitimized through a Programmatic Agreement between DOE-ID, the Idaho State Historic Preservation Office, and the Advisory Council on Historic Preservation.

Figure A-5. Experimental Breeder Reactor I.

Figure A-6. Aviator's Cave entrance.

A-5. REFERENCES

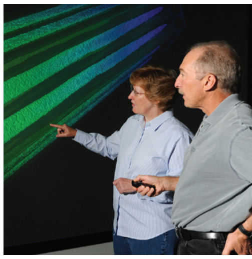
DOE Order 430.1B, *Real Property Asset Management*, Chg. 2, U.S. Department of Energy, September 2003.

DOE-ID, 2011, *INL Cultural Resource Management Plan*, DOE/ID-10997, Rev. 4, Department of Energy Idaho Operations Office, February 2011.

APPENDIX B





Prioritized Resource Needs

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Tables

APPENDIX B PRIORITIZED RESOURCE NEEDS

B-1. INTRODUCTION

Achieving the 10-year infrastructure vision requires INL to align its infrastructure priorities with both its critical mission goals and a reasonably forecasted funding profile. INL has refined its planning for major capital improvements, both acquisitions and enhancements, by prioritizing its core capabilities and outlining an approach for capital improvements based on program strategies and recognition of current funding outlooks. The project tables in this appendix reflect INL's highest priority of establishing its next generation of PIE and fuel fabrication capabilities. Investments are also included to sustain existing capabilities such as the ATR and the INL supporting infrastructure, including utilities and remote-handled LLW disposal.

Programmatic and general-purpose project and equipment needs are forecast annually as part of INL's program planning and budget formulation activities. INL maintains configuration-managed and controlled records of those needs and publishes them annually in the TYSP.

INL's capital acquisitions are funded in accordance with federal accounting standards-based funding determinations and are accomplished using a variety of acquisition mechanisms. Funding determinations have been obtained for many of the planned acquisitions; however, determinations are subject to change as projects are developed, scopes mature, and cost estimates are refined. The tables in this appendix delineate INL's plans by type of acquisition.

B-2. PRIORITIZED CAPITAL PROJECTS AND EQUIPMENT

B-2.1 Institutional General Plant Projects

Small, general-purpose construction projects are primarily accomplished via INL's IGPP process, which is one of INL's strategic investment options.

INL prioritizes qualifying infrastructure needs for this strategic investment at the Executive Leadership level and implements projects according to funding availability. If planned project acquisitions lag behind identified need dates due to constrained strategic investments, INL actively seeks appropriate funding alternatives such as program investment. The INL's IGPP plans are delineated in Table B-1.

B-2.2 Program-Funded Capital Projects and Operating-Funded Projects

INL identifies program-funded capital and operating projects through the annual program planning and budget formulation process. GPP and operating-funded project plans are listed in Table B-2. The table is limited to the current year (FY 2012) plus three additional years (FYs 2013-2015) because of the inherent uncertainties in program direction, priorities, and funding levels.

Table B-1. Institutional General Plant Project list ($k).

Ref No.	Area/ Sub Area[a]	Project	Mission	Added or Eliminated GSF	ROM TPC[b,c]	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
	MFC	MFC Technical Support Building (Deferred)	Nuclear Energy/ N&HS	TBD	TBD	66	-	-	-	-	-	-	-	-	-	-	-
	ATR Complex	TRA-653 Machine Shop Heating, Ventilating, and Air Conditioning Replacement (Complete)	Nuclear Energy	0	1,036	14	-	-	-	-	-	-	-	-	-	-	-
	MFC	MFC-752 Drainage (Complete)	Nuclear Energy	0	230	1	-	-	-	-	-	-	-	-	-	-	-
1	MFC	MFC Electrical Distribution Loop A	Nuclear Energy	0	5,067	2,258	1,500	1,200			-	-	-	-	-	-	-
2	MFC	Experimental Fuels Facility (formerly the Contaminated Equipment Storage Building Conversion)	Nuclear Energy	0	2,456	2,064	-	-	-	-	-	-	-	-	-	-	-
3	MFC	MFC Sewage Lagoon Capacity Upgrade	Nuclear Energy/ N&HS	0	7,453	6,370	107	-	-	-	-	-	-	-	-	-	-
4	MFC/ FMF	Glovebox Support Line	Nuclear Energy	0	6,623	95	-	-	3,075	1,948	-	-	-	-	-	-	-
5	MFC/ FMF	One-for-One Glovebox Replacement	Nuclear Energy	0	7,483	-	-	-	1,743	2,665	3,075	-	-	-	-	-	-
6	SW/SMC	INL Test Range Multiuse Facility	Nuclear Energy/ N&HS	10,000	11,350	-	-	-	600	2,400	8,350	-	-	-	-	-	-
7	SW/CFA	CFA-1618 Whole Body Counter/Lung Counter Annex	Nuclear Energy/ EE/N&HS	900	3,805	-	-	-	-	-	3,805	-	-	-	-	-	-
8	ATR Complex	ATR Operations Support Facility	Nuclear Energy	TBD	10,500	-	-	-	-	-	-	10,500	-	-	-	-	-

Table B-1. Institutional General Plant Project list ($k).

Ref No.	Area/ Sub Area[a]	Project	Mission	Added or Eliminated GSF	ROM TPC[b,c]	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
9	MFC/AL	Analytical Laboratory Waste Disposition Compliance Project	Nuclear Energy	0	1,727	-	-	-	-	-	-	1,727	-	-	-	-	-
10	CITRC	Critical Infrastructure Test Range Complex Substation Upgrade	N&HS	0	2,972	-	-	-	-	-	-	2,972	-	-	-	-	-
11	REC/IRC	Energy Storage Dry Room	EE	0	1,581	-	-	-	-	-	-	1,581	-	-	-	-	-
12	MFC/AL	MFC Stack Monitor Replacement	Nuclear Energy	0	975	-	-	-	-	-	-	-	975	-	-	-	-
13	MFC	MFC Generator Upgrade	Nuclear Energy/ N&HS	0	5,300	-	-	-	-	-	-	-	5,300	-	-	-	-
14	MFC	MFC Fiber Optic Backbone Capacity & Reliability Upgrade (Manhole 50 Reconfiguration)	Nuclear Energy/ EE/N&HS	0	1,826	-	-	-	-	-	-	-	1,826	-	-	-	-
15	MFC/AL	Analytical Laboratory Inert Fuel Handling Glovebox for Wet/Dry Sample Preparation	Nuclear Energy	0	2,080	-	-	-	-	-	-	-	2,080	-	-	-	-
16	ATR Complex	ATR Dial Room Replacement	Nuclear Energy	TBD	10,400	-	-	-	-	-	-	-	-	10,400	-	-	-
17	ATR Complex	ATR Complex Common Support Building II	Nuclear Energy	TBD	6,400	-	-	-	-	-	-	-	-	-	6,400	-	-
18	REC/IRC	Replace Obsolete IRC Fire Alarm System	Nuclear Energy/EE	0	1,193	-	-	-	-	-	-	-	-	-	1,193	-	-

Table B-1. Institutional General Plant Project list ($k).

Ref No.	Area/ Sub Area[a]	Project	Mission	Added or Eliminated GSF	ROM TPC[b,c]	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
19	MFC	MFC-782 Machine Shop Fire Sprinkler System Installation	Nuclear Energy	0	1,011	-	-	-	-	-	-	-	-	-	1,011	-	-
20	REC/IRC	INL Archives Center	Nuclear Energy/ EE/N&HS	TBD	6,424	-	-	-	-	-	-	-	-	-	-	6,424	-
21	REC	REC Information Technology Corridor Build-Out	Nuclear Energy/ EE/N&HS	0	2,847	-	-	-	-	-	-	-	-	-	-	2,847	-
22	MFC	Advanced Electrochemical Actinide Process Development & Monitoring Laboratory	Nuclear Energy	0	5,380	-	-	-	-	-	-	-	-	-	-	-	5,380
23	ATR Complex	ATR Complex Nuclear Training Center	Nuclear Energy	TBD	6,684	-	-	-	-	-	-	-	-	-	-	-	6,684
					Total	**10,868**	**1,607**	**1,200**	**5,418**	**7,013**	**15,230**	**16,780**	**10,181**	**10,400**	**8,604**	**9,271**	**12,064**

Note: The first three projects are included because they have FY 2012 funding.

a. Areas, sub areas, and facilities include MFC, ATR Complex, REC, IRC, FCF, FMF, CITRC, AL, SW, CFA, and SMC.

b. Much of the TPC data contained in this table are based on preliminary scoping, evaluation, and ROM estimates. Multiyear baseline data have been entered for the near-term projects for which it has been developed. The funding of out-year projects for which baselines have not been developed is shown as occurring in a single year, although in many cases funding will be spread over multiple years. Schedule and cost data will be refined as project plans are developed. TPC can reflect prior-year(s) costs and costs beyond 2023.

c. Capital funding (TEC) for a general plant project cannot exceed $10M according to the U.S. Department of Energy Budget Formulation Handbook. However, capital projects require both operating and capital funds for execution, the estimated aggregate of which is known as the TPC. Typically, TPC for a capital project will range between 115% and 130% as compared to the total estimated cost. That is, a project with a total estimated cost of $10M could have a TPC between $11.5M and $13M.

Table B-2. Program-funded capital and operating-funded projects list ($k).

INL Project / Program	INL Area	Project Description	Mission	Added or Eliminated GSF	ROM TPC	FY 2012	FY 2013	FY 2014	FY 2015
IFM	MFC	Irradiated Materials Characterization Laboratory	Nuclear Energy	12,000	12,322[a]	8,776	275	-	-
	MFC	MFC Dial Room Replacement	Nuclear Energy	1,800	9,842[a]	4,751	-	-	-
	MFC	MFC Modular Office	Nuclear Energy	13,000	3,668[a]	1	-	-	-
	MFC	MFC-752 Analytical Laboratory Safety Basis Upgrade Implementation	Nuclear Energy	0	4,947[a]	2,612	1,224	-	-
	MFC	Neutron Radiography Reactor Console Upgrade	Nuclear Energy	0	3,202[a]	300	1,256	-	-
	MFC	MFC Water Tank Replacement	Nuclear Energy/N&HS	0	2,500	-	-	2,500	-
	MFC	Transuranic Surveillance Glovebox	Nuclear Energy	0	3,000	1,500	1,500	-	-
	ATR	ATR Near Term Remote Monitoring and Management	Nuclear Energy	0	5,235	708	2,018	2,509	-
N&HS	SW	National Electric Grid Reliability Test Bed (Note: Funding has been requested but no formal commitments have been established.)	N&HS	20,000	TBD	2,000	8,000	5,000	5,000
S&S	MFC	Security Technology Command and Control Space	Nuclear Energy/ EE/N&HS	0	2,490	-	-	2,490	-
	MFC	Protected Area Perimeter Equipment	Nuclear Energy	0	2,647	-	-	-	2,647
	REC	Classified Computing Systems Infrastructure Upgrade	Nuclear Energy/ EE/N&HS	0	3,774	-	-	3,774	-
	SW	Live-Fire Shoot House Enhancements	Nuclear Energy/ EE/N&HS	2,000	3,654	-	-	-	3,654
RPS	MFC	Space and Security Power Systems Facility Addition	Nuclear Energy	2,000	2,500	-	-	2,500	-
					Total	**20,648**	**14,273**	**18,773**	**11,301**

a. TPC reflects prior-year(s) costs.

B-2.3 Institutional General-Purpose Capital Equipment

The IGPCE process enhances INL's ability to fund institutional needs while making more program funding available for critical program support. As with IGPPs, IGPCE is a strategic investment with allocations based on prioritized needs. IGPCE planned acquisitions are delineated in Table B-3. The table is limited to the current year (FY 2012) plus three additional years (FYs 2013-2015) because of the inherent uncertainties in program direction, priorities, and funding levels.

B-2.4 Program-Funded Capital Equipment

INL programs develop plans for capital equipment as part of their annual program planning and budget formulation process. These plans are presented in Table B-4. The table is limited to the current year (FY 2012) plus three additional years (FYs 2013-2015) because of the inherent uncertainties in program direction, priorities, and funding levels.

B-2.5 Line-Item Construction Projects

Congressional line-item funding is used to accomplish construction projects that have capital costs in excess of $10 million. INL is currently executing the three line-item construction projects listed in Table B-5.

B-3. OTHER INFRASTRUCTURE ACTIVITIES

INL has identified additional infrastructure activities necessary to support continued execution of mission objectives. These activities are presented in Table B-6. The ESL and REL leasehold improvements are funded from INL's strategic investments pool, as are the roof replacement activities. ATR major repair and replacement activities as well as footprint reduction are funded by the IFM Program. The funding mechanisms of the other activities have yet to be determined.

Table B-3. Institutional General Purpose Capital Equipment ($k).

Reference No.	Area/Sub Area	Equipment	Mission	ROM Total Equipment Cost	FY 2012	FY 2013	FY 2014	FY 2015
Approved	MFC	Modular Shielded Enclosure & Horizontal Transfer Cask	Nuclear Energy	5,835	368	4,394	998	-
Deferred	MFC	Irradiation-Assisted Stress Corrosion Cracking Test Rigs 3 & 4	Nuclear Energy	6,090	-	-	-	2,719
1	MFC	Eddy Current	Nuclear Energy	1,820	1,000	820	-	-
2	SW	Replace Wildland Fire Engine No. 5	Nuclear Energy/EE/N&HS	768	768	-	-	-
3	SW	Enhanced 911 System	Nuclear Energy/EE/N&HS	832	832	-	-	-
4	MFC	Visual Examination Machine	Nuclear Energy	1,820	1,000	820	-	-
5	REC	High-Performance Computing Network Transport	Nuclear Energy/EE/N&HS	2,052	2,052	-	-	-
6	MFC	Fuel Conditioning Facility/ Hot Fuel Examination Facility Thru the Wall Manipulators Development	Nuclear Energy	1,517	-	1,517	-	-
7	REC	Classified Critical Infrastructure Protection and Resilience Simulation Production Model	NHS	531	-	531	-	-
8	MFC	Fuel Conditioning Facility Suited Entry Repair Area Crane	Nuclear Energy	794	-	794	-	-
9	MFC	Irradiated Materials Characterization Laboratory Shielded Enclosure #2	Nuclear Energy	2,440	-	2,440	-	-
10	SW	Campus Switch Replacement (level 2)	Nuclear Energy/EE/N&HS	7,756	-	3,830	3,926	-
11	REC	Instrument, Control, and Intelligent Systems Signature: Resilient Control Test Network	N&HS	630	-	-	630	-
12	MFC	Analytical Laboratory Air Gap Isolation	Nuclear Energy	525	-	-	525	-

Table B-3. Institutional General Purpose Capital Equipment ($k).

Reference No.	Area/Sub Area	Equipment	Mission	ROM Total Equipment Cost	FY 2012	FY 2013	FY 2014	FY 2015
13	MFC	MFC Electronic Discharge Machining	Nuclear Energy	3,152	-	-	3,152	-
14	MFC	Hot Fuel Examination Facility Fabrication of 2nd Feed Through Glovebox	Nuclear Energy	880	-	-	880	-
15	SW	Replace Structural Fire Engine No. 2	Nuclear Energy/EE/N&HS	783	-	-	783	-
16	ATR Complex	Tritium Assay System	Nuclear Energy	538	-	-	-	538
17	SW	Replace Wildland Fire Engine No. 1	Nuclear Energy/EE/N&HS	722	-	-	-	722
18	REC	Enterprise Storage Area Network	Nuclear Energy/EE/N&HS	2,365	-	-	-	2,365
19	REC	Hybrid Energy System Control Simulator	EE	538	-	-	-	538
20	SW	Replace Wildland Fire Engine No. 3	Nuclear Energy/EE/N&HS	722	-	-	-	722
21	SW	INL Paging System	Nuclear Energy/EE/N&HS	1,798	-	-	-	1,798
22	REC	Long Term Evolution Network in a Box Semi Permanent Install	N&HS	2,343	-	-	-	2,343
23	SW	Replace Structural Fire Engine No. 3	Nuclear Energy/EE/N&HS	856	-	-	-	856
24	REC/CAES	200KV Transmission Electron Microscope for the Center for Advanced Energy Studies	Nuclear Energy	1,615	-	-	-	1,615
				Total	**6,020**	**15,146**	**10,894**	**14,216**

Table B-4. Program-funded capital equipment list ($k).

INL Project/Program	INL Area	Equipment Description	Mission	ROM Total Equipment Cost	FY 2012	FY 2013	FY 2014	FY 2015
Biofuels and Bioenergy	REC	Deployable Pilot Development Unit	EE	27,500[a,b]	-	1,000	1,000	1,000
	REC	Biomass Chemical Pre-Conversion System	EE	1,500	-	1,500	-	-
Advanced Energy Storage	REC	Battery Testing Equipment	EE	9,077[b]	2,529	-	-	-
	REC	3000A Single Channel Battery Cycler System	EE	2,000	-	-	2,000	-
Hybrid Energy Systems (including renewable energy systems)	REC	Power Converter for Energy Systems Complex	EE	3,000	-	3,000	-	-
	REC	Steam Generation Source	EE	500	-	-	500	-
	REC	High Pressure Enclosure	EE	500	-	-	500	-
	REC	Load Controller for Energy Systems Complex	EE	1,500	-	-	1,500	-
	REC	Controls for Generators & Load Management for the Energy Systems Complex	EE	1,500	-	-	-	1,500
	REC	Power Generation Skid Prototype	EE	5,000[a]	-	-	-	3,000
IFM	MFC	Irradiation-Assisted Stress Corrosion Cracking Test Rigs 1 & 2	Nuclear Energy	4,800[b]	4,207	-	-	-
N&HS (Work for Others)	REC	Mass Spectrometer	N&HS	1,500	1,500	-	-	-
	MFC	Hot Fuel Examination Facility Element Plate Checker	N&HS	3,000[b]	1,000	1,100	-	-
	REC	Accelerator Mass Separator	N&HS	2,000	-	-	2,000	-
Radioisotope Power Systems	MFC	Capital Equipment (glovebox, replacement environmental equipment, high temperature vacuum furnace, two trailer systems)	Nuclear Energy	6,000[b]	500	500	500	-
Very High-Temperature Reactor Technology Development	ATR/MFC	ATR Shipping Cask	Nuclear Energy	5,000	-	-	-	5,000

Table B-4. Program-funded capital equipment list ($k).

INL Project/Program	INL Area	Equipment Description	Mission	ROM Total Equipment Cost	FY 2012	FY 2013	FY 2014	FY 2015
NSUF	MFC	Additional post-irradiation examination equipment, support increased ability to prepare specimens for post-irradiation examination, initial equipment is additional focused ion beam.	Nuclear Energy	2,290	-	-	2,290	-
S&S	SW	Site-wide Video Upgrade	Nuclear Energy/ N&HS/ EE	3,500	3,500	-	-	-
	MFC, ATR, and INTEC	Entry Control Systems	Nuclear Energy/ N&HS	1,529	-	-	1,529	-
	SW	Life-cycle Replacement of Security Systems	Nuclear Energy/ N&HS/ EE	3,408	-	-	3,408	-
Total Program Funded Capital Equipment					**13,236**	**7,100**	**15,227**	**10,500**

a. Funding extends beyond FY 2015.

b. Total equipment cost reflects prior-year(s) costs.

Table B-5. Line-item construction project list ($k).

Ref. No.	Area	Project	Mission	Added or Eliminated GSF	ROM TPC	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
1	INL	Remote-Handled Low-Level Waste Disposal Project (Nuclear Energy/ NR) 13-D-905	Nuclear Energy	0	51,537[a,b]	3,800	6,710	18,832	8,100	4,170	1,735	-	-	-	-	-	-
2	INL	Advanced Post-Irradiation Examination Capability (Project engineering and design only) 13-E-200	Nuclear Energy	TBD	TBD	3,931	2,000	4,500	8,500	12,500	-	-	-	-	-	-	-
3	INTEC	Materials Security and Consolidation Project 08-D-702	Nuclear Energy / N&HS	0	17,419[b]	13,803	139	-	-	-	-	-	-	-	-	-	-
					Total	**21,534**	**8,849**	**23,332**	**16,600**	**16,670**	**1,735**						

a. DOE-NE portion only. The combined Nuclear Energy/NR TPC is $95,000K.

b. TPC reflects prior-year(s) costs.

Table B-6. Other infrastructure activities ($k).

INL Project/ Program	Area/ Sub Area	Activity Description	Mission	Added or Eliminated GSF	ROM TPC	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
ATR	ATR Complex	Upgrade the ATR Critical Facility control system	Nuclear Energy	0	9,760	-	-	-	9,760	-	-	-	-	-	-	-	-
ATR	ATR Complex	Upgrade the ATR diesel electric bus and switch gear	Nuclear Energy	0	44,000	4,990	7,800	9,500	6,710	7,500	7,500	-	-	-	-	-	-
ATR	ATR Complex	Upgrade the ATR emergency firewater injection system	Nuclear Energy	0	29,800	300	800	4,100	7,600	8,600	300	1,300	6,800	-	-	-	-
ATR	ATR Complex	Upgrade the ATR radiation monitoring seal system	Nuclear Energy	0	7,500	-	-	-	500	3,200	3,200	600	-	-	-	-	-
ATR	ATR Complex	Upgrade the ATR in-vessel post-accident monitoring system	Nuclear Energy	0	4,300	-	-	-	-	-	1,100	2,700	500	-	-	-	-
N&HS	MFC	Construct a facility for nonproliferation testing and evaluation	N&HS	TBD	11,450	-	-	-	-	11,450	-	-	-	-	-	-	-
N&HS	SW/SMC	Construct a multiuse facility to support SMC, N&HS, and ATR needs	Nuclear Energy/ EE/N&HS	34,375	9,822	-	-	-	-	-	9,822	-	-	-	-	-	-

Table B-6. Other infrastructure activities ($k).

INL Project/ Program	Area/ Sub Area	Activity Description	Mission	Added or Eliminated GSF	ROM TPC	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Mulitprogram	REC	Implement improvements to enable occupancy of the Energy Systems Laboratory	EE	0	7,500	3,200	1,900	400	-	-	-	-	-	-	-	-	-
Multiprogram	REC	Implement improvements to enable occupancy of the Research and Education Laboratory	Nuclear Energy/ EE	0	20,500	1,300	11,700	7,400	-	-	-	-	-	-	-	-	-
Multiprogram	SW	Replace and repair INL roofs	Nuclear Energy/ EE/N&HS	0	26,816	1,100	4,100	4,203	4,308	1,500	1,538	1,576	1,615	1,656	1,697	1,740	1,783
Multiprogram	SW/SMC	Close the SMC gap in the INL power distribution loop	Nuclear Energy/ EE/N&HS	0	510	-	-	-	-	-	-	-	-	510	-	-	-
Multiprogram	REC	Provide space and support systems for a new super computer	Nuclear Energy/ EE/N&HS	0	7,278	-	7,278	-	-	-	-	-	-	-	-	-	-
Multiprogram	REC	Relocate INL research library to improve space utilization	Nuclear Energy/ EE/N&HS	-12,094	1,538	-	1,538	-	-	-	-	-	-	-	-	-	-

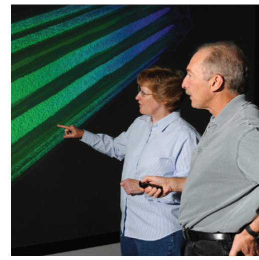
Table B-6. Other infrastructure activities ($k).

INL Project/ Program	Area/ Sub Area	Activity Description	Mission	Added or Eliminated GSF	ROM TPC	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Multiprogram	REC	Create a visitor and public outreach center for INL	Nuclear Energy/ EE/N&HS	0	2,455	-	-	-	-	-	-	-	-	-	-	-	2,455
Multiprogram	SW	Footprint reduction	Nuclear Energy	-377,272	17,276	240	0	1,864	1,385	2,235	2,325	2,751	1,238	1,574	1,072	1,280	1,312
					Total	**11,130**	**35,116**	**27,467**	**30,263**	**34,485**	**25,785**	**8,927**	**10,153**	**3,740**	**2,769**	**3,020**	**5,550**

APPENDIX C





Cognizant Secretarial Offices, Program Secretarial Offices, and Non-DOE Programs

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APPENDIX C COGNIZANT SECRETARIAL OFFICES, PROGRAM SECRETARIAL OFFICES, AND NON-DOE SITE PROGRAMS

Under DOE Order 430.1B, Chg. 1, *Real Property Asset Management*, the landlord of a site has the responsibility to act as a host landlord for its resident Cognizant Secretarial Offices (CSOs) or Program Secretarial Offices (PSOs), including coordinating all CSO/PSO programmatic needs and presenting a single coordinated TYSP, which includes any tenant-specific TYSPs. The site landlord also has the responsibility to ensure that the TYSP reflects infrastructure agreements between the lead PSOs and CSOs, that projected programmatic needs and potential growth are analyzed and reviewed with the programs, and that their infrastructure support requirements are integrated into the planning process.

The DOE-EM and Office of Naval Reactors are the two largest non-DOE-NE organizations at the INL Site. DOE-EM, which is a CSO, owns most facilities at the INTEC and RWMC, and manages the ICP and the Advanced Mixed Waste Treatment Project (AMWTP). The Office of Naval Reactors owns the NRF.

This appendix describes the facilities occupied, work performed, and recapitalization projects planned for implementation by DOE-EM. A brief overview of INL's support service interactions with the NRF is also provided.

C-1. IDAHO CLEANUP PROJECT AND ADVANCED MIXED WASTE TREATMENT PROJECT OVERVIEW

DOE-EM's contract for the ICP at the INL Site is to safely accomplish as much of DOE-EM's cleanup mission as possible within available funding, while meeting regulatory requirements through the contract completion date.

C-1.1 Idaho Cleanup Project Mission

The DOE-ID/INL mission is to develop and deliver cost-effective solutions to both fundamental and advanced challenges in nuclear energy (and other energy resources), national security, and environmental management. The DOE-EM ICP goal is to complete the environmental cleanup in a safe, cost-effective manner, consistent with the DOE-EM Five-Year Plan (dated February 2007). The objectives include:

- **Objective DOE-EM 1**: Complete efforts to safely accelerate risk reduction, footprint reduction, and continued protection of the Snake River Aquifer
- **Objective DOE-EM 2**: Complete shipment of TRU waste offsite and meet commitments in the Idaho Settlement Agreements
- **Objective DOE-EM 3**: Identify innovative approaches to post-2012 work scope, such as calcine, spent fuel, decommissioning and demolition (D&D), and institutional control
- **Objective DOE-EM 4**: Maintain federal baseline management and government-furnished services and items-delivery systems, and apply to administration of new contracts.

C-1.1.1 Scope and Schedule

Section C of the ICP contract, as amended by a number of contract modifications, defines the "target" scope of work to be completed by September 30, 2012. In addition to the target scope, a substantial amount of ICP work is being conducted under Section B.5 of the contract (items not included in target cost). Further, in April 2009, the ARRA provided funding to accelerate some high-priority target work and added a new B.5 scope to the ICP contract. All ARRA funded work scope is scheduled to be completed by September 2012. The current scope of the ICP is summarized below.

INTEC

- Target Scope:
  - Empty 11 of 15 Tank Farm Facility waste tanks (complete)
  - Demolish or disposition all excess facilities (complete)
  - Design, construct, and operate a treatment facility for liquid sodium-bearing waste (SBW)
  - Provide interim storage of steam reformed product generated during the term of the contract
  - Initiate preparation to empty the remaining four Tank Farm Facility waste tanks
  - Place all DOE-EM UNF in safe, dry storage (complete)
  - Deactivate DOE-EM UNF wet storage basins (CPP-603) (complete)
  - Dispose of or disposition all excess nuclear material (complete)
  - Complete all voluntary consent order (VCO) tank system actions (complete)
  - Complete all required Operable Unit (OU) 3-13 remediation (complete)
  - Complete OU 3-14 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Tank Farm Interim Action
  - Maintain and operate the Idaho CERCLA Disposal Facility (ICDF)
  - Maintain INTEC facilities and infrastructure systems
  - Provide the necessary design of the selected treatment process for INTEC calcine, hot isostatic pressing to support the development and submittal of two permit modification requests of existing Resource Conservation and Recovery Act (RCRA) Part B permits
- Non-Target (B.5) Scope:
  - Transfer Navy fuel, stored at INTEC, to dry storage at NRF
  - Perform management and oversight for safe storage of UNF at the Fort St. Vrain (FSV) Independent Spent Fuel Storage Installation (ISFSI) and the Three-Mile Island, Unit 2 (TMI 2) ISFSI
  - Provide support and subject matter expert services for the activities required to ensure proper and timely response to requests in support of the removal of UNF from the State of Idaho (currently stored at INTEC) and at the FSV Colorado facility (complete)
  - Receive UNF from domestic research reactors (DRRs) and foreign research reactors (FRRs) and place the fuel in dry storage at INTEC
  - Make preparations and complete initial set of shipments of Experimental Breeder Reactor II (EBR-II) material currently stored at INTEC to the MFC
  - Conduct CPP-603 mechanical upgrades to maintain the ability to transfer aluminum-clad UNF from the ICP at INL for recycling and the shipment of non-aluminum UNF to meet the Idaho Settlement Agreement (complete)
- ARRA (B.5) Scope:
  - Complete activities that support the receipt, processing, and ultimate disposition of 160 containers of remote-handled TRU waste, located primarily at MFC
  - Complete activities that support the disposition of an estimated 1,970 ft^3 of LLW and/or mixed low-level waste (MLLW) (including alpha-contaminated waste) retrieved from the AMWTP

- Demolish or disposition additional excess facilities (complete)
- Disposition of LLW, MLLW, and hazardous waste resulting from ARRA D&D activities.

RWMC

- Target Scope:
  - Retrieve stored remote-handled LLW and dispose of it at the Subsurface Disposal Area (SDA) or other appropriate disposal facility
  - Retrieve stored remote-handled TRU waste and dispose of it at the Waste Isolation Pilot Plant (WIPP) or transfer to MFC (complete)
  - Retrieve and dispose of waste resulting from the DOE-EM cleanup activities, including LLW, MLLW, hazardous, alpha-contaminated mixed low-level, and newly generated mixed and non-mixed TRU waste, at an appropriate disposal facility
  - Demolish and remove facilities no longer needed (ARRA-funded post April 2009)
  - Continue operation of the vapor vacuum extraction system
  - Continue groundwater monitoring program
  - Complete contract-specified remediation of buried TRU waste, including exhumation and disposal
  - Finalize and submit the final comprehensive Record of Decision (ROD) for Waste Area Group 7, OU 7-13/14 (complete)
- ARRA Target Scope:
  - Complete in situ grouting of mobile radionuclide sources, as identified in the OU 7-13/14 ROD (complete)
  - Complete Pit 5 Targeted Waste Exhumation, Packaging, and Characterization (complete)
  - Complete Pit 6 Targeted Waste Exhumation, Packaging, and Characterization (complete)
  - Exhumation of 0.25 acres of Pit 9 Targeted Waste (complete)
- ARRA (B.5) Scope:
  - Complete Pit 4W exhumation facility design and construction (complete)
  - Start Pit 4W excavation of the pit area footprint, retrieval and packaging, and shipment to WIPP of TRU and targeted waste (complete).

TAN

- Target Scope:
  - Demolish all DOE-EM facilities (only facilities required for groundwater remediation remain) (complete)
  - Complete all VCO tank system actions (complete)
  - Complete all remediation of contaminated soils and tanks at TAN (OU 1-10) (complete)
  - Continue CERCLA remedial pump and treat activities (OU 1-07B)
  - Close or transfer the TAN landfill to the INL contractor following completion of TAN demolition (complete).

ATR Complex

- Target Scope:
  - Demolish all DOE-EM-owned facilities (ARRA-funded post April 2009) (complete)
  - Disposition of the Engineering Test Reactor and the Materials Test Reactor complexes (complete)
  - Complete all VCO tank systems actions (complete)

- Complete the 5-year review of OU 2-13 (complete)
- Complete remedial actions for ATR Complex release sites under OU 10-08 (complete)

• ARRA (B.5) Scope:

- Demolish or disposition all excess facilities (complete)
- Disposition of LLW, MLLW, and hazardous waste resulting from ARRA D&D activities (complete).

CITRC

• Target Scope:

- Disposition the Power Burst Facility (PBF) Reactor (complete)
- Complete the 5-year review of OU 5-12 (complete)

• ARRA (B.5) Scope:

- Demolish or disposition excess facilities (complete)
- Disposition of LLW, MLLW, and hazardous waste resulting from ARRA D&D activities (complete).

MFC

• ARRA (B.5) Scope:

- Demolish or disposition excess facilities
- Disposition of LLW, MLLW, and hazardous waste resulting from ARRA D&D activities.

Miscellaneous Sites

• Complete all required remedial actions for OU 10-04

• Perform actions necessary to complete the OU 10-08 ROD by the enforceable milestone and implement the ROD, if finalized and signed during the contract period (complete).

A high-level summary schedule for completion of this scope of work is shown in Figure C-1.

C-1.1.2 Performance Measures

The ICP is held accountable for work scope through performance metrics based on measurable milestones or actions. Specifically, the ICP "Gold Chart" quantifies DOE's expectations by year for cleanup activities, such as disposal of LLW and MLLW, offsite shipment of stored TRU waste, UNF moved from wet to dry storage, and remediation of contaminated release sites and facilities. The Gold Chart metrics provide a consistent set of performance measures for the complex-wide DOE-EM program, and are a component of the DOE-Headquarters DOE-EM annual performance plan reported to Congress with the annual budget submittal. Gold Chart metrics are under DOE-EM configuration control and are statused monthly to the Office of the Assistant Secretary for DOE-EM. The February 2012 Gold Chart metrics are included in Table C-1.

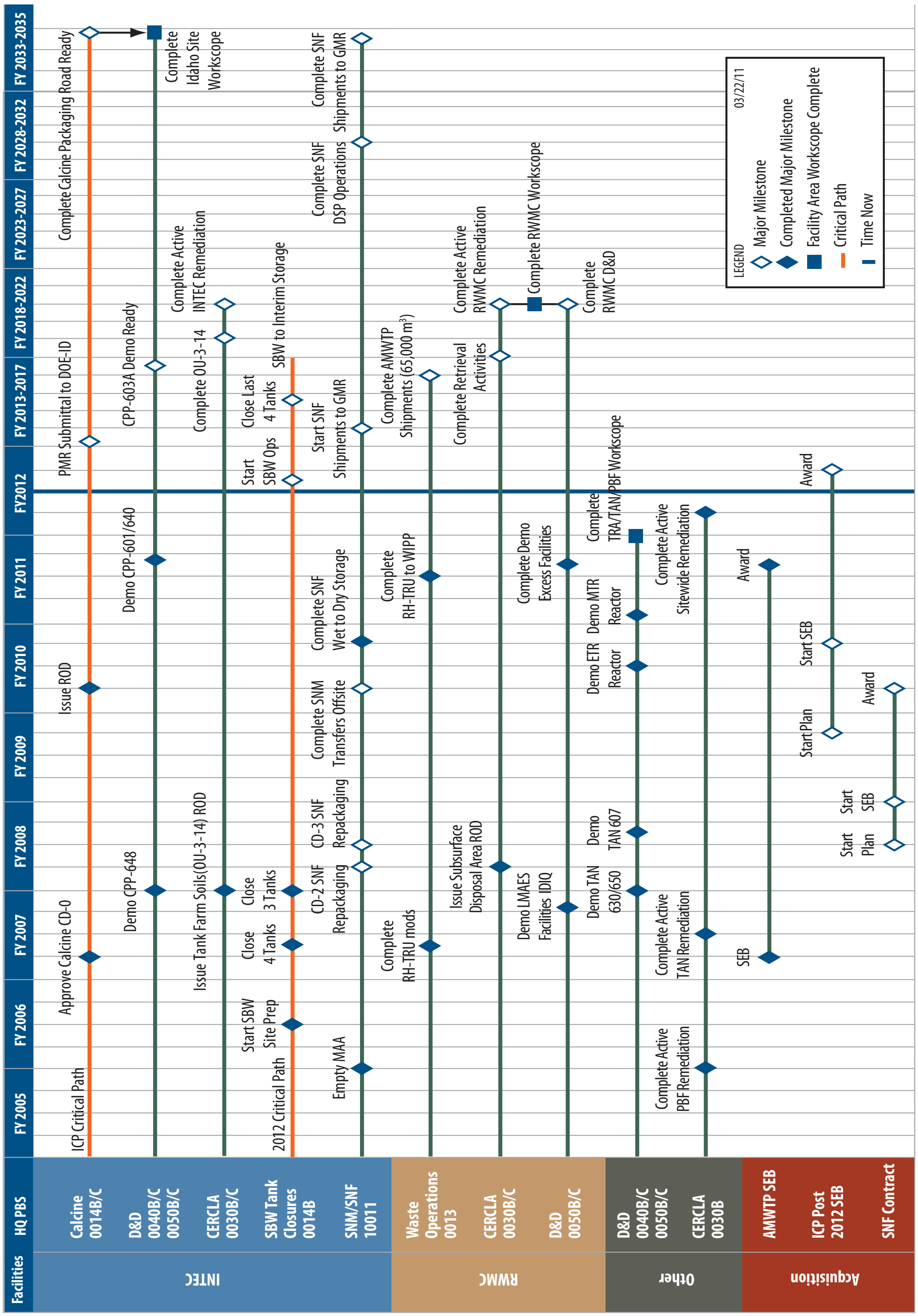

Figure C-1. Idaho Cleanup Project life-cycle schedule.

Table C-1. Idaho Cleanup Project CH2M-WG Idaho, LLC Gold Chart performance metrics.

CH2M-WG Idaho, LLC Gold Chart Performance Metrics February 2012 Monthly Report									
		FY 2012[a]			Contract Through Current FY End[b]			CWI Contract	
Gold Chart Metric	Units	Planned[c]	Actual	Status	Planned	Actual	Status	Planned	Status
DU Packaged for Disposition	Kg	-	-	-	-	-	-	-	-
eU Packaged for Long-Term Storage	Containers	-	Complete	N/A	652	652	100%	652	Complete
High-Level Waste Packaged	Containers	-	-	-	-	-	-	-	-
Industrial Facility Completions[d]	Facilities	13	Complete	N/A	107	107	100%	107	Complete
Liquid Waste Eliminated	Gallons	-	-	-	-	-	-	-	-
Liquid Waste Tanks Closed	Tanks	-	Complete	-	11	11	100%	11	Complete
LLW/MLLW Disposed	m^3	830	338	41%	37,874	30,758	81%	37,874	81%
Material Access Areas Eliminated	Areas	-	Complete	N/A	1	1	100%	1	Complete
Nuclear Facility Completions[d]	Facilities	9	Complete	N/A	25	25	100%	25	Complete
Plutonium Metal or Oxide Packaged	Containers	-	-	-	-	-	-	-	-
Plutonium or Uranium Residues Packaged	Kg	-	-	-	-	-	-	-	-
Radioactive Facility Completions[d]	Facilities	3	Complete	N/A	39	39	100%	39	Complete
Remediation Complete	Sites	-	2	-	120	122	102%	120	102%
Spent Nuclear Fuel (Foster Wheeler)	MTHM	-	-	-	-	-	-	-	-
Contact-handled TRU Waste Shipped to WIPP[c]	m^3	228	156	68%	5,084	4,986	98%	5,084	98%
Remote-handled TRU Waste Shipped to WIPP[e]	m^3	-	Complete	N/A	80	96.9	121%	80	Complete
CH2M-WG Idaho, LLC Internal Performance Metrics									
		FY 2012[a]			Contract Through Current FY End[b]			CWI Contract	
CH2M • WGI Proposed Metric	Units	Planned[c]	Actual	Status	Planned	Actual	Status	Planned	Status
VCO Tank Systems Closed	Systems	1	-	0%	68	67	99%	68	99%
SBW Treated	Gallons	750,000	-	0%	750,000	-	0%	750,000	0%
Spend Fuel (wet→dry)	Units	-	-	Complete	3,186	3,186	100%	3,186	Complete
Remediation Waste Disposed at ICDF[f]	m^3	2,734	1,597	58%	194,778	194,714	100%	194,778	100%

Table C-1. Idaho Cleanup Project CH2M-WG Idaho, LLC Gold Chart performance metrics.

Buried Waste Metrics[a]	Units	Current Month	Project To Date	Lifecycle Planned	Percent Complete
Targeted Waste Retrieved	m^3	-	4,907		
Targeted Waste Packaged	m^3	-	5,527		
Targeted Waste Shipped Out of State	m^3	9	5,480		
Pit Area Exhumed (Target Scope)	Acres	-	2.55	2.55	100.0%
Total Pit Area Exhumed (Target and ARRA)	Acres	-	2.96	5.69	52.0%

a. "Planned" is goal for the current fiscal year, per Gold Chart submitted to DOE-ID in September 2010. "Actual" is sum from October 1st of the current fiscal year through the current month; "Status" is "Actual"/"Plan."

b. "Planned" is sum of current fiscal year and all previous fiscal years of CH2M-WG Idaho, LLC contract, per Gold Chart submitted to DOE-ID in September 2010. "Actual" is sum from May 1, 2005 through current month; "Status" is simple ratio of "Actual"/"Plan."

c. Planned CH-TRU quantities updated 01/24/12 to align with the remaining ARP-I - V inventory of contact-handled TRU waste to be shipped to WIPP.

d. D&D metrics include ARRA-funded, target scope facilities (i.e., these facilities are also shown on the ARRA Metrics Chart). Non-target (B.5) facilities are not included in this Gold Chart.

e. Final package volume of RH-TRU is greater than planned. Planned RH-TRU 80 m^3 volume covered 675 drums of waste. Of this total, 638 of the 675 drums have been shipped to WIPP. The remaining 37 drums have been disposed as LLW/MLLW.

f. Volumes disposed at the ICDF include waste associated with target, recovery act, and other B.5 work scope.

With the addition of the ARRA-funded work scope, an additional set of performance metrics, separate from the “Gold Chart,” were instituted. Those metrics quantify the ICP’s performance against the expectations set by the ICP contract modifications that authorize the ARRA-funded work scope. ARRA metrics report the quantities of remote-handled TRU received, processed, and shipped; the amount of buried waste retrieved and the number of facilities demolished; and the number of jobs created or retained as a result of the ARRA work scope. The February 2012 ARRA Metric Chart is shown in Table C-2.

C-1.1.3 Funding and Staffing

The ICP is funded by DOE-EM. The annual projected funding for ICP, through FY 2012, is shown in Table C-3.

The ICP staffing will be aligned with project work scope, as necessary, throughout the course of the contract. Figure C-2 shows currently projected ICP staffing through the year 2012.

C-1.1.4 Facilities and Infrastructure Overview

A breakdown of building ownership showing DOE-EM-owned buildings (assigned to the ICP) versus DOE-NE-owned buildings is available in the FIMS database. As of March 2012, the FIMS database showed 117 DOE-EM-owned buildings and trailers at INL assigned to the ICP, with a total area of 1,088,627 ft^2.

Table C-4 provides a description of the buildings assigned to the ICP and their overall operating status, size, age, usage, and hazard description.

The current conditions of existing DOE-EM buildings assigned to ICP are illustrated in Figure C-3.

C-1.1.4.1 Maintenance

ICP will continue to maintain mission essential facilities/utility systems in accordance with DOE Order 430.1B, Chg. 1. Facilities/utility systems that no longer have a defined mission, and are considered candidates for decommissioning, will continue to undergo surveillance and maintenance adjustment according to the guidelines of DOE Guide 430.1-2, *Implementation Guide for Surveillance and Maintenance during Facility Transition and Disposition*.

A graded approach is implemented for surveillance and maintenance by ICP. The graded approach being used is commensurate with the facility/utility systems condition, mission need, and schedule for demolition.

Maintenance, whether preventive, predictive, or corrective, is performed at a level to sustain property in a condition suitable for the property to be used for its designated purpose.

Surveillance is the scheduled periodic inspection of facilities, utility systems, equipment, or structures to demonstrate compliance, identify problems requiring corrective action, and determine the facility’s present environmental, radiological, and physical condition. Facility/utility systems will be considered for recommendation of recapitalization based on facility/utility system conditions established by scheduled surveillance/inspections and the estimated remaining duration of the facility/utility systems mission.

Table C-5 is a list of the proposed ICP recapitalization projects for facilities, structures, systems, and equipment. Recapitalization recommendations will be described in the Condition Assessment Information System (CAIS) database section for the identified facility/utility system. Surveillance will be performed in a manner that ensures protection of the worker, the public, and the environment.

Table C-2. Idaho Cleanup Project February 2012 American Recovery and Reinvestment Act metrics.

DOE Ref. #	Work Scope Metrics	Units	Current Month Actual	Cum-to-Date Actual	Planned Cum-to-Date	Cum-to-Date Status (% Complete)	Life-Cycle Planned	Life-Cycle Status (%)	Notes
PBS 1K13 - Remote-handled Transuranic									
13.New.R1	Remote-handled TRU Received	Containers	0	160	160	100%	160	100.0%	160 "Planned" quantity decreases by 1 (per BEA). Mod 136 updates containers and cubic meters. Complete.
		m³	0	25.64	25.60	100%	25.6	100.2%	
	Remote-handled TRU Processed (Certification Ready)	Containers	0	128	150	85%	150	85.3%	Original received waste repackaged and ready for real-time radiography and dose to curie measurements. Mod 136 updates containers and cubic meters. Lifecycle planned value reflects funded portion only. If additional funding is received, 160 containers equating to 25.6 m³ would be processed.
		m³	0	22.44	22.6	99%	22.6	99.3%	
	Remote-handled TRU Shipped	Shipments[a]	0	44	88	50%	88	50.0%	Original received waste released for disposal as LLW/MLLW or TRU.
		m³	0	6.5	13.2	49%	13.2	49.2%	
13.R1	LLW Disposed	m³	NA	NA	NA	NA	NA	NA	All LLW disposed is D&D generated waste.
	MLLW Disposed	m³	NA	NA	NA	NA	NA	NA	All MLLW disposed is D&D generated waste.
	D&D Debris and Remediated Soils Disposed[b]	m³	176	37,884	24,439	155%	24,439	155%	% complete is a measure of actual waste generated and disposed vs. estimated quantities.
	Remote-handled TRU and Suspect Remote-handled TRU Transported from AMWTP to INTEC	Drums	NA	18	18	100%	18	100.0%	Remaining process/disposal scope deleted by DOE Contracting Officer direction (Section 1.G.b.5), Mod 097.
	D&D Industrial Waste	m³	541	21,468	21,468	100%	28,275	75.9%	Includes INTEC D&D, MFC D&D, and Offsite industrial waste shipments.
	LL/LLM "Other" Waste from AMWTP Processed/Shipped for Disposal	m³	0	47.41	26	NA	47.41	100.0%	Section 1.G.b.4, Mod 097 - Complete.

Table C-2. Idaho Cleanup Project February 2012 American Recovery and Reinvestment Act metrics.

DOE Ref. #	Work Scope Metrics	Units	Current Month Actual	Cum-to-Date Actual	Planned Cum-to-Date	Cum-to-Date Status (% Complete)	Life-Cycle Planned	Life-Cycle Status (%)	Notes
PBS 1K 30 – Buried Waste									
30B.R1	Complete In-Situ Grouting of Mobile Rad Sources	Insertions	0	2,168	2,168	100%	2,168	100%	Complete
	Complete Pit 4W Exhumation Facility (ARP-VI) Construction	% Complete	0%	100%	100%	NA	100%	100%	Complete
	Contact-handled TRU Waste Processed (Certification Ready)	m^3	NA	NA	NA	NA	NA	NA	Contact-handled TRU waste characterization is not ARRA funded.
	Pits 5 and 6 (NTB)	Acres	0	1.06	0.76	139%	0.76	139.5%	Complete
	Pit 9 (NTB)	Acres	0.00	0.48	0.16	297%	0.25	190.0%	Complete
	Pits 4W/10W (Operating)	Acres	0.00	0.38	N/A	N/A	0.15	253.3%	Complete
PBS 1K40 – D&D									
40B.NEW. R1.3	D&D Industrial Facility Completions (New)	No. of Facilities	0	1	1	NA	1	100.0%	Complete
		ft^2	0	2,300	2,300	NA	2,300	100.0%	
	D&D Nuclear Facility Completions (New)	No. of Facilities	0	9	10	90%	10	90.0%	TRA-712, 760, and 612 added to metric chart as a single metric per BCP 11-111 (Amended metric 10/04/2011).
		ft^2	0	35,441	70,441	50%	70,441	50.3%	
	D&D Radioactive Facility Completions (New)	No. of Facilities	0	3	5	60%	5	60.0%	Area of MFC-793E adjusted downward by 193 square feet (with DOE agreement) in Feb. 2010 for planned and actual.
		ft^2	0	1,963	17,134	11%	17,134	11.5%	
40B.NEW. STR.ETCH	D&D Stretch Goals (New)	No. of Facilities	0	2	2	100%	2	100.0%	Complete
		ft^2	0	1,411	1,411	100%	1,411	100.0%	
40B.NEW. R1.3	D&D Facilities Reduced (New)	NA	NA	NA	NA	NA	NA	NA	
	D&D Facilities Demolished (New) Subtotal	No. of Facilities	0	15	18	83%	18	83.3%	
		ft^2	0	41,115	91,286	45%	91,286	45.0%	

Table C-2. Idaho Cleanup Project February 2012 American Recovery and Reinvestment Act metrics.

DOE Ref. #	Work Scope Metrics	Units	Current Month Actual	Cum-to-Date Actual	Planned Cum-to-Date	Cum-to-Date Status (% Complete)	Life-Cycle Planned	Life-Cycle Status (%)	Notes
40B.R1.1	D&D Industrial Facility Completions (NTB)	No. of Facilities	0	12	12	100%	12	100.0%	Complete
		ft²	0	67,512	67,512	100%	67,512	100.0%	
	D&D Nuclear Facility Completions (NTB)	No. of Facilities	0	12	12	100%	12	100.0%	Complete
		ft²	0	114,968	114,968	100%	114,968	100.0%	
	D&D Radioactive Facility Completions (NTB)	No. of Facilities	0	16	16	100%	16	100.0%	Complete
		ft²	0	75,742	75,742	100%	75,742	100.0%	
	D&D Facilities Reduced (NTB)	NA	NA	NA	NA	NA	NA	NA	
	D&D Facilities Demolished (NTB) Subtotal	No. of Facilities	0	40	40	100%	40	100.0%	Complete
		ft²	0	258,222	258,222	100%	258,222	100.0%	
40B.R1.2	D&D Industrial Facility Completions (Operating)	No. of Facilities	0	20	20	100%	20	100.0%	Complete
		ft²	0	49,092	49,092	100%	49,092	100.0%	
	D&D Nuclear Facility Completions (Operating)	No. of Facilities	0	5	5	100%	5	100.0%	Complete
		ft²	0	193,217	193,217	100%	193,217	100.0%	
	D&D Radioactive Facility Completions (Operating)	No. of Facilities	0	7	7	100%	7	100.0%	Complete
		ft²	0	223,518	223,518	100%	223,518	100.0%	
	D&D Facilities Reduced (Operating)	NA	NA	NA	NA	NA	NA	NA	
	D&D Facilities Demolished (Operating) Subtotal	No. of Facilities	0	32	32	100%	32	100.0%	Complete
		ft²	0	465,827	465,827	100%	465,827	100.0%	

Table C-2. Idaho Cleanup Project February 2012 American Recovery and Reinvestment Act metrics.

DOE Ref. #	Work Scope Metrics	Units	Current Month Actual	Cum-to-Date Actual	Planned Cum-to-Date	Cum-to-Date Status (% Complete)	Life-Cycle Planned	Life-Cycle Status (%)	Notes
	D&D Totals	No. of Facilities	0	87	90	97%	90	96.7%	
		ft²	0	765,164	815,335	94%	815,335	93.8%	Footprint reduction only; not GSF.
Jobs Status									
	Number of Jobs Created or Retained	FTEs	NA	632	NA	NA	550	115.0%	FTEs are reported based on "productive hours" vs. "scheduled hours."

a. Remote-handled TRU shipped units – Containers have been changed to Shipments.

b. D&D waste quantities do not include industrial waste, which are being provided by DOE-ID by the projects.

Table C-3. Idaho Cleanup Project funding schedule ($M).

Funding	FY 2005[a]	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011[b]	FY 2012[c,d]	Total
Actual Funding									
ICP Target Funding (non-ARRA)	320	518	375	380	303	134	274	268	2,572
ARRA Funding (Target)					142	-21	-7		114
B.5 Funding (non-Target, non-ARRA)	27	9	30	28	31	45	34	29	233
ARRA Funding (non-Target)					296	6	7		308
Total Funding	**327**	**527**	**405**	**408**	**772**	**164**	**308**	**297**	**3,227**

a. Table excludes $16.5M in FY 2005 funding for contract transition activities.

b. FY 2012 funding includes current funding as of Contract Mod 206, dated February 28, 2012, and includes an expected increase of $151M overfunding through Mod 206.

c. FY 2012 funding is per DOE guidance, with Section B.5 funding developed annually, with no future commitment.

d. No current contract coverage exists beyond the year 2012.

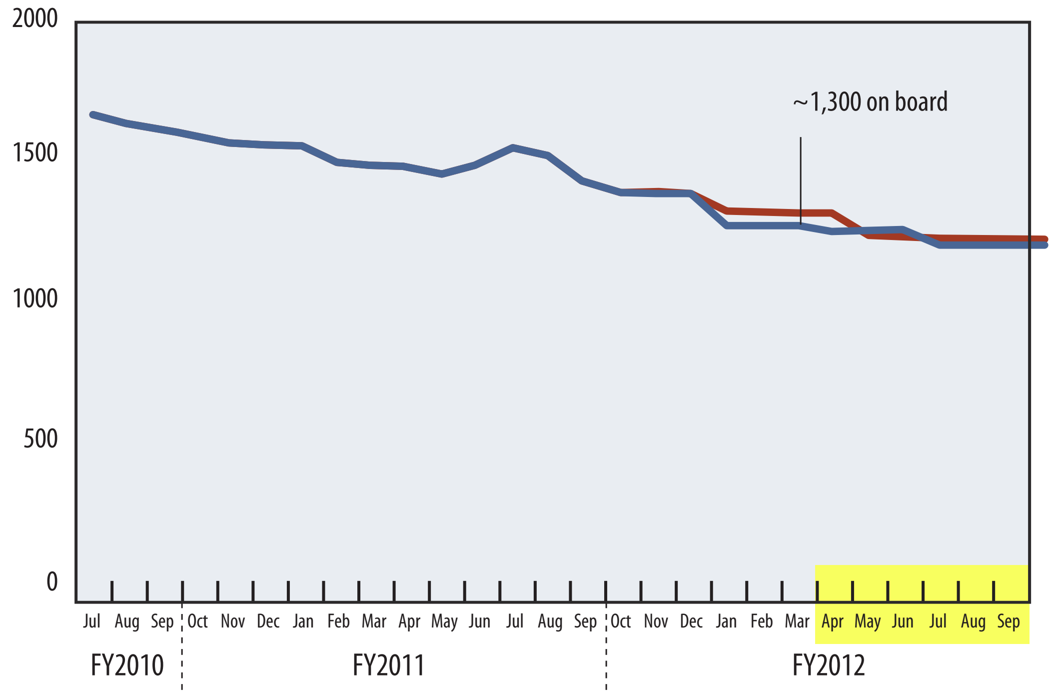

Figure C-2. Projected Idaho Cleanup Project staffing for full-time equivalents averaged over the fiscal year.

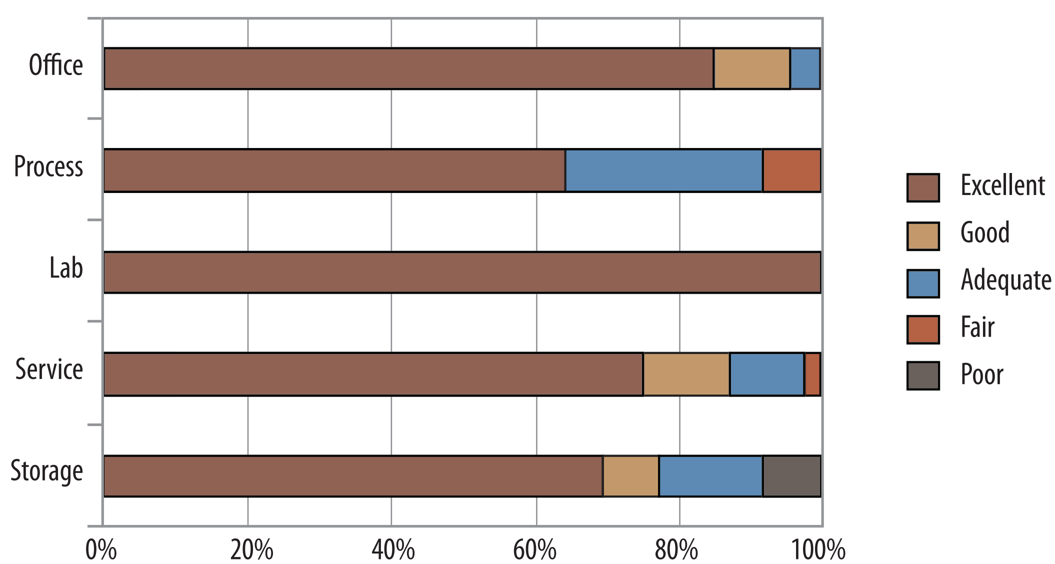

Figure C-3. Fiscal year 2011 Facility Information Management System conditions of Department of Energy Office of Environmental Management buildings assigned to the Idaho Cleanup Project.

Table C-4. Idaho Cleanup Project building data.

ID	Name	Type	GSF	Year Built	Usage Code	Hazard Description
Idaho Cleanup Project Operating Facilities with Future Missions (no D&D planned under the ICP contract)						
CF-TR-01	CFA CERCLA Staging Office	Trailer	400	1990	101 Office	10 Not Applicable
CPP-1604	Office Building	Building	22,633	1986	101 Office	10 Not Applicable
CPP-1605	Engineering Support Building	Building	17,105	1986	101 Office	10 Not Applicable
CPP-1606	Plant Support Warehouse	Building	16,267	1986	400 General Storage	10 Not Applicable
CPP-1608	Contaminated Equipment Storage	Building	4,000	1987	607 Other Buildings Trades Shops	04 Radiological Facility
CPP-1615	Equipment Building 7th Bin Set	Building	263	1989	593 Nuclear Waste Processing and/or Handling Building	04 Radiological Facility
CPP-1617	Waste Staging Facility	Building	1,044	1986	593 Nuclear Waste Processing and/or Handling Building	02 Nuclear Facility Category 2
CPP-1618	Liquid Eff. Treat. Disp. Bldg.	Building	5,845	1990	593 Nuclear Waste Processing and/or Handling Building	04 Radiological Facility
CPP-1631	Production Computer Support	Building	12,000	1988	297 Computer Buildings	10 Not Applicable
CPP-1642	Fire Pumphouse	Building	656	1992	694 Other Service Buildings	10 Not Applicable
CPP-1643	Fire Pumphouse	Building	656	1992	694 Other Service Buildings	10 Not Applicable
CPP-1647	Water Treatment Facility	Building	2,879	1991	694 Other Service Buildings	10 Not Applicable
CPP-1650	Training Support Facility	Building	6,990	1992	230 Traditional Classroom Buildings	10 Not Applicable
CPP-1659	Contaminated Equipment Maintenance Bldg.	Building	1,846	1986	601 Maintenance Shops, General	02 Nuclear Facility Category 2
CPP-1663	Security & Fire Protection Support	Building	4,891	1992	101 Office	10 Not Applicable
CPP-1671	Protective Force Support Facility	Building	3,107	1993	296 Security Hq/Badge Issuance/Gate Houses	10 Not Applicable
CPP-1673	Utility Control Center	Building	1,600	1993	615 Electrical/Motor Repair Shops	10 Not Applicable
CPP-1676	Oil Hazardous Materials Building	Building	113	1994	410 Hazardous/Flammable Storage	05 Chemical Hazard Facility
CPP-1681	Box Staging Area	Building	5,100	1994	401 Programmatic General Storage	04 Radiological Facility
CPP-1683	Waste Operations Control Room	Building	2,018	1996	642 Communications/Control Centers	02 Nuclear Facility Category 2
CPP-1684	Standby Generator Facility	Building	3,760	2000	694 Other Service Buildings	10 Not Applicable
CPP-1686	Access Control Facility	Building	7,469	2000	296 Security Hq/Badge Issuance/Gate Houses	04 Radiological Facility
CPP-1688	SSSTF Decon Building	Building	6,266	2003	593 Nuclear Waste Processing and/or Handling Building	10 Not Applicable
CPP-1689	SSSTF Administration Building	Building	1,960	2003	101 Office	04 Radiological Facility
CPP-603	Wet and Dry Fuel Storage Facility	Building	40,759	1953	412 Special Nuclear Material Storage	02 Nuclear Facility Category 2

Table C-4. Idaho Cleanup Project building data.

ID	Name	Type	GSF	Year Built	Usage Code	Hazard Description
CPP-604	Rare Gas Plant/Waste Building	Building	21,175	1953	593 Nuclear Waste Processing and/or Handling Building	02 Nuclear Facility Category 2
CPP-605	Blower Building	Building	3,436	1953	593 Nuclear Waste Processing and/or Handling Building	04 Radiological Facility
CPP-606	Service Building Powerhouse	Building	14,921	1953	694 Other Service Buildings	10 Not Applicable
CPP-611	Water Well #1 Pumphouse	Building	216	1953	694 Other Service Buildings	10 Not Applicable
CPP-612	Water Well #2 Pumphouse	Building	216	1953	694 Other Service Buildings	10 Not Applicable
CPP-613	Substation #10	Building	1,823	1953	694 Other Service Buildings	10 Not Applicable
CPP-614	Diesel Engine Pumphouse	Building	626	1984	694 Other Service Buildings	10 Not Applicable
CPP-615	Waste Water Treatment Plant	Building	171	1982	694 Other Service Buildings	10 Not Applicable
CPP-616	Emergency Air Compressor	Building	424	1979	694 Other Service Buildings	10 Not Applicable
CPP-626	Office/Change Room	Building	2,068	1953	101 Office	10 Not Applicable
CPP-639	Instrumentation Building Bin Set 1	Building	169	1978	593 Nuclear Waste Processing and/or Handling Building	02 Nuclear Facility Category 2
CPP-644	Substation #20 Emergency Power	Building	1,805	1960	694 Other Service Buildings	10 Not Applicable
CPP-646	Instrument Building 2nd Bin Set	Building	91	1966	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-647	Instrument Building 3rd Bin set	Building	91	1966	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-649	Atmospheric Protection System	Building	4,825	1976	591 Materials Handling or Processing Facilities	04 Radiological Facility
CPP-652	Cafeteria/Offices	Building	8,858	1976	291 Cafeteria	10 Not Applicable
CPP-655	Craft Shop/Warehouse	Building	16,757	1977	601 Maintenance Shops, General	10 Not Applicable
CPP-658	Instrument Building 4th Bin Set	Building	81	1980	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-659	New Waste Calcine Facility	Building	84,080	1981	593 Nuclear Waste Processing and/or Handling Building	02 Nuclear Facility Category 2
CPP-662	Maintenance/Fab Shop	Building	4,000	1979	601 Maintenance Shops, General	10 Not Applicable
CPP-663	Maintenance/Crafts/Warehouse Building	Building	64,197	1980	601 Maintenance Shops, General	04 Radiological Facility
CPP-666	FDP/FAST Facility	Building	152,388	1983	412 Special Nuclear Material Storage	02 Nuclear Facility Category 2
CPP-671	Service Building 5th Bin Set	Building	240	1981	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-673	Service Building 6th Bin Set	Building	256	1986	694 Other Service Buildings	10 Not Applicable
CPP-677	UREP Load Center #2	Building	512	1983	694 Other Service Buildings	10 Not Applicable
CPP-679	Tent Fabrication Facility	Building	2,023	1983	605 Carpentry Shops	10 Not Applicable
CPP-684	RAL	Building	13,101	1985	712 Chemical Laboratory (Nuclear)	03 Nuclear Facility Category 3

Table C-4. Idaho Cleanup Project building data.

ID	Name	Type	GSF	Year Built	Usage Code	Hazard Description
CPP-692	Waste Stack Monitor System	Building	663	1983	591 Materials Handling or Processing Facilities	04 Radiological Facility
CPP-697	East Guardhouse and Vehicle Monitoring Facility	Building	4,082	1986	296 Security Hq/Badge Issuance/Gate Houses	10 Not Applicable
CPP-TB-1	Carpenter Shop	Building	1,261	1980	601 Maintenance Shops, General	10 Not Applicable
CPP-TB-3	TB-3 FPR Eastside Guardhouse	Building	176	1986	641 Guard Houses	10 Not Applicable
CPP-TR-19	Office Trailer	Trailer	300	1974	101 Office	10 Not Applicable
CPP-TR-54	Control Trailer	Trailer	400	2001	101 Office	10 Not Applicable
CPP-TR-55	ICDF Administrative/Operations Trailer	Trailer	1,440	2011	101 Office	10 Not Applicable
CPP-TR-56	Treatment Facility Washdown Support Office	Trailer	317	2001	101 Office	10 Not Applicable
CPP-TR-57	ICDF Rad Con Trailer	Trailer	638	2003	694 Other Service Buildings	04 Radiological Facility
CPP-TR-67	IWTU Document Control Trailer	Trailer	1,525	2004	101 Office	10 Not Applicable
MFC-TR-1718	D&D Trailer	Trailer	1,423	2006	101 Office	10 Not Applicable
TAN-1611	Pump and Treatment Facility	Building	1,500	2000	591 Materials Handling or Processing Facilities	10 Not Applicable
TAN-1614	In Situ Bioremediation Facility	Building	1,482	2003	591 Materials Handling or Processing Facilities	10 Not Applicable
TRA-1601	D&D Radcon Office	Trailer	1,423	2005	101 Office	10 Not Applicable
TRA-1602	D&D Engineering Office Building	Trailer	3,696	2005	101 Office	10 Not Applicable
TRA-1603	D&D Craft Office/Breakroom	Trailer	1,423	2005	101 Office	10 Not Applicable
TRA-1604	D&D Project Management Office	Trailer	3,696	2005	101 Office	10 Not Applicable
TRA-1607	D&D Craft Trailer #2	Trailer	1,423	2006	101 Office	10 Not Applicable
TRA-698	Comfort Station #1	Trailer	296	2005	694 Other Service Buildings	10 Not Applicable
TRA-699	Comfort Station #2	Trailer	296	2005	694 Other Service Buildings	10 Not Applicable
WMF-698	ARP Storage Enclosure	Building	20,800	2005	415 Nuclear Waste Storage Facility	02 Nuclear Facility Category 2
WMF-TR-1	ARP Sample Support Trailer	Trailer	1,680	2004	694 Other Service Buildings	10 Not Applicable
WMF-TR-13	ARP Restroom/Change Room	Trailer	1,106	2006	631 Change Houses	10 Not Applicable
WMF-TR-2	ARP Operations Support Trailer	Trailer	1,420	2003	694 Other Service Buildings	10 Not Applicable
WMF-TR-3	ARP Non Destructive Assay East Trailer	Trailer	317	2006	101 Office	10 Not Applicable
WMF-TR-4	ARP Office Trailer	Trailer	317	2004	101 Office	10 Not Applicable
WMF-TR-6	ARP Men's Change Trailer	Trailer	660	2003	631 Change Houses	10 Not Applicable

Table C-4. Idaho Cleanup Project building data.

ID	Name	Type	GSF	Year Built	Usage Code	Hazard Description
WMF-TR-7	ARP Women's Change Trailer	Trailer	400	2003	631 Change Houses	10 Not Applicable
WMF-TR-8	637 West Office Trailer	Trailer	1,432	2005	101 Office	10 Not Applicable
WMF-TR-9	637 East Office Trailer	Trailer	1,432	2005	101 Office	10 Not Applicable
Idaho Cleanup Project Facilities Operating Pending D&D						
CPP-1636	Warehouse	Building	4,800	1989	400 General Storage	10 Not Applicable
CPP-1646	Anti-C Safety Handling	Building	3,708	1991	411 Nuclear Contaminated Storage	10 Not Applicable
CPP-1651	Operations Training Facility	Building	6,242	1992	231 Specialized Training Buildings	10 Not Applicable
CPP-1662	Remote Insp. Engr. Facility	Building	3,173	1992	781 Large Scale Demonstration/Research Building	10 Not Applicable
CPP-1666	Engineering Support Office	Trailer	7,168	1993	101 Office	10 Not Applicable
CPP-1678	Contractors Lunch Room	Building	2,044	1994	631 Change Houses	10 Not Applicable
CPP-618	Tank Farm Measure/Control Building	Building	249	1955	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-623	Tank Farm Instrument House	Building	64	1960	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-628	Tank Farm Control House	Building	1,552	1953	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-632	Instrument House Tank Farm area	Building	67	1960	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-635	Waste Station WM-187-188	Building	331	1960	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-636	Waste Station WM-189-190	Building	363	1965	694 Other Service Buildings	02 Nuclear Facility Category 2
CPP-674	UREP Substation #40	Building	425	1983	694 Other Service Buildings	10 Not Applicable
CPP-698	MK Offices/Warehouse	Building	23,958	1984	101 Office	10 Not Applicable
WMF-601	Radcon Field Office	Building	5,044	1976	101 Office	02 Nuclear Facility Category 2
WMF-603	Pumphouse	Building	1,435	1977	694 Other Service Buildings	10 Not Applicable
WMF-604	Change House & Lunch Room	Building	1,272	1977	631 Change Houses	10 Not Applicable
WMF-605	Well House 87	Building	33	1979	694 Other Service Buildings	10 Not Applicable
WMF-609	Heavy Equipment Storage Shed	Building	11,133	1979	450 Shed Storage	02 Nuclear Facility Category 2
WMF-619	Communication Building	Building	945	1989	642 Communications/Control Centers	10 Not Applicable
WMF-620	Work Control Center, Trailer	Trailer	1,577	1988	101 Office	10 Not Applicable
WMF-621	Work Control Support, Trailer	Trailer	1,538	1988	101 Office	10 Not Applicable
WMF-622	Office Annex, Trailer	Trailer	1,605	1985	101 Office	10 Not Applicable

Table C-4. Idaho Cleanup Project building data.

ID	Name	Type	GSF	Year Built	Usage Code	Hazard Description
WMF-637	Operations Control Building	Building	24,262	1995	101 Office	10 Not Applicable
WMF-639	Firewater Pumphouse #2	Building	1,812	1995	694 Other Service Buildings	10 Not Applicable
WMF-645	Construction Support Trailer	Trailer	1,568	1991	101 Office	10 Not Applicable
WMF-646	Field Support Trailer	Trailer	1,568	1991	101 Office	10 Not Applicable
WMF-653	Office Annex #2, Trailer	Trailer	1,513	1993	101 Office	10 Not Applicable
WMF-655	Material Handling Facility	Building	5,483	1995	400 General Storage	04 Radiological Facility
WMF-656	Maintenance Facility	Building	4,999	1995	601 Maintenance Shops, General	10 Not Applicable
WMF-657	Construction Field Support Trailer	Trailer	1,568	1960	101 Office	10 Not Applicable
WMF-658	RWMC Office	Building	4,518	1995	101 Office	10 Not Applicable
WMF-661	Hazardous Material Storage	Building	128	1996	410 Hazardous/Flammable Storage	10 Not Applicable
WMF-680	Building Trailer	Trailer	720	2001	101 Office	10 Not Applicable
WMF-681	Building Trailer	Trailer	720	2001	101 Office	10 Not Applicable
Idaho Cleanup Project Facilities in Deactivation						
MFC-766	Sodium Boiler Building	Building	14,546	1962	792 Laboratories, General (Nuclear)	04 Radiological Facility
MFC-767	EBR-II Reactor Plant Building	Building	18,967	1963	783 Research Reactor	04 Radiological Facility
MFC-793B	SCMS Alcohol Recovery Annex	Building	576	1979	694 Other Service Buildings	04 Radiological Facility
Idaho Cleanup Project Facilities Shutdown Pending Disposal						
CPP-691	Fuel Processing Restoration Facility	Building	160,611	1992	400 General Storage	10 Not Applicable
WMF-1612	Retrieval Enclosure II	Building	46,038	2007	593 Nuclear Waste Processing and/or Handling Bldg.	02 Nuclear Facility Category 2
WMF-1614	Retrieval Enclosure III	Building	35,040	2007	593 Nuclear Waste Processing and/or Handling Bldg.	02 Nuclear Facility Category 2
WMF-TR-5	ARP RadCon Trailer	Trailer	229	2004	101 Office	10 Not Applicable
Idaho Cleanup Project Facilities with D&D In Progress						
WMF-1618	Retrieval Enclosure VI	Building	33,150	2011	593 Nuclear Waste Processing and/or Handling Bldg.	02 Nuclear Facility Category 2
WMF-697	Retrieval Enclosure I (PIT 4)	Building	56,688	2004	591 Materials Handling or Processing Facilities	02 Nuclear Facility Category 2

Table C-5. Idaho Cleanup Project proposed recapitalization projects (updated March 22, 2012).

Facility	System	Description	Justification (e.g., end of service life, modernization, major repairs, etc.)	ROM Estimate ($K)	Risk Ranking (H,M,L)	Hazard Ranking (H,M,L)	Comments
CPP-666	Basin Water Treatment	Resin Bed and VACCO Filter Replacement	End of service life	150	M	L	Assumes design, materials, and installation.
INTEC	ECS	Upgrade ECS	Correct deficiencies	5,639	H	H	ROM based on contract extension proposal estimate
CPP-666	HVAC	CPP-666 HVAC Upgrades	End of service Life	3,825	H	H	ROM based on contract extension proposal estimate
CPP-666	Utility Piping	New west utility interface	End of service life	1,615	H	H	ROM based on contract extension proposal estimate
INTEC	Utility Control System	Electrical Distribution System	End of service life-obsolete	3,183	H	H	ROM based on contract extension proposal estimate
CPP-666	FAST Distributed Control System	Water treatment and HVAC controls	Modernization - obsolete system	1,598	H	M	ROM based on contract extension proposal estimate
CPP-606	Air Compressors	Replace Air Compressors com-uti-614 and com-uti-617 and relocate to FAST	End of service - replace	1,305	M	H	ROM based on contract extension proposal estimate
INTEC	INTEC Power Distribution PM Recovery Phase III	Electrical Distribution Maintenance Recovery	End of service life	4,528	M	H	ROM based on contract extension proposal estimate
CPP-666	Roof	Roof Replacement	End of service life	2,386	M	M	ROM based on contract extension proposal estimate
CPP-603	Doghouse Entry Platform/Roof Access	Install a platform to allow radiological personnel more room to don radiological equipment.	Safety	1,000	M	M	
CPP-603	Shield Door	Upgrade repairs to west side shield door	End of Service Life-Upgrade	1,000	M	M	
INTEC	MSMs	Replace All	Electronic Parts Obsolete	3,500	M	M	Replace 34 MSMs, include parts and labor

Table C-5. Idaho Cleanup Project proposed recapitalization projects (updated March 22, 2012).

Facility	System	Description	Justification (e.g., end of service life, modernization, major repairs, etc.)	ROM Estimate ($K)	Risk Ranking (H,M,L)	Hazard Ranking (H,M,L)	Comments
INTEC	PARs	Replace with new	End of Service Life-Obsolete	5,000	M	M	Consider excluding CPP-659 from estimate
CPP-1769	Potable Water	Replacement of Chlorinator (CL-UTI-901)	End of Service Life	150	M	L	Assumes design, materials, and installation.
CPP-1618	FRAC-WLK-171	Replacement LET&D Tube Bundle	Single point failure. Continued operation of the LET&D puts in jeopardy the remaining reboiler.	500	M	H	A damaged, used reboiler is in storage. Extent of damage is unknown. Decontamination and repair would be needed to reuse.
INTEC	CAMs and Air Samplers	CAMs and Air Samplers	End of Service Life	800	M	H	Consider excluding CPP-659 from estimate
INTEC	Eds and Readers	Eds and Readers	End of Service Life	300	M	H	
INTEC	Filter Counters	Filter Counters	End of Service Life	150	M	H	
INTEC	Portable Instruments	Portable Instruments	End of Service Life	350	M	H	
INTEC	RAMs	RAMs	End of Service Life	350	M	H	Consider excluding CPP-659 from estimate
INTEC	RCIMS	RCIMS	End of Service Life	250	M	H	
INTEC	TLDs	TLDs	End of Service Life	1,000	M	H	
INTEC	Whole Body Counters	Whole Body Counters	End of Service Life	700	M	H	
INTEC	Roads/Sidewalks	Roads / Sidewalks		2,000	M	H	
CPP-1683	DCS-WN-900	LGWDCS Console Replacement	The consoles are the highest cost for maintenance of the DCS	1,000	L	M	In communication with Rockwell Automation
CPP-603	Abandoned Roof Duct	Remove Contaminated Ductwork	Risk reduction	1,000	L	M	Contaminated ductwork has begun to corrode; painting will reduce risk

Table C-5. Idaho Cleanup Project proposed recapitalization projects (updated March 22, 2012).

Facility	System	Description	Justification (e.g., end of service life, modernization, major repairs, etc.)	ROM Estimate ($K)	Risk Ranking (H,M,L)	Hazard Ranking (H,M,L)	Comments
CPP-603	In-Cell Cranes and Par Upgrade	B5 Previously funded project - Only funded for the CRN-GSF-401/PAR Crane	Cranes need to be refurbished and installed	610	L	M	Cost projection does not include CRN-GSF-101 Crane inside IFSF area. CRN-GSF-401/PAR unit has been refurbished and is in CPP-1636 awaiting installation.
CPP-603	Crane	CRN-SF-001 Crane only	End of Service Life-Upgrade	250	L	M	Procurement of Crane Components Completed and Installation Design Completed.
CPP-659	Acid Recycle System Valves	Replaces valves in the acid recycle system	Valves have PEEK seats that are not suitable for concentrated acid. Valve failure could result in 18,000 gallon acid spill.	540	L	M	Cost to remove acid
CPP-666	Basin Area Communication	PA System Upgrade - Improve Clarity	Cannot hear - comp measures required	500	L	M	
CPP-666	Cranes	Spare parts, inventory and warehousing of existing spare parts	End of Service Life-Upgrade	500	L	M	
CPP-666	FO-905 Cranes	Upgrade and replace parts	End of Service Life-Obsolete	250	L	M	
CPP-666	FO-960 Cranes	Upgrade to new crane	End of Service Life-Upgrade	1,500	L	M	
CSSFs (various buildings)	Hatch Plugs	Install inspection plugs or fabricate new hatches to allow periodic inspection without pulling the hatches	Modernization (suggested by Management as cost savings)	1,000	L	M	Potential regulatory impact
CPP-606	OOS Equipment & Building	D&D OOS Equipment and Partial Bldg	Reclaim footprint of building no longer in use	2,000	L	L	
CPP-659	Lights	Replace Mercury Vapor Lights	Replacements Unavailable - Obsolete	1,000	L	L	

Table C-5. Idaho Cleanup Project proposed recapitalization projects (updated March 22, 2012).

Facility	System	Description	Justification (e.g., end of service life, modernization, major repairs, etc.)	ROM Estimate ($K)	Risk Ranking (H,M,L)	Hazard Ranking (H,M,L)	Comments
CPP-603	Roof	Reslope Roof	Risk reduction	1,000	L	H	
INTEC	Outdoor Lighting	Outdoor Lighting		1,000	L	H	

Ranking Key:

Risk:
High (H) - on borrowed time
Medium (M) - Significant issues/failure likely by FY 2015
Low (L) - Improvement/nice to have

Hazard:
High (H) - Direct impact to safety/mission/regulatory requirements
Medium (M) - Potential Impact to safety/mission/regulatory requirements
Low (L) - No impact to safety/mission/regulatory requirements

Table C-6. Idaho Cleanup Project capital and line-item projects ($).

Project	Costs[a,b]	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012
Capital Projects									
Remote Waste Disposal Project / HFEF Cans CPP-666	Actual	0	0	0	0	847,357	-557	-846,800	0
CPP-603 (IFSF) HVAC	Actual	266,509	224	-5,441	0	0	0	0	0
CPP-604 Embedded Lines	Actual	34,011	886,420	186,332	82,940	807,258	-2,791	0	0
CPP-652 Cafeteria Safety Upgrade	Actual	189,715	225,336	1,401,087	-85,408	0	0	0	0
INTEC Security Fence	Actual	80,609	471,351	-2,965	0	0	0	0	0
RWMC Transuranic Analytical Lab Trailer	Actual	0	0	0	0	3,875,207	11,492	0	0
INTEC Dial Room Upgrade	Actual	0	0	0	0	0	1,115,959	3,921,706	6,140

Table C-6. Idaho Cleanup Project capital and line-item projects ($).

Project	Costs[a,b]	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012
Rad Liquid Tank Waste	Actual	0	326,661	68,930	0	0	0	0	0
CPP-602 Navy Conference Room	Actual	0	0	0	0	0	236,744	16,741	0
RWMC Office Complex (ARRA funded)	Actual	0	0	0	0	0	803,221	116,391	0
Stack Monitors (ARRA funded)	Actual	0	0	0	0	0	1,225,895	-6,743	0
INTEC Operations Trailer (TR-79) (ARRA funded)	Actual	0	0	0	0	0	510,585	0	0
Line-Item Projects									
IWTU PED	Actual	3,996,434	47,186,234	31,337,484	1,699,531	1,928,961	4,013	-1,748	0
IWTU Construction	Actual / Budget	0	1,410,472	43,932,005	76,837,480	123,812,841	106,860,291	18,184,605	1,269,678
Remote Treatment PED	Actual	0	0	2,272,643	2,504,731	67,558	18,568	0	0

a. Actual costs shown through FY 2011.

b. Budgeted costs shown are for FY 2012 (unless no FY 2012 budget is in place, in which case FY 2012 costs-to-date are shown).

Facility management, with assistance from designated experts in each discipline, will identify facility-specific surveillance and maintenance activities. The source of any such surveillance requirements and the end points at which the surveillance and maintenance activities can be stopped for facilities and structures slated for D&D also will be identified.

Any reduction in surveillance and maintenance will be justified and documented in accordance with company procedures.

ICP also is responsible for over 115 small support structures (e.g., septic tanks, fuel storage tanks, and concrete pads), many of which will be demolished as the need for them is eliminated. These structures are identified in the FIMS database as OSFs and are not specifically addressed in this discussion. They include facilities such as CPP-749 (underground storage vaults for Peach Bottom fuel), CPP-1774 (TMI 2 dry storage modules), and CPP-2707 (dry UNF cask storage pad).

The ICP will complete a minimal number of capital equipment and line-item projects to maintain facilities that are safe, compliant, and capable of supporting ICP mission needs. Table C-6 identifies those currently contained in the ICP life-cycle budget at this time.

C-1.1.4.2 Utilities

Utilities and operations DOE-EM funds directly support site area missions. Utilities services and funding outside the site areas are maintained and operated by the lead PSO (DOE-NE).

By the year 2012, ICP plans to reduce its cleanup missions down to two primary areas — INTEC and RWMC. The RWMC utility systems are structurally sound and are expected to sustain operations until mission completion without major upgrades. The utility systems will be maintained as described in Section C-1.1.4.1.

The INTEC electrical distribution system received a major upgrade (completed in FY 2003) using line-item construction project funding. The underground water systems are old (i.e., over 40 years of service) and may require upgrades. Utility systems that are considered part of the Vital Safety Systems will be maintained as priorities, and the remaining utilities will have maintenance conducted as described in Section C-1.1.4.1.

Utility systems will be considered for recommendation of recapitalization based on utility conditions established by scheduled surveillance/inspections and the estimated remaining duration of the utility mission. Recapitalization recommendations will be described in the CAIS database section for the identified utility system.

Utility metering per building is not present at RWMC or INTEC. Based on the planned footprint reduction at RWMC and INTEC, both areas are expected to have a minimum reduction of 25% in utilities costs. The other three areas (TAN, PBF, and the ATR Complex) are to have the DOE-EM presence eliminated, which will eliminate associated DOE-EM utilities costs.

C-1.1.4.3 Energy Management

With regard to energy management, the ICP is focusing its efforts on terminating utilities to facilities no longer necessary for the DOE-EM cleanup mission.

Process changes at INTEC during the period of 2008-2010 resulted in water savings of over 350 million gallons/year. D&D of the INTEC Analytical Laboratory facilities during FY 2011 resulted in savings of an additional 50 million gallons/year.

A site data package was issued by DOE in 2010 as part of a Notice of Opportunity (NOO). The NOO requested interested ESPCs to submit proposals for an energy and sustainability project for the INTEC and RWMC facilities.

Proposals were received and evaluated during FY 2011. Due to the low cost of energy and water at the INL site and the high cost of the proposed energy conservation measures (ECMs), it was determined by DOE-EM that the ICP facilities would be removed from the ESPC. The potential payback of the ECMs were too long to justify implementation.

C-1.1.4.4 *Operating Facilities with Ongoing Missions (no D&D planned under ICP contract)*

The ICP is responsible for 115 facilities (89 buildings and 26 trailers) with ongoing missions (i.e., facilities needed to complete the cleanup mission that are currently operating and not scheduled for D&D under the ICP contract). These include facilities for UNF storage, waste storage and processing, and for fire protection and security installations.

C-1.1.4.5 *Facilities Scheduled for D&D*

A significant portion of the ICP work scope involves D&D of excess facilities. Prior to receipt of ARRA funding in April 2009, 171 facilities were scheduled for D&D. In addition to funding the D&D of some of these facilities, which were subject to delays because of funding shortfalls, ARRA funded D&D of an additional 50 facilities — 221 in all. The original planned footprint reduction resulting from D&D of the 171 buildings was 1,626,845 ft^2. ARRA funding increases the total planned footprint reduction to 2,181,438 ft^2. As of February 2012, 217 buildings have been demolished, with a total footprint reduction of 2,131,382 ft^2.

The status of DOE-EM-owned buildings and structures scheduled for D&D in the course of the ICP contract is shown in Table C-7.

C-1.1.4.7 *Inactive Facilities Awaiting D&D*

Currently, three facilities are shut down and awaiting D&D (Table C-7). Following operational shutdown and transition, the first disposition activity for these facilities is usually to deactivate the facility. The purpose of deactivation is to place a facility in a safe shutdown condition that is cost effective to monitor and maintain for an extended period until the eventual decommissioning of the facility. Deactivation places the facility in a low-risk state with minimum surveillance and maintenance requirements.

C-1.1.4.8 *Deferred Maintenance*

DM will be reported in FIMS for those DOE-EM buildings with a designation of “Operating” (i.e., no D&D under the ICP contract). Reported DM will be based on existing values for DM and information resulting from scheduled facility-condition-assessment survey inspections.

Should facility inspections or surveillance activities identify the need to perform maintenance that has been deferred, ICP engineering and cost estimating will help establish that cost and it will be reported accordingly. However, because the ICP life-cycle baseline does not include any specific capital projects for the reduction of DM, baseline changes will be pursued as necessary to address the issue.

Table C-7. Idaho Cleanup Project decontamination and decommissioning plan.

ID	Name	Condition	GSF	Year Built	Est. Disp. Year	Model Building Description	Usage Code Description	Hazard Description
Idaho Cleanup Project Facilities in Deactivation								
MFC-766	Sodium Boiler Building	N/A	14,547	1962	2012	MB16 Other-Desc brief in comments field/supp doc	792 Laboratories, General (Nuclear)	04 Radiological Facility
MFC-767	EBR-II Reactor Plant Building	N/A	18,967	1963	2012	MB16 Other-Desc brief in comments field/supp doc	783 Research Reactor	04 Radiological Facility
MFC-793B	SCMS Alcohol Recovery Annex	N/A	576	1979	2012	MB05 Steel Light Frame	694 Other Service Buildings	04 Radiological Facility
Idaho Cleanup Project Facilities D&D in Progress								
WMF-1618	ARP-VI Retrieval Enclosure	N/A	45,400	2010	2012	MB05 Steel Light Frame	593 Nuclear Waste Processing and/or Handling Building	02 Nuclear Facility Category 2
WMF-697	ARP-1 Retrieval Enclosure	N/A	56,688	2004	2012	MB05 Steel Light Frame	593 Nuclear Waste Processing and/or Handling Building	02 Nuclear Facility Category 2

C-1.1.5 Conclusions

By the year 2012, the following ICP achievements will have resulted in significant risk reduction at INL:

- Shipping a large majority of the stored TRU waste to WIPP for final disposition
- Treating most of the liquid SBW
- Removing UNF from wet storage in spent fuel pools to safer dry storage
- D&D of major facilities at TAN, ATR Complex, and PBF
- Removing and disposing of several hundred thousand cubic meters of contaminated soil
- Exhumation of a large majority of the targeted waste at SDA.

By the year 2012, the DOE-EM footprint at INL will have been reduced by over 1 million ft^2, and DOE-EM will have a presence solely at INTEC and RWMC.

While the ICP contract ends in the year 2012, there will be substantial DOE-EM scope to complete beyond that date. That scope includes shipping the remaining TRU waste to WIPP, treating the remaining liquid SBW, emptying and grouting the last four tanks that currently hold that waste, completing the Calcine Disposition Project, continuing to operate the vapor vacuum extraction units at RWMC, cleaning up soils under INTEC buildings, finishing capping the INTEC Tank Farm area, continuing the packaging and final disposition of UNF, and capping the SDA at RWMC. By the year 2035, the DOE-EM cleanup mission at INL will be complete.

C-1.2 Advanced Mixed Waste Treatment Project Mission

The specific AMWTP requirements are to retrieve, characterize, treat, and dispose of TRU waste. The waste is currently stored in drums, boxes, and bins contained in RWMC Transuranic Storage Area storage buildings. Approximately 90% of the waste has been retrieved and has been found to consist of mixtures of various solid materials, including paper, cloth, plastic, rubber, glass, graphite, bricks, concrete, metals, nitrate salts, process sludges, miscellaneous components, and some absorbed liquids. Much of the remaining waste to be retrieved is stored in degraded containers and will require added retrieval enclosure and repackaging techniques. The waste characterized to date includes both RCRA hazardous waste constituents and radioactivity, thereby classifying it as mixed waste. Some waste may also contain Toxic Substances Control Act-regulated materials such as polychlorinated biphenyls and asbestos.

C-1.2.1 Advanced Mixed Waste Treatment Project Facility Status

The AMWTP is a DOE-EM-funded program. The overall vision for the AMWTP is to treat waste for final disposal by a process that provides the greatest value to the U.S. Government. The original contract called for the licensing, design, and construction of a treatment facility that had the capability to treat specified INL waste streams, with the flexibility to treat other INL and DOE regional and national waste streams. This treatment facility was constructed by British Nuclear Fuels, PLC. In April 2005, all AMWTP facilities and equipment owned by British Nuclear Fuels, PLC were purchased by DOE. DOE contracted with Bechtel BWXT Idaho, LLC to operate and maintain the facilities.

This agreement lasted from 2005 through September 2011. As of October 2011, Idaho Treatment Group, LLC, has taken over operations and maintenance of these facilities, along with the DOE-provided RWMC facilities, WMF-610 and WMF-628.

Currently, the AMWTP facilities are operational and require normal maintenance and repairs. Some major facility upgrades may be required through FY 2015 to accommodate the more difficult waste streams. Routine upgrades and facility modifications are expected to continue. Proposed AMWTP recapitalization projects are delineated in Table C-8.

DOE is evaluating other uses for the AMWTP facilities and equipment once disposition of the estimated 65,000 m^3 of stored TRU waste at RWMC is complete. The facilities are being considered for utilization as a national asset to process waste materials from other sites across the DOE complex.

C-2. OFFICE OF NAVAL REACTORS

NRF is operated by Bechtel Marine Propulsion Corporation, under contract with and direct supervision of the Naval Nuclear Propulsion Program. NRF is not under the purview of DOE-ID; therefore, NRF real property assets information is not available in this plan.

INL provides support services to NRF, including, but not limited to, bus transportation, motor vehicle and equipment use, electrical power, electrical distribution system management, fire department services and firefighter training, telephone and other communications services, roads and grounds maintenance (outside NRF boundaries), medical support services, railroad operations, and specialized machine shop services.

Additionally, ICP routinely dispositions MLLW generated at NRF and has contract instruments in place to treat remote-handled TRU waste and disposition hazardous waste. Remote-handled LLW via 55-ton scrap casks is dispositioned at RWMC for NRF. The NRF disposes some of its CERCLA waste at ICDF.

C-2.1 Naval Reactors Facility Background

Established in 1950 to support development of naval nuclear propulsion, NRF continues to provide support to the U.S. Navy's nuclear powered fleet.

C-2.2 Naval Reactors Facility Forecast

NRF is one of the INL Site's primary facility areas that will continue to fulfill its currently assigned missions for the foreseeable future.

C-3. REFERENCES

DOE Guide 430.1-2, *Implementation Guide for Surveillance and Maintenance during Facility Transition and Disposition*, U.S. Department of Energy, September 29, 1999.

DOE Order 430.1B, *Real Property Asset Management, U.S. Department of Energy*, February 2008.

Table C-8. Advanced Mixed Waste Treatment Project proposed recapitalization projects (updated April 12, 2012).

Facility	System	Description/Repair	Justification (e.g., end of service life, modernization, major repairs, etc.)	ROM Estimated Cost	Comments
WMF-676	310/320 Conveyors and Box Lifts	North and South Box Lifts, Box Import Conveyor/Lift, Variable Geometry Doors, ICS Sensors.	Mechanical wear, debris binding operation, lack of guarding, historic periodic rebuild, repair when fails.	$200,000	Rebuild chains and guides, hydraulic lift operating mechanisms, lifts, and clean.
WMF-676	335/345/370/390 Drum Movement Robots	Current configuration not documented.	Update drawings and software to accurately reflect current configuration.	$54,000	Perform update and copy software parameters.
WMF-676	330/340 Brokk Waste Processing Remote Arms/ Hydraulics	Numerous hydraulic failures in cell, multiple tools have failed and are stored in cell, numerous mechanical/structural failures, design not reflected in current configuration, operator stations are ergonomically deficient.	Down time is excessive, usually at least one Brokk at all times.	$1,146,000	Reconstruct the design basis, design backup systems, and install, clean out the debris, and broken equipment. Note: Install a second Brokk arm in each box with ability to shift hydraulic systems.
WMF-676	340 Guillotine	Not operable. Hydraulic system will not build pressure.	Needed to process sludge drum carcasses and size reduce.	$5,000	Repair hydraulic system; replace cutting edges, and shim, test.
WMF-676	320 BOGR	Requires frequent blade changes, debris pickup tube clogs; fire has occurred.	Frequent blade changes when cutting metal boxes, impacting import of feed to box lines.	$50,000	Replace the BOGR with the new, redesigned unit currently in storage at the Lindsay Blvd. facility. Two weeks production time, $50,000 material which includes possible refurb of the unit in storage due to age.
WMF-676	350 Shredder	"Bridges" boxes frequently, door pins are severely worn, dirty and material adrift.	This unit frequently impacts production as a result of boxes to be shredded not feeding. Requires material not native to the process to be fed, increasing waste volumes.	$100,000	Design a fix to cause the machine to work as intended, design and fab of the fix, rebuild door hinges. One month production time, $100,000. Note: $20K engineering, $50K shop fab, $30K misc.
WMF-676	In Cell Cameras	Raising/Lower devices are broken/defect. Many cameras are dirty.	Maintenance is frequently impossible due to failure of raising/lowering devices. Many cameras are hard to see through due to dirt.	$40,000	Replace/repair camera mounts. Clean all housing and lenses.
WMF-676	BTPs	Swaggers frequently fail. Protector Ring design allows frequent damage in the form of bending.	Repair requires shut down of product loading area/compactor. The frequently impacts production.	$50,000	Determine failure modes/design fix and implement. (Gueess) Simple fixes are in process, Redesign not practical.
WMF-676	Super Compactor	System working fine. Spare parts review and availability needs to be looked at.	None	$50,000	Estimate additional spare parts around $50K. Two months for compilation of list of additional parts.

Table C-8. Advanced Mixed Waste Treatment Project proposed recapitalization projects (updated April 12, 2012).

Facility	System	Description/Repair	Justification (e.g., end of service life, modernization, major repairs, etc.)	ROM Estimated Cost	Comments
WMF-676	Assay 100/101	Software is obsolete and should be replaced. Detector (older) cooling systems show a higher failure rate and should be updated. Lack of redundancy of installed detectors causes loss of production for each failure.	Software is available and should be installed. There are 18 detectors total to support 8 fixed installed in assay systems; 12 have an old style cooling system which is showing a higher than normal failure rate. When one detector fails the entire assay machine must be taken out of service, which cuts production to 50% of normal with two assay units in service.	$1,810,000	Replace software and test. Update cooling systems on spares and install when failures occur. The approach to this is currently unknown. Engineer a backup, modify the facility as necessary, test, train, and place in service.
WMF-676	ICS/FTS/WTS software and hardware	FTS Hardware is at end of life. FTS software is still supported on site.	Upgrade of test bed and production machines. System would be offline tested prior to installation to minimize downtime.	$100,000	Replacement of hardware for production and test bed.
WMF-676	HVAC	System will not shift reliably from operating to standby units. Installed systems control relays are unreliable and cause numerous losses of ventilation. Electrical equipment is dirty and fails due to previous incident where drive belts burned. Replacement HEPA filters are not yet available and there is insufficient assurance they will be delivered in time to prevent shutdown. Manual dampers have failed or in very poor material condition. HEPA radial filters do not meet ASME code requirements for face velocity.	This system in general needs extensive engineering and repair. Major design deficiencies exist in relays and condensate collection. Current system design results in HEPA filter face velocities in excess of that allowed by ASME code (5 fpm). This issue requires resolution and if not accepted as is, could result in a huge treatment facility modification.	$6,600,000	Redesigns: $100,000 design and drafting, $750,000 in construction work. Production impact is 14 days. Maintenance: Resources are the issue, in work control and crafts. Requires 2 instrument techs, 2 electricians, 2 mechanics, 1 work controller to properly upgrade this equipment. HEPA Face Velocity: Accept as is uses existing resources. A modification to lower face velocity is in excess of $4M and 3 months production time. Note: engineer, design and build new HEPA banks. Remove wall of treatment facility and using rad controls, remove existing and install new larger units.
WMF-676	Utilities (boilers, air compressors, breathing air, heating, etc.)	Air conditioning capacity is not adequate to keep cell temperatures down during hot summer months.	Human comfort issues for people making cell entries requires cell air temperatures to be low. Current cooling coil capacities are insufficient.	$500,000	Engineering, equipment, installation.

Table C-8. Advanced Mixed Waste Treatment Project proposed recapitalization projects (updated April 12, 2012).

Facility	System	Description/Repair	Justification (e.g., end of service life, modernization, major repairs, etc.)	ROM Estimated Cost	Comments
WMF-676	352 LLW	Slide Gate Gaskets Failing.	Rubber gasket material is deteriorating and needs replaced.	$50,000	Determine failure modes/design fix and implement.
WMF-676	815, 24 VDC electrical	Connect 24V plant system to all C&D robotics consoles 335/345/370/390	This will remove the requirement of connecting a TPC to power up PECs during cell entries to allow for visual indications.	$5,000	Engineering, equipment, installation.
WMF-618	Crane	Installed overhead gantry crane is potentially a single point failure.	This risk has been recognized and a spare crane acquired. There is no planned replacement that would lessen the impact on production should a failure occur. Prolonged storage of the new spare will lead to deterioration in material condition.	$100,000	Install the spare crane, make electrical modification, and test/train.
WMF-618	TruPact Loading Systems (Vacuum, etc.)	Vacuum system is frequently unreliable.		$40,000	Need to replace vacuum pumps with scroll compressors. Downtime estimated less than a week.
WMF-634	RTR 101/106	Table movement and rotators fail frequently. Cameras fail frequently and are very difficult to find spares. Shutters and image intensifiers require frequent repair.	These units require overhaul and adequate spare parts.	$1,000,000	Obtain spare parts, update equipment to modern for which spares exist, install and train. These can be done individually helping to minimize production impact.
WMF-634	Assay 102/103	Software is obsolete and should be replaced. Detector (older) cooling systems show a higher failure rate and should be updated.	Software is available and should be installed. There are 18 detectors to support 8 installed, 12 have an old style cooling system which is showing a higher than normal failure rate. When one detector fails the entire assay machine must be taken out of service, which cuts production to 50% or normal with two assay units in service. Detector replacement	$270,000	Item 1: replace software and test. Item 2. Update cooling systems on spares and install when failures occur. Item 3: Engineer a backup, modify the facility as necessary, test, train, and place in service. Note: estimate is based on one assay machine in service and one able to keep up with production; cost is less because modification made in the treatment facility would apply here in part.

Table C-8. Advanced Mixed Waste Treatment Project proposed recapitalization projects (updated April 12, 2012).

Facility	System	Description/Repair	Justification (e.g., end of service life, modernization, major repairs, etc.)	ROM Estimated Cost	Comments
WMF-634	Drum Vent	Replacement of UPS that is damaged.	Drill head works but spares for motor dealing with obsolescence.	$5,000	Cost around $15K, downtime.
WMF-635	GGT	Summer ambient temperatures become very high due to increased heating capacity recently installed.	40 additional GGT units were added with no change in the existing ventilation system.	$150,000	Upgrade the ventilation system, design, and construction.
WMF-635	Drum Vent	Punch has seen some reliability issues.	Recent upgrade of punch needs evaluation period.	$5,000	Redesign Punch head as necessary.
			Total	**$12,330,000**	

APPENDIX D






Strategic Sustainability

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APPENDIX D STRATEGIC SUSTAINABILITY

D-1. IDAHO NATIONAL LABORATORY STRATEGY FOR GLOBAL SUSTAINABILITY LEADERSHIP

The DOE-NE, DOE-ID, and DOE Office of Engineering and Construction Management identified sustainability as a high-priority initiative with an emphasis on meeting federal energy, water, and greenhouse gas (GHG) reduction goals. INL institutionalized a strategy to implement sustainable practices in facility design and operation, procurement, and program operations that incorporate:

- EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*
- EO 13423, *Strengthening Federal Environment, Energy, and Economic Performance*
- DOE Order 436.1, *Departmental Sustainability*
- DOE *Strategic Sustainability Performance Plan* (SSPP; DOE 2011).

INL's vision for FY 2023 is to be a leading laboratory for sustainability performance in the United States and globally. Achieving sustainability means simultaneous consideration of economic prosperity, environmental quality, and social equity.

Sustainable INL

INL will carry out its mission of ensuring the nation's energy security with safe, competitive, and sustainable energy systems without compromising the ability of future generations to meet their own needs.

The sustainability strategy supports the long-term objective to ensure the efficient and appropriate use of laboratory lands, energy, water, and materials, as well as the services that rely upon them. INL will move beyond compliance-oriented initiatives to sustainability as the key strategy for achieving both a competitive advantage and meaningful change. This transformation sharpens INL's focus on new designs, building upgrades, and scientific research.

Sustainability principles (Figure D-1) are consistent with BEA's Strategy Roadmap approach to laboratory management, as found in Policy 111, *Idaho National Laboratory Policies and Standards of Performance*.

The challenge of implementing sustainability is to minimize the impact to operations while increasing the health and viability of the laboratory.

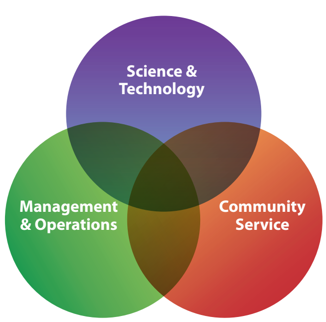

Figure D-1. Simultaneous excellence and sustainability principles.

INL is integrating sustainability performance improvements in the areas that matter most to its stakeholders, including minimizing the environmental footprint, taking a progressive approach to mitigating climate change, and championing energy conservation.

The first step toward sustainability is to educate managers and staff about the physical, cultural, socioeconomic, and ethical dimensions of sustainability. The second step is to empower INL employees to understand and apply sustainable practices in their work activities.

To achieve this, INL is fully implementing sustainability into its culture through thoughtful consideration of all aspects of sustainable design, facility operation, and process modifications to establish sustainability as central to ongoing success as a premier national laboratory.

To meet the sustainability challenges, INL has formulated the following comprehensive strategy to address the immediate needs of its staff and facility users:

- Employ new business models to fund sustainability projects
- Ensure flexible facility design and operations meet the needs of a world-class sustainable laboratory
- Advance GHG emissions reduction efforts and adopt comprehensive policies to reduce INL's carbon footprint
- Leverage planning teams to identify and recommend strategies for maintaining sustainable reliability at minimum cost
- Synchronize world-class vehicle fueling infrastructure for government and private fueling
- Fully implement the *FY 2012 INL Site Sustainability Plan with the FY 2011 Annual Report* (SSP; DOE-ID 2012)
- Establish realistic sustainability goals and metrics that are based on legal requirements and adapted to our geographic region
- Maintain quality workplaces for employees and users through rehabilitating, renovating, and upgrading those enduring buildings that can readily support current and future missions
- Improve the energy and resource efficiency of new and existing leased facilities
- Integrate campus development with responsible regional and local planning.

The established INL Sustainability Program will continue to promote economic, environmental, and social sustainability for INL, helping to ensure its long-term success and viability as a premier DOE national laboratory. The Sustainability Program seeks to achieve measurable and verifiable energy, water, and GHG reductions. The Program is also responsible for providing strategic leadership for the entire INL; advancing sustainable building designs; exploring the potential use of renewable energy; reducing utility costs across INL; and supporting cost-effective facilities, services, and program management.

D-1.1 Idaho National Laboratory Site Sustainability Plan

The DOE SSPP (DOE 2011) addresses how DOE will meet the goals of the applicable "greening the government" executive orders and statutes. The SSP (DOE-ID 2012) outlines how INL will implement continual efficiency improvements directed at meeting the goals and requirements included in the SSPP. The SSP also summarizes energy and fuel use reporting requirements and references criteria for performing sustainable design.

BEA, as the primary INL contractor, annually updates the SSP, adding specificity as projects are developed and requirements change.

The SSP encompasses all contractors and activities at the INL Site under the control of DOE-ID, including the DOE-EM. NRF operations are excluded because NRF planning and reporting occur through the DOD. This appendix focuses on the DOE-NE activities and plans from the SSP.

The SSP provides the strategy and tactics to achieve progress towards meeting the required goals but does not, on its own, guarantee success. As noted in this section, goals for fleet fuel use and GHG emissions reductions should be met or exceeded; however, additional significant resources will still be needed to develop and implement energy and water reduction projects and to increase waste diversion activities to secure success for INL in meeting all its Sustainability Program goals.

D-1.2 Funding

As a government entity, INL is limited in funding acquisition pathways. There is no standard formula for funding sustainability initiatives. However, realistic funding strategies reflect four main sources:

1. ESPC
2. Utility Energy Savings Contracts (UESCs) and utility incentive programs
3. Direct and indirect funding and reinvesting cost savings from sustainable actions
4. Special funding requests (third party, DOE-NE, line item).

A practical hybrid approach is achievable where all stakeholders participate with funding. Each of the four sources has merits and drawbacks. For example, ESPC projects are comprehensive and time consuming to develop. Typically, an ESPC project can take over 12 months for project development, followed by 18 months or more for design and construction.

To supplement the four sources listed, INL will request strategic investment funding to accomplish energy and resource efficiency projects that are not readily implemented with alternative funding sources. These projects will focus on facilities that can be updated to meet the EO 13423 Guiding Principles (http://www.wbdg.org/references/mou.php). Table D-1 provides a snapshot of the projects identified for implementation to be prioritized against laboratory resources over a minimum of three fiscal years.

D-1.3 Sustainability Goals

INL adopted the major programmatic sustainability goals contained in the Executive and DOE Orders and the SSPP. Sustainability is a performance improvement strategy that is readily validated through performance measurement and reporting. The following subsections discuss in greater detail the primary energy, water, and fuels usage goals that are the basis for validating the performance of INL sustainability.

INL Sustainability Program Major Goals

- *Energy usage reduced 30% by FY 2015 compared to FY 2003*
- *Water usage reduced 16% by FY 2015 compared to FY 2007*
- *Petroleum fuels usage reduced 20% by FY 2015 compared to FY 2005*
- *Alternative fuels usage increased 100% by FY 2015 compared to FY 2005*
- *GHG emissions reduced 28% by FY 2020 compared to base year FY 2008.*

TableD-1. Energy and resource efficiency project summary.

INL Project/Program	Area	Project Description	ROM Total Project Cost ($K)	FY 2012 ($K)	FY 2013 ($K)	FY 2014 ($K)	FY 2015 ($K)	FY 2016 ($K)
Strategic Investment - Sustainability	REC	IF-616/617 (WCB) Chiller Replacement	280	280				
	REC	IF-601 (RESL Office Building) Exterior Lighting Replacement	24	24				
	REC	IF-616 (WCB) Interior Lighting Upgrades	222	222				
	REC	IF-602 (IRC Office Building) Water Fixture Replacement	37	37				
	REC	IF-654 (EROB) CO_2 Sensor Installation	30	30				
	REC	IF-616/617 (WCB) Water Fixture Replacements	165		165			
	REC	IF-616/617 (WCB) Exterior Lighting Replacements	74		74			
	REC	IF-654 (EROB) Exterior Lighting Replacements	101		101			
	REC	IF-603 (IRC Laboratory Building) Motors/Controllers Replacement	191		191			
	MFC	MFC-Wide Water Fixture Replacements	543		272	271		
	REC	IF-616/617 (WCB) HVAC Boiler Replacement	250			250		
	REC	IF-616/617 (WCB) HVAC Controls Modification	228			228		
	REC	IF-616/617 (WCB) "Kite Light" Modification, Rezone HVAC, and Install new VAV Boxes	164			164		
	REC	IF-654 (EROB) HVAC VFD Controls Installation	46				46	
	REC	IF-654 (EROB) Computer Room Economizer Cooling Coil Addition	33				33	
	REC	IF-616 (WCB) Computer Room Heat Recovery	47				47	
	REC	IRC-Wide LED Exterior Lighting Upgrade	50				50	
	REC	IRC IF-601, 611, 627, 638, and 657 HVAC/Controls Upgrades	448				448	
	REC	IF-606 (IAB) & IF-608 (IORC) LED Exterior Lighting Upgrade	67				67	
	REC	IF-608 (IORC) Economizer Cooling Coil Installations to (9) Liebert Units	132				132	
	REC	IF-603 HVAC Upgrades	1,088					1,088

TableD-1. Energy and resource efficiency project summary.

INL Project/Program	Area	Project Description	ROM Total Project Cost ($K)	FY 2012 ($K)	FY 2013 ($K)	FY 2014 ($K)	FY 2015 ($K)	FY 2016 ($K)
NE-32 - INL Sustainability Program	Sitewide	Advanced Meter Installations	498	100	398			
Sustainability - SMC - US Army	SMC	High Bay Lighting Replacement	164	164				
	SMC	Lighting Replacements T12 - T8	257	128	129			
	SMC	Air Handler VFD Installations	60		60			
	SMC	Air Handler Heat Recovery Loop Installation	180		180			
	SMC	Boiler Economizer Installation	48			48		
	SMC	Convert Boilers to Dual Fuel, LNG, or Electric	589			294	295	
	SMC	Air Handler Unit Replacements	300			150	150	
	SMC	Solar Wall Installation	60				60	
		Total Cost	**6,376**	**985**	**1,570**	**1,405**	**1,328**	**1,088**

D-1.3.1 Energy Reduction

The INL goal for energy efficiency is a 30% reduction in energy intensity by FY 2015 as compared to the FY 2003 energy intensity baseline. On average, an annual energy use reduction goal of 3% supports meeting the overall goal and provides a means to measure and trend progress (Figure D-2). INL energy use is typically normalized for weather related factors to provide an accurate comparison with base year FY 2003. Energy intensity at the end of FY 2011 was reduced 5.6% (or 10.5% when normalized for weather).

Energy intensive loads that are mission-specific are excluded from the goal, including the ATR and its support facilities, but are not exempted from the responsibility to reduce energy use, where practicable. Energy sources affected by this goal include electricity, natural gas, fuel oil, liquefied natural gas (LNG), and propane.

As shown in Figure D-2, energy efficiency is currently not trending toward meeting the required reduction goal. Planned facility removal has resulted in an increase in energy intensity by decreasing the total building square footage, while only minimally impacting the overall energy use. INL expects this trend to diminish as facility removal efforts end and as ESPC and strategic investment projects are completed.

Methods to reduce energy use include capital project upgrades, operational modifications, and behavior changes by the INL workforce.

An MFC ESPC project included $33 million in energy and water saving upgrades that will provide overall energy reductions for the INL Site of 5%. Data are being validated and systems optimized to maximize the investment. INL's next ESPC project is being developed for the enduring assets at CFA and the ATR Complex.

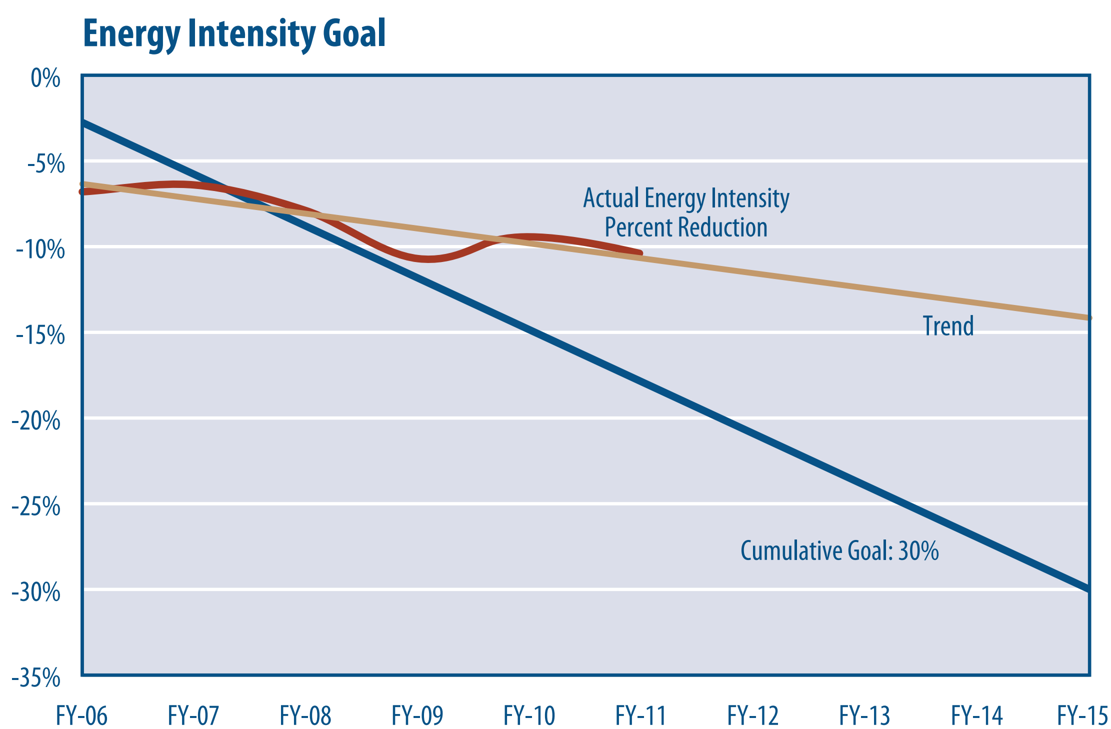

Figure D-2. Idaho National Laboratory energy-intensity reduction goal of 3% each year in Btu/ft^2 for a total of 30% by FY 2015 as compared to FY 2003.

This project is expected to reduce energy and water usage an additional 5%. The project will complete final development during FY 2012; design and construction will begin in FY 2013.

Additional energy reductions will be obtained through implementation of strategic investment funded projects, projects funded by the Office of Facilities Management, and projects funded by the U.S. Army at SMC. These projects are listed in Table D-1.

The City of Idaho Falls is planning to upgrade all of its electrical power meters to advanced smart-meter technology. INL plans to upgrade the Idaho Falls facilities during the summer of FY 2012 as part of the city's initial upgrade project. This upgrade will provide smart meters and a network to supply a central data-collection point, view and analyze the data, and provide demand management capabilities. INL will have access to this data-collection system, which will support improved demand management capabilities.

Metering is also planned for all buildings upgraded by ESPC projects and as identified by the INL Metering Plan (PLN-3911). This Plan provides a spreadsheet for Idaho Falls and INL Site locations where metering is cost effective and will result in 90% of the total electricity at the INL Site being metered at the building level. Metering provides additional data compilation and utility management benefits.

In addition to providing a means of trending and validating energy savings, metering also provides proactive space management opportunities. Energy and water usage information assists with electrical demand management, enhanced resource utilization, and transfer or assignment of energy costs to the user in a more accurate manner. Advanced metering provides a method to encourage and validate employee behavior change, and provides a dependable tool for facility managers to optimize building systems and controls.

The critical constraint to goal accomplishment is how well INL is able to create sustained change in behavior. If you want different results, you have to change the system. The strategy for behavior change was adapted from private industry and includes:

- Elevate sustainability in company governance, including Leadership Management Team oversight and accountability over environmental and social issues, and linking executive and other employee compensation to sustainability goals
- Robust regular dialogues with key laboratory stakeholders on sustainability challenges, including employees, managers, and suppliers
- Open reporting on sustainability strategies, goals, and accomplishments
- Systematic operations and performance improvements to achieve environmental neutrality and other sustainability goals across the entire INL portfolio.

Table D-2 provides the energy consumption and generation projections for major INL Site areas through FY 2015 based on historic data and estimated efficiency impacts of current and planned projects and operational changes. This table illustrates the energy intensity (Btu/ft²) status and forecast. It also provides data for base year FY 2003, the latest complete year (FY 2011), and a high-level forecast of the energy intensity in FY 2015 when planned projects, new facilities, and operation changes are complete.

D-1.3.2 Water Reduction

The INL goal for water usage is a 16% reduction of usage intensity by FY 2015 (Figure D-3), or 2% each year, as compared to the FY 2007 water-usage intensity baseline measured in gal/ft².

Table D-2. Idaho National Laboratory energy intensity status and forecast.

Area	Base Year FY 2003 (Btu/ft²)	FY 2011 (Btu/ft²)	% Change from FY-03	Forecast FY 2015 (Btu/ft²)	Forecast % Change from FY-03	Comments
REC	95,070	112,238	18%	99,895	5%	New, efficient, industrial and laboratory facilities (higher energy intensity than office buildings): RESL, ESL, and REL. Upgrade projects in WCB, EROB, and Utility Building facilities. These upgrade projects should provide improvements; however, there will still likely be an estimated overall 5% increase from FY 2003.
MFC	275,256	204,274	-26%	197,402	-30%	ESPC #2 is complete and is providing a 5% reduction in energy use.
ATR Complex	126,616	180,131	42%	171,125	35%	Assumes that ESPC #3 is complete and provides an additional 5% reduction in energy use. Does not include ATR electricity, as it is currently exempted from the goal. Total energy use is down at the ATR Complex; however, significant square footage reduction of buildings in standby mode has increased the energy intensity of the remaining buildings.
INTEC	305,550	235,272	-23%	230,567	-25%	INTEC's energy use is down significantly from FY 2003, and is expected to continue with additional reductions as more processes are eliminated. Additional 2% energy reductions are estimated before the end of FY 2015. The new IWTU will be an energy intensive facility with a relatively short temporary mission, and is planned to be excluded from the energy reduction goal when it comes online.
CFA	127,280	102,595	-19%	97,465	-23%	Assumes that ESPC #3 is complete and is providing an additional 5% reduction in energy use.
SMC/TAN	184,747	251,637	36%	245,346	33%	SMC is planning internally funded energy efficiency projects and is considering participating with ESPC #3. Estimating a 2.5% reduction in energy use over the next 4 years.
RWMC	78,227	122,020	56%	61,010	-22%	Assumes that the current processes and mission are complete and that the buildings are in a standby mode, providing a 50% reduction in overall energy use as compared to current use.
Total Desert Site	196,491	173,323	-12%	151,948	-23%	Includes all of the major desert site areas except ATR, which is currently exempted.
Total INL Site	**174,997**	**157,811**	**-10%**	**136,667**	**-22%**	**Total includes all REC facilities and the major desert site areas (except ATR). This is the final score that INL will be graded on for meeting the SSPP goals.**

Notes:

1) The SMC and ATR Complex have reduced their overall energy use but have decreased square footage even more, so the energy intensity has gone up significantly for both areas. Buildings with large square footages and low energy use in standby mode, such as the Materials Test Reactor at ATR Complex and the Hot Shop Facility (TAN-607) at TAN, have been removed since base year FY 2003, contributing to the observed increase in energy use intensity.

Table D-2. Idaho National Laboratory energy intensity status and forecast.

Area	Base Year FY 2003 (Btu/ft²)	FY 2011 (Btu/ft²)	% Change from FY-03	Forecast FY 2015 (Btu/ft²)	Forecast % Change from FY-03	Comments
As an example, at ATR Complex:						

	FY 2003	FY 2011	Change	
Energy Use	59,850 MBtu	56,332 MBtu	-6% reduction	Positive metric based on total energy usage decreasing
Square Footage	472,684 ft^2	312,730 ft^2	-34% reduction	Positive metric based on contractual desire to decrease building footprint
Energy Use Intensity	126,616 Btu/ft^2	180,131 Btu/ft^2	+42% increase	Negative metric based on tremendous footprint reduction, but EO goals requires this metric usage

2) INTEC also has experienced reductions in square footage; however, the facilities removed were mostly active right up to decommissioning and demolition and were fully functional during base year FY 2003, so the energy intensity at INTEC has been predominantly reduced commensurate with the reduction in square footage.

3) Additional projects needed to achieve the estimated deficit of 8% toward the FY 2015 goal will be developed and included in the annual TYSP updates, and may be partially funded with BEA Strategic Investment Funding planned for sustainability projects over three fiscal years.

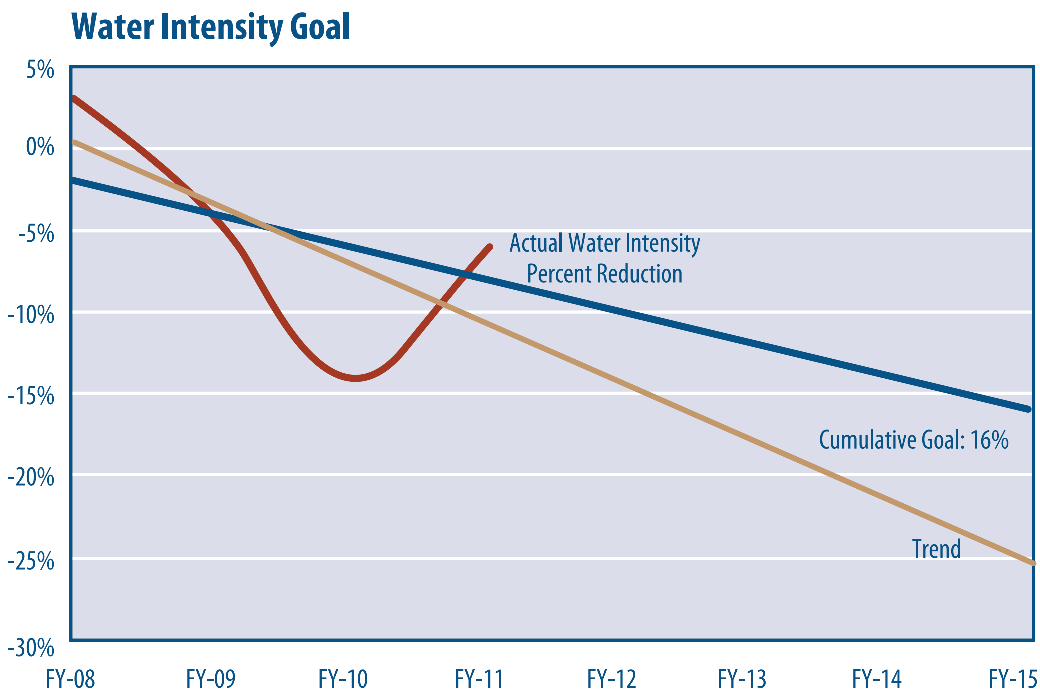

Figure D-3. Idaho National Laboratory water-intensity reduction goal of 2% each year in gallons/ft² for a total of 16% by FY 2015 as compared to FY 2007

INL reports water consumption as all water pumped from the ground onsite and all water procured from the City of Idaho Falls. The INL Site has reduced water use intensity by 6% and total water pumped by 14.5% as compared to the FY 2007 baseline. As shown in Figure D-3, the INL Site is trending toward achieving its water reduction goal.

INL is also using alternative funding methods for water reduction projects. The ESPC project planned for the ATR Complex and CFA will eliminate once-through heating ventilating and air conditioning (HVAC) cooling water, increase efficiency through fixture replacements, and address improvements in industrial water use. Additionally, water reduction opportunities (i.e., wholesale water fixture upgrades at MFC) will continue to be evaluated to increase water efficiency while addressing ongoing water waste processing issues.

In all cases, water metering will be required for installation during ESPC projects (providing for enhanced project validation) in addition to operational and maintenance tools.

D-1.3.3 Fleet Fuels Reduction

INL is developing diversified strategies for reducing fossil fuel use and carbon emissions associated with light- and heavy-duty vehicles. The DOE sustainability goals for transportation fuels include a 30% reduction of petroleum fuel use by FY 2020 (Figure D-4) and a 100% increase of alternative fuels by FY 2015 (Figure D-5), both as compared to the FY 2005 usage baseline. Both graphs illustrate that INL is trending well toward meeting the goals.

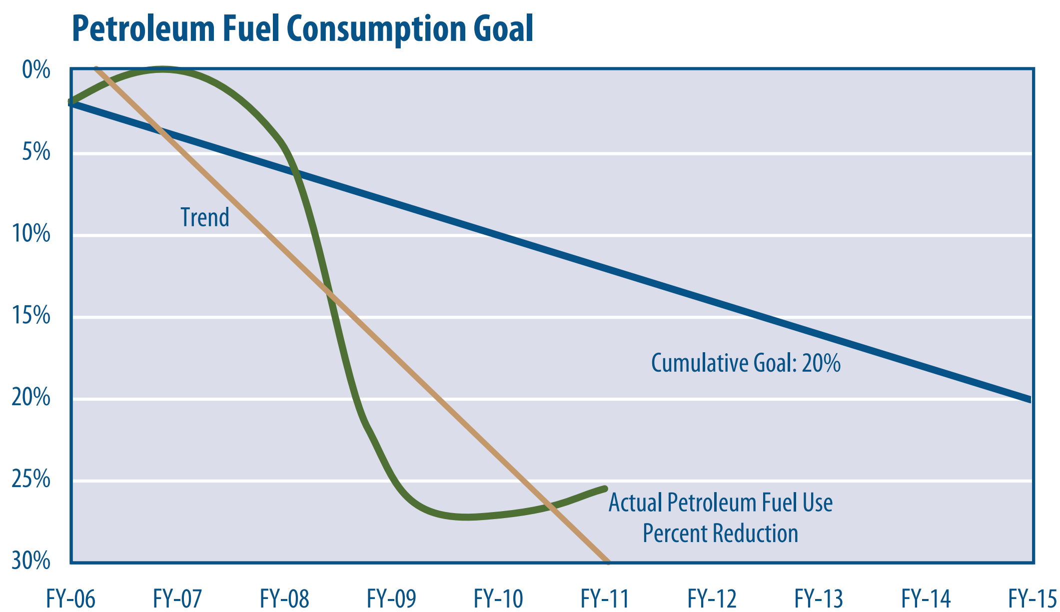

Figure D-4. Idaho National Laboratory petroleum fuel-reduction goal of 2% each year in gallons consumed for a total of 20% by FY 2015 as compared to FY 2005.

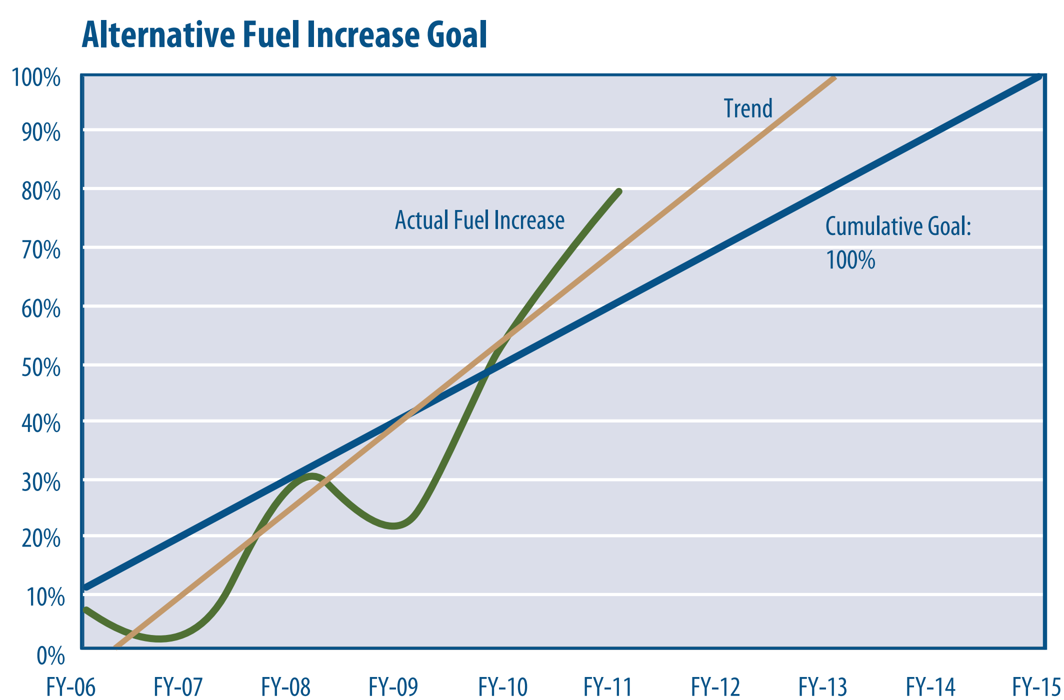

Figure D-5. Idaho National Laboratory alternative fuel-increase goal of 10% each year in gallons consumed for a total of 20% by FY 2015 as compared to FY 2005.

There are many opportunities to affect DOE's petroleum fuel usage by implementing fuel reduction and fuel switching activities at INL. INL continues to meet and exceed the transportation fuel goals by actively pursuing increased E-85 and biodiesel fuel usage. These increases are facilitated by mandating the use of alternative fuels in all flex-fuel vehicles, and by increasing the quality of biodiesel fuel while researching and implementing the use of B20 biodiesel blend in the INL bus fleet throughout the winter season. Other strategies include right sizing the INL fleet, obtaining higher-efficiency hybrid and flex-fuel vehicles, and expanding the availability of alternative fuels in Idaho Falls and at INL.

D-1.4 Carbon Footprint

In addition to sustainability goals for energy, water, and fleet fuel reduction, DOE has committed to reduce Scope 1 (direct emissions from sources owned or controlled by INL) and Scope 2 (indirect emissions from consumption of purchased electricity, heat, or steam) GHG emissions by 28% before the end of FY 2020 (Figure D-6) as compared to the FY 2008 baseline. INL has calculated the initial Carbon Footprint, as found in *Idaho National Laboratory's FY 11 Greenhouse Gas Report* (INL 2012), and updates the report annually. This GHG inventory supports the INL initiative to lead GHG emissions-reduction efforts and is an accepted method of identifying environmental impacts by

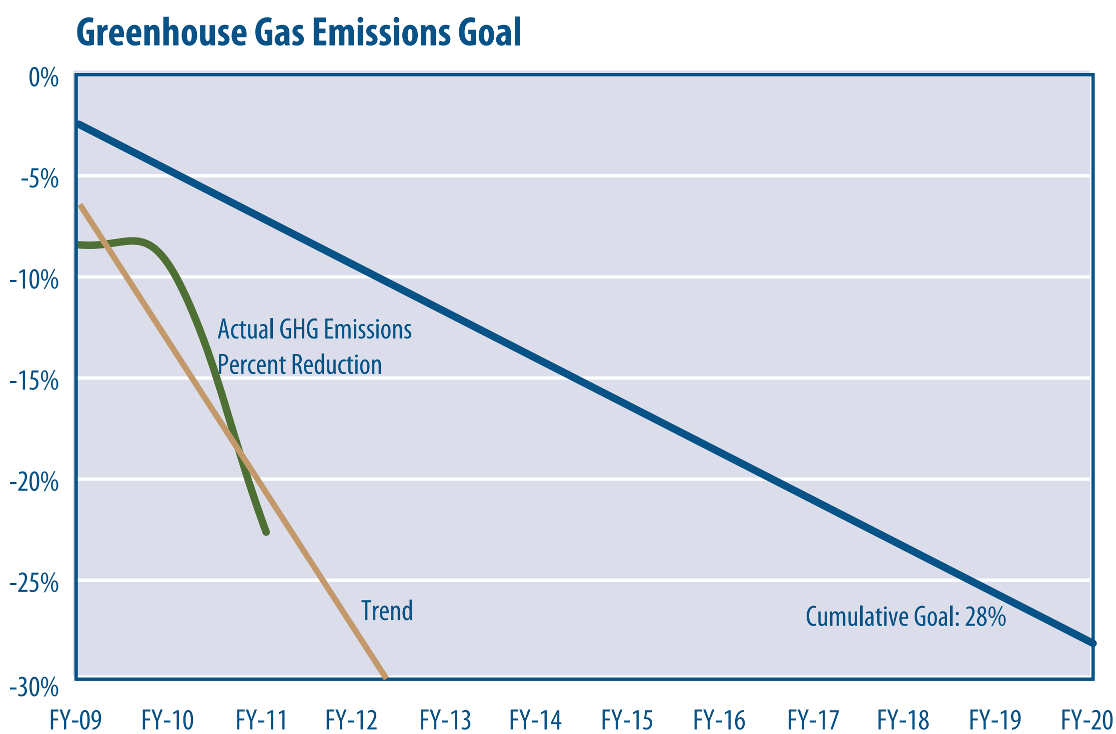

Figure D-6. Idaho National Laboratory greenhouse-gas reduction goal of 28% of total Scopes 1 and 2 GHG emissions by FY 2020 as compared to FY 2008.

assessing major GHG contributors and the best methods to reduce them. As evidenced by data entered into the Comprehensive Energy Data Report, Scope 1 and Scope 2 emissions decreased 22.5% from the baseline year, as reported by the Sustainability Performance Office (SPO). Figure D-6 illustrates that INL is well positioned to meet its goal.

INL will continue to implement projects that reduce electricity and fuel usage, while at the same time reduce corresponding GHG emissions. Activities to reduce INL's Carbon Footprint include increasing infrastructure efficiency and switching to fuel with less GHG-intensive emissions.

The INL strategy to reduce GHG emissions also includes:

- Reduce mobile combustion from INL fleet vehicles and equipment
- Identify increased waste diversion opportunities
- Reduce the amount of direct purchased electricity
- Increase the amount of direct purchased renewable or green energy
- Reduce or eliminate fuel oil use for onsite stationary electricity and heat generation.

By FY 2013, INL will track and allocate GHG emissions on a program-by-program basis to incorporate accountability. INL updates GHG emissions reports annually.

D-1.5 High Performance Sustainable Buildings

All new construction, major renovations, and alterations of buildings greater than 5,000 ft² must comply with the EO 13423 Guiding Principles and, where the work exceeds $5 million, each must be LEED Gold certified. INL has developed a High Performance Building Strategy (Morton 2010) to assist with achieving these goals in both DOE-owned facilities and leased facilities.

At least 15% of the INL building inventory over 5,000 ft² must meet the EO 13423 Guiding Principles by FY 2015. The U.S. Green Building Council's Portfolio Manager database is the accepted tool to document and demonstrate compliance with the Guiding Principles. INL has identified 26 buildings best positioned to meet the Guiding Principles and is targeting these facilities for metering and efficiency upgrades that will help to document and meet the associated requirements. Table D-3 outlines these facilities.

D-1.5.1 Sustainability in Owned Facilities

INL addresses sustainability in both new and existing owned facilities by ensuring that the EO 13423 Guiding Principles are implemented through new building designs and through the evaluation of existing buildings for physical and operational modifications to meet the requirements.

All new building projects are designed to meet the EO 13423 Guiding Principles at a minimum, with new building projects over $5 million designed to certify as LEED Gold for New Construction. The existing building inventory at INL was evaluated using DOE's Metering Guidance (DOE 2006) to determine the best candidates for building level advanced metering. Buildings meeting the criteria will have advanced meters installed and will be further evaluated for updates to meet the Guiding Principles by FY 2015. The Guiding Principles will be primarily met through documenting INL supporting processes and procedures and through planned facility upgrades.

Table D-3. Buildings planned to meet Executive Order 13423 Guiding Principles.

Buildings Planned to Meet Guiding Principles	Metered	Connected to the Carrier iVue Building Control System	Water Metered	Guiding Principle Compliant	Comments
REL	2014	2013	2014	2014	LEED Gold in FY 2013
ESL	2012	2012	2012	2013	LEED Gold in FY 2012
IMCL	2012	2012	2012	2013	LEED Gold in FY 2012
IF-665 (CAES)	Yes	No	Yes	Yes	LEED Gold
IF-683 (RESL)	2012	Yes	No	2013	LEED Gold in FY 2012
TRA-1608 (TSB)	No	No	No	Yes	LEED Certified
TRA-1626 (TTAF)	Yes	Yes	No	2013	LEED Certification Pending Energy Use Reductions
IF-601	Yes	Yes	No	2013	
IF-602	Yes	Yes	No	2014	
IF-616	Yes	2012	Yes	2014	
IF-654	Yes	Yes	Yes	2012	Guiding Principle Compliant in FY 2012
IF-663	Yes	Yes	No	2012	Guiding Principle Compliant in FY 2012
IF-680	Yes	2012	2013	2014	Water Meter by City of Idaho Falls
IF-684	Yes	2012	2013	2014	Water Meter by City of Idaho Falls
CF-1611	Yes	Yes	No	2013	
CF-1612	Yes	Yes	No	2013	
CF-1618	Yes	Yes	No	2013	
CF-609	2012	2012	No	2015	
CF-621	2012	2012	No	2015	
CF-623	2012	2012	No	2015	
CF-696	2012	2012	No	2015	
CF-698	2012	2012	No	2015	
MFC-710	Yes	2012	No	2014	
MFC-725	Yes	2012	No	2014	
MFC-782	Yes	2012	No	2014	
TRA-628	2012	2012	No	2014	

D-1.5.2 Sustainability in Leasing

Leased buildings will be obtained that provide the best value to government; that maximize employee comfort, health, and productivity; and minimize operating and utility costs. Certification to LEED Gold for New Construction is the INL standard for design and construction of new building leases or build-to-suit leases. New leases on existing buildings will include provisions to evaluate the facility prior to occupancy for energy efficiency and the ability of the building systems to provide the appropriate indoor environmental quality. When leases on existing buildings are renewed, negotiations will include energy updates to maximize energy efficiency and employee productivity by incorporating the EO 13423 Guiding Principles. For leases intended to be very short-term temporary occupancies, the buildings will be evaluated and updated on a case-by-case basis, with a preference for a facility that demonstrates better energy efficiency and indoor environmental quality.

INL has demonstrated its commitment to these essential goals through recent building space acquisitions, including the build-to-suit ESL and REL, both of which are planned for LEED Gold certification in FY 2012 and 2013, respectively.

D-1.6 Regional and Local Integrated Planning

INL will seek to advance regional and local integrated planning by first incorporating LEED for New Construction into all new building designs and by seeking certification credits in areas associated with site selection and transportation planning. In addition, INL will continue active involvement with local planning organizations, including:

- Idaho Strategic Energy Alliance
- Yellowstone Business Partnership
- Yellowstone-Teton Clean Cities Coalition
- Bonneville County Transportation Committee
- City of Idaho Falls
- Targhee Regional Public Transportation Authority.

D-1.7 Additional Activities Focused on 2023

INL will continue to support energy and water efficiency reductions, transportation fuel efficiency, and GHG reductions through a variety of creative and proactive sustainable activities, including, but not limited to:

Building Standards:

- Ensuring that all new construction and new infrastructure leases include provisions to obtain the U.S. Green Building Council LEED Gold certification, at a minimum.
- Applying the EO 13423 Guiding Principles to operations and renovations of all appropriate enduring INL infrastructure.
- Incorporating new EO 13514 requirements for net-zero facilities into design and construction of all new facility projects by FY 2020. Net-zero means that the facility generates at least as much renewable energy as the total energy it consumes.
- Providing INL campus development and planning to address effective space management, facility utilization and disposal, and operations consolidation through trending and analyzing facility utilization and utility usage data.
- Incorporating cool roof principles and technologies into roof replacements and new construction projects.

Behavior Modifications:

- Evaluating and updating INL engineering standards; the INL High-Performance Building Strategy; and other internal plans, goals, and documentation of sustainability-related activities to remain current with Federal requirements and to provide engineers with practical tools to implement sustainability.
- Reviewing and analyzing new building designs, proposed changes to existing buildings, and requests for new-leased facilities to ensure the acceptance and integration of sustainable concepts.
- Actively leading and contributing to federal, Battelle Corporate, and INL working groups and communities of practice, as well as the Energy Facility Contractors Group (EFCOG), to influence future goals and requirements that will lead to increased efficiency, reduced emissions, and more productive infrastructure environments.
- Actively pursuing advanced metering to provide central "real-time" energy and water usage evaluation, utility-level demand-side management, and measurement tools to assist with facility management, process operation, and employee involvement.

Greenhouse Gas Reductions:

- Evaluating and supporting potential onsite renewable energy construction opportunities, purchasing locally generated renewable energy, and purchasing renewable energy credits to support the growth and success of renewable energy generation industries and to reduce GHG emissions.
- Increasing the overall efficiency of the INL fleet, while focusing on increased opportunities to use alternative fuels.
- Achieving carbon neutrality for all infrastructure activities by FY 2025.

D-2. SUSTAINABILITY PROGRAM BARRIER AND GAP ANALYSIS

Table D-4 provides a barrier and gap analysis illustrating areas where the INL Sustainability Program needs to focus efforts to ensure that goals are met.

As discussed in Section D-1.2, four primary sources of funding exist. The primary INL method of funding project opportunities remains ESPC and UESC mechanisms; however, all funding options will be pursued to reduce the gap between the various DOE SSPP (DOE 2011) requirements and the potential to meet or exceed those requirements.

D-3. REFERENCES

DOE, 2006, *Guidance for Electric Metering in Federal Buildings*, DOE/EE-302, Federal Energy Management Program (FEMP) and US DOE Energy Efficiency and Renewable Energy (EERE), http://www1.eere.energy.gov/femp/pdfs/adv_metering.pdf, February 3, 2006.

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DOE-ID, 2012, *FY 2012 INL Site Sustainability Plan with the FY 2011 Annual Report*, DOE/ID-11383, Department of Energy Idaho Operations Office, January 2012.

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PLN-3911, *INL Metering Plan*, Revision 0, Idaho National Laboratory, August 1, 2011.

POL-111, *Idaho National Laboratory Policies and Standards of Performance*, Revision 5, Idaho National Laboratory, August 16, 2010.

Table D-4. Sustainable goals gap description.

Goal	Current	Future	Gaps
GHG Reduction	**INL Carbon Footprint Baseline Complete for Scopes 1, 2, and 3 GHG** – The DOE SSPP goal for Scope 1 and Scope 2 GHG reductions is 28% by FY 2020. GHG emissions reductions are not a high priority at the programmatic level and the value of GHG reductions is not yet a commonly held priority.	**Facility Design and Operations Meet the Needs of a World-Class Sustainable Laboratory** – Facilities are designed and operating to maximize energy efficiency, which in turn reduces associated GHGs. Commonly held value that energy savings and fuel switching contribute to reduced GHG emissions and energy savings are reinvested into additional sustainable upgrades and back into the benefitting programs that champion the energy efficiency improvements.	Very low cost electricity at INL ($.035/kWh). Limited alternative fuels available at INL and limited additional electric loading capacity at some INL Site locations. Limited understanding that energy efficiency and fuel switching are directly related to GHG reductions. Lack of up-front capital to make energy efficiency improvements. Long lead-time to develop and implement alternatively funded projects (ESPC and UESC).
Energy Reductions	**INL Infrastructure Designed and Operated to Meet Program Needs** – INL facilities are designed and operated to meet programmatic needs with energy and water usage usually considered as a second level priority. Energy reduction goal is 30% by FY 2015. INL is currently at a 4% reduction and is behind on annual incremental improvements towards the goal.	**Facility Design and Operations Meet the Needs of a World-Class Sustainable Laboratory** – Facilities are designed and operated to maximize energy efficiency. Energy cost savings are equally reinvested into additional sustainable upgrades and back into the benefitting programs that champion the efficiency improvements.	Very low cost electricity at INL ($.035/kWh). Older existing facilities with significant operational problems that limit the ability of facilities personnel to operate efficiently. Lack of up-front capital to make energy efficiency improvements. Long lead-time to develop and implement alternatively funded projects (ESPC and UESC).
Renewable Energy Purchase and Generation	**Renewable Energy Certificates Purchased at a Minimum Amount of 7.5% of INL Electric Consumption** – INL purchases renewable energy certificates in lieu of onsite renewable energy generation.	**INL Generates 10% of Electrical Energy Use Onsite** – INL incorporates renewable energy generation opportunities in ESPC projects and self-generates at least 10% of on-going electric energy needs from renewable sources.	Very low cost electricity at INL ($.035/kWh). Renewable energy options are expensive with long payback periods that negatively affect ESPC terms.
Water Reductions	**Water Usage as an Inexpensive Resource** – Water is used for cooling and service utilities as an inexpensive resource with little incentive to use efficiently.	**Facility Design and Operations Meet the Needs of a World-Class Sustainable Laboratory** – Facilities are designed and operated to maximize potable and nonpotable water efficiency. Water is valued as a limited commodity and water cost savings are equally reinvested into additional sustainable upgrades and back into the benefitting programs that champion the efficiency improvements.	Water is very inexpensive at INL ($.60/kgal) and is plentiful from the Snake River Aquifer. Many existing one-pass cooling processes are inexpensive and require little or no maintenance.

Table D-4. Sustainable goals gap description.

Goal	Current	Future	Gaps
Transportation Fuels – Diesel and Biodiesel	**INL Bus Fleet** – Current INL bus fleet is efficient and provides employees with safe, reliable transportation to and from the INL Site. INL bus fleet is aging and needs replacement for approximately one-half of the fleet. INL is in the unique position to provide DOE-HQ with a majority of its required petroleum reductions through an upgrade of the INL bus fleet and fuel switching to natural gas.	**Reduced Carbon, Nonpetroleum Transit Services for INL Employees** – INL bus fleet upgraded to higher efficiency clean-diesel technology and a high percentage of biodiesel (B20 or higher) is used throughout the winter season. **Provide DOE-HQ Petroleum Reductions** – INL provides DOE-HQ with petroleum fuel reductions that will significantly reduce petroleum usage at the DOE level and allow DOE to meet its petroleum fuel reduction goal for the complex as a whole.	Resources needed for leasing and maintaining the new clean-diesel technology bus fleet. Availability of high quality biodiesel fuel that avoids recurring problems with microbial growth and fuel system filter clogging.
Transportation Fuels – Gasoline and E 85	**INL Light-Duty Fleet** – INL is in a state of growth with alternative fueled vehicles and currently has more E-85 vehicles than can be conveniently fueled.	**World-Class Vehicle Fueling Infrastructure for Government and Private Fueling** – INL fueling infrastructure provides alternative fuels conveniently across the entire INL and provides access to employees to use alternative fuels in private vehicles. 75% or more of INL light-duty vehicle acquisitions are alternative fuel vehicles.	Availability of fueling infrastructure for all employees is not convenient or at adequate locations to serve all needs. Employee culture needs to be refined to accept the use of alternative fuels in all vehicles that use alternative fuels. Cost of alternative fuels is still excessive in this area and needs to be obtained at a lower cost to compensate for the 30% reduction in energy content of E-85. INL is dependent upon the mix of vehicles that GSA provides. An increase in hybrid gasoline fueled vehicles to replace existing E-85 fuel vehicles will affect INL's ability to increase the use of alternative fuels.
Carbon Footprint	**Draft INL Carbon Footprint** – Completed carbon footprint for base year FY 2008. Carbon footprint includes all Scopes 1, 2, and 3 GHG emissions, exceeding the minimum required emissions reporting of Scopes 1 and 2.	**Lead GHG Emissions Reduction Efforts** – Provide technical leadership to SPO for compilation, calculation, and reductions methods for Scopes 1, 2, and 3 GHGs.	Established guidance from SPO defining scope categories and emissions compilation strategies. Carbon production not tied directly to programs. Carbon chargeback requires modification to accounting systems.

Table D-4. Sustainable goals gap description.

Goal	Current	Future	Gaps
Sustainable Leasing	**Facilities Procured to Meet the Current Employee Quantity** – Facilities are procured as needed to house employees as missions and programs change. Acquisitions work the best with the building stock that is available in Idaho Falls, if possible.	**Facility Acquisition and Design to Meet the Needs of a World-Class Sustainable Laboratory** – Sustainable features are included in the solicitations for all new and leased facilities to the maximum extent possible. INL does not consider procuring or designing a facility or facility modification that does not promote sustainability and certify as LEED Gold (at a minimum).	Current entrenchment of culture that INL cannot afford a sustainable facility on a lease contract and that the building owners will not step up and offer facilities that meet sustainable requirements and follow the guiding principles. Current entrenched belief that obtaining a below average facility for a short period has a higher priority than employee comfort or mission productivity.
High Performance Building Design	**INL Infrastructure Program** – INL building projects are designed to meet all technical aspects of operational and functional needs. Sustainable features are not currently accepted as required or are not desirable design features.	**Facility Acquisition and Design to Meet the Needs of a World-Class Sustainable Laboratory** – Sustainable features are included in the designs of all new facilities to the maximum extent possible. INL does not consider procuring or designing a facility or facility modification that does not promote sustainability and is not certified as LEED Gold (at a minimum). All new roofs or roof replacements are "Cool Roofs," as defined by Secretary Chu's memorandum. Existing buildings are modified and operated to meet the Guiding Principles for HPSBs.	Current entrenchment of culture that sustainability is a non-essential design requirement that does not contribute to laboratory function or productivity. Reprioritize project cost premium needed to incorporate sustainability into new building design and construction. Reprioritize resources for upgrades to existing facilities to increase their efficiency, comfort, and productivity.

*The **Research and Education Laboratory** (REL), a 148,000-square-foot facility now under construction in Idaho Falls, will be the showcase laboratory facility for INL. REL offers three stories of modern, open-floor laboratory space with state-of-the-art laboratory tools, equipment, and resources.*

*The **MaCS** Laboratory, located at the **Center for Advanced Energy Studies** (CAES), enables national users to access high-end analytical equipment including a transmission electron microscope, an atom probe, a focused ion beam system, a Raman spectrometer, and an atomic force microscope.*

*The biomass **Feedstock Process Demonstration Unit** focuses on the preliminary processing, formulating, and densification of biomass feedstock.*

*The **Idaho Completion Project** (ICP) under CWI continues to clean up legacy DOE activity sites and reduce the INL footprint with significant results in environmental restoration and waste minimization.*

*At the **Advanced Mixed Waste Treatment Project** (AMWTP), the Idaho Treatment Group continues cleanup of Cold War legacy wastes, packaging, consolidating, and shipping them to the Waste Isolation Pilot Plant for safe final disposition.*

*At INL's **High-Performance Computing Facility**, the Fission supercomputer supports a large spectrum of energy, materials, basic science, and engineering research in support of Nuclear Energy, National and Homeland Security, and other crucial national programs and missions.*




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