TRANSFORMED

A RECENT HISTORY OF THE IDAHO NATIONAL LABORATORY

2000-2010

Submitted to
Idaho National Laboratory

Submitted by
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FORWARD

A DECADE OF TRANSITION FOR IDAHO'S NATIONAL LABORATORY

During the first decade of this century, Idaho National Laboratory (INL) got a new name, a new structure, and a newly-revitalized mission as the nation's lead nuclear energy research laboratory. For a laboratory that began the decade in search of a well-defined mission and being offered up for cleanup and closure, the 2000s saw a dramatic turnaround.

As the last century ended, Idaho's national laboratory was still known as the Idaho National Engineering and Environmental Laboratory (INEEL), the last "e" in the acronym symbolizing the fact that the majority of the lab's budget came from the Department of Energy's Environmental Management program. As the new century progressed, however, the department merged INEEL and Argonne National Laboratory-West (ANL-W) into one unified "INL." The result was a nearly billion dollar a year entity that led the newly-revitalized interest in nuclear power, in a country trying to cope with the specter of global warming and rising carbon emissions.

To accommodate this growing mission and revitalize a laboratory that had not seen much in the way of new infrastructure over the past 20 years or so, the Department of Energy and Congress invested over $900 million in the lab through the Idaho Facilities Management Fund. That money was spent upgrading the infrastructure at the Advanced Test Reactor Complex and the Materials and Fuels Complex at the desert site, and at the Research and Education Campus in Idaho Falls – the three areas where the INL's primary nuclear energy research mission is carried out.

The 2000s also saw development and implementation of the Advanced Test Reactor National Scientific User Facility, which made the ATR – the nation's workhorse materials testing reactor – more widely available to university and private sector researchers.

At the same time, the lab saw significant growth in its national and homeland security mission. This was a natural post-9/11 evolution. It capitalized on the lab's relative geographic isolation through development of resources including its National Security Test Range, Critical Infrastructure Test Range, and Specific Manufacturing Capability facility. The INL's role in protecting the nation after 9/11 ranged from building tank armor for the Army's main battle tanks, to thwarting cyber attacks on the country's utilities.

The lab accomplished these milestones under new leadership. In 2005, Battelle Energy Alliance won the contract to manage the newly-formed INL, and under the guidance of Laboratory Director John Grossenbacher, began the sometimes challenging task of meshing the different cultures of the former INEEL and the former Argonne-West. INL and the new Idaho Cleanup Project also had to work together to divide the support services that had been managed under one contractor previously. It was a sometimes challenging period, but the end result was that two highly-affective entities – the laboratory and the cleanup project – both took giant steps forward in the 2000s.

Jim Cooper
Deputy Manager, Idaho Cleanup Project

FORWARD

IDAHO CLEANUP PROJECT: A "DECADE OF DOING"

Over the last decade, cleanup at the U.S. Department of Energy's Idaho Site has gone from conception to more than half completion. As the century turned in 2000, the Department was still doing a lot of paper studies on how to tackle thorny problems like remediating nuclear waste that was buried over the Snake River Plain Aquifer. We were still in the design phases of figuring out how to empty and close tanks that contained high-level radioactive waste, and that were also perched above the aquifer. We had just begun tackling the task of shipping boxes and barrels of stored transuranic waste to New Mexico for disposal at the Waste Isolation Pilot Plant.

Now, as we look back at the decade, we can take a great deal of satisfaction in what has been accomplished in environmental restoration and waste management activities during that time. Protecting the aquifer has always been one of the prime goals of the cleanup and waste management programs here in Idaho, and amazing progress has been made in that vital area over the past 10 years. More specifically, we have:

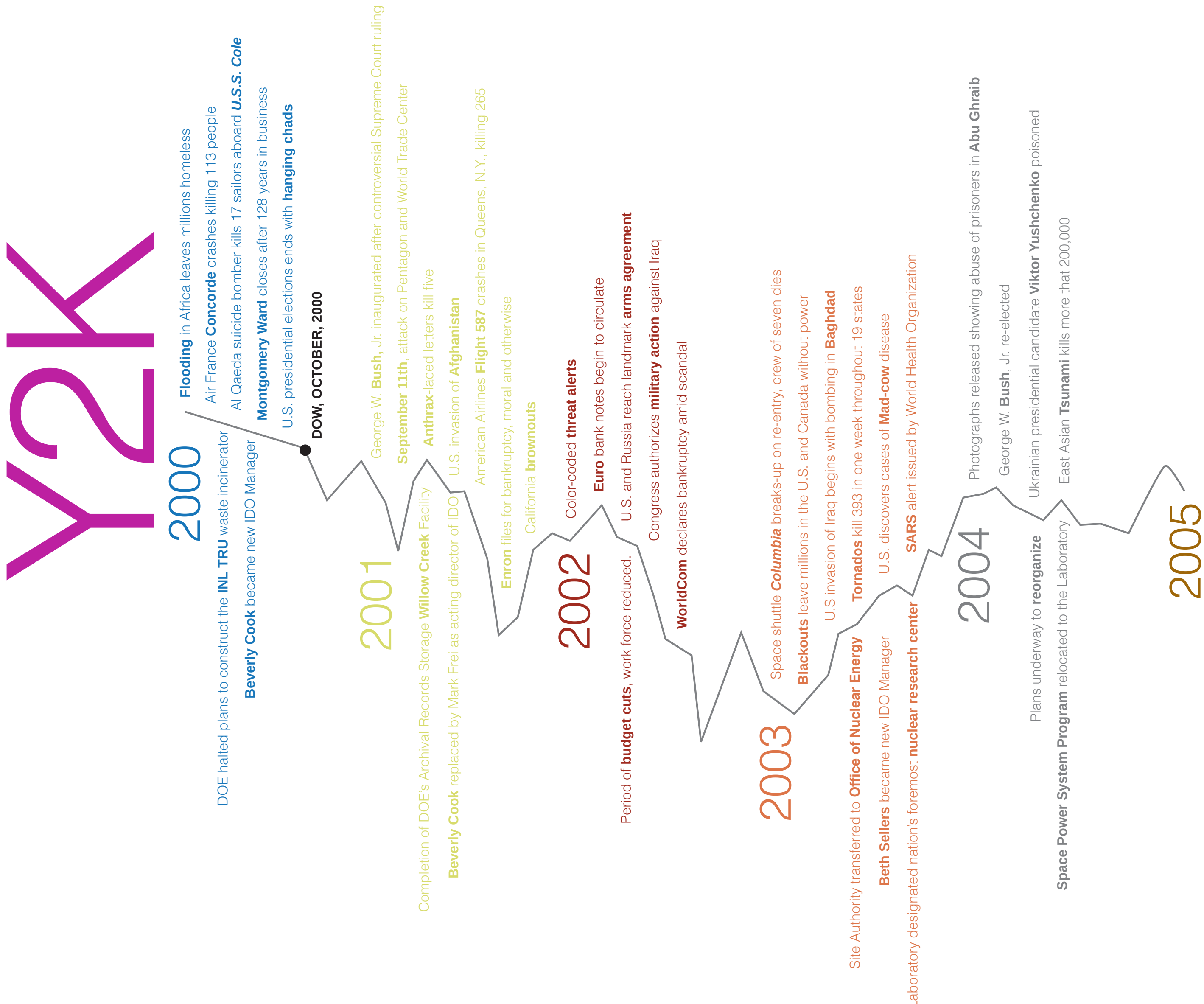
- Dug up over 70 percent of the "targeted buried waste" which we have committed to remove, process and ship out of state for disposal.
- Shipped more transuranic waste from Idaho to WIPP than any other DOE site (over 37,000 cubic meters).
- Successfully drained, grouted and closed all of the aging spent nuclear fuel pools on site, keeping in service only the most modern spent fuel pool in the DOE complex, which meets all current safety criteria.
- As this book went to print, we were on the verge of starting up the Integrated Waste Treatment Unit, which will process the remaining 900,000 gallons of sodium-bearing radioactive liquid still stored on site, turning it into a solid form ready for offsite disposal, and allowing us to clean and close the final four high-level liquid waste tanks on site.
- Through the decommissioning and demolition process, reduced the "footprint" of site facilities by 68 percent (over 2,000,000 square feet demolished).

If I had to characterize the past decade for the Idaho Cleanup Project, it would be the "Decade of Doing." The Idaho Cleanup Project made huge strides in keeping DOE's commitments to the people of Idaho, in continuing to protect the aquifer, and in restoring the trust in DOE and INL that is essential to the laboratory's ability to continue to carry out its vital research missions. This history book is dedicated to the thousands of men and women who worked hard to make these accomplishments a reality.

ACRONYMS

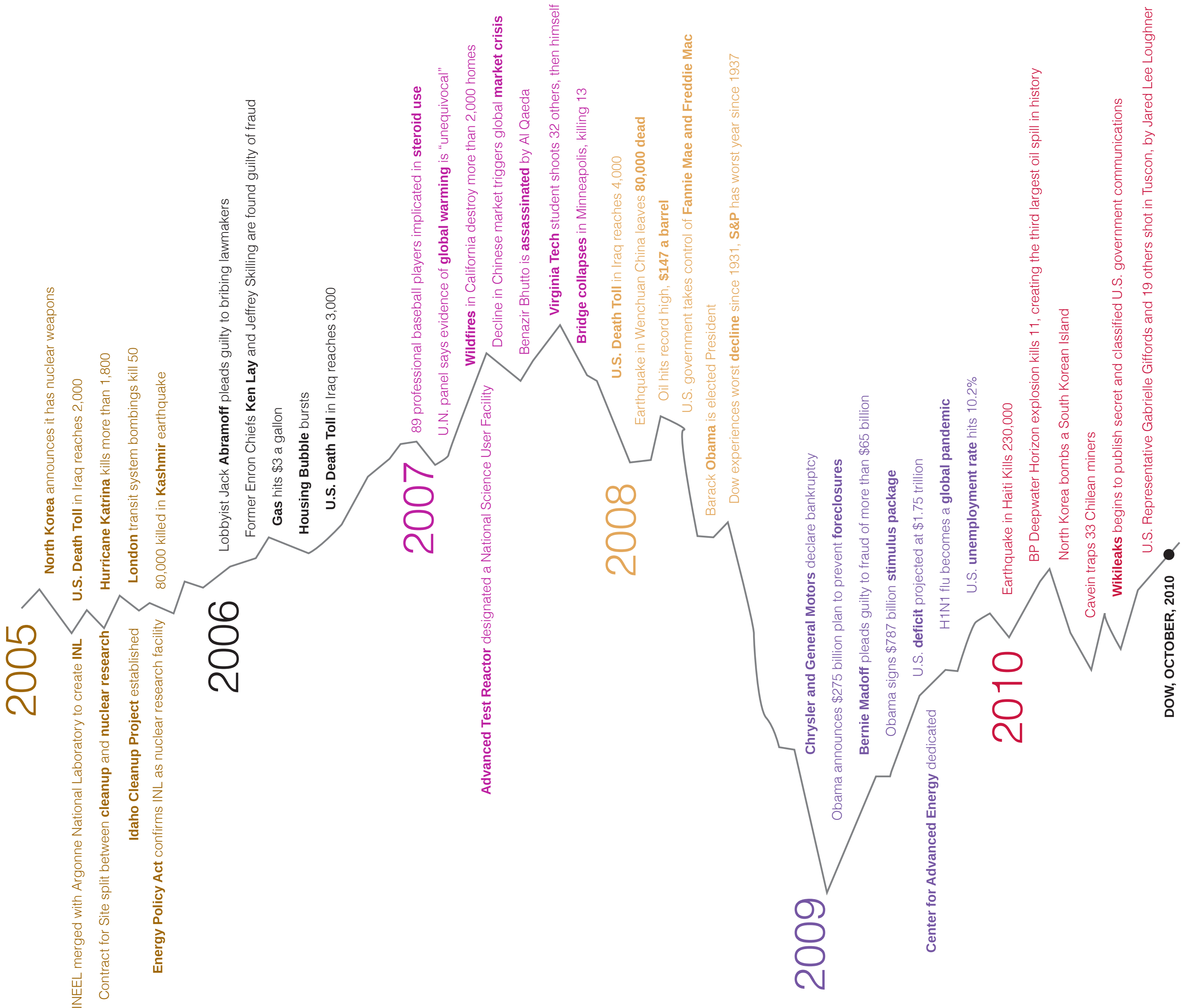
ALWR	Advanced Light Water Reactor
ANL-W	Argonne National Laboratory-West
ARA	Auxiliary (formerly Army) Reactor Area
ARP	Accelerated Retrieval Project
ASRG	Advanced Sterling Radioisotope Generator
ARVFS	Army Reentry Vehicle Facility Site
ATR	Advanced Test Reactor
ATRC	Advanced Test Reactor Complex
BEA	Battelle Energy Alliance
BLM	Bureau of Land Management
C	Celsius
CAES	Center for Advanced Energy Studies
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFA	Central Facilities Area
CIA	Central Intelligence Agency
CITRC	Critical Infrastructure Test Range Complex
CTF	Contained Test Facility
CWI	CH2M-WG Idaho, LLC
D&D	Deactivation and Decommissioning
DoD	Department of Defense
DOE	Department of Energy
DOE-ID	Department of Energy-Idaho Operations Office
EBR	Experimental Breeder Reactor
EG&G	EG & G Idaho, Inc.
EIS	Environmental Impact Statement
EM	Office of Environmental Management
EMS	Environmental Management System
ETR	Engineering Test Reactor
FBI	Federal Bureau of Investigation
FFRDC	Federally Funded Research and Development Center
GAO	General Accounting Office
GIF	Generation IV International Forum
GNEP	Global Nuclear Energy Partnership
HAER	Historic American Engineering Record
HEU	High Enriched Uranium
HFEF	Hot Fuels Examination Facility
HTGR	High Temperature Gas Cooled Reactor
ICP	Idaho Cleanup Project
ICDF	Idaho CERCLA Disposal Facility
ICPP	Idaho Chemical Processing Plant
IET	Initial Engine Test Facility
IFR	Integrated Fast Reactor
INEEL	Idaho National Engineering and Environmental Laboratory
INEL	Idaho National Engineering Laboratory
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
ISO	International Organization for Standardization
IWTU	Integrated Waste Treatment Unit
LEED	Leadership in Energy and Environmental Design
LEU	Low Enriched Uranium
LOFT	Loss-of-Fluid Test Facility
LMAES	Lockheed Martin Advanced Environmental Systems
LMITCO	Lockheed Martin Idaho Technologies Company
LMR	Liquid Metal Cooled Reactor
MFC	Materials and Fuels Complex
MIT	Massachusetts Institute of Technology
M&O	Maintenance and Operations

MTR	Materials Test Reactor
NASA	National Aeronautics and Space Administration
NE	Office of Nuclear Energy
NGNP	Next Generation Nuclear Plant
NRAD	Neutron Radiography Reactor
NRC	Nuclear Regulatory Commission
NRF	Naval Reactors Facility
NSUF	National Science User Facility
OU	Operable Units
PBF	Power Burst Facility
R&D	Research and Development
REC	Research and Education Campus
RTC	Reactor Technology Complex
RTG	Radioisotope Thermoelectric Generator
RWMC	Radioactive Waste Management Complex
SCADA	Supervisory Control and Data Acquisition
SDA	Subsurface Disposal Area
SFR	Sodium Cooled Fast Reactor
SMC	Specific Manufacturing Capability
SMCP	Specific Manufacturing Capability Project
SNF	Spent Nuclear Fuel
SSER	Sagebrush-Steppe Ecosystem Reserve
SSPSF	Space and Security Power Systems Facility
STEM	Science, Technology, Engineering, and Mathematics
SWMU	Solid Waste Management Units
TAN	Test Area North
TRA	Test Reactor Area
TREAT	Transient Reactor Test
TRU	Transuranic (Waste)
TSF	Technical Support Facility
VHTR	Very High Temperature (Gas Cooled) Reactor
WAG	Waste Area Group
WIPP	Waste Isolation Pilot Plant
WROC	Waste Reduction Operations Complex
WRRTF	Water Reactor Research Test Facility
ZPPR	Zero Power Plutonium Reactor



BUSH WMD Abu Ghraib DOW STIMULUS TSUMANI
Worldcom FORECLOSURES S&P $ SEPTEMBER 11th
Shooter EURO Bankruptcy SARS Crash BAILOUT
Coded Alerts MAD COW
OBAMA Baghdad
COURT ARMS OIL SPILL DEFICIT DEATH TOLL
Wikileaks ASIA BLACKOUTS bombing FLOODING
Terrorist North Korea Collapse AL QAEDA Threat Level
Housing Bubble ENRON Hanging Chad PANDEMIC

1 INTRODUCTION: FORGING OPPORTUNITIES FROM ADVERSITY

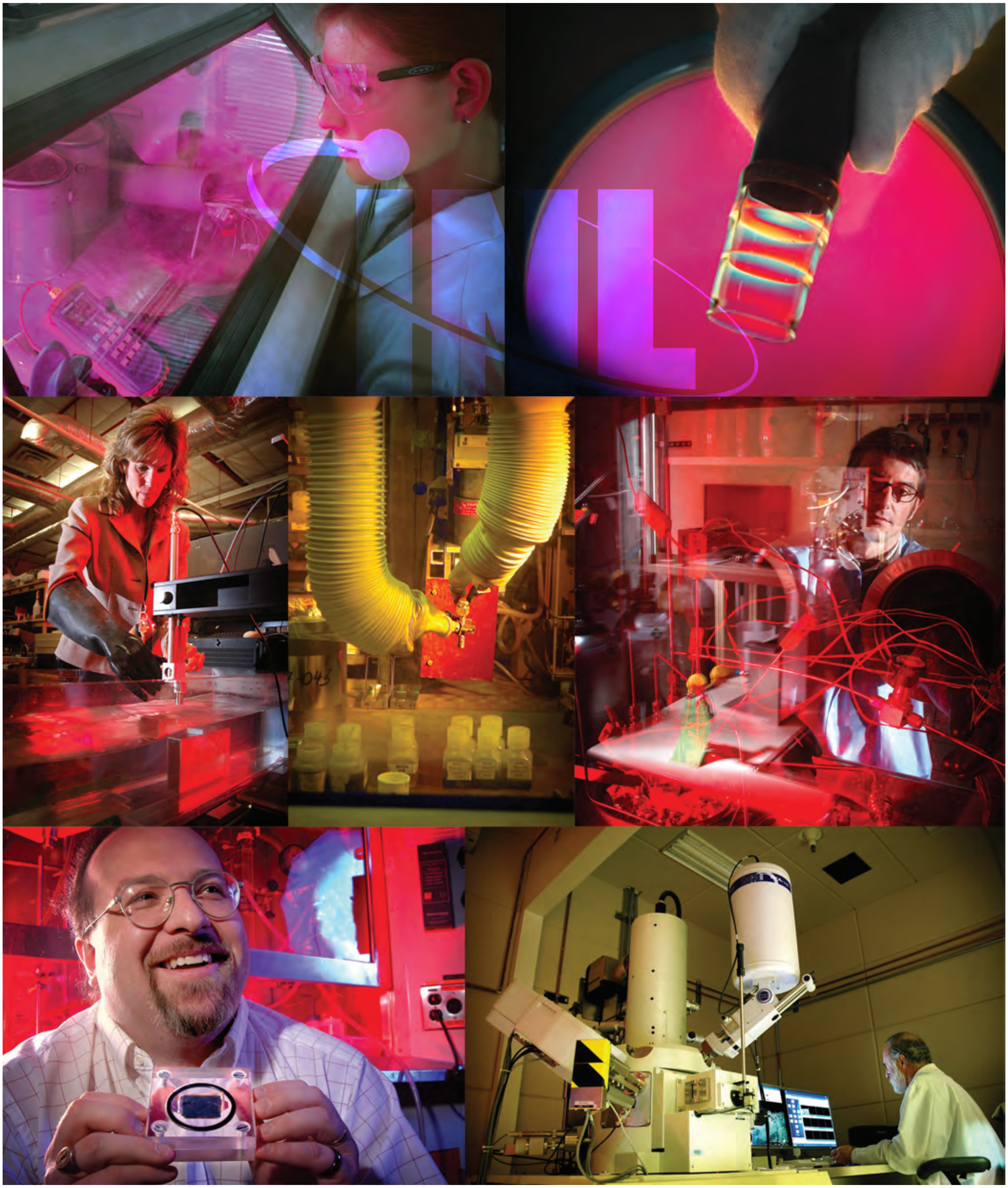


Called the "decade from hell" by one social commentator, the events of the twenty-first century's first decade have been transformative.[1] From September 11 to the war in Afghanistan, from the war in Iraq to Hurricane Katrina, from the "hanging chad" presidential election of 2000 to the great recession of 2008-09, Americans have faced significant and deep events that have changed our way of life. This transformative decade is the context for this history that looks at Idaho National Laboratory's (INL) recent past. At the close of the twentieth century, the twenty-first-century mission of INL was largely uncharted. In 2010, it is the National Laboratory System's lead in nuclear energy research as well as other programs. INL's response to the challenges of the new century offer all of us lessons in forging opportunities out of adversity.

Every great and deep difficulty bears in itself its own solution. It forces us to change our thinking in order to find it.[2]
- Niels Bohr

The world environment that provided the Site with its original mission, nuclear energy research, had changed dramatically, calling for a change in thinking about the Site and its future missions in the twenty-first century. INL's closure was potentially looming. Instead, building on the Site's historic portfolio of scientific research and innovation and advancing the inherent advantages of the Laboratory's desert property, INL began meeting the millennium's challenges. It accomplished this, by not only going back to its roots in nuclear research, but by also developing other research arms that applied to homeland security, national defense, communications, and environmental cleanup. This history is about the change in thinking that engendered this transformation.

Proving the Principle: *A History of the Idaho National Engineering and Environmental Laboratory 1949-1999*, by Susan M. Stacy, the well-crafted history of the first 50 years of operation at INL, demonstrated the people of INL's sustained efforts at "picking at the edge of knowledge" and their adherence to science.[3] The years between 2000 and 2010 saw those same traits in play but in a floating world of great social, economic, and political change. To capture how they achieved traction, a wide array of individuals associated with INL were interviewed. Their first hand accounts thread the narrative, providing perspective on a past that is searingly close in memory. Although chronicling such recent history is difficult simply because it is so close and events are perceived differently by each individual, most people pointed to 1995 as the correct point of departure for this history, the year the Idaho Settlement Agreement was reached.



"I STARTED WORKING here as the Cold War came to an end. And a lot of the traditional missions that were done here, sort of the bell cow missions, were going away. So by the mid-nineties, 1995… when the Settlement Agreement was signed, we were sort of casting about for a mission for the site." *- Brad Bugger, 2010*

2 We Have a Deal 1995-2000

Between 1995 and 2000, INL was in a state of transition. The nation's research needs that had been its impetus and had shaped its operations since 1949 had changed dramatically. With the end of the Cold War, our defense needs as a nation had also lessened and environmental cleanup appeared to hold the trump card. While the hard fought objectives in the Settlement Agreement would create a program for environmental cleanup, the loss of missions that were entrenched in INL's corporate history was troubling and the loss of historic facilities that symbolized those missions through Department of Energy's (DOE) developing deactivation and decommissioning policies made that loss even more palpable. In a very visceral manner, INL, like its other DOE counterparts, would have to learn to deconstruct the tangible elements of its past. How would the DOE and the Site leadership construct its future?

BLUEPRINT FOR CLEANUP

When the negotiators at the table reached consensus, a historic agreement among the State of Idaho, the U.S. Navy, and the DOE was reached that is without parallel within the DOE complex. Known colloquially as the Settlement Agreement, the document settled a lawsuit over shipment of spent nuclear fuel to INL for storage. However, its execution, which ended years of struggle between DOE and the state, had far reaching ramifications. In one sense, it provided a comprehensive path forward that has structured environmental cleanup at INL ever since. This cleanup is scheduled to be completed in 2035 or earlier. Perhaps more importantly, it bridged concerns and created an understanding between the federal site and its state and local community about the future of their partnership.

The backstory for the Agreement actually began decades earlier. The fast paced research vigor of INL's first three decades in nuclear research disintegrated in the 1980s as the political and social climate toward nuclear reactors and nuclear research grew hostile following the 1979 Three Mile Island incident and the 1986 Ukrainian disaster at the Chernobyl Nuclear Power Plant.

While there were no casualties and very little radiation release, the Three Mile Island incident was the first serious commercial nuclear power accident, resulting in a partial meltdown of a reactor core. The incident effectively put a halt to the spread of new nuclear facilities in the United States.

Chernobyl was far worse and had much greater international implications. Studies have shown that the graphite reactor design at Chernobyl, a problematic containment system, and human error were at fault; this situation took lives and created a high level of risk for cancer for individuals in the neighboring areas.[1] Chernobyl changed American attitudes toward nuclear safety and reinforced antinuclear sentiment. The timing was ironic. Argonne's EBR-II loaded with Integrated Fast Reactor (IFR) fuel pins at INL had just demonstrated successfully that reactor safety could be achieved through the laws of physics, but the gains demonstrated would be lost in the public discourse that followed Chernobyl.[2] DOE would order Argonne to shut down EBR–II in 1994 and the IFR program was canceled.[3]

Since the INL first began operations in the early 1950s, the Naval Nuclear Propulsion Program has maintained a significant presence. The mission of the Naval Nuclear Propulsion Program, also known as Naval Reactors, is to provide militarily effective nuclear propulsion plants and ensure their safe, reliable, and long-lived operation. Naval Reactors is a joint DOE and United States Navy organization having responsibility for all aspects of the Navy's nuclear propulsion, including research, design, construction, testing, operation, maintenance, and ultimate disposition of naval nuclear propulsion plants. This work is accomplished at laboratories and shipyards throughout the country including significant contributions made at the Naval Reactors Facility (NRF) and other INL facilities in research, testing, and spent fuel management activities. This publication does not address all Naval Nuclear Propulsion Program activities on the INL.

Shrinking defense needs resulted in a decision to discontinue training of Navy personnel at the NRF on the INL. This unique Naval training facility housed three prototype nuclear propulsion reactors, the S1W, the A1W, and the S5G, each of which provided a training environment that simulated actual conditions aboard a submarine, aircraft carrier or other ship within the fleet for about 39,000 Navy students since the 1950s. The training, considered an honor for those selected, typically brought a naval student to Idaho for a six-month stay. For the early cadres of students, the S1W, the prototype for the propulsion plant for the *USS Nautilus*, trained them for future duties aboard the world's first nuclear powered ship.[4] The three prototypes at NRF were shut down respectively in 1989, 1994, and 1995, but important research, examination, and spent fuel management work continues in support of the U. S. Navy's nuclear-powered fleet.

The door slammed shut from a national perspective in 1993 when President Bill Clinton in his State of the Union Address characterized nuclear power research and development as programs that were no longer needed.[5] At this point, INL had only three operating reactors. Two, the Advanced Test Reactor (ATR) and the Advanced Test Reactor Critical, were integral to maintaining the Navy's fuel and material testing program. While the Navy was the most substantial user of the ATR, it also served other clients. The low-power Neutron Radiography Reactor (NRAD), located at ANL-W, also was in operation but the Transient Reactor Test (TREAT) facility was on standby. It was clearly a low point in the once busy center for nuclear research.

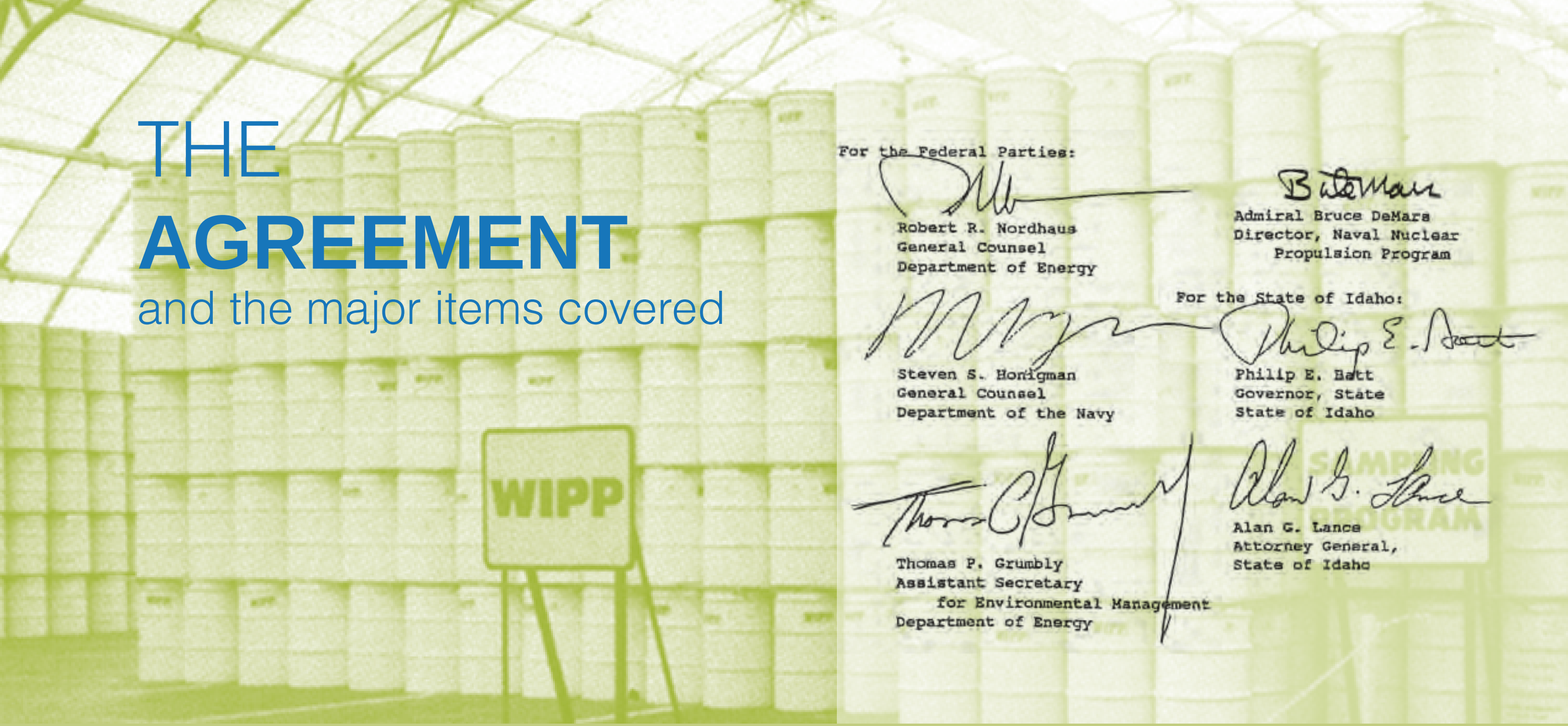
If the exportation of research from Idaho was in a lull, the DOE's importation of transuranic waste from the Rocky Flats site was not. In addition, the Naval Nuclear Propulsion Program needed to ship spent nuclear fuel to Idaho to support on-going examination and research activities and to support the refueling of Navy submarines and aircraft carriers. Fuels removed from naval reactors aboard Navy warships or training ships, as well as those from terrestrial reactors, were shipped to Idaho for storage. Rocky Flats was a Cold War facility situated northwest of Denver, Colorado that fabricated plutonium pits used as triggers in nuclear weapons, as well as a host of other weapons components.[6] The plant was shut down in 1989 due to safety issues and to allow DOE to bring it into compliance with federal regulations. However, the temporary closure became permanent as the requirements for the nuclear stockpile changed. Its mission became cleanup, specifically, the stabilization and repackaging of the plutonium and plutonium-contaminated scrap and residuals that remained after years of production. Rocky Flats began preparing waste for disposal as TRU waste in 1967, and this was shipped to INL.

Concerns over Idaho becoming a nuclear materials dumpsite were raised in the highest office of the state. Idaho Governor Cecil Andrus took center stage. A third-term governor, Andrus considered the INL an economic asset for Idaho but that perception would change dramatically if the INL did not protect the environment that was the State's natural asset. DOE's storage of spent nuclear fuel and waste without an end plan was not acceptable, and Andrus set actions into motion that would lead to the Settlement Agreement.

From shipment blockades to campaigning for the opening of an underground cavern in New Mexico for waste disposal to litigation, the years between 1988 and 1995 were contentious and the events are fully chronicled in INL's *Proving the Principle.* The measures taken by Andrus were bold but well intentioned. Notably, they were occurring in a challenging environment for the DOE, which was in the midst of redefining its priorities and missions as it entered the post Cold War era. The Navy's role in the controversy brought a third party to the table. In 1992, the DOE decided to discontinue spent fuel reprocessing at the Idaho Chemical Processing Plant, but continued to use the facility for storage of spent fuel. This new, and once again static, treatment of used nuclear material was considered unacceptable to Governor Andrus, and it was agreed that an Environmental Impact Statement (EIS) was needed to relieve the conflict.
The EIS was initially about waste management and environmental restoration at INL but was later expanded to address DOE's national program for storage of its spent fuel, as well as the Navy's. Each of the negotiating parties looked to the process to remedy the situation. "The Navy wanted to send its fuel to Idaho. Idaho wanted a scientific document to demonstrate that storing TRU waste and spent fuel above the aquifer was environmentally unacceptable. DOE wanted to manage its national responsibilities and use its resources at the INL in the most optimal way, hopefully welcomed by its host state."[7]

THE AGREEMENT

and the major items covered



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Assistant Secretary
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Department of Energy

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Attorney General,
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DOE agreed to:

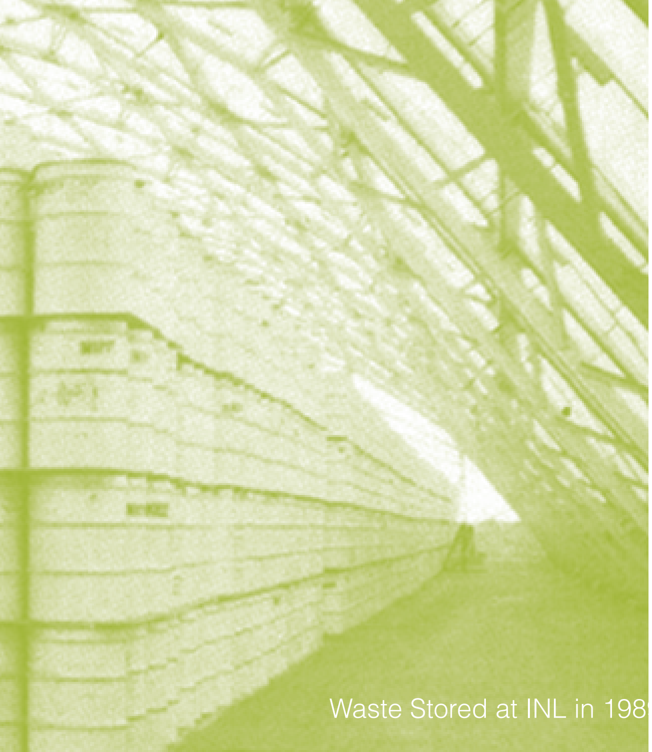
- Remove all stored transuranic waste from INL at a target date of 2015, but no later than 2018, with transuranic shipments out of Idaho beginning by April 30, 1999.
- Begin operating a mixed-waste treatment facility for transuranic and alpha-contaminated mixed low-level waste by 2003.
- Limit shipments of DOE-owned spent nuclear fuel until an out-of-state repository or interim storage facility is operating and accepting INL spent fuel.
- Complete removal of all nuclear spent fuel from the state by 2035.
- Finish treatment of all calcined high-level waste by 2035.
- Transfer all spent fuel from underwater storage to dry storage by 2023.
- Certify shipments, which is necessary to meet national security and nonproliferation requirements.

The Navy agreed to:

- Transport only those shipments of naval spent fuel to the INL that are necessary to meet national security requirements.

The State of Idaho agreed to:

- Allow the U.S. Navy to resume shipments of its spent nuclear fuel to the INL, which may accept a total of 575 Navy shipments through the year 2035.
- Allow up to 61 shipments of foreign research reactor spent fuel to the INL for storage though Dec. 31, 2000.
- Allow DOE-owned spent nuclear fuel to be shipped to the INL after Dec. 31, 2000, but limiting the total amount of DOE-owned spent nuclear fuel. No more than 55 metric tons of heavy metal owned by DOE (about 497 truck shipments) will be accepted.
- Process DOE permit applications in a timely manner, consistent with law and regulations.



Waste Stored at INL in 198

Definitions:

Spent nuclear fuel is fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing

High-level waste is highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly from reprocessing and any solid waste derived from the liquid that contains a combination of transuranic and fission product nuclides in quantities that require permanent isolation.

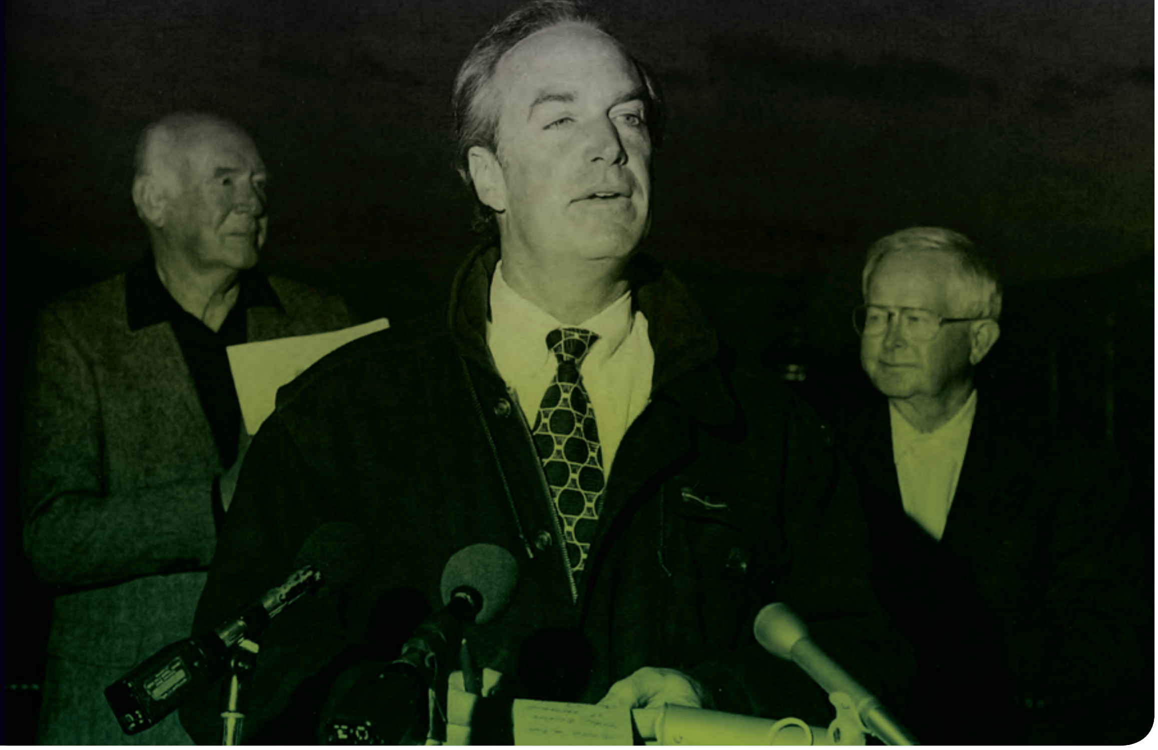
Transuranic waste contains man-made elements with an atomic weight heavier than uranium. Transuranic waste was produced during reactor fuel assembly, nuclear weapons production and fuel reprocessing operations.

Source: Pamphlet, *The facts on… The Settlement Agreement, INL*, October 1999.

The EIS and Record of Decision were published in 1995. The process allowed public involvement and forced all parties to reckon with the issues at hand. However, from many of Idaho's political leaders' perspective, the outcome was not favorable. The Record of Decision allowed the Site to receive 2,000 shipments of spent fuel, as well as other materials. The key element that had ignited the conflict was not addressed. No guidance was provided on when the waste would leave the Site.

Governor Phil Batt, Governor Andrus' successor, was now in the driver's seat for Idaho, and he persisted in obtaining an agreement for his state that detailed when the waste and spent fuel would leave. Meetings among the DOE, Idaho, and Navy representatives were held in neutral venues to tackle the issue between June and September of 1995. John Wilcynski, then Idaho's DOE manager, noted that the meetings that took place were emotional and contentious. Despite this, by September of 1995, the participants hammered out a straightforward document that outlined what was not settled through the environmental review process - the management of spent nuclear fuel and radioactive waste at INL through 2035. DOE, through the Agreement, also allotted $30 million dollars toward economic development to help diversify the economy of southeast Idaho.[8] Brad Bugger with public affairs offered this perspective:

> *The Settlement Agreement finally put that issue to rest, or at least it took us a long way towards putting that issue to rest. There were still legal issues over buried waste, but at least we knew what the rules were as far as how much waste we could accept here and spent nuclear fuel. There were rules established for when the waste that was already here had to be treated and shipped out of state. So we had targets, we had goals, and I think that was really important. The other reason I say the Settlement Agreement was important is that it allowed us as a department and as a site to go to Congress and make a strong case for cleanup funding. And we had this settlement agreement, which was a court-enforceable agreement, to back us up.*[9]



Governor Dirk Kempthorne at the podium during an event commemorating the first shipment of Rocky Flats waste en route to WIPP. Former governors, Andrus and Batt, behind him.

ADDING AN "E": THE NATION'S ENGINEERING & ENVIRONMENTAL LABORATORY

Beginning in 1997, the name of the Idaho laboratory changed twice from Idaho National Engineering Laboratory (INEL) to Idaho National Engineering and Environmental Laboratory (INEEL) to Idaho National Laboratory (INL). From this point forward, except where directly quoted, the Laboratory will be simply referred to as "the Laboratory," or the "Site".

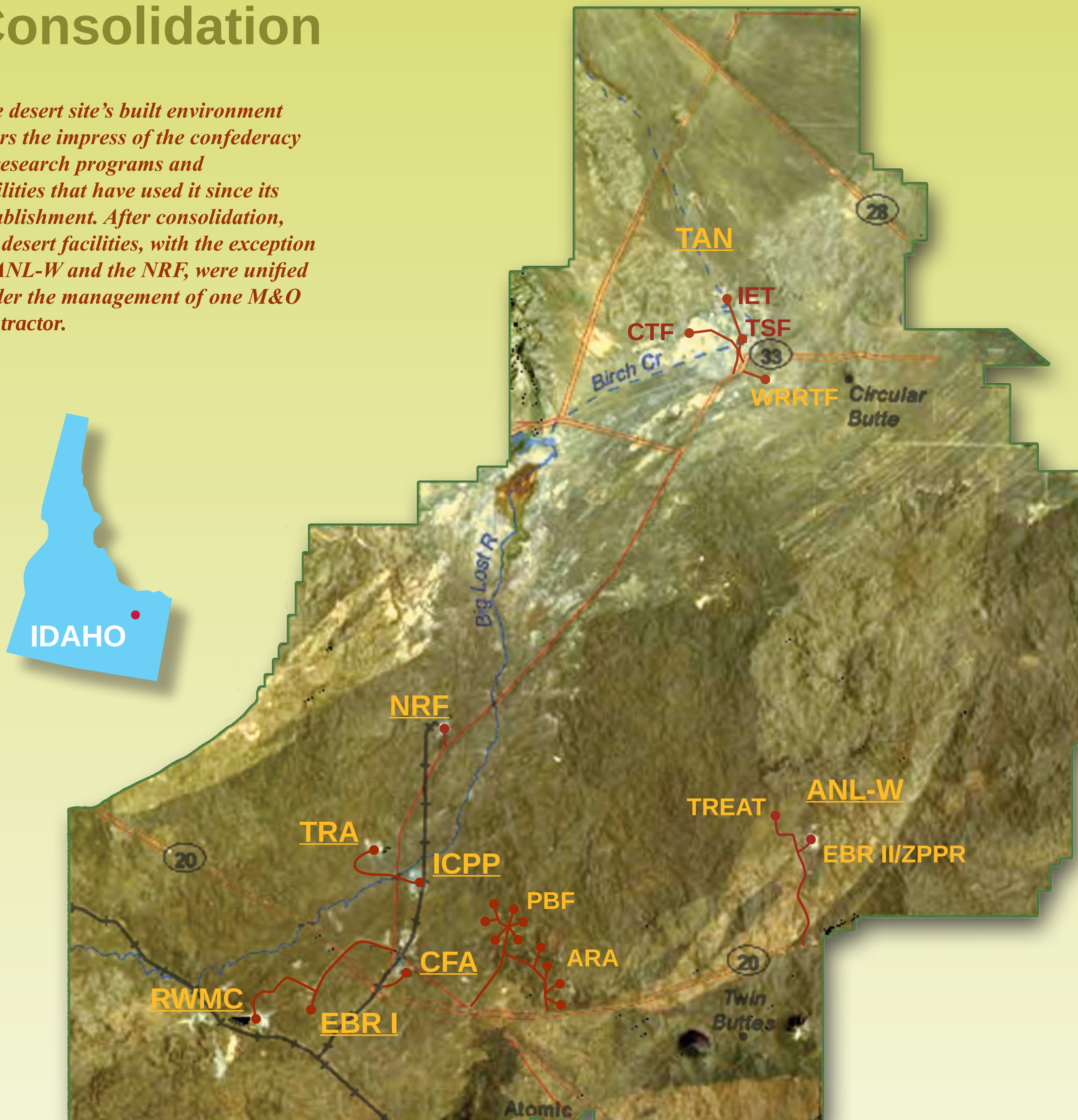
Professional historian Susan Stacy noted that while the pursuit of the Settlement Agreement was gripping the headlines, work moved forward at the Laboratory in a number of areas, particularly with the environment. DOE's commitment, under Admiral James Watkins, to environmental cleanup was evident in DOE funding. In 1992, there was a 25 percent budget increase request for DOE's environmental restoration and waste management program and the program grew in strength over the decade. Notably, 60 percent of the Laboratory's budget was directed toward waste management, decontamination, and decommissioning in 1995, the year the agreement was signed.[10]

Changes that stemmed from DOE management policy were in the offing as DOE sought to establish more control over the DOE field offices in the wake of an incident involving the management of the Rocky Flats site. In terms of management, the Laboratory may have offered a special case as DOE-ID Manager John Wilcynski points out:

> *It called itself the Idaho National Engineering Laboratory. It had five major M&O contractors at the time. It had Westinghouse for the Chem Plant, it had EG&G for laboratory and other things, it had Morrison-Knudsen for construction. I can't remember all of them. But it was a time in government or nationally, when we were taking on massive deficit spending and it was clear that us voters were going to insist that budgets get balanced and end this massive deficit spending. And my own view, and this is just pretty blunt and pretty candid, was that in the early nineties, the Idaho site was sort of fast asleep in*

Consolidation

The desert site's built environment bears the impress of the confederacy of research programs and facilities that have used it since its establishment. After consolidation, the desert facilities, with the exception of ANL-W and the NRF, were unified under the management of one M&O contractor.



MAP KEY

Test Area North **TAN**

Initial Engine Test **IET**

Naval Reactors Facility **NRF**

Test Reactor Area **TRA**

Idaho Chemical Processing Plant **ICPP**

Central Facilities Area **CFA**

Radioactive Waste Management Complex **RWMC**

Experimental Breeder Reactor I **EBR -1**

Power Burst Facility **PBF**

Army Reactor Area Auxiliary Reactor Area **ARA**

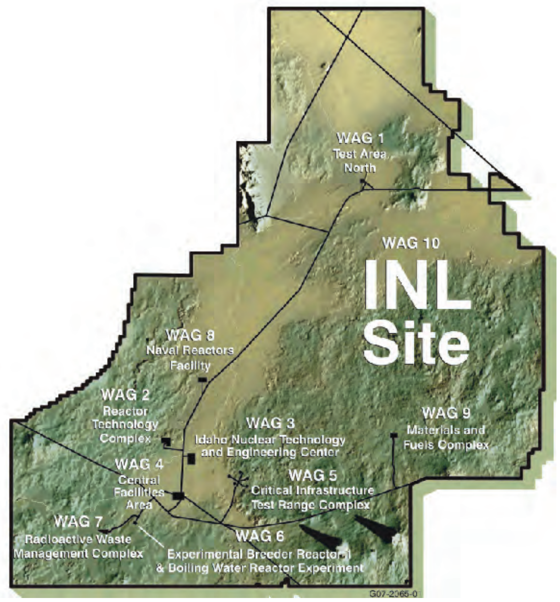
Transient Reactor Test **TREAT**

Experimental Breeder Reactor II/ Zero Power Physics Reactor **EBR II / ZPPR**

Argonne National Laboratory West **ANL-W**

WAG # Site	OUs
WAG 1 Test Area North	10
WAG 2 Reactor Technology Complex	13
WAG 3 Idaho Nuclear Technology and Engineering Complex	13
WAG Cleanup Central Facilities Area	13
WAG 5 Critical Infrastructure Test Range Complex	9
WAG 6 EBR-I and BORAX	5
WAG 7 Radioactive Waste Management Complex	14
WAG 8 Naval Reactors Facility	8
WAG 9 Materials & Fuels Complex	4
WAG 10 Site-wide, Miscellaneous	4

Source: INL Idaho Cleanup Project http://www.globalsecurity.org/wmd/facility/idaho_inel-icp.htm.



the federal spending trough not feeling threatened at all by where it all might go. It was a very inefficient place, because with five contractors, it had five sets of everything. There were entry procedures, for example, in the Chem Plant that were different than entry procedures elsewhere on the Site because Westinghouse ran the Chem Plant and EG&G ran everything else. Five sets of managers, five sets of accounting systems... and every senior manager in DOE-Idaho sort of had their own contractor. So one of the early big things that I was a huge advocate for, and Augie Pitrolo was still there, was you have to re-compete the Site and we have to consolidate these contracts into one. And we have to look to 30+ percent efficiency by doing this consolidation because the country is going to do something about deficits and this site will be hit, and it has to get more efficient to be ready to do something about that and respond to it.[11]

DOE-ID manager Augustine Pitrolo would start the consolidation process at the Site that would bring it under the management of one prime contractor rather than five. The management contract did not include the ANL-W and the NRF.[12] Lockheed Martin Idaho Technologies Company was selected in 1994 to manage the Laboratory but was advised that renewal of the contract for the Site management was not a given but would be competitively bid. Clearly, a new era was in the making.

Bidding for the contract to consolidate the Laboratory, which had historically been a confederation of research entities, took courage and acumen. The winning bidder was asked not only to provide a management framework that would unify the Site but also to provide a vision of what the Laboratory should be. Lockheed Martin supplied the winning vision - to become the nation's leading nuclear cleanup laboratory developing research and strategies to help the DOE's complex deal with their environmental legacy, as well as provide solutions to

Large Format Photography (exterior and interior) taken in 1998 as part of a Historic American Engineering Record of the Test Area North's Hangar (TAN) 629. Built as the Flight Engine Test facility for the Aircraft Nuclear Propulsion Project of the U.S. Air Force and the Atomic Energy Commission, it was later adapted for reuse.

(Left) Historic American Engineering Record Photography of Old Waste Calcining Plant Taken Prior to Demolition. Source: Library of Congress.

private industry. Senator Dirk Kempthorne, Idaho's U.S. Senator in 1993, would help lead the charge. According to Brad Bugger:

> *We would do cleanup research as well as actual cleanup, and then we would share that research with other labs and private industry. And to go along with that in the late nineties, Senator Dirk Kempthorne said people don't understand how important cleanup is to your mission. We need to change the name to make it explicit. And so the decision was made to change the laboratory from the Idaho National Engineering Laboratory to the Idaho National Engineering and Environmental Laboratory so we got another "E" in our name at the time. And that really drove our mission for about four or five years. We were going to be the nation's leading cleanup laboratory.*[13]

While the name change would not be formalized until 1997, the Laboratory eagerly embraced the mantle of environmental cleanup.

The process for investigating and decontaminating waste sites at the Laboratory had been in place since 1991 when the Environmental Protection Agency, DOE, and the state of Idaho's Department of Health and Welfare had signed the Federal Facility Agreement and Consent Order also known as the "Cleanup Agreement."[14] The Laboratory was considered a Superfund site under the 1980 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). An Environmental Restoration Program was established to tackle the contamination problems and decommission facilities that were no longer in use. A new lexicon based on a very different perception of the Site evolved as the environmental issues

were studied and characterized, and treatment plans were developed. As seen in the chart above, the Site was geographically divided into 10 Waste Area Groups (WAGs) that were then further subdivided into operable units to help prioritize environmental actions. An operable unit represented a small group of sites with similar treatment needs that could be handled in a single project. Initially, 83 operable units were identified, however, some were later combined as the effort moved forward.

Deactivation and decommissioning (D&D) of facilities considered excess was an integral part of the environmental agenda and the Laboratory's landscape changed dramatically as D&D work proceeded. Facilities that were no longer in use and for which new missions could not be found or that could not be adapted for reuse were targeted. Responsibility for these facilities was transferred from program use to the Office of Environmental Management. The objective was to stabilize them to minimize any safety risks and then, when funding and an appropriate technology was available, to move toward decontamination and decommissioning. In 1996, the Laboratory had 276 surplus facilities.[15] Historic facilities that previous generations of Laboratory workers felt passionately about in terms of their professional investment and their contribution to the nation's history were slated for cleanup and, in some cases, demolition. The Laboratory's cultural resources team read last rites as they prepared or oversaw preparation of photographic documentation and research of historically significant facilities such as the ARVFS Bunker and the Old Waste Calcining Facility for inclusion into the Library of Congress's Historic American Engineering Record (*HAER*) to preserve the history of these facilities for future generations.

However, as Kliss McNeel, who works for the Site's cleanup contractor, points out a cultural shift occurred as the D&D work force began understanding the environmental objectives and took pride in their D&D work. While not all, many went from, "You can't tear this building down, I grew up here," to "Wow, look how we are cleaning up the environment."[16] For the most part, D&D was figuring out how to do the job and getting it done and in many cases, the crew involved with a facility's demolition shared as intimate a knowledge of the facility as its designers and builders. A number of facilities were subject to D&D as the program got under way prior to the establishment of the Idaho Cleanup Project in 2005.

HARD LESSONS LEARNED

Three events grabbed headlines in the 1990s as Idaho began to cleanup the Site: one occurred in the excess yard, the other was a cleanup project gone wrong, and the third had to do with public opposition to a waste incinerator. In 1993, an incident occurred that brought unwanted notoriety to the Laboratory. With the end of reprocessing, the Fuel Processing Restoration Facility, then under construction, was no longer needed and its stainless steel components were excessed following DOE protocol. Because the material that was excessed was part of a larger system designed to reprocess spent nuclear fuel - which can ultimately generate nuclear weapons-grade material - those parts were under export control and that was a condition of the sale. Tom Johansen, owner of the Frontier Car Corral in Pocatello and scrap metal dealer, purchased the excessed materials for $153,999.[17] The enterprising dealer was described as a businessman who “had an eye out for the big score.”[18] After learning of the value of the parts as part of the reprocessing process, his intent changed from the acquisition of a scrap metal to selling the reprocessing equipment as is and his subsequent “sales” contact with British Nuclear Fuel redlighted the issue for the State Department. Phones began to ring as news of the deal spread.

A front-page story in the *Wall Street Journal* and visits by the national media ensued. The well-intentioned sale of the government property that followed the correct procedures resulted in an unforeseen outcome that was a difficult lesson learned. DOE reframed its policies and their enforcement as a result, while Idaho’s management team began the negotiation to buy back the equipment from Johansen. After a few weeks of negotiation, he agreed to render the equipment into scrap metal. The incident, wryly referred to by many at the Laboratory as the “Incident at the OK Car Corral,” would long be remembered by all involved for its volatility.

Pit 9 is also a conversation starter. Located on a corner of a 88-acre shallow-land-burial area for the disposal of solid, radioactive waste, Pit 9 contains mixed transuranic and low-level waste buried between 1954 and 1970. Transuranic waste refers to plutonium-contaminated clothing and equipment that was shipped to the facility primarily from the Rocky Flats Plant and then buried in pits and trenches. In 1994, a fixed price $179 million contract was let for a demonstration project for the removal of the buried waste in Pit 9 to a Lockheed Martin subcontractor, Lockheed Martin Advanced Environmental Systems (LMAES). EG&G Idaho was the Site’s management and operations contractor in 1994; Lockheed Martin inherited the subcontractor when it won the bid for site management in 1995. Pit 9’s location made it accessible and some knowledge of what it contained helped guide the project planning. If successful, the lessons learned from the project could be applied elsewhere on site for buried waste.

Unfortunately, the project stalled when the initial technology chosen, an acid leaching system to remove contaminants, was set aside but no alternate plan was adopted. Worse, this decision came after the completion of a massive building on rails that housed a machine with a robotic arm that could traverse the pit and collect waste without releases of plutonium to the air. The expensive project infrastructure stood in readiness with about 31 percent of the total project funds expended but no clean soil in sight. As EPA and state-imposed deadlines were not met for design plans, the regulators fined DOE nearly one million dollars for missing the agreed upon deadlines in March 1997.[19]

A 1997 *Post Register* article referred to the problem as a “snarled radioactive cleanup.” It was a snarl at multiple levels – the technological issue of removing the waste

(Photographs) Waste retrieved from Pit 9 is separated for disposal using a glovebox technology during the GEM Project that removed 454 barrels of waste from Pit 9. Source: www.deq.idaho.gov/inl_oversight/waste/pits_4_9.

A **BLACK** EYE

In the mid-nineties, there was a real emphasis on privatization of cleanup. In other words, the government had been doing all of the cleanup through our contractors under what's known as an M&O contract, Management and Operations Contract. So we were using the same contractors we used to run the lab and do research to do the cleanup. And we would give them a cost-plus-award-fee contract and say, "Go out and do whatever it takes to accomplish a cleanup project. We'll cover the cost and then we'll give you a fee over and above that." And there was a thought that private industry could do this more cheaply and efficiently and that there was no reason to give these companies award fees and to reimburse all their cost. So the thought was, Let's go out and put these things up for bid at a fixed price and let the private industry tell us how they're going to do the cleanup and then make them responsible for it at that fixed price. And if they make a profit that's great, if they don't make a profit that's too bad, that's their problem. So we went out and bid a bunch of contracts under that theory, and the first one out of the chute was the Pit 9 contract.

Pit 9 was an area where transuranic and mixed low-level waste and hazardous materials were all buried back in the nineteen—I want to say 1960s. It was a small area compared to all of the other buried waste that we have at the Idaho site, but it was going to be a test case. We were going to prove this concept of privatization. We were going to prove that you could dig up this material. It was plutonium contaminated. There was a lot of concerns that it's pyrophoric or that it—that you might have unplanned criticality or that you would have issues with workers breathing the plutonium. So there was a lot of concern about how to effectively dig this up. Well, Pit 9 was going to show the world how to remediate this kind of waste. So we put the contract up for bid and a company, Lockheed Martin Advanced Environmental Systems (LMAES) won the contract. And then shortly thereafter another Lockheed Martin Company became the M&O here, the management and operations contractor. And Lockheed Martin Advanced Environmental Systems was a subcontractor to Lockheed Martin Idaho Technologies Company. So the problem that we had was we had one Lockheed Company essentially managing another Lockheed Company. So they had to create a separate organization that was shielded from Lockheed Corporate to manage the Pit 9 subcontractor. It's all very complicated and technical, but it's a key part of the story.

So they started doing their work. Their concept was that they were going to build two buildings—a treatment building and a facility that was on rails, that would slide across the pit and remotely dig up the waste, and then the waste would be shipped across to the treatment building where it would be sorted, characterized, and treated for off-site shipment—very expensive proposition. And the idea behind it was that they would remotely dig up all of this waste so their workers wouldn't be exposed and they wouldn't have criticality problems and they wouldn't have those kinds of issues. So they started to work. And a year or so into the process we were in the process of issuing another privatization contract, and that was to build and operate the Advanced Mixed Waste

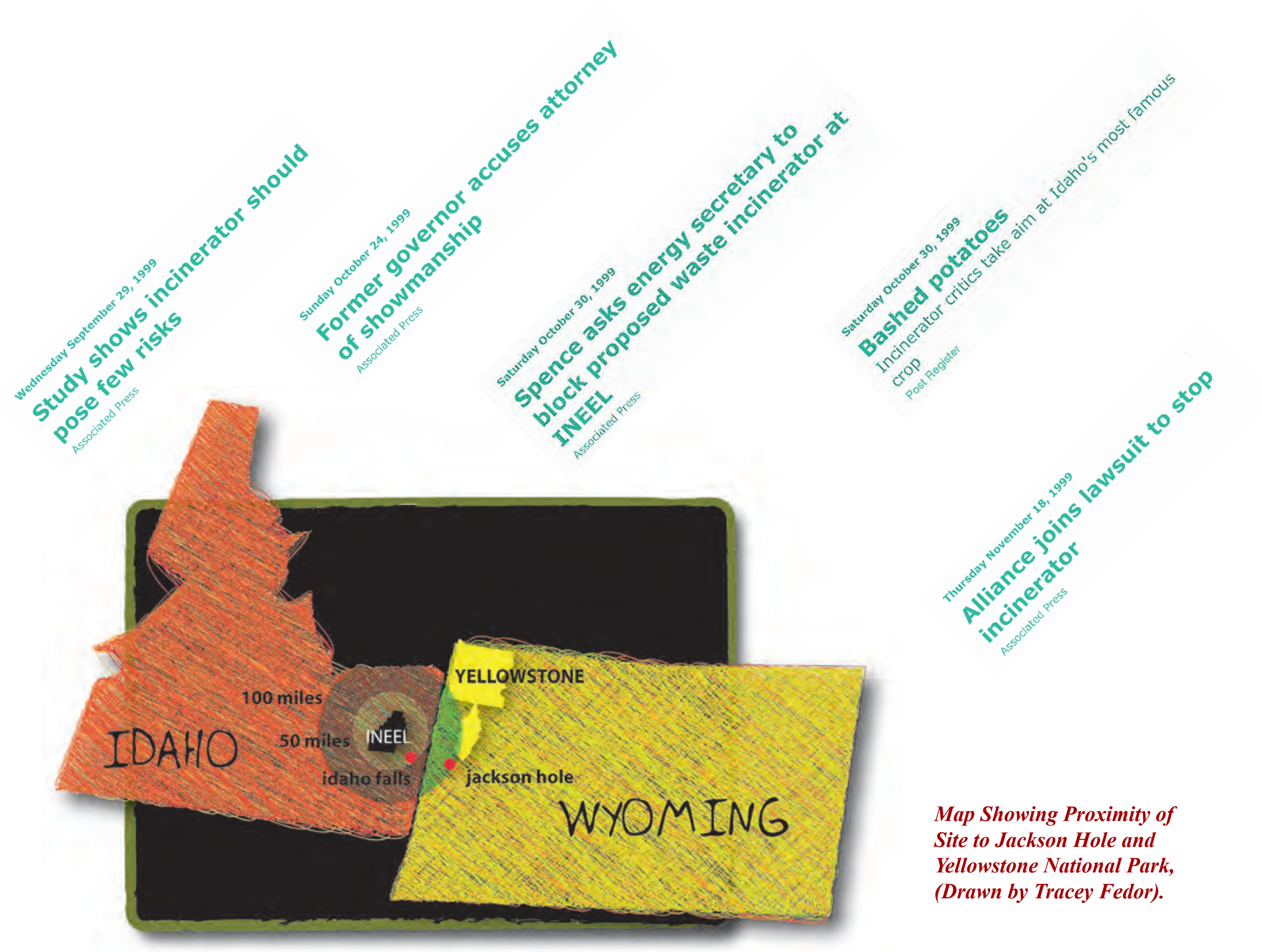
Treatment Project. We had large quantities of transuranic waste. After 1970 we stopped burying the waste, we started storing it above ground. So we said, Okay we're going to get private industry to build a facility that will characterize all of that above-ground waste, pack it up appropriately and ship it off to the Waste Isolation Pilot Plant in New Mexico. So we issued that contract and a company, British Nuclear Fuels, won that contract. Well, not coincidentally around that same time, LMAES … was one of the bidders for the Advanced Mixed Waste Treatment Project. They started complaining about the Pit 9 project, that they had been misled by the government about the extent of the contamination there. They started submitting requests for reimbursement for certain costs. They started complaining that they couldn't do the job at the fixed price that they had agreed to. And it became apparent to a lot of people that Lockheed was sort of betting on the outcome, that they were low-balling the Pit 9 project and expecting to make the profit by using that treatment facility in the Pit 9 facilities for the Advanced Mixed Waste Treatment Project. And when they didn't get the bid and it became apparent that they were not going to be able to amortize their costs over both projects, then we started getting a lot of complaints from Lockheed that they couldn't do the job at the cost that they had agreed to, that DOE had misled them about what was in the pit and so forth and so on.

So for the couple of years they missed deadlines, DOE had to go back to the State of Idaho and renegotiate the cleanup agreement on Pit 9. We took a very, very big black eye in the public from people saying, They've spent millions of dollars on this Pit 9 Project and haven't dug up a teaspoonful of waste. So it got ugly. It went to court needless to say. And the result of it all was that eventually, many years down the road, the court agreed that Lockheed had signed up to the deal and that they needed to reimburse the Department the money that they'd been paid to that point, and that Lockheed owed what it would cost to tear down those buildings at Pit 9. So they paid for it, those buildings were dismantled—they were never completely finished but they were completely dismantled at cost to Lockheed. So we recovered the money that we paid Lockheed and Lockheed had to pay to tear down the buildings.

What happened then was that in the late nineties, early 2000s, the Department said, Okay well clearly the Lockheed privatization experiment is not going to work. We need to figure out another way to remediate that pit. So they started looking at much simpler approaches, industrial-type approaches where it basically used front-end loaders. They would build like a containment tent around the pit, dig up the barrels and remotely characterize them and get them ready for WIPP. That worked on a small scale. And then when we brought in our cleanup contractor, CWI, they scaled it up to a larger scale. And right now as we sit here in 2010 they're being very successful in digging up waste. Now they haven't gone back to Pit 9 after the initial test. This fall they're going to dedicate the facility over Pit 9 to remediate it, and it's going to be a very joyous day because it will bring an end to the Pit 9 saga, which has been a big black eye for the department over many years.

Brad Bugger, 2010.

Editor's note: Pit 9 was successfully remediated in the summer of 2011.



Map Showing Proximity of Site to Jackson Hole and Yellowstone National Park, (Drawn by Tracey Fedor).

safely and in a cost effective manner, the contract itself, and the changing of the M&O guard. This contract was a first attempt at fixed-price contracting for privatized cleanup at INL, meaning the contractor would complete the project for a known price provided the scope of work was accurate. In this case, the scope had not changed but the subcontractor, already late on producing results, was asking for additional funds to accommodate the change in methods. Another wrinkle was the fact that Lockheed Martin Advanced Environmental Systems (LMAES) was a sister company to the new M&O contractor. Finally, the loss of a bid by LMAES on a second but related project may have played into the conflict as it doused hopes that the beleaguered and projected project shortfall on the Pit 9 project could be covered by the related project funding.[20]

June brought a precautionary notice to 155 employees working on the cleanup that a layoff may occur if the contract dispute did not end. John Wilcynski, DOE-Idaho Manager expressed his disappointment with the situation but firmly stated that, "DOE still expects them to perform the work as agreed upon." The Pit 9 issue continued to fester with features appearing in the *Washington Post* and NBC News spotlighted it on a "Fleecing of America" episode.[21] The workers were laid off in August when all work was halted at Pit 9. Negotiations would proceed unsuccessfully over the next year, resulting in the termination of the company's contract for default.

The irony of what was supposed to be a demonstration project was not lost on the community. "Except for

Newspaper Headlines Provide a Chronicle of the Unfolding Debate over the Impacts of the Proposed Waste Incinerator.

contractual and managerial ineptitude, it hasn't shown us anything. We're back to where we started, and that's not the place where we want to be," stated Kathleen Trever, the head of the state's Oversight Program.[22] The dispute, now headed to court, became a footnote to a full-blown saga. While DOE could later claim some solace with the receipt of compensation for the funds it had advanced to the subcontractor and the removal of the Pit 9 apparatus at the company's expense, the lessons learned came hard.

DOE officials reminded the frustrated public that Pit 9 was a small part of a larger whole that needed to be treated and began a new planning process that called for drilling to get a sense of what was underground and the creation of a retrieval strategy. While the 1999 project objective remained essentially the same as developed in 1994, the rhetoric, methods, and scale of approach had changed dramatically. The new plan was more humble in scale. Once the probe data was analyzed, a small area would be selected for a small-scale waste retrieval excavation. While the potential for explosion or fires as a result of drilling offered a new roadblock, research by a panel of experts was able to allay fears and the probing of the pit area started in December 1999 with actual samples of contents scheduled for excavation in 2000.[23]

The year 1997 brought public opposition to DOE's plans to build a waste incinerator as part of a 1.2 billion dollar Advanced Mixed Waste Treatment Facility that would prepare nuclear waste for shipment to New Mexico as per the Settlement Agreement. About 22 percent of the waste was targeted for incineration that would eliminate hazardous chemicals and other organic solvents. While regulatory officials contended that radioactive air emissions from the process would be smaller than a dose received during a transcontinental flight, this stance was not received kindly by Jackson, Wyoming residents who felt they should have had input into the permitting process. Their community lies outside the 50-mile radius that was considered in the project planning and permitting process. Thus, no public meetings were held in the town. However many residents felt that the project could have an impact on their air quality given their proximity and wind patterns and they wanted to be heard.

In Idaho Falls, populated by engineers, scientists, site workers and nuclear advocates, concerns about the *waste treatment facility have been minimal. Travel across three mountain ranges to Jackson, and the resort workers, outdoor lovers, and ranch owners are more likely to think of the INL as a toxic brewer of green goo.*[24]

There was clearly a divide in opinions and values. In response to the concerns, the Idaho Department of Environmental Quality allowed the Wyoming community to review the completed air quality analysis while the permit process moved ahead. Concurrently, Jackson resident and lawyer, Gerry Spence, marshaled opposition under the banner, "Keep Yellowstone Nuclear Free" and gathered pledges to raise $500,000 to fight the incinerator's construction, citing that the community was not provided an opportunity to comment on an undertaking that in their opinion, would impact their community. While state officials and others in the debate felt that the risks imposed by the incinerator process were minimal, there was also a concern that the public needed to understand that the permitting process was there to protect them and that the process was being handled responsibly.

A battle royale was in the making. The opposition under Spence's direction gained allies when the Snake River Alliance, the Jackson Hole Conservation Alliance, the Sierra Club, and others joined the lawsuit, which alleged that the DOE had entered into a contract to build the incinerator without public involvement and called for a fuller environmental review. An EIS was undertaken in 1998 but the fact that it postdated the letting of the contract to British Nuclear Fuels would be a sticking point.

The Idaho community also hunkered down in their support of the project. Former Governor Batt would characterize Attorney Spence as a "showman" and the opposition's well-heeled membership is frequently noted in the newspaper articles that chronicle the lawsuit.[25]

Not content with just casting the incinerator as destroyer to America's western icons, such as the Grand Tetons and Yellowstone National Park, the critics took up the effect of the incinerator on Idaho's potato industry, entreating their support. They received a quick rebuff: "It's irresponsible and careless," said Dan Goicoechea, spokesman for the Idaho Farm Bureau Federation.

"We are concerned any time a person who has the media spotlight and some amount of celebrity…makes comments beyond their realm of knowledge or expertise." He and others pointed out that the Site and potato farmers had worked together for 50 years and that a thorough testing program had kept them good neighbors.[26]

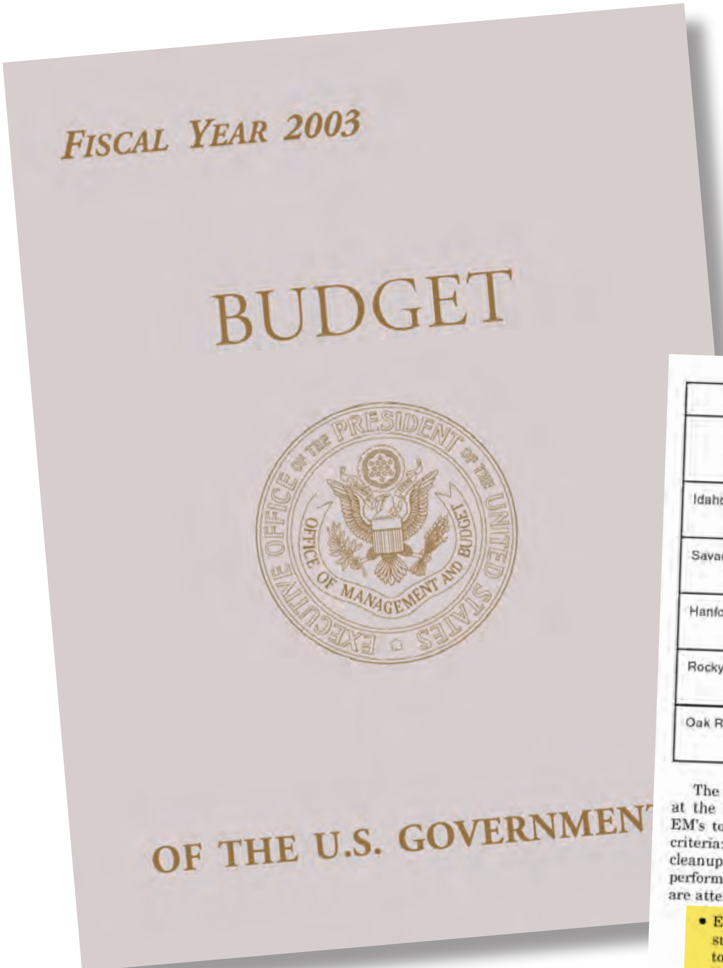
DOE opened an office in Jackson to receive input and to provide information about the facility and in December 1999, DOE's General Counsel Mary Anne Sullivan and Ellen Livingston, senior program manager to Secretary Richardson, flew to Boise and Jackson to get input first hand from both sides. Both governors sought federal leadership in solving what was becoming a conflict between the states. DOE offered to provide a "first alert" system to notify residents of any problems by giving access to real-time monitoring data via the internet and pointed to a lack of participation of Wyoming residents on the Citizen's Advisory Board or in oversight roles.

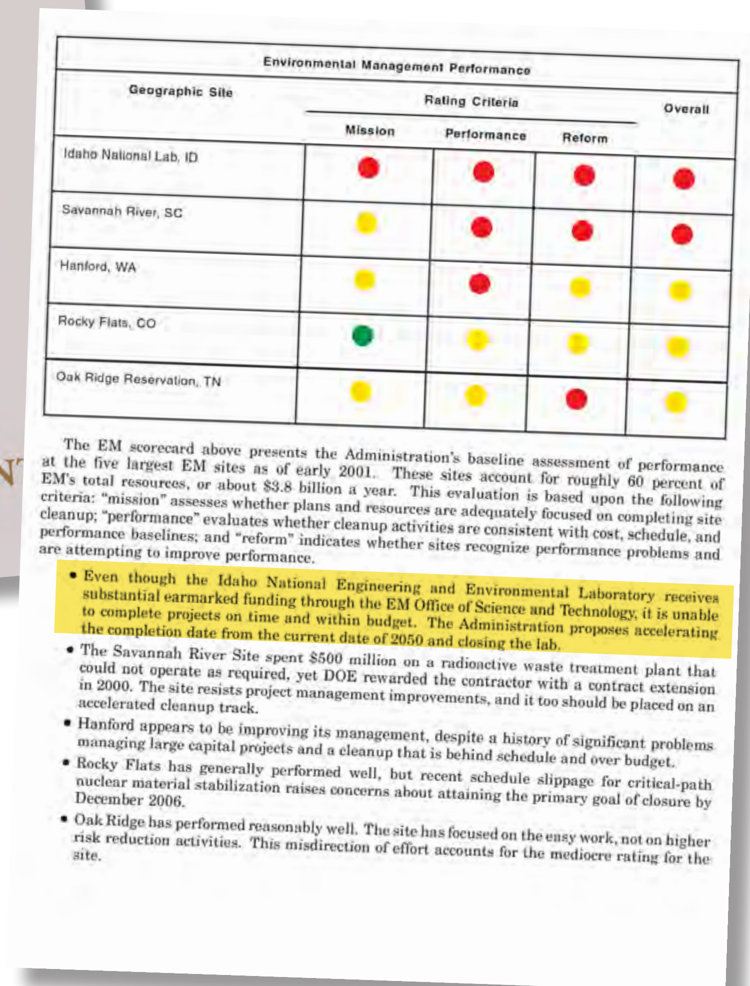
While the effort to find middle ground did not go unnoticed, it did not change the tide of opinion. At the close of December 1999, consideration of expanding the lawsuit was reported and the lines remained drawn. Brad Bugger, DOE-ID spokesman, reiterated DOE's stand, noting that the amount of plutonium that will be released from the incinerator was so small that it could not be measured, it had to be calculated. Such statements did not squash the opposition and articles such as "Not in My Yellowstone - A Nuclear Incinerator Upwind of Old Faithful? The Controversy Burns On" fueled the Wyoming community and its allies.[27]

The controversy ended when the DOE signed an agreement in March 2000 that stated they would halt plans to construct the incinerator and would explore alternatives to incineration. In 2001, low-level waste incineration, considered a workhorse treatment technology, was shutdown or suspended at the Laboratory and South Carolina's Savannah River Site and a Blue Ribbon Panel was formed and charged with developing alternatives to the terminated TRU waste incinerator.[28] The environmental groups had scored a victory and made it clear that the Laboratory's concerned community was no longer just Idaho but also included the surrounding region.

GOING FORWARD

The 1990s were tumultuous in the words of former DOE-ID manager John Wilcynski and the Site was not well positioned to handle the cultural change that was coming. The Laboratory would no longer reprocess fuel, an underlying mission for the Site historically, which eliminated the need for certain facilities. Naval Reactors adjusted its Idaho work priorities as part of post war transitions. Economic development was needed in the community beyond the Laboratory. Changing the mindset about D&D and waste had to occur to be viable and this happened with both successes and setbacks. At the close of the twentieth century, the Laboratory was working into its new identity, developing and honing its cleanup program, and looking for ways to re-inform the DOE complex and the American public about its capabilities and assets.





Environmental Management Performance				
Geographic Site	Rating Criteria			Overall
	Mission	Performance	Reform	
Idaho National Lab, ID				
Savannah River, SC				
Hanford, WA				
Rocky Flats, CO				
Oak Ridge Reservation, TN				

The EM scorecard above presents the Administration's baseline assessment of performance at the five largest EM sites as of early 2001. These sites account for roughly 60 percent of EM's total resources, or about $3.8 billion a year. This evaluation is based upon the following criteria: "mission" assesses whether plans and resources are adequately focused on completing site cleanup; "performance" evaluates whether cleanup activities are consistent with cost, schedule, and performance baselines; and "reform" indicates whether sites recognize performance problems and are attempting to improve performance.

- Even though the Idaho National Engineering and Environmental Laboratory receives substantial earmarked funding through the EM Office of Science and Technology, it is unable to complete projects on time and within budget. The Administration proposes accelerating the completion date from the current date of 2050 and closing the lab.
- The Savannah River Site spent $500 million on a radioactive waste treatment plant that could not operate as required, yet DOE rewarded the contractor with a contract extension in 2000. The site resists project management improvements, and it too should be placed on an accelerated cleanup track.
- Hanford appears to be improving its management, despite a history of significant problems managing large capital projects and a cleanup that is behind schedule and over budget.
- Rocky Flats has generally performed well, but recent schedule slippage for critical-path nuclear material stabilization raises concerns about attaining the primary goal of closure by December 2006.
- Oak Ridge has performed reasonably well. The site has focused on the easy work, not on higher risk reduction activities. This misdirection of effort accounts for the mediocre rating for the site.

Source: Excerpted from the OMB 2003 Budget, pages 126 and 127. http://www.gpoaccess.gov/usbudget/fy03/pdf/bud14.pdf

3 CLEAN IT UP CLOSE IT DOWN 2000-2003

(Opposite page) The proposed budget for 2003 contained a report card for DOE's sites, scoring each on their environmental performance. The Laboratory's performance was not rated well and a statement that followed proposed that the cleanup program should be accelerated and the Laboratory closed down. While this statement would later be retracted, the phrase "clean it up and close it down" caught the Laboratory and its constituents unaware.

The Laboratory greeted the new century with a woman at its helm. Beverly A. Cook, a 15-year veteran of the Site, mechanical engineer, and first woman DOE-ID manager, brought excellent credentials to the job of managing the lead laboratory for DOE's Office of Environmental Management. Cook possessed a strong background in research and science. Secretary of Energy Bill Richardson noted on her appointment that she would bring a "broad perspective to the management of this important field office."[1] The new manager would be tasked with showcasing the Site's nuclear skills, furthering its environmental cleanup, overseeing a new contractor, managing both the desert facility and the burgeoning in-town facilities, and encouraging research and development that could be used beyond the Site's borders. While these charges were considerable, Cook would be asked to do more. She would also have to weather a funding and identity crisis that threatened the Site's future.

BEVERLY **COOK,**
DOE-ID Manager, 2000-2001

MAKE NO MISTAKE, CHANGE IS COMING

The suggestion to downsize or "right-size" DOE's laboratory system stemmed from the "Galvin Task Force," an independent body established by the Secretary of Energy's Advisory Board, in a report titled, *Alternative Futures for the DOE Laboratories*, published in February 1995. The study concluded that DOE's laboratory system need not expand beyond its core research areas and that compelling research in traditional mission areas, such as national security, energy, environmental science and technology, and fundamental science, should shape the system's future. Moreover, it suggested a more integrated approach to applied energy programs between the laboratories and industry, but also stressed that each laboratory should have a mission statement and that lead laboratories should be designated on the basis of their programmatic strengths.[2]

While no recommendations were made concerning the closure of specific laboratories, the Task Force advanced the idea of a competitive laboratory system that weighed closure, consolidation, and potential expansion of laboratories based upon their research performance and value as a public investment. Not all of the recommendations offered by the Task Force were adopted, but some were, and certainly the perception that each laboratory would have a research strength that could be used by the system and nation was one of those that took hold.

As DOE began this evaluation process, Idaho was in the grips of finalizing the Settlement Agreement and getting its footing in environmental management with the Office of Environmental Management as the lead DOE program office for the Site.[3] The nation's nuclear energy research that Idaho had pioneered was to a great extent dormant under Clinton's presidency. Sponsorship within DOE programs, particularly for research, had waned, seemingly leaving decontamination and the disposal of facilities as its major mission. Beth Sellers, who would later become DOE-ID Manager, noted:

> *"Idaho had been…forgotten for probably the previous decade, nuclear energy was not hot in the country, and, yes, it was just a little backwater place in Idaho, even though it had a terrific history. It is because of… the Idaho National Laboratory Site that nuclear energy was even a reality in the world today. [But] because of the state of nuclear energy, it just wasn't doing much cutting edge kind of work. It had clean-up work. That seemed to be the highest priority. And there was some nuclear energy work going, but the budget had been cut quite dramatically from a headquarters standpoint and Congressional standpoint."* [4]

Despite Secretary Richardson's catchphrase, "Strength through Science" in 2000, the Laboratory was having a tough sell when it came to research and development (R&D). While the overall DOE spending request for R&D increased by eight percent, that increase was not earmarked for the Laboratory's newly established prime research domain - making environmental cleanup more cost effective and efficient. Manager Cook

Wake up, America!
The Y2K bug is coming!

Once computers are asked to divide by zero, they'll realize humankind's fallibility, become self-aware and take over the planet. I beg you all, on New Year's Eve, surround your computers with powerful magnets so they can't chase us. And if I don't make it out of my Y2K bunker alive, please see that George Will gets my collection of awkward baseball metaphors.

Stephen Colbert, New York, N.Y.
November 21, 1999
Source: *Newsweek*, Monday June 8, 2009

The advent of the computer bug became swept up with millennial alarmism as prognostications about the potential for nuclear meltdowns, electrical blackouts, and planes falling from the skies abounded. Hype over potential problems spiraled and Y2K became a gift to social commentators such as Stephen Colbert who poked fun at many Americans in "what if" mode as they began to stock their basements with food and water preparing for whatever may happen.

The end of a millennium has always engendered some angst but when the year 2000 rolled in, the Y2K bug, known more formally as the Century Date Change, or at the Laboratory, "the Year 2000 rollover," compelled concern. Early computer programmers, in an effort to save valuable computer space and memory, used two digits rather than four to denote a year. This well-intentioned practice became a shortcoming in judgment as the year 2000 approached. Would computers, now intrinsic to our society, interpret 2000 as 1900? If that happened, would a host of other issues occur based on such an incorrect assumption? Utility companies, banks, manufacturers, communications firms, the nuclear industry, as well as the Federal government hurried to act. Being Y2K compliant became the prime directive as computer programmers, IT specialists, emergency responders and others around the world sought solutions to the problem.

The Federal Government created a command center to monitor the situation named the National Center for Y2K.[48] And federal sites began their preparations. At the Laboratory, response plans and exercises were prepared to train the staff on this new type of challenge: "Usually our drills deal with fires or releases to the environment and focus on a few facilities. Y2K will be a challenge to our infrastructure-computer systems, power supplies, communications-so it will be a much larger multitude involving the nation, all Lockheed Martin Idaho Technologies Company site facilities, Argonne National Laboratory, the Naval Reactors Facility and state and local agencies." [49] The Laboratory organizations created different scenarios that could occur and outlined game plans that could handle a loss of heat, power, or communications.

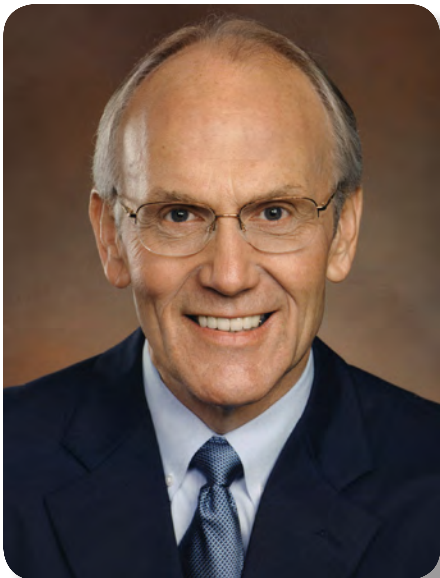
The Laboratory participated in a national Y2K exercise for federal agencies in September 1999 that tested their responses and provided feedback. Forest Holmes, the emergency planner for Lockheed Martin Idaho Technologies Company, summed up the preparations: "We don't know what exactly will happen. Some of the 'experts' say we should expect localized short duration outages of utility systems and some 'experts' say we might not see anything happen. In either case, we must be prepared for each eventuality. We have a lot of innovative thinking going on to make sure we're ready for whatever does happen."

Fortunately, the world remained essentially the same on the 2000 rollover and, in retrospect, mention of the Y2K bug would produce chortles rather than grief. However, the sense of preparedness and the unity of action taken to ready the nation and the Site would help prepare for a real crisis that would occur in 2001 when planes did fall from the sky and our country experienced a national crisis.

commented: "It has been difficult to convince Congress that the money spent for R&D is well spent. That is our challenge – to show them the payoff."[5] Closing a second avenue for funding, 1999 also brought a change in DOE funding policy that disallowed the national laboratories from using funds allotted for environmental cleanup for research. These circumstances resulted in a $10.7 million dollar shortfall in research funding at the Laboratory in 2000 and a delay in moving forward with a major research initiative pushed by site contractor Bechtel BWXT Idaho that looked at how underground pollution migrates through soil and groundwater.

The financial crisis and its potential meaning was recognized by the Idaho Congressional delegation, which got to work on persuading four separate committees in the House and Senate to "reprogram" the lost funding for 2000. Representative Mike Simpson talked about the difficult challenge in obtaining this reversal, stating: "[Senator] Larry [Craig], [Senator] Mike [Crapo] and I worked diligently to get it reinstated. INL employees can be proud of Idaho's congressional delegation."[6] Securing the funding for 2000 was a triumph for all involved, but it brought an awareness that Congress needed to see real

LARRY **CRAIG**



MIKE **SIMPSON**

MIKE **CRAPO**

"NEWSPAPER HEADLINES ***across the nation and energy bills in the mailboxes of consumers spell out our critical need for an energy policy that doesn't fall apart." -Senator Larry Craig***

research results, that the Laboratory leadership needed to speak up for itself, and that the Idaho congressional delegation's participation was critical.

One year later, the future of the Site's funding would again be challenged.[7] Again, Senator Larry Craig, Representative Mike Simpson, and others went to Washington with bats swinging. Craig, a member of the Senate Energy and Natural Resources Committee for 11 years, cosponsored a bill to rekindle nuclear energy production, banking on public opinion generated by the electricity crisis in California, the high cost of energy, and the Bush administration's need for a long-range energy plan. To nuclear backers, the time to revisit the nuclear option was right. The bill, entitled *The Nuclear Energy Electricity Assurance Act of 2001*, introduced by Senator Peter Domenici of New Mexico, would signal an intent by Congress to increase funding on nuclear energy production but would not offer funding. The program outlined in the bill included the development of a new test reactor, incentives to make existing nuclear reactors more efficient, and laid the groundwork for new commercial reactors. The Laboratory and Argonne-West, as the DOE's lead research laboratories, would be essential to the effort if the need for development of future nuclear technologies resonated with the new president and the American public.[8] The opportunity for Idaho was not lost on Senator Craig.

Loss of the Laboratory was untenable for the state that had just produced a strategic plan for the development of science and technology that aimed at building, attracting, and sustaining a highly technical work force. Governor Kempthorne was certain that the "new economy" would call for a more diverse workforce, arguing that Idaho needed to grow high-tech companies with the same measure of success as the state's potato industry. The Laboratory was already a partner with the state in this planning process with Bill Shipp, the Laboratory Director, serving as the chair of the Governor's Science and Technology Council.[9] The potential loss of the state's premier research vanguard, the Laboratory, in achieving such goals, as well as the regional economic ramifications, did get the attention of the state's leadership. The congressional leadership went for the jugular this time, focusing on the need for sufficient funding for the Laboratory to meet its cleanup commitments in 2002. "We're concerned by recent press reports that this program may receive a funding cut or level funding that will not move the program forward, will threaten the environmental health of our regions and subject the department to lawsuits from our states."[10]

Coincident with the Site's changing profile within DOE, internal changes were also occurring. When Bechtel assumed the responsibility of running the Laboratory in 1999, it instituted a change in the work culture that stressed efficiency and cost effectiveness.

The new work environment was welcomed by some, but required change for others as organizational changes began to occur. Hints of budget issues were rumored. In late January 2001, Bechtel announced a hiring freeze referencing the need to manage the Site on a fixed budget.[11] In April, a first look at the Bush budget suggested even more difficult times may be ahead for the Idaho workforce and its leadership. The first budget cut showed a possible 18 percent decrease in clean-up funding for the Laboratory, plus the deepest reductions for DOE's overall programs were in the area of nuclear energy research, knocking the funding for the Nuclear Energy Research Initiative from $35 million to $18 million.[12] When submitted to Congress, the actual figure slated for the Laboratory in the Bush budget would be a loss of $115 million in funding, roughly 15 percent of the Site's budget.[13]

From April through November, the workforce worked under a cloud of uncertainty. The terrorist attack on September 11, discussed below, left an indelible mark on the nation. And September saw the leave taking of DOE-ID Manager Beverly Cook to Washington where she assumed a job at headquarters. Mark Frei would assume responsibilities as acting manager until a permanent manager was identified. Prior to his appointment, Frei served as Deputy Assistant Secretary for Project Completion in DOE's Environmental Management program, with cleanup responsibility for the Hanford, Idaho, and Savannah River sites. The manager's post would not be filled permanently for almost 18 months. To handle both the budgetary pressure and the need to restructure the workforce, the Laboratory initially announced that 1,200 jobs were to be eliminated.[14] Four hundred forty workers elected to take early retirement in June 2001 and an involuntary layoff of about 125 individuals occurred in November, with another layoff forecast for midsummer 2002. The situation was difficult and perhaps worsened by job restructuring within the workforce to reflect changes in the Site's mission. In addition, Bechtel, in order to deal with the prospect of "flat funding," was considering subcontracting out certain tasks to other companies to reduce costs, further eliminating jobs. In November 2001, 7,762 employees worked at the Laboratory, including DOE and Argonne West. It was the lowest total employment at the facility in 25 years.[15] Needless to say, times were rough.

A turning point occurred in November when the 2002 Energy and Water Development Appropriations Act was placed on President Bush's desk for signature. The act provided $19.5 billion for the DOE in 2002, an $877.2 million increase over the previous year. And it specifically provided a $123 million increase for projects that would satisfy the requirements of the Settlement Agreement. The Idaho Congressional delegation was instrumental in this turn around. In April, Senator Crapo, serving in a Senate caucus, had moved the Laboratory's case forward with an amendment that increased DOE's cleanup budget by $1 billion. Also, Representative Mike Simpson, a member of the House Nuclear Cleanup Caucus, stayed on message, convincing the House that meeting cleanup requirements in all states was essential. Moreover, in his words, "the passage of this bill is crucial to maintaining and expanding the INL and Argonne West's role as our nation's premiere nuclear energy research and environmental management laboratories."[16]

Finally, as a member of the Senate Energy and Natural Resources Committee, Senator Larry Craig's role was key in obtaining the reversal in funding for 2002. Craig brought his experience and seniority into play.

> *"Through a mixture of both sweet talk and hard talk, Larry Craig set about doing what he does best – which is getting the job done for Idaho. Through Larry Craig, Idaho has a voice when the dollars-and-cents decisions are being made about who gets what… Through both his appropriations work and his senior position*

Another visible accomplishment was the completion of DOE's first National Archives and Record Administration-certified facility for record storage at the Willow Creek Building in Idaho Falls in 2001.

on the Senate Energy and Natural Resources Committee, Craig is working to educate his colleagues about the assets of southeastern Idaho. He is talking to them about the bright prospects for nuclear energy and the expertise of the men and women of the INL and Argonne. Who knows? Perhaps southeast Idaho will someday host some of those new generation nuclear reactors or do the development work behind their creation."[17]

INSIDE THE LABORATORY

Despite the overarching funding crisis that pervaded the first years of the century, Laboratory operations did not stand still. In a "state of the Laboratory" address

Bright Light Award and Energy@23

DOE recognizes INL lithium battery electrolyte development with the Energy@23 and Bright Light Awards. From left to right - Eric Peterson, Joe Delmastro, Mason Harrup, Thomas A. Luther (seated), Alan Wertsching, and Frederick F. Stewart.

DOE recognized a team of Laboratory chemists in 2001 that developed a technology that would improve the quality of life for consumers and save money. Winning two prestigious awards, the Bright Light Award and the Energy @23 Award, chemist Mason K. Harrup and his colleagues, Joe Delmastro, Alan Wertsching, Frederick F. Stewart, Eric Peterson, and Thomas A. Luther, developed a lithium battery solid electrolyte that dominated both competitions within the DOE laboratory system. The solid electrolyte will lead to safer, more versatile, longer-lasting rechargeable batteries, lasting 50 percent longer than their competition. Moreover, their production is considered more environmentally friendly; their waste products are essentially glass, phosphate and nitrogen compounds, which can be converted to fertilizer. The initial development targeted extending battery life for use in space and in heart pacemakers, but that vision would later expand to other uses. The Laboratory's Environmental Systems Research Candidate Program and DOE's Office of Nonproliferation funded the R & D that focused on three areas. First the team learned how lithium ions move through a polymer, then threaded that polymer in a ceramic scaffold akin to a trellis, and finally strengthened the electrolyte in ways that would improve performance.

"We're very pleased to receive this recognition," said Dave Miller, director of chemistry and geosciences. He noted that the discovery stemmed from the Laboratory's multi-program nature, "The work comes from trying to understand the fundamental question of ion transport in harsh chemical environments. Some Laboratory researchers were looking to use the polymers for environmental cleanup activities, and separately, some were developing batteries for the DOE's energy mission. People working on both were able to see the crossover."[50]

Firemen at Ground Zero, Manhattan, New York City, New York.

Engineers Experience **Ground Zero**

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Idaho Falls Post Register
Author:
Corey Taule, November 2, 2001

You ask the four men to describe what 100-foot-high piles of twisted and burning steel really look like. You've seen images on television and pictures in newspapers, but something tells you that unless you were there to smell it and see it you'll never know for sure. So you ask them to describe it. You ask them to tell you about the firefighters searching for their lost brothers. You ask them about the mothers, husbands, fathers, wives, sons, daughters, friends and grandparents holding up pictures of loved ones and holding vigils. You ask them how they dealt with the horrible reality that about 6,000 people are buried in the 16-acre-wide smoldering remains that served as their office for the past month. You ask the four men, and they give it to you straight: "It looked like hell," Mark Langlois said.

On September 26, Langlois, Robert McFarlane and James Pollard, safety engineers at the Idaho National Environmental and Engineering Laboratory, arrived in New York to help with recovery efforts at the site of the September 11 attacks on the World Trade Center. Another INL engineer, David Larson, joined them about a week later. Until Saturday, the men worked six days a week and 12 hours a day to help keep as safe as possible those clearing the rubble and searching for bodies at ground zero. All tried to keep their minds on business, on the reason they were brought in from Idaho. It is just another construction job, they told themselves. Separate yourself from the emotion. But you don't see people hugging, crying and throwing up on normal construction jobs. You don't see clergy and counselors and Red Cross volunteers on normal construction jobs. You don't work side by side with men and women who have lost dozens of their best friends on normal construction jobs. "Looking at the firefighters and the pain and the anguish on their faces, that will live with you for a long time," Pollard said.

But we can't ignore the other part of what they experienced during their time in New York. The people willing to work seven days a week and 24 hours a day to find those who died there. The friends they made. The men who drove up from Louisiana to feed the volunteers Cajun food for breakfast. The free drinks at the bar once people learned what they were doing. The sincere appreciation and the heartening camaraderie. "You see the worst and the best of humanity all in one place," Langlois said. They describe themselves as four ordinary men doing what they were asked to do. But as Dick Nugent, INL's general manager for environmental, safety and health and quality assurance, pointed out, there is a new definition of hero in this country following September 11.

at the close of 2001, Bill Shipp, the new Laboratory Director, noted many of the year's achievements.[18] First, the Laboratory changed the way it did business, making the organizational changes and adopting procedures and policies that were more closely aligned with DOE's business culture. Second, it met a major milestone specified in the Settlement Agreement six weeks ahead of schedule. This was accomplished by transferring spent nuclear fuel and materials from deteriorating storage pools to a new aboveground fortified storage site. Other cleanup achievements included the preparation and shipment of 680 cubic meters of transuranic waste from Idaho to the Waste Isolation Pilot Plant (WIPP) ; reducing the volume of liquid radioactive waste in underground storage tanks to less than one million gallons for the first time in 43 years; and removing 9 tons of volatile organic compounds from the subsurface to control, and in some cases, reduce, contaminated groundwater plumes. While Pit 9 would remain an ongoing saga, it did not overshadow these achievements in the cleanup mission. In addition to these measurable advances, Shipp's address went further, noting a change in mindset. Cleanup was important but it was not the future of the site; research and development would lay the foundation for the Laboratory's growth. In 2001, the Laboratory made great strides in this regard by increasing its sales of the Sites' R&D organizations by 18 percent. The Laboratory's lithium batteries technologies received Energy@23 and Bright Light awards and a R&D 100 award was given for the Laboratory's Super Hard Steel developed by Daniel James Branigan, which was considered one of the most significant technologies developed in 2001. These and numerous other awards garnered by the Site attested to its perseverance under pressure.

The terrorist attack of September 11, 2001 influenced American lives on many levels. Historians will explore its effects on the American psyche for decades, but it changed our way of thinking about security and, with an almost Pompeian effect, created a horizon across the nation of new facilities, new safeguards, and new policies designed to protect and safeguard the nation.

In Idaho, the most immediate change was the Laboratory's security posture as the Site went on "high-alert," but new concerns also arose over the transfer of radioactive waste by rail or truck. Safeguards that were considered adequate prior to September 11 were no longer acceptable, and the federal government suspended shipments of nuclear materials nationwide twice by November.

The crisis had other ramifications for the Laboratory, which had been involved with national security projects almost from its inception. In 2000, the Laboratory's National Security Division was officially created. Its budget in 2002 was about $19 million and in 2003 it grew to $25 million. The Department of Defense (DoD) was their primary customer but work for the newly formed Department of Homeland Security was in a growth mode by 2003. Interest in some of the Laboratory's previously designed detection and assessment systems grew as new uses were identified for them after 9/11. Digital Radiography/Computed Tomography systems designed as mobile x-ray units capable of identifying contents of stockpiled munitions were constantly upgraded. The award winning Portable Isotopic Neutron Spectroscopy system was another assessment tool needed by the DoD to identify contents of unexploded munitions or barrels. Other research projects were developed for detection purposes, such as a system designed by INL's James Jones that could identify the presence of nuclear materials in container vessels. The National Guard's toolkit benefited from the development of a lightweight, wireless camera that could be used to gather information under special circumstances. About 250 employees within the National Security Division in 2003 contributed to this success,

Worker monitoring communication towers within CITRC.

and reports from engineers within the group suggest that the fast paced work environment in which designers and technicians collaborated to design prototypes was both successful and professionally rewarding.[19]

However, the most significant research tool developed for Homeland Security at Idaho was the Critical Infrastructure Test Range Complex (CITRC), which is a national program that researches, develops, and tests technologies, systems, and policies to protect the nation's infrastructure. The complex is located on areas formerly occupied by the Auxiliary (originally Army) Reactor Area (ARA) and the Power Burst Facility (PBF), later part of the Waste Reduction Operations Complex (WROC). Notably, the remainder of land not occupied by CITRC facilities is designated part of the sitewide critical infrastructure test range.[20]

Essentially, the CITRC site serves as a real-world natural laboratory in which the best ways to safeguard the nation's infrastructure can be tested. "9/11 not only helped emphasize the vulnerabilities of the infrastructure, but also emphasized how these infrastructures are connected."[21] Thus the Laboratory began installing new systems such as a Wireless Testbed to research communication systems, followed by a National SCADA Testbed to learn how to best protect the country's power grids and wastewater systems. A testbed is a full- or near full-scale, functioning model that allows more realistic testing of control systems than computer simulations.[22] These new facilities included industrial-scale infrastructure components, including a full-scale electric power grid with a 61-mile transmission loop, seven independent substations, and a control room for conducting comprehensive interoperability, vulnerability and risk assessments. The idea was to protect and control the systems that produce and distribute our power from physical or cyber attacks. The research group would go on to develop modeling and simulation capabilities and in 2007 procured the only Real Time Digital Simulator certified for government applications in the country.
In addition, the invasion of Iraq in 2003 and Afghanistan prior to that brought another Laboratory contribution into focus – tank armor. The Site's armor manufacturing capability was proven long before 9/11. The U.S. Army had developed an armor package using depleted uranium for its M1-A1 Abrams Main Battle Tank in the 1980s and had established a production plant within Test Area North (TAN) in 1984, in a facility originally built in the 1950s as a hangar for a nuclear powered-aircraft that was never built. Designated the Specific Manufacturing Capability (SMC), the highly classified defense program known on Site as Project X turned out the first armor packages in

An M1-A1 Abrams tank spits fire as it sends a 120mm shell down range during live-fire training at Udairi Range in Kuwait on April 27, 2007. DoD photo by Cpl. Jeremy Ross, U.S. Marine Corps. (Released)

From left, DOE-ID's Ray Furstenau, INL's Riley Chase, SMC's Joel Duling, Army's Ltc. Evans and Mike Martell, and DOE-ID's Jim Malmo stand with the flag presented in recognition of work performed by the Specific Manufacturing Capability project.

The flag is one of only three that the Army had flown in Iraq in 2009 to recognize outstanding organizations that support U.S. troops in the field. SMC was privileged enough to be presented with one of these flags to thank them for the armor SMC builds for the M1A2 Abrams Main Battle Tank.

A brass plaque below the framed flag reads: "This flag was flown over Baghdad, Iraq on 1 July 2009 and is presented to the Idaho National Laboratory in recognition of the work they do in support of the warfighter to make the Abrams Tank the most survivable Tank in the World."

Source: http://www.id.doe.gov/news/PressReleases/PR091216.htm

What We Make Saves Lives

INL's contribution to the protection of our nation's soldiers had been ongoing for two decades when it began to produce tank armor under the generalized program name of SMC. Its government industry research continues "to support the Abrams program, and advanced research, development and prototyping of lightweight higher-performance armor for use on combat and combat support vehicles within the Department of Defense's current armored force and future combat systems."[51] The products and research also benefit our homeland security initiatives, law enforcement agencies, and special military operations.

Billing itself as a rapid response program, it provides survival solutions through modeling, simulations, the development of prototypes, and a geography that permits field trials if needed. While the SMC is the historic cornerstone of the program, it has grown in the breadth of its expertise offering the Department of Defense and the commercial sector a number of "survivability solutions." Key components include: Armor and Barrier Development; a Ballistic and Blast modeling team; Ballistic and Blast Testing Evaluation, Critical Infrastructure Vulnerability assessments, Specific Manufacturing Capabilities, Explosive Detection Technology Development and Assessment; Ballistics and Explosives Attack Avoidance Technology Department; and Technology transfer to commercial environments.

The program's Material Research expertise rests on the Laboratory's 50 years of experience in this area and a number of armor types are involved including ceramic, metal, encapsulated ceramic, and composite armors. Used innovatively, this knowledge provides protection from the battlefield to the homefront.

(Right) Example of a pressureless sintered form of Aluminum Oxynitride (AlON) under development as a transparent armor

"THERE MUST BE, ***within our Army, a sense of purpose ... A willingness to march a little farther, to carry a heavier load, to step into the dark and unknown for the safety and well-being of others." - General Creighton Abrams***

1986. The Army would publicly announce the program in 1990 and the specially armored tanks, in materials denser than lead, were placed in combat during the 1991 Persian Gulf War. The success of the armor led to the Army's decision to produce 1,150 M1-A2 tanks by retrofitting older M-1 tanks, a process that would keep workers, although a reduced work force, busy through 2003.[23]

In 2000, the Army announced an expansion of the successful SMC project, asking the Laboratory to also produce side armor packages for the M1 Abrams Main Battle Tanks. The expansion led to a $3.5 million increase in the program's $50 million budget and added 20 new jobs. An M1 Abrams Main Battle Tank, loaned to the Laboratory by the DoD in recognition of the Site employees' performance and dedication, was put on display at TAN in 2000. "The SMC project has produced over 3,000 armor packages -- all of them on-time and within budget, with 100 percent quality acceptance by the Army," said Bernie Meyers, president of contractor BWXT LLC and Bill Shipp's successor. "Today's announcement is reinforcement for the good work of INL employees," said Beverly Cook, Manager of the DOE's Idaho Operations Office. "It is a fitting reward for years of doing the job right the first time."[24]

The Iraq War would deepen the DoD's needs in this field of expertise and would spawn new research. Laboratory researchers would go on to develop lightweight armor composites for personnel, as well as vehicle protection. Even robotics research benefited from this area of expertise for use in protecting robots designed to enter areas or spaces that are dangerous for humans.[25]
The national security mission and the armor-manufacturing program were not products of 9/11, but they changed because of it. The Laboratory excelled in both, showing the unique research and development strengths of its desert facility whose infrastructure could provide real life information about the security of our nation's infrastructure and whose armor protected American life.

BREAKTHROUGH

The light at the end of the funding tunnel seemed to be finally at hand at the close of 2001, until the White House's 2003 budget summary was released on February 4, 2002. INL was shocked to learn that the Bush "administration proposes accelerating the [environmental cleanup] completion date from the current date of 2050 and closing the lab."[26] While this statement was clarified later to mean that the environmental mission would end, not the research mission, the release of that statement put closure on the table. Christine Ott observed:

> *"At that time we were under the Office of Environmental Management; that was the lead program office for this site at that time. And there was a statement in the budget submission that talked about cleaning up and closing out Idaho. And that really got a lot of people's attention in Idaho."*

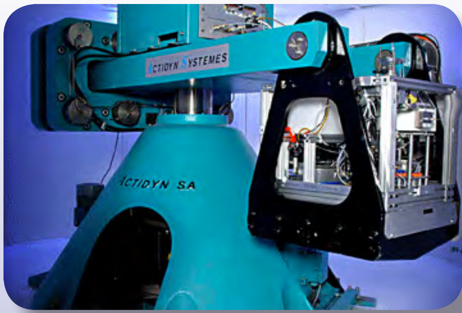
The onerous phrase, "clean it up and shut it down," became a battle cry to the Laboratory and its stakeholders. While the Idaho congressional delegation had politely overlooked Bush's 2002 budget decreases, citing that his contested election did not allow time for well-thought out budget preparation, the 2003 proposed budget was a bitter disappointment. The successful efforts of the previous years in obtaining or reinstating funding for the Laboratory had not produced the permanent results that were needed. The statement in the proposed budget suggested that the federal perception of the Site was as an area for environmental remediation, not a national laboratory. This perception was not shared by the Laboratory, the state of Idaho, or some individuals in DOE.[27]

Moreover, while the 2003 proposed budget aim of stepping up environmental cleanup was well received, the proposed budget also decreased the Laboratory's funding, limiting any chance of that occurring. Though DOE had retracted the statement concerning closure, it still did not appear to have a game plan for the site's future. The lack of a dedicated manager to champion the Site within DOE programs was problematic and what appeared to be a sluggish search for a candidate stoked uncertainty about DOE's intentions. Pit 9 also contributed to the dilemma; for some outsiders it was their primary frame of reference for the Idaho facility. Mired in legal disputes and contractual wrangling, the project that was to deliver innovative cleanup solutions instead remained a stumbling block to the Laboratory that prided itself on getting the job done.

The next few months were a slog. A major disagreement between the state and DOE on the parameters of the Settlement Agreement roiled. DOE contended that the Laboratory's 88-acre waste burial site, which included Pit 9, was not subject to the agreement but was instead covered by the 1991 Cleanup Agreement. The state disagreed. An accord was reached out of court in May between DOE, the EPA and the state of Idaho. The agreement called for a 50-year acceleration of the site's cleanup moving the completion target from 2070 to 2020 and stated that all waste sites would be removed or back-filled or capped. Congress would need to approve the funding for the cleanup, but when passed it would secure a "more stable funding stream for the future" and would allow Laboratory workers to get back to work "helping this country meet its national security, basic science, environmental and energy needs."[28]

With that commitment in place, a contingent of mayors and local leaders went in June to lobby Washington on the important role the Laboratory played for both the state and nation. Acknowledging that 60 percent of the site's budget was involved with environmental cleanup, they wondered what would happen in 2020 after cleanup was complete? Would that funding disappear or would it be redirected toward research? Certainly, a major thrust of the trip was to bring attention to the critical need for a new manager that would be a champion for the Site within DOE. The delegation met with Jessie Roberson, DOE's Assistant Secretary for Environmental Management, and a host of other DOE officials, as well as their elected representatives to provide input on the job search and to stress the importance of the position to east Idaho.[29]

Within a month and with incredible gusto, DOE provided its decision on the Laboratory's future. The Laboratory was to become the country's flagship facility for the development of nuclear energy and Secretary of Energy Spencer Abraham announced the new mission in Idaho Falls, as well as a pledge of funding to: "'jumpstart' the site's transformation."[30] Authority for the Site was to be transferred from the Office of Environmental Management to the Office of Nuclear Energy at the end of the fiscal year. The transformation was to be gradual but, when completed, the Laboratory would be front and center in the development of the next generation of nuclear power and the development of advanced fuels. Paul Pugmire, spokesperson for Argonne-West, noted



Predicting How Fluids Move Underground

This research domain was claimed early on by INL researchers who sought answers about the movement of fluids underground to inform future environmental planning and to better understand the consequences of past actions. The science of this movement was still relatively unexplored and Bechtel BWXT made furthering knowledge about this a priority during its tenure. The acquisition of a geocentrifuge and the establishment of the Geocentrifuge Research Laboratory in Idaho Falls moved the research initiative forward, not only opening up this unique facility to DOE scientists but allowing its use by outside researchers. Laboratory scientists are able to create predictive models and experimental simulations that can be field tested and compared to the Laboratory results.

"The geocentrifuge subjects a sample to a high-gravity field by spinning it rapidly around a central shaft. In this high-gravity field, processes, such as fluid flow, occur much more rapidly. Using this technique, researchers can study the effects of tens of years of gravity-induced fluid movement in a few days or weeks. INL researchers are using the geocentrifuge to evaluate engineered caps and barriers, develop more effective landfill designs, improve our ability to characterize contaminated sites, and study basic geophysical processes."

Source: https://inlportal.inl.gov/portal/server.pt?open=512&objID=598&parentname=CommunityPage&parentid=11&mode=2&in_hi_userid=291&cached=true

that Idaho's experience certainly played a role: "The technology to generate electricity through nuclear energy was developed here; that's our primary legacy." However, Yucca Mountain was also key. Abraham referenced the importance of the July 9th decision to move forward with licensing of Yucca Mountain as the nation's high-level radioactive waste storage site in his talk. With that addressed, the Department could begin charting the future and in that future, the Idaho Laboratory was to be central to a potential nuclear renaissance. Newspaper articles chronicle the aftermath of the announcement as the word spread that the Laboratory had rebounded from closure.[31] All waited to see how the change was to occur and if funding would be commensurate with the importance of the new mission. After months of uncertainty, the change seemed incredible.

The remaining months in 2002 witnessed the establishment of the geoscience laboratory with the purchase of a geocentrifuge that would help scientists understand how fluids behave in the ground. Knowing about this characteristic would be critical to understanding the potential impact of a flood, earthquake, or pollution on a specific environment.[32] Argonne West was designated as DOE's preferred manufacturing site for nuclear generators to be used in space exploration. The Radioisotope Thermoelectric Generator program, which was to be moved from Mound, Ohio to Idaho, was the first new nuclear program for Argonne-West in years, making it a definite cause for celebration.[33] October brought news of eight competitive grants in the amount of $6 million dollars from DOE's Nuclear Energy Research Initiative and the office of Energy Efficiency and Renewable Energy won by Laboratory researchers. The grants funded research in reactor design and nuclear-assisted production of hydrogen as a transportation fuel.[34] Also, by the end of the year, BNFL could claim success on its construction of a mixed waste treatment plant completed two years ahead of schedule to comply with a deadline set by the Idaho Settlement Agreement. The plant was constructed to repackage Cold War nuclear weapons production waste (contaminated clothes, tools, and other items) into drums and ready it for compaction that would reduce the waste volume to one fifth of its size prior to shipment to WIPP.[35] Finally a large layoff of potentially 400 workers scheduled for the summer was averted with only 25 individuals affected.[36] In contrast to earlier in the year, the final months of 2002 were clearly more positive, stable and productive.

JUMPSTARTING THE SITE'S TRANSFORMATION

The year 2003 saw the unfolding of DOE's vision for the site. First, the 18-month search for new leadership ended on April 1. Beth Sellers, a native South Carolinian, was selected for the post. DOE's announcement of her selection describes her responsibilities and provides insight into their thinking at that point in time:

> *"Sellers will manage the return of the Idaho site to its core mission of nuclear technology development, necessary to support the Nation's expanding nuclear energy initiatives. DOE is currently engaged in a comprehensive planning effort for the site's future. These plans envision Idaho at the center of the Department's efforts to develop advanced Generation IV nuclear energy systems, nuclear hydrogen production capabilities, advanced fuel treatment technologies, and to assist NASA in the development and testing of space power systems. Sellers will also support the Department's Office of Environmental Management in meeting its goal of accelerating cleanup at the Idaho National Engineering and Environmental Laboratory from 2012 to 2035. That cleanup program is on schedule and Sellers will be responsible for managing it to its conclusion."*[37]

Sellers had 20 years of DOE experience and was director of the National Nuclear Security Administration's operations in Kansas City, Missouri, when she was selected. Stating she liked to take hard problems and get something out of them, she liked what Idaho had to offer as a multi-program laboratory and the promise of its future. Her previous boss, John Arthur, noted her talent for delivering results: "She is the right leader at the right time in Idaho."[38] John Kotek, a veteran of Argonne-West and a researcher on the next generation of reactors, was selected to assist Sellers as deputy manager in July. His role in the new order was to grow the Laboratory, particularly its nuclear energy missions.[39]

With the search for a new manager completed, DOE announced the results of its planning in May and it involved sweeping changes. First, ANL-W would be united with the Laboratory and the resulting site was to be renamed the Idaho National Laboratory (INL). The Laboratory's primary mission was now seen as nuclear research. Two competitive contracts were to be let for the Site's management; one for the R&D mission, the operation of the nuclear facilities, and site infrastructure; and a second for environmental cleanup. DOE saw this split of tasks as part of the Laboratory's revitalization and an avenue toward meeting its cleanup commitments. DOE's Office of Nuclear Energy, Science and Technology would oversee the Laboratory, while the cleanup contract would be handled under Environmental Management. The announcement was a blow to Bechtel who, despite

Beth Sellers
DOE-ID Manager, 2003-2009

"Hey, We'd Like You To Go To Idaho."

In 1999, the Under Secretary of Energy, Bob Card, brought me into his office and said, "Hey, we'd like you to go to Idaho. Would you consider doing this? We want to make a huge transformation happen out at the Idaho Operations office." And he told me that would be the toughest job I'd ever have because they had the toughest regulators in the nation in Idaho. And I just laughed at him and I said, "I don't think so." I had been up in Richland, Washington where I dealt with the regulatory structure and their Tri-Party Agreement. I said, "I don't think it gets any tougher than that." He says, "Yes it does." (laughter) So anyway, he convinced me to come out to Idaho and help headquarters do their transformation. But when I got to Idaho and I learned what was going on with the Settlement Agreement and how stubborn everybody was with the issues that were at play— it was technically not the same level of complexity that they had up at Richland at all. From a long-term, I mean decades and decades of historical perspective, it was much more difficult than Washington State. So I learned that it was a tough situation here. However, when the DOE decided to make this change happen in Idaho, it was like everybody was finally to the point where, maybe we can talk about it and try to resolve this issue and get something established, because it would be good for everybody. It would be good for the nation. And years, you've got to let go of all this past at some point in time.

receiving high performance ratings for its work since 1999 from DOE, was now facing competition in 2004 for either of the next contracts to manage the federal site.[40]

In June, a small group of DOE-ID staffers moved into new digs on Lincoln Road in Idaho Falls.[41] Their job of guiding the procurement process for the new contractor had started. Two hundred "INL suitors" from 100 companies visited the Site to learn about the proposed contracts. Bill Magwood, DOE's Director of Nuclear Energy, Science and Technology, and Paul Golan, from DOE's Office of Environmental Management, handled the overflow crowd. Each talked about the essential criteria for the proposed contracts. On the research side, So in 2003 I came onboard [officially]. Bill Magwood was the Office of Nuclear Energy Director. He had a great vision for what he wanted to do out at the site with Bob Card being the Under Secretary and Jessie Roberson being the Assistant Secretary of Energy for Environmental Management, everybody worked together to create what they ultimately wanted to see in Idaho. And it was something! It was a very exciting process to go through.

Bill Magwood and Jessie Roberson each wanted to make sure that their programs got a solid foundation and that they were really going to be moving towards progress rather than maintenance mode. [Instead of] let's just keep things running because people like to have jobs, let's get out there and put a plan in place where we can actually show some progress and clean up a site. Idaho doesn't need to be a site that needs to be cleaned up for decades. It was a doable thing. Bill Magwood was getting lots of indications that the Bush Administration was probably going to start supporting nuclear energy. He wanted to establish a laboratory that was going to be positioned to lead the country in the renaissance for nuclear energy research.

There had been one contract out here at the INL at the time and Bechtel had it. They were doing a great job; however, the department made the decision to recompete their contract at the end of their five-year term. They did this because they wanted to change the face of what was going on in Idaho, not because of any performance issues. So it was decided, there would be two prime contracts. The clean-up contract, the Idaho Clean-Up Program, was the brainchild of Jessie Roberson. The Idaho National Laboratory contract was the brainchild of Bill Magwood, with lots of input from lots of people. So we went through those competitions at the same time period. One was awarded five months before the other in 2005. They were good proposals. The word had gotten out that the DOE really was going to revitalize Idaho, [that it was its number one priority] which made the delegation in the State of Idaho very happy, and made the governor very happy. I mean, everybody wanted to see things happen at this laboratory. It set a new direction that had not been set in the DOE before.

Another significant thing that happened on the Idaho National Laboratory contract was the combination of the Argonne Site with this laboratory, because they had always reported to the Argonne National Laboratory in Chicago. The DOE had talked about that for 30 years, but it never had the chutzpah to go out and actually do it; it just didn't have the impetus or justification to do something so dramatic.

Beth Sellers, 2010

this meant reducing unnecessary overhead and attracting individuals with advanced degrees. On the clean up side, creative thinking would be needed to get the job done more efficiently and safely and for less money. All were instructed to "Think big, really big" but were also warned that budgets would be relatively flat though 2012.

In Washington, the Senate Subcommittee on Energy and Water Development Appropriations approved $20 million for INL to begin designing an advanced reactor system. The Committee also approved $78 million for the Advanced Fuel Cycle initiative, $6 million to upgrade the Advanced Test Reactor, $1.5 million for the Idaho Accelerator Center at Idaho State University and $4 million for the Subsurface Science Research Initiatives

THERE'S CERTAINLY A DIFFERENCE ***between a 1,290-pound gorilla and a 725-pound gorilla, but there's no denying the smaller ape still is a powerful creature. The same can be said for the Idaho National Engineering and Environmental Laboratory's impact on eastern Idaho's economy. While the site is 56 percent the size it was 10 years ago when its work force peaked at around 12,900, it's still one of the region's most important anchors. And with employment stabilized at the INL after 18 months of cuts, eastern Idaho is ending its third quarter with brighter economic prospects than believed earlier this year. -Paul Menser Post Register September 29, 2002.***

developed by the Laboratory and the Inland Northwest Research Alliance. In addition, other Laboratory projects were also approved.[42] Appropriations were still a long way off but the first hurdles had been cleared. Back in Idaho Falls, three INL inventors, Greg Lancaster, James Jones, and Gordon Lassahn, received word they won an R&D 100 award for their Change Detection System, a software that identifies minute changes in digital imagery.[43] By perfectly aligning digital images, the software can detect any changes in the subject matter, enabling recognition of cars moved, a drawer or desk disturbed, or brain tumor beginning to grow again. The Laboratory revitalization seemed like it was off and running.

August would bring disappointment when the Senate approved the energy bill but not the funding. September brought layoffs, a product of a reorganization that occurred in preparation for the splitting of the contract. Bechtel BWXT president and general manager and laboratory director Bill Shipp announced his retirement in October. Although it predated his leadership, the Pit 9 controversy would always be central to his tenure and it would finally come to trial in August. In that case, Lockheed Martin Idaho Technologies Company (LMITCO), the former site operator, sued its sister company, Lockheed Martin Advanced Environmental Systems (LMAES) for more than $100 million, including $54 million to refund DOE for LMAES' inability to complete its contract. A memorandum written in 2003 by Judge Lynn Winmill indicated the issues at hand: "[Evidence] lends support to LMITCO's contention that LMAES ignored the uncertainty over the contents of Pit 9 and the potential large cost overruns in order to attract more profitable business in waste remediation. On the other hand, there is evidence that LMAES was misled into thinking that the contents of Pit 9 were relatively benign." While the trial ended in November 2003, the U.S. District Court of Idaho would find for LMITCO almost a year later in 2004.[44] While DOE would be reimbursed, it was a lesson learned concerning privatization.

Good news occurred in October, when the Laboratory moved the last of the Power Burst Facility spent fuel rods out of five underwater basins and safely placed them in dry storage. Removal of the fuels was a milestone in the cleanup effort to empty the basins and reduce the risk of contaminating the aquifer.[45]

The year 2003 closed with a delay of the contract procurement to January 2005 and Bechtel BWXT was asked to stay on board until January 31, 2005. The energy bill had passed the House but was stalled in the Senate due to a Democratic filibuster. Regardless, Senator Craig and others remained optimistic that the Generation IV reactor, that would produce both electricity and hydrogen, was in Idaho's future.[46] Simply said, the reactor was perceived as the Site's long-term future. However for the short term, Bechtel BWXT's new president, Paul Divjak, was not waiting on Washington. He instead intended to look for ways to strengthen the Laboratory's research portfolio, noting that the burgeoning interest in national security and developing high-tech business would engender research. His job was also to shore up morale. The breadth of the changes over the last two years had taken its toll on the workforce and the September layoffs had further impacted Site morale.[47] On the DOE side, Beth Sellers and John Kotek faced different challenges as they took over the reins at Idaho. Both would provide a voice for the Laboratory at home and in Washington. With a clear and defined vision of the future INL as DOE's lead laboratory for nuclear research and an understanding that environmental cleanup was a project not a mission, the transformation had been firmly jumpstarted.

…WHEN YOU’RE EXPECTED TO go revitalize the whole commercial nuclear energy complex for the country as a national laboratory, you’ve got to bring some creativity to the table.
- Beth Sellers

4 BRINGING CREATIVITY TO THE TABLE

(opposite) This almost psychedelic design is actually a simulation of INL's Advanced Test Reactor's interior. INL's advanced simulation capabilities are one area of creative expertise.

A re-evaluation of the nuclear industry was percolating at a number of different levels in American society in the 1990s. Much of this was tied to a national and international "taking stock" that was occurring at the upcoming turn of the century and indeed the millennium. China's economy was expanding exponentially. Global population growth was still out of control, and everybody wanted more coal and gas, both of which are finite resources. To make matters worse, global warming and climate change were of increasing concern. After the terrorist attacks of September 11, 2001, there was also a growing worry about the nation's dependence on foreign oil, a situation that has mired the United States in the volatile Middle East. The California brownouts of 2001, the 2003 blackouts in the Northeast, and the potential for terrorist attacks on the nation's electrical infrastructure, brought the issue of our vulnerable electrical grid to the forefront. Increasingly, it looked as though changes were going to be necessary, and that nuclear energy would be one of the major solutions to many of the energy problems that needed to be faced in the twenty-first century. This was true not just in the United States, but also around the world.

For Idaho, as the previous chapter discussed, the turn-around came in 2003. In that year, the Secretary of Energy, Spencer Abraham, announced that the Idaho site would be designated the premier national nuclear energy laboratory.[1] To show that this was a serious move, the site's sponsor within the DOE complex was changed from Environmental Management (EM) to the Office of Nuclear Energy (NE). Site clean up was still important, but there was now a clear shift toward nuclear energy research.

The Idaho decisions all came together at the same time as the 2005 Energy Policy Act, which had been specifically pushed by the state's congressional delegation. The Idaho site would be reborn as the nation's preeminent nuclear energy research laboratory. Within that framework, the act was specific about the need for energy independence, a larger nuclear workforce, and new reactor types. In recognition of this new nuclear mission, the Idaho site was officially renamed the Idaho National Laboratory (INL) on February 1, 2005 and the transformation initiated in 2003 began to occur.[2]

DIVISION AND UNIFICATION

To foster the growth of this new mission, the functions of the Laboratory were divided into two main categories: clean up and nuclear research. To assure success in each category, DOE elected to select two different contractors, requiring two contracts. Since its inception, the Idaho Site had been operated under several contracts and prime contractors, even though there was some consolidation under Lockheed in the 1990s. This changed in 2005, when the site contract was "split" and two contracts were let to accomplish the Site's two missions. Christine Ott, who served as chief financial officer for the Idaho Operations Office, explained the rationale for the split:

> *There were discussions early on relative to having re-designated the preeminence of the lab over just the cleanup program, whether it would be possible to keep a single contract that would really demonstrate both of those missions. And both of the two program offices, EM and NE, agreed that it just wasn't going to be logical to try to craft a management and operating contract that would give both parties the focus that they needed to have, because there was going to be a heavy lift to try and grow a lab almost from scratch here, because it had been so minimized during the cleanup days. The clean up is also such a divergent type of work that is intended to put itself out of business, so different formations needed to take place. So, early on there was kind of the opinion among the program offices and our office that we're probably going to have to split this up; we just don't think we can craft a single document that would be all things to all people.*[3]

PERSPECTIVE ON THE SPLIT

Ray Furstenau, Deputy Manager for Nuclear Energy, DOE-ID Operations Office - For the Laboratory, the INL, which was split off from the cleanup work, we kept with a traditional, what they call an M&O contract and an FFRDC designation, which is a Federally Funded Research and Development Center. We kept that designation for the lab, kept the contract type cost-plus-award-fee, and then the contract type for the Idaho cleanup project was a cost-plus-incentive-fee, and that revolved around target scope and cost.

[This wasn't suitable for] an R&D effort, since you're not sure what it's going to cost and it's hard to do it under a cost-plus-fixed-fee. So… we tried to motivate cleanup work by focusing on cleanup and the Laboratory contract to focus on research, primarily in nuclear but also another primary mission was homeland security, national security missions, taking advantage of the isolated parts of the site and the security advantages we have with an isolated site.

So that was the big focus, nuclear R&D and also a secondary mission of national security. That was the focus of the lab. We got a contractor that then would specialize… on R&D, and [that could] live harmoniously on the same site [with the cleanup contractor]. That was the trick.

How do you separate the workforce? Who goes to what contractor? It sounds simple enough and you can do that for specific scopes of work, but a contractor then has support organizations like legal [services], buses, cafeteria, contracting work. Under one contract you supported everybody, but now how do you divide that pie up? How do you shift some of that work? So that was quite an effort to [split it up]. Some things they ended up buying from each other. If one contractor didn't choose to have that function they could agree that, Okay you provide that to me, I'll provide you with something else. Eventually they may want to do it on their own and they have this amicable divorce where they can now function as a unit without necessarily depending on each other. There are still activities like the fire department that are done by the Laboratory for the entire site. Buses are provided by the Laboratory for the entire site and the other tenants like NRF [Naval Reactors Facility] and ICP, the cleanup project, then buy that service from the lab. So we had a couple of years [of transition] from when we awarded the contracts in 2005. There were a lot of growing pains from that, or separation pains, however you want to look at it.[5]

Beth Sellers, Manager, DOE-ID Operations Office - When you've got a site of seven thousand people they had to go through and decide who was going to be on the cleanup side of the house and who was going to be on the INL side of the house. The Laboratory [INL] contract was let first, so the perception was if you were picked by the INL you were more special than if you weren't picked and were left over for the cleanup contractor, which from a Department of Energy standpoint is not true. The clean up is dreadfully important. But you know how perceptions go with people. And so there was a lot of consternation on the contractor's side of the house from this. But the contractor leadership tried to be very sensitive to this whole thing and everybody landed in a position before it was all said and done.[6]

Lori Robb, Manager, Records Management Group - In 2005 DOE decided to split the contract into the cleanup side and the research side. Basically we had six thousand employees that didn't know which side they were going to be working for. And there was a head-count restriction on the BEA side, on the Battelle side. We have Document and Records Service Centers, as we call them, at each of the facilities and all of the people that work in those centers worked for me as well as all the people at Records Storage. And when, because of this head-count restriction, BEA extended job offers to all the management personnel, a lot of the staff was left on the CWI side, even though they may not have had anything to do with cleanup. And so I became BEA and everyone that worked for me was CWI. And that relationship continued for a while. I was still their manager but they worked for a different company.[7]

The Materials and Fuels Complex, known earlier as the ANL-W Campus, was designated in 2005.

From the beginning, it was decided that the NE, or nuclear energy, contract would be for 10 years, with five-year renewals. The cleanup contract would be for seven years.[4] The nuclear energy contract was awarded to Battelle Energy Alliance, while site clean up was awarded to CWI, more formally known as CH2M-WG Idaho, LLC. As might be expected, the split in the contract was not easy to effect.

Another change brought growing pains. As part of the reorganization of the Laboratory, it was also decided to unite all nuclear energy research at the Idaho site under one umbrella. This meant finally merging ANL-W with the rest of the Laboratory facilities. This idea had been considered for years, but the split in the contract gave DOE the final incentive to realize the unification of the two research populations, 3,000 on the INL side and 600 on the Argonne side. As a result, when Battelle Energy Alliance took over the Laboratory facilities, Argonne-West was already in the process of being folded into the new program. The Argonne-West campus was re-designated the Materials and Fuels Complex (MFC).[8]

Argonne-West, which reported directly to Argonne National Laboratory in Chicago, had always had a more free wheeling research atmosphere than the rest of the site and the merger was considered a difficult one.[9] It was, however, long anticipated, and by most accounts was handled well. Beth Sellers' take on the merger provides insight:

And I'm sure there were people who decided, No I don't want to go with this new… Laboratory, I want to stay with Argonne Chicago and people had opportunities to make some changes if they chose to take advantage of them. It was a 10-week transition on the Laboratory side of the house, a very short transition, which I happen to think is a good thing. The longer you drag things out, the more difficult it gets because it allows more push-back on decisions that are made. We got through [the merger] in 10 weeks and got the Laboratory started. And its [new] mission was to go enhance nuclear energy for the country.[10]

WORKING THE 60/40 RATIO

"Finish the 60 and grow the 40" had become a common expression at the site, hearkening back to former Idaho Operations Office manager John Wilcynski's observation that the long-term goal was to "clean up the legacy and grow our future."[11] Even in 2005, the basic 60/40 ratio was still the same, with cleanup garnering around $600 million and the Laboratory receiving around $400 million. The goal was to reverse that ratio as cleanup neared completion and as the Laboratory mission grew.[12]

While those numbers make it seem as though the two missions, clean up and nuclear energy research, were fighting it out for funds, they are actually complementary. Both are required, and not just because law mandates the clean up. The two go hand-in-hand. A successful clean up gives the public confidence that any new work will be performed responsibly by the Site. As Ray Furstenau stated:[13]

I think as long as the cleanup work is getting done you can get general support [for new programs]. You're always going to have the factions that love anything nuclear—they've grown up around it, they have generations that work there. I mean, those people are going to like that. Then you've got the middle that might not care that much one way or the other but if the site supports the cities and towns, it must be okay. So they're okay with it because it's providing jobs and secondary jobs. And then you have factions that don't like anything nuclear, it doesn't matter what you do. The more logical folks say, Okay you're going to do something new in nuclear. Clean up your old mess first…. If you're going to go do new R&D, maybe build new plants here, why should we endorse you doing that if you can't even clean up the legacies that were created in the fifties, sixties, seventies? By doing the cleanup, and there's been a lot of good work done to give evidence to that, Okay we'll support your [new work]. Maybe we're not nuclear fans but you're doing what you said you were going to do so we'll support you on that. And so I think that's why the cleanup work is so important…. The milestones that we agreed to, going back to the Settlement Agreement, are being met. And that provides the background to say, Okay, you guys are doing what you said you were going to do.[14]

As mentioned before, the split in the contract required a new round of contractors. The cleanup program was awarded to CWI (CH2M-WG Idaho, LLC). Another smaller on-going cleanup program, the Advanced Mixed Waste Treatment project, was assumed by Bechtel BWXT Idaho, LLC. The nuclear research contract was for the operation of the INL. This contract, considered the main one at the site, went to Battelle Energy Alliance, LLC (BEA). BEA is a consortium comprised of Battelle, BWX

Innovative Contract Management

Beth Sellers, 2010 - When we put these contracts in place in 2005, we had established a process within the field office here that we were going to train everybody on what was in these contracts, what contract management was all about, because frankly the Department of Energy does oversight in contract management. We don't make the technical decisions, we lay that on the contractors with our contracts. And so we had a lot of interesting discussions on the Department of Energy side of the house to tell our people, "no you can't tell the contractor what to go do, no, that's way too much detail." They have performance objectives in their contracts and we write them every year. We have over-arching performance goals for the contractors and that's what we're going to manage them to. So we took each one of the contracts and did a detailed training class on it—we had four modules actually that were created just for this site, and made little baby contracts out of each of the contracts, the salient points that were good from how DOE interfaces with a contractor standpoint.

And these little pocket contracts became everybody's best friend. And when people would sit down in meetings and say, "Well I think the contractor needs to go do this and that, well is that DOE's decision? Well let's check it out." And you can just flip and go, "No I don't think that is. I think that's already written down and that's the contractor's decision, [it has] already been decided that this contractor has to go implement it." So we had to do change on the DOE side of the house. It's not enough that you're expecting the contractor to change, DOE has to change as well or everything falls apart. And how many times have we seen that in the Department of Energy, where we put a contract in place but DOE will not keep their fingers out of it. It's just human nature. I think there is also a lot of pressure from Congress and stakeholders to do things differently after you put a contract in place. And a Management and Operations (M&O) contract is a different contracting mode than anybody else in the world uses. It does allow the DOE a lot of flexibility on doing change without having to go through lots of documentation and change orders.

So we put that contract deliberately in place because we wanted the flexibility. Because, if you remember, we had contracts that lasted 50 and 60 years, and so we wanted to be able to make changes in those without having to go through a lot of rigmarole from a contract management standpoint, but we wanted to do it differently here in Idaho because it was time. DOE was getting beat up by the Congress, beat up by the GAO, beat up by anybody who was paying any attention to us about screwing up all our contracts. And so we wanted to do good contract management over here, and so we started back in 2003 with that whole impetus, spent time training people in 2004, and then when these contracts were let in 2005 we did training on the specifics of what those contracts maintained. And then we did annual refreshers every year after that about, Okay what went good and bad this year?

The interesting piece of this was that DOE knew that contract better than the contractors did. The contractors were used to working in the old mode of doing business. They were used to being spoon-fed. It's very easy if you're a contractor if you've got the DOE telling you all the time, Go do this, go do that. Whispering behind the [scenes] or even put it in writing. It was very easy to manage a contract at that point in time. But when you're expected to go revitalize the whole commercial nuclear energy complex for the country as a national laboratory, you've got to bring some creativity to the table. They're the experts, and so it's a different level of expectations. And so DOE-Idaho got recognized for that several times. The under secretary recognized us one time for it, and we were written up in a government partnership for public service. They used us as a case study on good contract management in government. It doesn't get any better than that.

From left to right: Nancy Schweitzer, Montana Governor Brian Schweitzer, DOE-ID Manager Beth Sellers, INL Laboratory Director John Grossenbacher, and INL's Director for Advanced Energy Studies Dr. J.W. (Bill) Rogers, Jr.

Technologies, Inc., Washington Group International, the Electric Power Research Institute, and an alliance of various universities, led by MIT.[15]

The BEA operation at the Laboratory really has three main focuses. The first and most important is nuclear energy research. The second is programs associated with National Homeland Security, an area of research that has grown dramatically since the terrorist attacks of September 11, 2001. The third is energy and environment, which entails research on themes pertinent to energy but only peripherally concerned with nuclear research. This includes topics such as bio-fuels, electric cars, and batteries. The Laboratory was to be a multi-program laboratory with a primary focus on nuclear research.

While the nuclear energy mission is the main purpose of the Laboratory, the second mission, dealing with Homeland Security, is significant as well. It has grown considerably in recent years since many customers want to use the site due to its size and isolation. The Homeland Security mission is covered by an umbrella program that includes all Laboratory work not done for the DOE, referred to as "Work for Others."[16] To oversee all of these various Laboratory activities and generate growth requires a good laboratory director.[17] Battelle's John Grossenbacher has held this position since 2005.[18] Before joining Battelle, Mr. Grossenbacher had a distinguished career with the U.S. Navy, achieving the rank of Vice Admiral and Commander of the U.S. Naval Submarine Forces. Educated at the U.S. Naval Academy, he completed his graduate degrees at Johns Hopkins University and then completed the Harvard University Graduate School of Business Administration Program for Management Development. By all accounts, he has been successful at growing the 40.

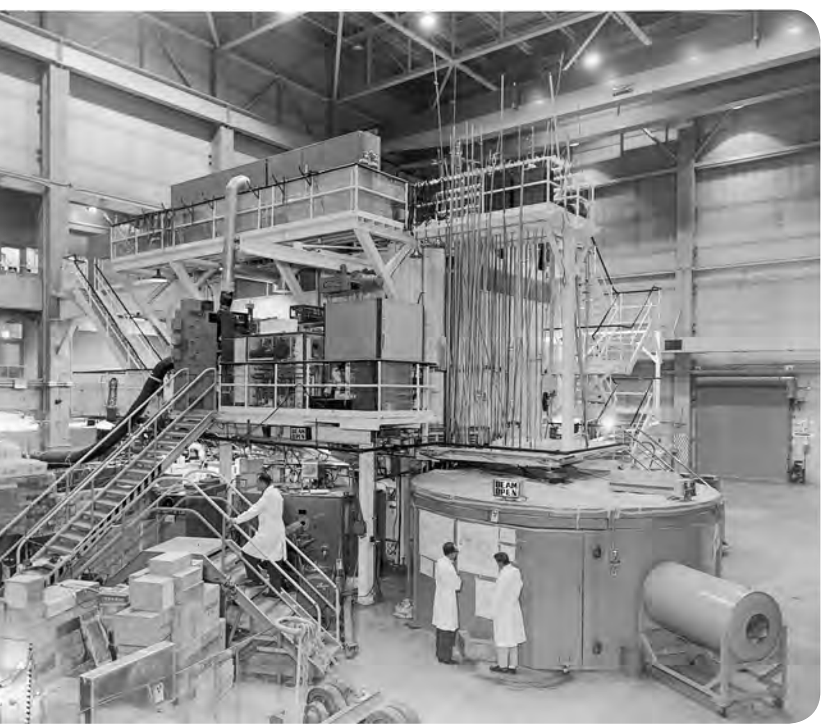
RETURN TO NUCLEAR ENERGY RESEARCH

In the early 2000s, there was a surge of interest in the greater use of nuclear energy as a means of solving some of the nation's gravest energy problems. Almost all Americans are concerned about the nation's energy dependence on oil from unstable and vulnerable parts of the world. The nation's energy supply is just too vital to our economic well-being to allow this situation to fester as it has for the past few decades. In addition, nuclear reactors produce no greenhouse gases, and are not limited by the availability of sun, wind, or river in the production of electricity.

The Laboratory was the first place to test the idea of using reactors to produce commercial electrical power. In fact, one of the test reactors from the 1950s, the Materials Test Reactor (MTR), has been called the mother of all American power reactors. With EBR-I, the Idaho site was also the first to show that it was possible to breed nuclear fuels.[20] In the years since the heyday of EBR-I and the MTR in the 1950s, there have been about 130 commercial nuclear power reactors constructed in the United States, and almost all of these were built in the 1960s and 1970s.[21] These plants, many of which are aging, produce around 20 percent of the nation's electricity. As has been stated earlier, due to the unfortunate accident at Three Mile Island and the disaster at Chernobyl, nuclear reactor construction has been on hold, at least in this country, until very recently. As late as 2005, President G. W. Bush could state in a speech that "America has not ordered a nuclear power plant since the 1970s, and it's time to start building again."[22]

Since 2005, the mission of the Laboratory has been to facilitate that building, an endeavor for which it is ideally suited. The groundwork was laid in 2003,

The Materials Test Reactor (1952-1970) was the second reactor built at the National Reactor Testing Station, now the INL. Used to test materials' performance in intense radiation environments, it has been called the "mother of all American power reactors" by professional historian Susan Stacy.



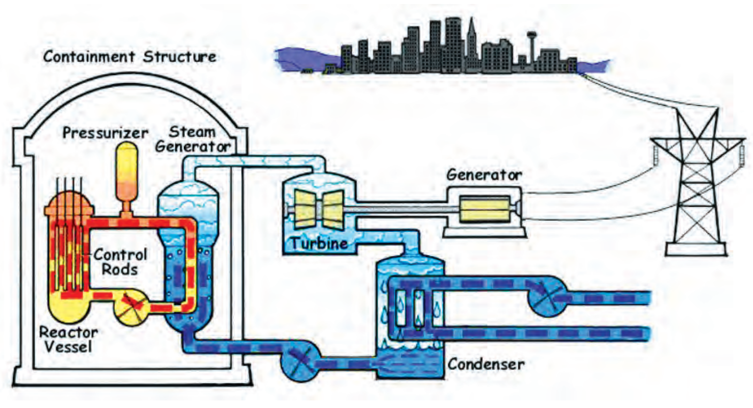
when the Laboratory was designated the nation's preeminent nuclear energy laboratory by the Office of Nuclear Energy, the office within the DOE complex that has been charged with advancing the nuclear energy agenda. The NE research budget has expanded from $193 million in 2003, to $320 million just three years later, an increase of 70 percent.[23]

The Laboratory's expanded missions are primarily nuclear, but they have branched into other areas where nuclear energy has some application. In addition to nuclear reactor and fuel research, there is research on the production of hydrogen by nuclear power for a new generation of industrial uses. There is an over-arching concern to make all existing and new energy systems more efficient, by whatever means possible.[24]

John J. Grossenbacher is a strong believer in the nuclear future, but recognizes that no one single way will work in the future, as it did in the late twentieth century: "INL is at the center of the national effort to bring advanced, environmentally sensitive energy technologies to the American consumer."[25] To make a success of the new nuclear energy program, it is essential to mix a number of different goals as well as time-perspectives. Nuclear research in the 2000s has both short-term goals and long-term goals, and both must be achieved to ensure the success of the nuclear renaissance. The Laboratory, sitting in the cockpit of the nuclear renaissance, is tasked with overseeing this success, not by command but by example. As Dr. Harold McFarlane, Deputy Associate Laboratory Director of Nuclear Programs at INL, once commented, the Laboratory needs to be an "honest broker" in the whole process, without an ax to grind in the selection of technologies and materials. As he has stated:

> *[The Laboratory has] to provide technical expertise and advice to DOE when various organizations come in with… proposals and claims, to be able to evaluate them, not to advocate or disparage but… try to state things in a objective way. We need to maintain the expertise for that kind of thing. More importantly, we are central to leading and organizing the research in some of the key areas for advanced nuclear systems, the technology associated with them, in particular developing advanced fuels for future types of reactors. This is a very long-term process historically, something that takes on the order of twenty years, so it requires very specialized facilities that we have… at the INL. Some of [the facilities] are very expensive to replicate. In this [cost-cutting] era it's more likely that we'll see consolidation for these sorts of high-cost, high-maintenance facilities.*[26]

It is one thing to talk about a nuclear renaissance but carrying it out requires concrete steps. Any renaissance of the nuclear mission has got to address the immediate need for more electrical power from nuclear reactors. This is the short-term mission for the Laboratory. This research



Light Water Reactor

is specific to light water reactors since those are all that are currently in use in the United States. In the rest of the world, light water reactors comprise approximately 80 percent of all power reactors. It is the most feasible technology in any hypothetical expansion of the U.S. nuclear industry, and much of the global nuclear industry, within the next 50 years.[27]

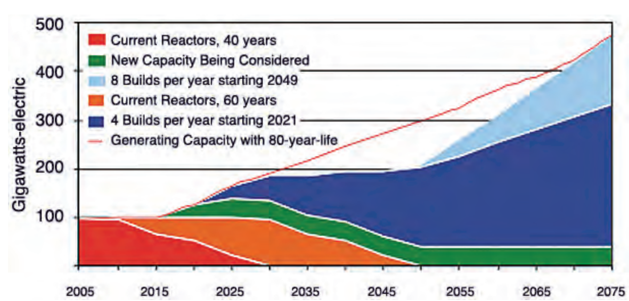
In earlier decades, U.S. government reactor research has concentrated on non-light water reactors, leaving light water research to the commercial nuclear industry.[28] Considering the cost of nuclear expansion, federal research will have to retool to address the current issues that must be met in order to bring nuclear energy back to the forefront, as it was for a while in the 1960s. It is estimated that the government and industry will have to share the costs of both the new research and expansion.[29]

There are at least three main concerns in the short-term research required for the nuclear renaissance, and these include: 1) problems with the nuclear infrastructure; 2) extending the life of existing commercial reactors; and 3) the development of new forms of light water reactors. All are crucial, but none more than infrastructure. In the U.S., the nuclear infrastructure dates to the 1960s and the 1970s. The nuclear industry itself is a skeleton of what it was in the 1970s. Nuclear construction crews are currently too small to handle any sort of major expansion. The old manufacturing centers are mostly gone. Even government regulation is a problem; the Nuclear Regulatory Commission (NRC) will have trouble approving any new projects that face these sorts of limitations.[30]
Another related issue is the need to extend the life of existing commercial reactors, most of which were built in the 1960s and 1970s and were licensed for 40 years. In 2007, the existing U.S. commercial reactors was comprised of 104 nuclear plants, located on 66 sites in 31 different states. The push now is to expand those licenses for another 20 years, and possibly 40. To do so would require a number of upgrades. Reactor tanks and other equipment, as well as old analog control systems, might have to be replaced. The Laboratory is greatly involved in the research needed to extend the life of current reactors and their components.[31]

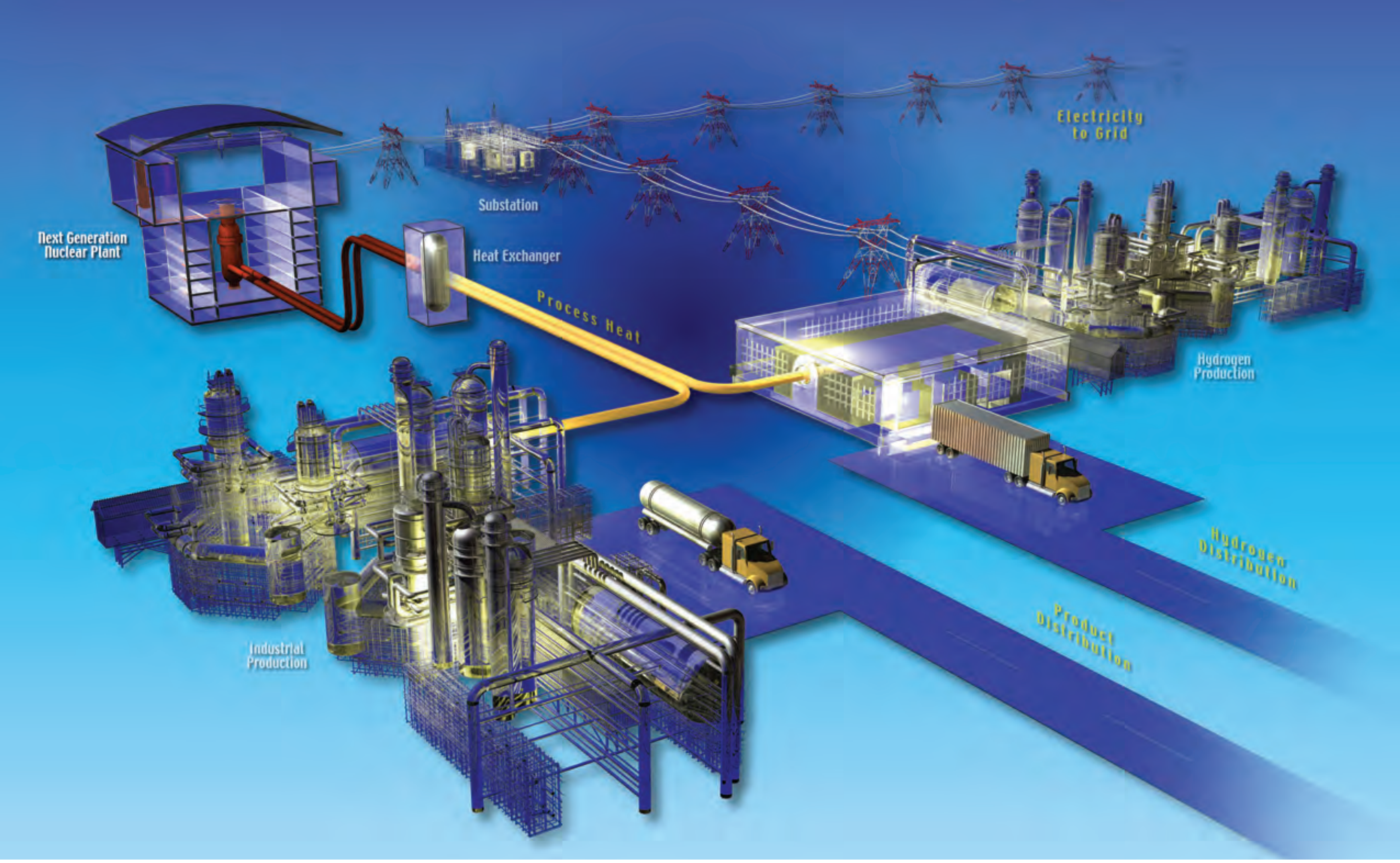
Preserving the existing reactors will not be enough to bring on a renaissance. There will have to be more reactors. Back in 2002, DOE established a program called "Nuclear Power 2010," designed to facilitate the establishment of new nuclear power plants by streamlining the selection of new sites and expediting the whole permitting process.[32]

Work is also being done on new types of light water reactors that would work well with existing reactors. This includes mass-produced small modular reactors installed in much less time and at much less cost than a typical commercial reactor.[33] Perhaps more critically, there is new research on the development of Advanced Light Water Reactors (ALWR), considered essential for any major expansion of nuclear facilities in the United States. These would require new high-voltage lines and modern digital instrument and control systems.[34]

The long-term mission of the Laboratory is to design and sponsor the next generation of commercial nuclear plants,



Nuclear Electricity Generation Capacity



Generation IV- Next Generation Nuclear Plant (NGNP)

plants that would not be limited to light water technology. With the rise of global warming and world population increase, the need for more powerful nuclear reactors is self-evident, not just in the United States but also around the world. As of 2008, there were 439 commercial nuclear plants in 31 countries, producing 16 percent of the world's electricity.[35] All of these numbers will have to increase if the world is to have electricity without greenhouse gas emissions. The generic name for these new reactors is "Generation IV," and the Laboratory will be the place where much of this research, certainly the research done in the United States, will take place.

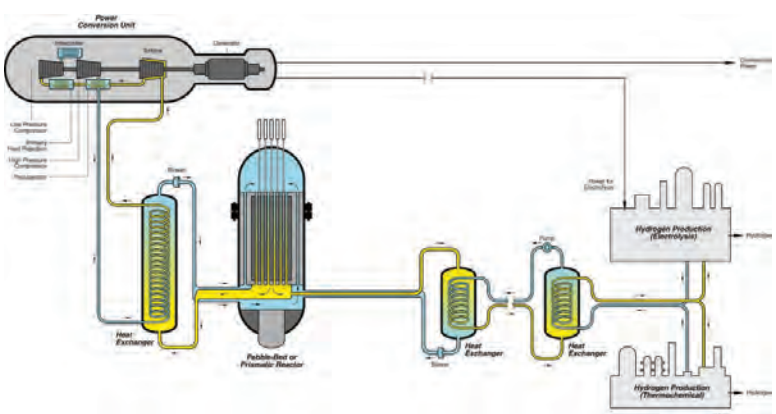
"Generation IV" requires some explanation. Since the 1950s, there have been three generations of commercial nuclear reactors. Generation I were the experimental reactors of the 1950s and 1960s, many of which were constructed and tested at the Idaho site. Generation II are the large central station power plants built in the 1960s and 1970s, most of which are still in place. Generation III are the next generation experimental reactors, such as the passively safe advanced reactors. Generation IV reactors have yet to be built. They will have to be more powerful, yet safer than the reactors in operation today. They will have to "meet the challenge of domestic and international needs" by being resistant to nuclear weapons use and materials proliferation. They also must produce less radioactive waste, and be more economical.[36] The NGNP will produce heat for industrial manufacturing, as well as electricity for homes.

At present there are six possible technologies that might power Generation IV reactors: very high temperature; molten salt; sodium-cooled; supercritical water cooled; gas-cooled; and lead-cooled reactors. In recent years, research has been leaning toward the development of high-temperature gas-cooled reactors (HTGRs) and liquid metal-cooled reactors (LMRs). These would have marked advantages over the current light water reactors by providing a tremendous amount of extra process heat. This heat could have many applications, including cracking water vapor for hydrogen, valuable in future industrial applications.[38]

So far, the most promising of the six possible technologies appears to be the very high temperature gas-cooled reactors that could operate at temperatures of 1,000 degrees C, far surpassing the current limits of light water reactors, which can only reach 300 degrees C. It is expected that these new reactors will be able to get three times the power out of the same amount of fuel, with a 13 percent burn-up rate rather than the usual 3-4 percent with the current light water reactors. They could also be made safer as well. David Petti, the Very High Temperature Reactor Technology director at the Laboratory, has stated that:

> *"...the integrity of the individual fuel particle in the reactor has historically been the first line of defense in reactor safety, so for us these new 'superfuels' are very exciting developments with enormous potential to improve power, efficiency, and the lifetime of our new and operating commercial reactors."*[39]

The goal of the Generation IV research is to have the new reactors ready for use by 2030 or by mid-century.[40] An integral part of the Generation IV research is the development of the "Next Generation Nuclear Plant," the NGNP. This is the flagship project for the



Conceptual diagram for a Very High Temperature Reactor (VHTR).

Laboratory, and was specifically written into the 2005 Energy Policy Act by Senators Pete Domenici of New Mexico and Larry Craig of Idaho.[41] Present research would suggest that this next generation reactor could be some sort of commercial-sized modular gas-cooled thermal reactor, using a helium coolant. It could generate electricity, hydrogen, or both.[42]

The NGNP is a big project, but the emphasis has shifted from one aspect to another over the years, as is often the way with experimental research. The work on the NGNP was delayed so frequently that the prototypes have already been designed in other countries. It is now more common to consider building the NGNP for process heat.

In recent years, it has looked more and more likely that the NGNP will be built somewhere else as required by the needs of the petrochemical industry.[44] As a research topic, the main shift at the Laboratory has already moved away from a completely new NGNP to one of the most critical aspects of the reactor operation—the development of a closed fuel cycle.

The development of a closed fuel cycle is part of the Advanced Fuel-Cycle Initiative, a program designed to advance the economy of nuclear energy and also secure the goal of nuclear non-proliferation around the world.[45] It is now one of the most prominent DOE research and development programs, dedicated to the development of new nuclear fuel cycles.

Different Perspectives on Generation IV Reactors

Why would you need hot gases in a commercial reactor?

Most of our reactors today are light water reactors, which means they're cooled or moderated by light water. And they're optimized for the production of electricity. High temperature reactors open the door for doing other things, because basically a reactor is no more than a means of providing heat, using fission. And if you use gas as a coolant you're able to create a higher temperature outlet. The light water reactor is optimized to produce hot water under pressure… and then run it through a turbine and produce electricity. The idea here is to take hot gas and have that be the product. Now what the heck do you need hot gas for? Well, it turns out that all the chemical processing, oil processing, everything like that, normally requires the burning of coal or natural gas to create the high temperatures needed to drive chemical processes. And it's dirty from a CO_2 point of view and expensive. You're also using a raw material that could be processed into a chemical as a feedstock. So the question is, Can you design and build a high temperature reactor economically that could serve that mission? And we've been pursuing that now here for about five years, spent $500 million I believe or thereabouts on it. And hopefully there'll be a prototype built either here in Idaho or somewhere else. Now why somewhere else? We think that to get this built, industry has really got to want it. And if they're going to bring money to the table, frankly they get to choose where it's built. And they're more likely, because they want to demonstrate these process heat applications, to choose a site where there is chemical processing going on today. But that's an undecided question.

- Dave Hill, Deputy Laboratory Director- Science and Technology at INL, 2010

How the NGNP could be better than the light water reactors - electricity and process heat.

Our commercial reactors in the U.S. right now are called light water reactors. They basically use water as the moderator… and the coolant. That limits the temperatures at which you can operate. The two [current] types are either boiling water or pressurized water. Those are the two types of light water reactors we use in the U.S. right now. One boils the water and one pressurizes the water, the primary coolant water. So you have some restrictions on… how high a temperature you can operate at because you're dealing with water. Now, the thought with the high temperature gas reactors is that you can operate at much, much higher temperatures. Where a light water reactor may be limited to maybe 300°C, a high temperature gas reactor can reach outlet temperatures of 750°C to 1000°C. When you get to higher temperatures, efficiency goes up for generating electricity and then you [also] have high temperature process heat applications that other industries like the petrochemical industry could use. So it could be used as an electricity generator or just a way of making process heat. In the petrochemical industry, they use heat to develop their products and they burn hydrocarbons to get the heat, so they have to burn their own feedstock. Oil is such a valuable commodity, it's such a compact transportation source, why waste it? Why waste it on the mundane process of generating heat? Let something else do that. And nuclear is ideal for that. So that's kind of the concept, use a non-carbon emitting source to provide that process heat that the petrochemical industry may need. And a high temperature gas reactor like a Next Generation Nuclear Plant can provide that higher temperature, whether it's process heat for [chemical processing or for] more efficient hydrogen generation, for cracking water to make hydrogen which can then be used as a transportation fuel.

- Ray Furstenau, Deputy Manager for Nuclear Energy, DOE-Idaho Operations Office

A fuel cycle is the entire life span of nuclear fuel, from acquisition, fabrication, use, re-use, and disposal. The goal of any new fuel cycle arrangement is to provide greater efficiency and greater safety, especially in the area of non-proliferation. Research in this area has concentrated on generating higher rates of fuel burn-up and creating less waste.[46]

In the United States, the issue that really drives the push for closed fuel cycles is our inability to find a politically acceptable location for the final disposal of spent nuclear fuel waste. As was stated by the former Assistant Secretary of Nuclear Energy, Dennis Spurgeon, there is no good reason to waste so much fuel that would then have to be stored in temporary facilities.[47] The government has long recognized that fuel has to be made more efficient.

There is also the issue of non-proliferation. Light water reactors, the vast majority of all reactors around the world, require enriched uranium to operate. The normal level of the isotope U-235 in natural uranium (U-238) is a mere 0.7 percent. Even though light water reactors operate with just low enriched uranium (LEU) - uranium with levels of U-235 increased to 3-5 percent - the problem remains that if you can make LEU you could also eventually make the more dangerous highly enriched uranium (HEU), even weapons-grade material.[48]

The Laboratory has a big role to play in the major non-proliferation programs endorsed by the DOE. It has helped remove HEU from places like Kazakhstan in the former Soviet Union, as part of DOE's Global Threat Reduction Initiative.[49] It also has been designated one of the International Nuclear Fuel Cycle Centers, which might be called upon in the future to provide nuclear

(Above and Opposite) INL today has multiple facility areas to carry out its charge for innovative nuclear research mission. The Research and Education Campus, which houses the Laboratory's administrative, technical support and computer facilities, and the in-town laboratories, is located in Idaho Falls. The INL Research Center and the Center for Advanced Energy Studies are in-town facilities.

The ATRC is located on the southwest side of the federal property. Its facilities include the Advanced Test Reactor, Advanced Test Reactor Critical Facility, Radiation Measurement Laboratory, Radiochemistry Laboratory and the Safety and Tritium Applied Research Facility.

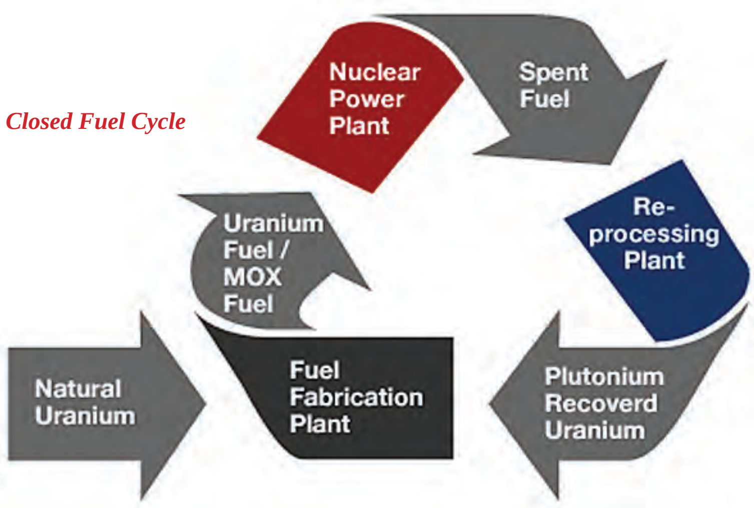
Finally the Materials and Fuels Complex, once Argonne –West, is located on the south east part of the site. Its facilities include the Hot Fuel Examination, Fuel Conditioning, Fuel Manufacturing, Space and Security Power Systems, and Transient Reactor Test facilities.


MATERIALS AND FUELS COMPLEX


ADVANCED TEST REACTOR COMPLEX


RESEARCH AND EDUCATION CAMPUS

Closed Fuel Cycle



fuel to various participating countries, under the condition that the spent fuel is returned to the sender. This would discourage many countries from making their own nuclear fuel, thus creating technologies that might threaten non-proliferation.[50]

The Laboratory's current campus arrangement reflects its nuclear energy research focus. During past incarnations of the facility, there were as many as eight different major work areas. For the INL, the Laboratory's configuration is simplified, with most reactor and reactor materials work limited to just three areas. Two of these, the ATR Complex and the Materials and Fuels Complex, are located on the Site. The third, the Research and Education Campus, is located in Idaho Falls. The new facilities, particularly the facilities at the Research and Education Campus, support the new collaboration that is anticipated between government and industry in the realm of nuclear research.[51]

The ATRC is located on the southwest side of the federal property. Its facilities include the ATR, Advanced Test Reactor Critical Facility, Radiation Measurement Laboratory, Radiochemistry Laboratory and the Safety and Tritium Applied Research Facility.
The MFC, formerly Argonne –West, is located on the southeastern part of the site. Its facilities include the Hot Fuel Examination, Fuel Conditioning, Fuel Manufacturing, Space and Security Power Systems, and Transient Reactor Test facilities.

This research shift from the NGNP, which is still awaiting its final shape and location, to a more immediate concern with closed fuel cycles, is reflected in this arrangement. The MFC hosts much of the new research on fuel cycles and other aspects of nuclear fuel development.[52] There are a number of different programs at the MFC. It is the site of the soon to be D&D'd Experimental Breeder Reactor II (EBR-II), in operation from 1964 to 1994, the first breeder reactor to produce more fuel than it used. EBR-I proved this concept. The Fuel Conditioning Facility began in 1964 to do reprocessing for the EBR-II and now is devoted to the issue of spent fuel. There are many other programs, including the Advanced Nuclear Fuel Development and Examination Program. A major part of this program involves taking nuclear fuels made in the MFC and testing them in the ATR, followed by an examination in the Hot Fuel Examination Facility.[53]

One of the programs, housed at the MFC, is the Center for Materials Science of Nuclear Fuel. This is one of 46 Energy Frontier Research Centers announced by the DOE. The purpose of the Center is to create computer models to predict the behavior of materials in nuclear reactors and to validate those models.[54]

Two main features of the new campus arrangement are the ATR, constructed back in the 1960s within what was then Test Reactor Area, and the Center for Advanced Energy Studies (CAES) established within the Research and Education Campus in Idaho Falls. These two facilities, one old and one new, are crucial to the new nuclear energy missions of the Laboratory.

ADVANCED TEST REACTOR

The ATR is known as the world's largest test reactor. It was begun in 1967 for nuclear propulsion work for the Navy.[55] During this period, its main function was "to prove out the fuel and other materials for the reactors that powered submarines and aircraft carriers." Even though it was under-utilized for a period after that, as late as 2005, its main mission was to test reactor fuels and materials for the Naval Nuclear Propulsion Systems.[56] Beginning that year, however, its mission was expanded to include research for the development of the next generation nuclear reactors and materials for those reactors.[57] In 2007, the ATR was designated a National Scientific User Facility (NSUF).[58]

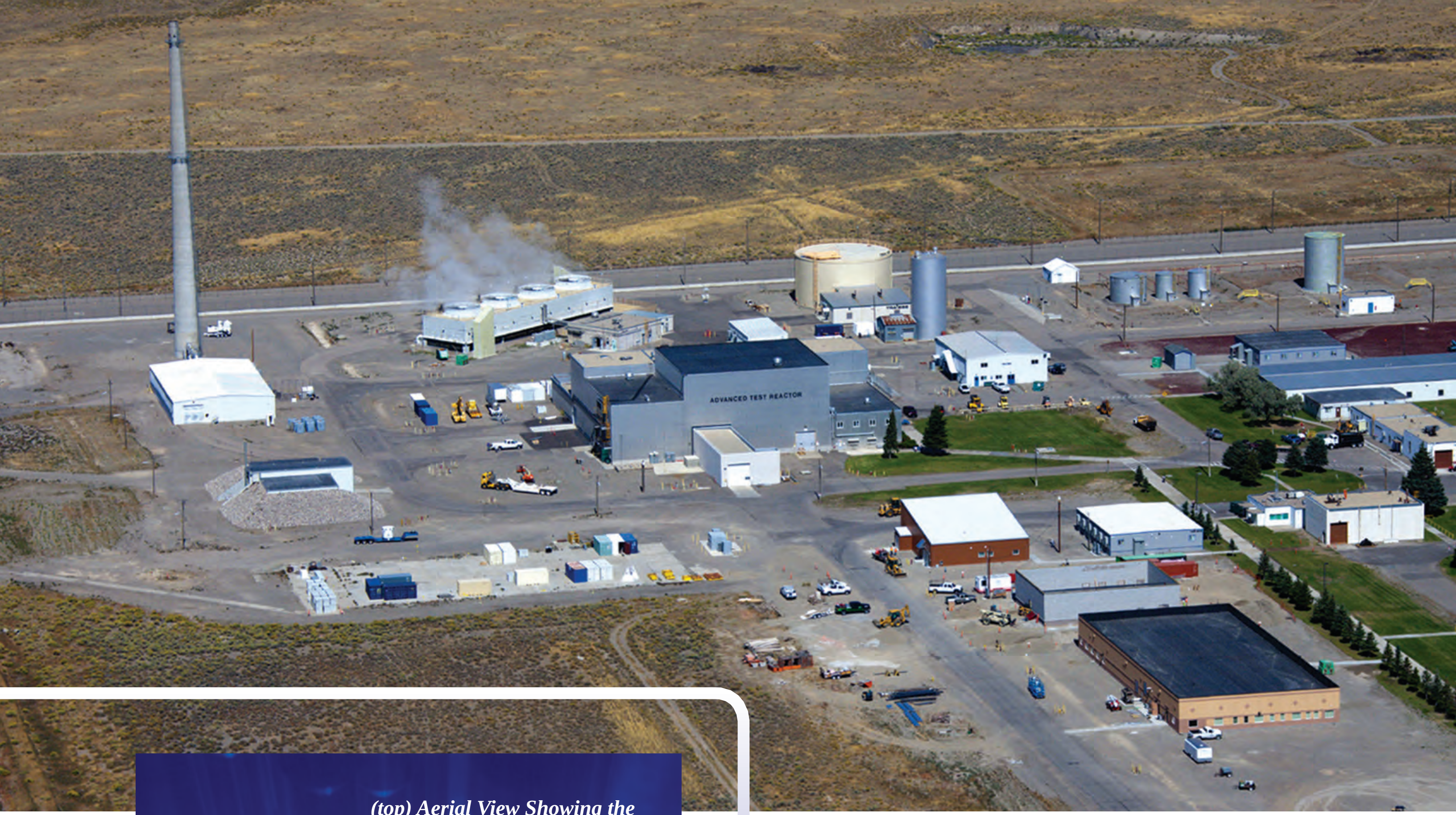
The ATR is ideal for research on new commercial reactors. It is a pressurized light water moderated, beryllium-reflected reactor that has been in operation for over 40 years.[59] Navy reactors all use light water, for obvious reasons, and U.S. commercial reactors do the same, largely because they were modeled after the success of the early Navy reactors. Furthermore, the ATR can generate very high neutron flux, allowing materials to be tested for their reaction to high temperature, high pressure, and high levels of radiation. The ATR has been called a "time machine" and a "high octane reactor." With its high flux, it accelerates the effects of

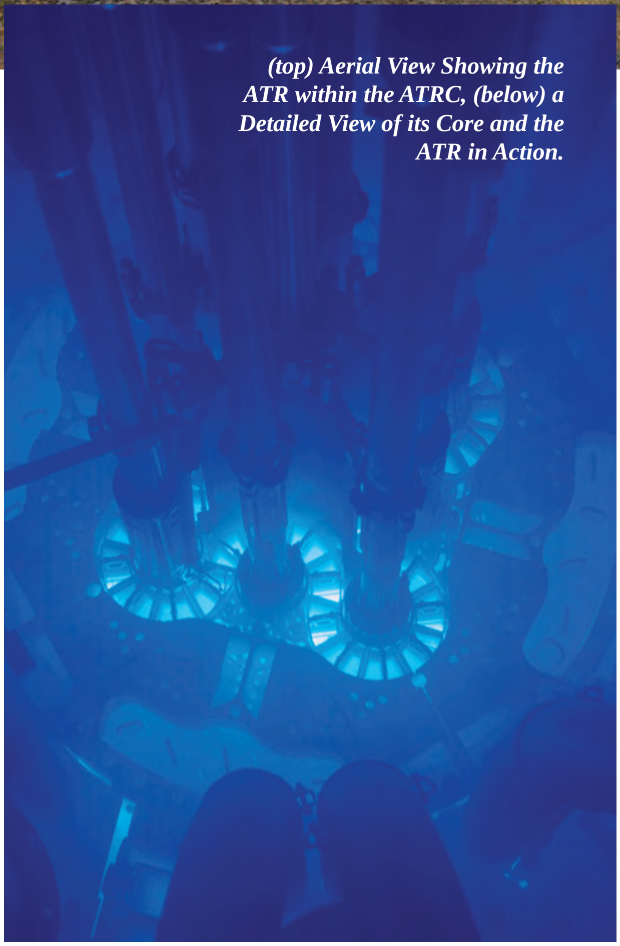
Reactor Technology Complex Back Story

The Reactor Technology Complex, home of the ATR: The original purpose of the ATR Complex was to support high neutron flux reactors and test the effects of irradiation on reactor materials, fuels, and equipment. It was first established in the 1950s, and one of the first things constructed was the MTR, located in Building TRA-603. This seminal reactor was followed by others, namely the ETR in TRA-642, and the ATR in TRA-670. Only the ATR is still in operation (Action Memorandum ETR 2007:3), and it is the main focus of the new RTC. The name of the Reactor Technology Complex was later changed to the Advanced Test Reactor Complex.

The Research & Education Campus

This contains the Laboratory administrative facilities, including technical support, and general laboratory and computer facilities. It is Laboratory's public face, one of the Site's three main campuses for the new research mission to position itself at the forefront of the nuclear renaissance. It is dedicated to find the best "secure, sustainable energy solutions" for the future of the country and the globe (Join the Energy Renaissance n.d.:12; INL 10 Year 2007:2.14).





(top) Aerial View Showing the ATR within the ATRC, (below) a Detailed View of its Core and the ATR in Action.

exposure to radiation, providing wear results within days or weeks rather than months or years. Even though it has been in operation for decades, it is constantly being rejuvenated. Its core internal parts are replaceable, and they are replaced every 8-10 years.[60]

There are other facilities that operate in conjunction with the ATR. These include the Advanced Test Reactor Critical Facility, the Radiation Measurement Laboratory, the Radiochemistry Laboratory, and the Safety and Tritium Applied Research Facility.[61]

The ATR figured prominently in the new research mission of the Laboratory, especially after it was designated a NSUF.[62] This designation opens up the reactor to use by new customers, in addition to the Laboratory and the Navy. This development was especially well received by the light water reactor community operating small research reactors in various universities around the country. The first experiments from these facilities were selected for the ATR in 2008, and since that time, schools as varied as MIT, the University of Florida, North Carolina State University, University of Illinois, University of California-Santa Barbara, Utah State University, University of Wisconsin, and the Colorado School of Mines, have all used space and facilities at the ATR complex. The ATR also supports an education program on reactor use, as witnessed by summer courses, internships, and various team projects.[63]

The ATR is critical to the new Laboratory mission, which is to expand nuclear research not just at the Laboratory but also around the entire country. As Dave Hill, Deputy Laboratory Director of Science and Technology, stated:

> *Designating ATR as a National Scientific User Facility was very, very important. With that came the ability to offer the space inside ATR to competitively awarded experiments and we chose to do that to proposals that were led by universities. So we're trying to broaden the user base, making the capabilities here available to a wider range of users. I don't remember off the top of my head how many experiments we have running right now, but half a dozen… all competitively awarded, led by groups from University of California-Santa Barbara, and University of Illinois is in the mix there, Drexel, North Carolina State. And we even went further than that. We recognized on seeing some of their proposals that the work being proposed might not use ATR's full capabilities but could be done more cheaply and more simply at other test reactors around the country. So we made partnership deals with, for example, MIT, for the use of the MIT reactor. Same competitive process, but now the experiment might go off to MIT to be irradiated, and come back here to be examined. It doesn't even have to come back here because we extended the model and brought in other university facilities as partners and now it might go to MIT to be irradiated and to Wisconsin to be looked at if it can be done safely, if the sample is small enough that it doesn't represent a radioactive or a radiological threat.*
>
> *In conjunction with that, we run a user's week in the summer. The one that just concluded had about 150 students here. We teach them about irradiation damage and how to do experiments. One of the exciting things about that is we're drawing in what I'll call non-traditional universities, ones without nuclear engineering departments who are getting interested in the subject, because there's interesting research and money to back it. So we're really broadening the base of research for nuclear energy, using our facilities as a lever to do that. It's really quite an exciting time.*
>
> *If the examination work is done here, it's done at MFC. And so we'll see over the start of this year results start to come out of that and from examinations at MFC. We're even extending [work] to foreign corporations now. The basic principal here is that these*

ATR Researchers

facilities are [unique]. It's impossible to conceive that we'll build their like again any time soon. So the object is to take these facilities, for which we are the stewards for the country, and to bring them together with the best ideas, the best people, rather than just treat it all as Idaho's issue. So that's how we're applying the user facility concept around ATR and the associated facilities.[64]

CENTER FOR ADVANCED ENERGY STUDIES

Another integral element to the new Laboratory mission is the CAES, created in 2005 and located on the Science and Technology Campus in Idaho Falls. This off-site location makes the facility more available to outside and independent researchers.

CAES was created with the idea that it would serve as "an independent entity, in which the INL and Idaho, regional, and other universities cooperate to conduct on-site research, classroom instruction, technical conferences, and other events for a world-class academic and research institution." The main purpose of the CAES is to popularize and spread nuclear research and education. Its official function is to serve as a world-class center of "thought leadership" on nuclear issues. This is in recognition of the need for the U.S. to produce a new crop of nuclear scientists and engineers, people that will be essential if we are to move forward with a nuclear renaissance.[65]

The formal inauguration for CAES was in May of 2005, and the campus was dedicated on February 20, 2009, after a construction cost of $17 million. The center was built to Leadership in Energy and Environmental Design (LEED) Green Building standards.[66] With a staff of around 100 people, it was to house all, or parts, of four different research and development centers: Advanced Modeling and Simulation; Nuclear System Design and Analysis; Fuels and Materials Research; and Space Nuclear Research. Its over-arching principle is to do all manner of basic research to secure future energy needs, concentrating on nuclear energy, but certainly not limited to that. Some of the research topics include: Generation IV reactors, gasification technologies, hydrogen research, and carbon sequestration technology. More specifically, it was expected to evaluate nuclear fuels for industry and government, test new fuels for advanced reactors, support services for the ATR, and provide modern research facilities for universities, industry, and international guests.[67]

CAES was always considered an integral part of the new Laboratory mission. As Christine Ott stated:

We wrote in [the original 2005 contract] that we wanted… whoever won the lab contract to establish a Center for Advanced Energy Studies, which would draw heavily on universities across the country, across the world for that matter, as well as industry to the extent that it fit. And so the university programs were always an integral part of what we thought we were going to be getting when CAES was originally envisioned. And the university programs have been very good for the Idaho schools. I mean, they paid a lot of attention to what the workload was going to be here and the nature the R&D work was going to be, but there are a lot of universities from outside of Idaho that are active in the university programs. And I think it's been good for the Idaho schools, but I think it's also been good for those projects that go to MIT or Ohio or North

(above) The 55,000-square-foot CAES building is one of the only "green" structures in eastern Idaho. CAES is registered for Leadership in Energy and Environmental Design (LEED) certification and plans to certify at the Gold level, the second highest rating.

(right and below) Site leadership breaks ground for the building in 2005.

Carolina. When you get all of those researchers in here and a lot of those grad students, the crosstalk is really valuable, whether they take some of that back to their own schools or just learn to appreciate something more about universities other than their own, because there's a lot of collaboration that takes place. So again, that was something that was consciously built in, that we wanted to have more of a university presence. Most [DOE] laboratories [already] have an immediate connection with a single university, like Argonne, which was actually run by the University of Chicago, or the Defense Labs that are aligned with the University of California. A team member of the

Oak Ridge Lab is the University of Tennessee. So there has always been this real connection with universities.[68]

"WORK FOR OTHERS" AND NON-DOE WORK

At the Laboratory, "Work for Others" is both an umbrella program and a catch-phrase for all work done on Site that is not funded by the DOE The major DOE programs at the Laboratory are cleanup and nuclear energy research. Other nuclear-related programs, funded by NASA and the DoD, fall under the Work for Others program. Some Work for Others programs are situated at the Laboratory largely because of its isolation, expertise, and pre-existing infrastructure. Whether nuclear or not, Work for Others is still administered or at least coordinated by DOE officials and their contractors at the Laboratory.

Work for Others has been an active program at the Laboratory since at least the 1980s, when the Army's Specific Manufacturing Capability Project, making tank armor out of depleted uranium, got its start as Project X.[69] As the Site's original nuclear mission began to dry up in the 1990s, Work for Others became important not as a sideline but as a base, even if it was only in the range of $100 million per year. It helped keep the Laboratory together when regular DOE work would not have been sufficient. As DOE-ID's Peggy Brookshier, who took over Work for Others in 2005, said about those early days, "it helped the lab keep their core competency in being able to do research and attract researchers."[70]

The program was essential for retaining and maintaining the Laboratory's scientists when regular DOE funding was spotty. As Peggy Brookshier stated:

INL Researcher Explaining Facet of Armor Research, Testing Area in Background.

Developing Synergy: Managing the Work for Others Program

What this community and what the lab needs to look at - and it's tough to do because managers have a hard time with it - is if you get a good synergy going between companies on the outside, particularly in the local Idaho Falls area, you've got researchers going back and forth and that's what you want. They'll go out to the outside, they'll come back into the lab, they'll go back out. That's how you keep things [progressing]. But managers think, Well I don't want to keep training people. I've got to keep this, or I don't want this technology spun-out because then I can't get credit for it. The whole idea is to keep bringing new stuff in, developing new stuff, and letting it go out to be commercialized. [Commercialization is] not the lab's business, that's [for] outside. And if they're working with them on some R&D and there's some specific stuff that they know INL has, those companies will come back to INL and say, Look we need you to do research in this particular area for us, get that synergy going. And I wish they would really concentrate on some of that, [because] that's how you start becoming more of a world-class lab. Your employees are going back and forth and in and out, but you're growing the community, you're growing the technology, and you're getting better research

Peggy Brookshier, 2010

INL Assisted DoD in Setting Up Wind Turbines on Ascension Island

[Researchers] don't all want to do the same thing but they like to have some fun things to do, and you need some of that stuff in order to maintain your researchers. You don't always have something. R&D is not, 'today I'm going to have my breakthrough and today I'm going to discover the cure for cancer.' It doesn't work that way. Some researchers come with their own little sandbox they want to play in. That's not necessarily what DOE wants, but DOE doesn't necessarily have the funding to keep them fully employed either, so they go out and find areas in their niches. And it's a real good synergy if it's developed and used right.[71]

Work for Others is still prominent at the Laboratory, despite the rebirth of the nuclear mission. Brookshier noted that the Work for Others program is still a third of the total Site budget.[72] The main difference is that now, Work for Others has to be more selective in the programs that it accepts.

The lab can't do just any work for the private sector. They cannot compete with others out there. Just because you like INL and you don't want to go to 3M…, that's not good enough. You have to ask, Is it something [INL] should really be doing and only they have a unique capability *for? There is a set of circumstances that have to be met, and you get audited on those periodically.*[73]

Despite this set of circumstances, the range of the Work for Others program is broad. Among the major programs that have been brought in and worked on since 2005, are the Advanced Hydropower Turbine System, called "Hydro" for short; the Electric Vehicle Program; various DoD programs; Homeland Security programs; NASA power systems; work for the Army Corps of Engineers; and the NRC. There is private sector work as well, but this is often more limited.[74]

NASA PROGRAM

One of the oldest of these various nuclear-related programs is the one for NASA, even though that program has only moved to the Laboratory recently. This program is for the creation of radioisotope power systems suitable for space flight. The Space Power System Program, which had been at Mound Laboratory in Ohio, was relocated to the MFC in 2004. The new facility is called the Space and Security Power Systems Facility (SSPSF). This is the modern facility that provides radioisotope thermoelectric generators (RTGs) for NASA's recent space flights, specifically the New Horizons mission to Pluto in 2006 and the Mars launch.[75]

RTGs are essential for space travel, since they can provide electricity for long-distance spacecraft, whether that vessel is in darkness, cold, or high levels of radiation. RTGs are powered by Plutonium-238, using thermocouples to convert radioisotopic thermal heat into electric current, all of which is done without moving parts.[76] The RTGs are constructed in glove boxes and then subjected to vibration tests to determine their durability in a possible space flight. [77]

For various reasons, plutonium-238 is not suitable as a weapons material, but is ideal for RTGs. Unfortunately, NASA is facing a shortage of plutonium-238, which has not been made in this country since the late 1980s. Until domestic production of plutonium-238 is resumed, it is essential to preserve our dwindling supply. For this reason, a new version of the RTG is underway. Known as the Advanced Stirling Radioisotope Generator (ASRG), it uses a Stirling motor to convert thermal energy to electricity. It uses less plutonium-238 than the traditional RTGs with thermocouples.[78]

INL's Center for Space Nuclear Research designed nuclear-powered "hoppers" that could be more efficient than rovers — a few dozen could map the entire Martian surface in just a few years.

SPECIFIC MANUFACTURING CAPABILITY PROJECT (SMC) AND NATIONAL SECURITY PROGRAMS

The Specific Manufacturing Capability Project (SMCP) is the DoD program that constructs armor for the U.S. Army's M1A1 and M1A2 Abrams tank from billets of depleted uranium. Described in the previous chapter, this is the only major industrial manufacturing program at the Laboratory and is projected to remain operational through at least 2015.[79]

There is a range of national security programs that have set up shop at the Laboratory in the years since September 11, 2001 and are integral to the site's multi-program mission. Some noted in the previous chapter are discussed more fully here. Most of these are funded by Homeland Security and are designed to protect the nation from hypothetical attacks against various aspects of its infrastructure, particularly its electrical grid and computer systems. In addition to Homeland Security, this has brought in other national security agencies, such as the FBI and the CIA, the so-called "three letter agencies."[80] The largest of these projects is the Critical Infrastructure Test Range Complex (CITRC).

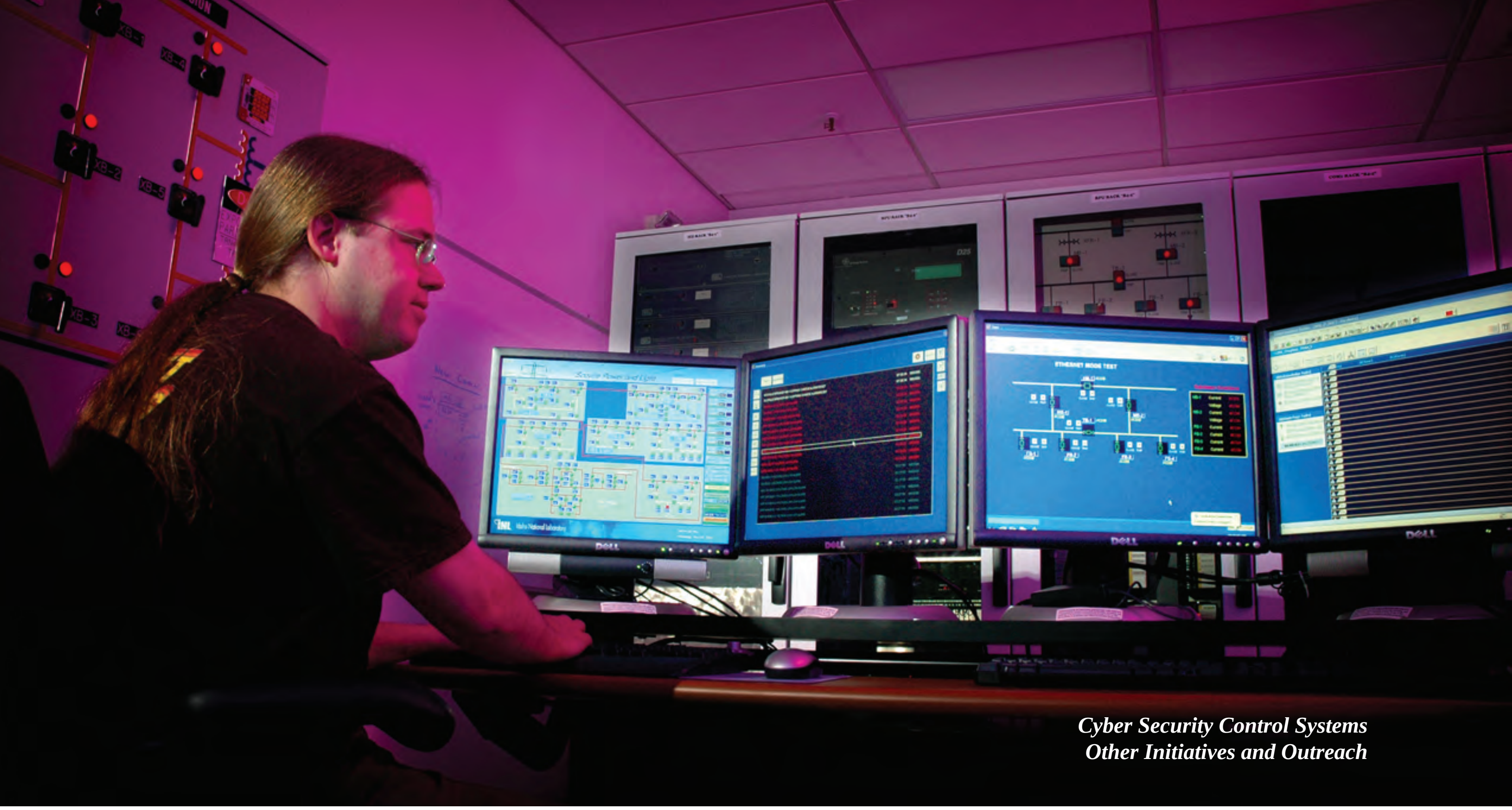
The CITRC is a Homeland Security project designed to protect the nation's infrastructure. This complex occupies the old Auxiliary (Army) Reactor Area and parts of the former SPERT/ Power Burst Facility.[81] There are other test ranges as well. There is the Supervisory Control and Data Acquisition (SCADA) Test Range, with full-scale testing capabilities and electrical grid work and control systems, and the explosives test range. There is also a test range for radiological training as part of a program to remotely examine shipping containers for hidden nuclear materials.[82]

There are also programs to deal with cyber-security. As Dave Hill commented:

> *[This is] not PC desktop type security, but from industrial computer systems. Which means that apart from anything else, we have a lot of pasty-faced guys and girls here with ponytails and sandals, who spend a lot of time trying to break computer systems, and do so very successfully. Commercial companies send their stuff to us to see if we can break it and we always can…. That grew up here because of the industrial control systems we had in our infrastructure, and it has become a specialty here. We have a support capability for the Department of Homeland Security here. If there is sabotage around the world or malfunction of equipment, and there's a suspicion that it might be cyber caused, we're one of the teams that investigates. It's a long way from nuclear energy.*[83]

The Laboratory has a number of different programs that are not directly related to the nuclear mission or to national security. One of these is the work that is being done on environmental sustainability as it pertains to the nuclear industry. This work centers on the best means of disposing of radioactive waste within environmental constraints.[84]

There is the Bio-fuels Initiative. The Laboratory is working up a plan for providing organic materials like wheat straw and cornstalks to bio-refineries to manufacture fuel. As of 2009, it was DOE's goal to have 60 billion gallons of bio-fuel made from American sources by the year 2030.[85]


Cyber Security Control Systems
Other Initiatives and Outreach

The Laboratory has also entered into energy agreements with outside entities like the Saskatchewan provincial government, concerning research into energy resources like uranium, heavy oil, oil shale, oil sands, and carbon dioxide capture. As the former INL Associate Laboratory Director for Energy and Environment, J. W. (Bill) Rogers, Jr., stated, the agreement "expands our collaborative relationships on Western regional energy interests and concerns."[86]

Closer to home, the Laboratory has a Small Business Outreach, designed to set up working partnerships between the Laboratory and small business, particularly in Idaho. The program also educates small businesses about compatible programs and opportunities within the Laboratory.[87]

As part of its public outreach program, the Laboratory administers a number of education grants at a number of different levels. Science, Technology, Engineering, and Mathematics (STEM) Education Grants are awarded to deserving teachers at the elementary, middle, and high schools levels.[88] College scholarships are awarded as well, including the $4 million that was given by participating institutions to some 150 students at the Twentieth Annual Hispanic Youth Symposium. Other groups are also rewarded with similar grants and internship opportunities.[89]

The Laboratory wins awards on its own for its research and other work within the DOE complex. The Secretary of Energy's award has gone to people like Beth Sellers.[90] Other awards have been given to projects within the Laboratory complex, such as Communication Technologies, Process Sciences, Energy Technologies, Environmental Technologies, and Consumer Products.[91] The 11 R&D 100 awards given to the Laboratory and staff between 2004 and 2010 attest to the Laboratory's innovative technical abilities and the range of its contributions to worker safety, to the American military, to the cell phone user, and to the tourists at Yellowstone Park. It also shows the Laboratory's collaborative commitment with its research partners.

Secretary of Energy Steven Chu and Laboratory Director John Grossenbacher exchange ideas with young INL Scientists.

SUMMARY

Between 2003 and 2009, INL clearly reinvigorated its nuclear research mission and developed into a multi-program laboratory under the BEA contract. At the same time, the Idaho Cleanup Project managed by CWI continued to advance the site's environmental stewardship and meet the milestones set in the Settlement Agreement. Their success at meeting these milestones was integral to the site's future on a number of levels. Perhaps the most important of these was the clear signal it provided the community, state, and region that INL was a strong environmental steward of the federal property that met its obligations.

INL Summer Interns, 2009

INL R&D 100 Awards 2004-2009

The R&D 100 Awards, also known as the "Oscars of Innovation," are given out annually honoring 100 of the most technologically significant products developed by industry, academia, and government-sponsored research that enter the marketplace. Between 2004 and 2009, INL scientists garnered 11 of these awards in the areas of Environmental Technologies, Communication Science, Software, Process Science, Energy Technologies, and Life Sciences. 2006 was a banner year when four R&D 100 awards were claimed by INL researchers. This shows the breadth of the award-winning products and underscores how Americans in all walks of life benefit from INL's innovation.

INEEL Geologic and Environmental Probe System

Environmental Technologies (2004)

Richard Jones and Jim Loftus

What it does: This probe allows workers to safely measure the amounts of contamination inside waste areas without harming the surface or equipment.

Ultrastable Catalase Enzyme from Yellowstone Bacteria

Life Sciences (2004)

Vicki Thompson, William Apel, and Kastli Schaller

Researchers William Apel, Kastli Schaller, and Vicki Thompson (seated).

What it does: Hydrogen peroxide (HP) has many industrial applications but its residue is harmful to humans on contact or through ingestion. To degrade hydrogen peroxide in these processes into non-harmful oxygen and water, a catalase, an enzyme, is used. However, a catalase's efficacy is affected by harsh industrial conditions. INL researchers identified an enzyme in Yellowstone National Park's hot spring pools that reacts with HP and is more robust, outperforming its commercial competitors significantly.

Visual First Responder (VFRTM) Wireless Video

Communication Technologies (2005)

Kevin Young

What it does: The VFRTM is a portable, lightweight, wireless video camera/transmitter and receiver system that allows emergency responders to send high quality video from terrorism, accident or disaster sites to a remote command post, up to five miles away.

Scientist Kevin Young with Hazmat Camera

(From left) Frank Carney, Terry Turner, Bruce Wilding, Mike McKellar, Kerry Klingler, and Douglas Stacey

Compact High Efficiency Natural Gas Liquifier

Compact High Efficiency Natural Gas Liquefier

Process Sciences (2006)

Bruce Wilding, Terry Turner, Michael McKellar, Dennis Bingham, Frank Carney, Kerry Klingler, Douglas Stacey and David Anderson

What it does: This technology allows natural gas users an avenue towards less expensive liquefied natural gas facilities. It does not require a large facility and it has an uncomplicated design that allows for low maintenance. The technology would also win the Federal Laboratory Consortium for Technology Transfer for Excellence in Technology Transfer in 2007.

INL Robot Intelligence Kernel (RIK)

Software (2006)

(From left) David Bruemmer, Douglas Few, Miles C. Walton, and Curtis Nielson

What it does: Robots are used in situations that are dangerous. However, most are designed to follow commands and if communication is lost, the robot no longer can perform. This technology consists of an on-board control architecture that provides any mobile robot with intelligence comparable to a highly-trained police dog

Sources: R&D Magazine Online, R&D 100 Awards Archive, 2004 -2009. http://www.rdmag.com/Awards/RD-100-Awards; **Precision Nanoparticles**, https://inlportal.inl.gov/portal/server.pt?open=514&objID=1269&mode=2&featurestory=DA_524323; **INL wins three R&D 100 Awards** https://inlportal.inl.gov/portal/server.pt?open=514&objID=1555&mode=2&featurestory=DA_346222; **INL antibody technology** earns international media attention, Federal Lab award, https://inlportal.inl.gov/portal/server.pt?open=514&objID=1269&mode=2&featurestory=DA_116920

(From left) Terry Todd, Troy Tanter, and Nick Mann.

Nano-Composite Arsenic Sorbent (N-CAS)

Energy Technologies (2006)

R. Scott Herbst, Nicholas R. Mann, Terry A. Todd, and Troy J. Tranter

What it does: This technology provides a cost effective way to remove arsenic from water that is seven times more effective than current techniques.

Xylanese Enzyme

Xtreme Xylanase

Life Sciences (2006)

Collaborator: INL and University of Idaho

(From left) William A. Apel, Morgan Bruno, Kastli Schaller, Elizabeth Taylor , David N. Thompson, and Vicki Thompson

What it does: This technology uses a distinctive enzyme that helps a microbe thrive in hot acidic waters at Yellowstone Park to convert components of biomass feedstocks into energy-rich sugars. These sugars can be used in place of petroleum to make fuels and chemicals.

Antibody Profiling Identification

Life Sciences (2008)

Vicki Thompson, John Snyder, and William A. Apel

Collaborators: Identity Sciences

What it does: The device and software quickly tests forensic samples, converting antibody profiles of an individual's immune system into a unique pattern resembling a bar code. It provides a cost efficient, quick tool for forensic specialists to identify forensic evidence and build a searchable database. It also handily won the Federal Laboratory Consortium award for Excellence in Technology Transfer for 2008.

RFinity Mobile Open-Encryption Platform

Communication Technologies (2009)

Steven McCown, Aaron Turner, Kurt Derr, Kenneth Rohde, and Troy Moore

Collaborator: INL and RFinity

What it does: An innovation that offers a low-cost, plug-n-play option that enables virtually any wireless telecommunications device to safely store sensitive personal information and perform secure transactions.

Water Sampling Using Concentrator

Water Sample Concentrator

Environmental Technologies (2009)

Michael Carpenter, Lyle Roybal, Paul Tremblay, H.D. Lindquist, and Vicente Galliardo

Collaborators: INL, Teledyne Isco, Inc., U.S. EPA

What it does: The concentrator filled a critical need for water sampling methods that can be used with greater success by monitors.

Precision Nanoparticles

Process Sciences (2009)

Bob Fox, Joshua Pak, and Rene Rodriguez

Collaborators: INL and Idaho State University

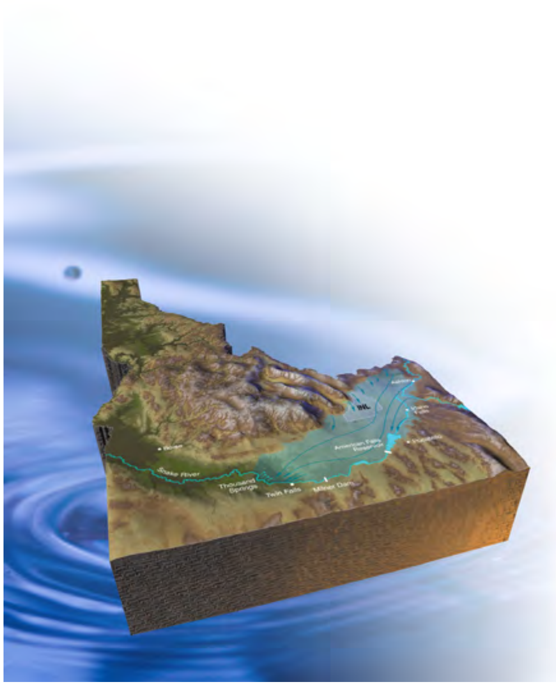
Precision Nanoparticles Inc.

Scientist Bob Fox , Member of Team on Nanoparticle Breakthrough

What it does: Harnessing solar radiation is an important energy goal and the creation of revolutionary solar cell designs and breakthrough nanoparticles are needed to move us closer to that goal. This technology, identified serendipitously, creates affordable, uniform nanoparticles bypassing the need for cleanrooms and costly materials used to manufacture solar cells. The breakthrough could help make solar cells more efficient and speed the development of nanotechnology.

5 BALANCING THE MACHINE WITH THE GARDEN

THE IDAHO CLEANUP PROJECT AND INL'S ENVIRONMENTAL STEWARDSHIP



"...the main concern

is protection of the aquifer, the environment, and just everything that makes life whole." - **Willie Preacher, 2010.**

Located in the southeastern Idaho desert, the Laboratory is an 890-square mile federal installation described in one source as roughly 85 percent the size of the state of Rhode Island. Mountain ranges tower to the west, north, and northwest and the Snake River Plain Aquifer, one of the most productive groundwater resources in the U.S. and the primary water source for Southeastern Idaho, lies below its high-desert terrain.[1] The impress of the national laboratory's footprint is slight when compared to the vast amount of acreage that remains undeveloped. Ninety-four percent of the site is undeveloped and its ecological research potential has been recognized as a national asset earning it the designation of a National Environmental Research Park in 1975.

The six percent of the site that has been developed is the machine within the garden. The Laboratory, with over 8,000 employees as of 2010, is the third largest employer in the state, with an annual budget of well over $1 billion that translates into almost 20,000 jobs within the region.[2] It is a state and regional economic asset and for that reason the state's political leadership has played a large role in garnering the funding that has allowed the site to return to its nuclear research roots. The same leadership has been involved with defining the terms of the Settlement Agreement and monitoring the site's environmental conduct as DOE works to cleanup the aquifer below the Site and prevent additional contamination.

The twenty-first-century site, unlike its mid twentieth-century counterpart that operated under secrecy behind the fence, shares its environment in as open manner as possible with its neighbors and its region due to regulations set in place to protect the public. This stewardship requires balancing the primary needs of the nuclear energy research machine and the treatment of its legacy with the needs of the garden, listening to the voices of its previous keepers, the Shoshone-Bannock Tribes, and complying with environmental regulations. This chapter focuses on that delicate balance, starting first with the cleanup effort and then describing the Site's overall environmental stewardship.

IDAHO CLEANUP PROJECT

While the Settlement Agreement may have established the charter for future cleanup activities, the designation of a separate contract and contractor has helped to realize that charter. Achieving DOE's commitments has been the focus of the Idaho Cleanup Project (ICP), established by DOE in 2005 and managed by CH2M-WG Idaho, LLC (CWI). CWI is still into its first seven-year, $2.9-billion contract to cleanup the site, and DOE Office of Environmental Management has oversight over its progress.[4]

The ICP is specifically charged with "the environmental cleanup of the legacy wastes generated from World War II-era conventional weapons testing, government-owned reactors, spent fuel reprocessing, and nuclear and alternative energy research."[5] The overarching aim of the project is to reduce risks to workers, the public, and the environment and to protect the Snake River Plain Aquifer. A great deal of this cleanup has occurred since 2005.[6]

The cleanup is essential to clear the way for the facilities required for the new nuclear energy research mission described in the previous chapter. This will entail the continued development of three modern campuses: the ATRC and MFC on the Laboratory site, and the Research and Education Campus in Idaho Falls. It is anticipated that there will be a new transportation corridor between the two on-site campuses. To make room for this new mission, many older Laboratory facilities have already been removed, with others scheduled to follow.[7]

Hey they've done it right out there...

… I think if you looked at the combination of the funding going into the cleanup and the funding going into the lab at the time, the cleanup was pulling in most of the funding back then, approximately $600 million a year and the lab about $400 million. The ultimate vision was to transpose those so eventually as the cleanup would go down or complete, the funding needed there would go down but the lab would grow. And so that's what we had back in the 2005 timeframe…. We certainly had enough money to continue with the cleanup activities. There was interest in growing the lab side. So $400 million probably wasn't enough on the lab side to do ultimately what they wanted to do. …We've seen growth since 2005 on the lab side so I think the vision that we … had back then is being realized, which is great to see. Since then the lab has hired additional Ph.D.s and researchers and doubled the budget that they had when you compare it to what they had back in 2005. And that was important to do for the local economy here because the lab is such a significant contributor to the local economy.

And then we put in place a cleanup contract that had fixed annual funding numbers identified for the term of the contract period. It was a cost-plus-incentive-fee contract so that obligated the government, provided that Congress appropriates the funds, to provide that amount of money to the contractor to ensure that they can get the scope of work done. And so we committed to that at the time. And it was pretty effective. I mean, generally speaking we got enough money to continue to fund those contracts. Here recently it's been a little tight just because as a nation it's been tight getting appropriations, but in general we've met those targets that are in the contract….

…(The community is)… very supportive because of the work we've done on the cleanup side. When I first got here there was still a lot of criticism and skepticism relative to whether the government was going to follow through on the cleanup activities and deal with the liabilities that existed at the site. So that was a challenge at the time. We had to establish some pretty solid relationships with the State of Idaho, the Department of Environmental Quality. We had a local Indian (community) here, the Shoshone-Bannock Tribes, and also the Idaho Falls community. A lot of that history goes back to the Settlement Agreement, and the state is pretty adamant that they want that Settlement Agreement to be met. So anytime there's an issue relative to our ability to do that or desire to do that it usually results in some kind of conflict. It took a lot of effort to both resolve that buried waste issue from a legal standpoint, but in parallel with that demonstrate that out in the field we were serious about getting the cleanup done. And that's what we did and really turned things around relative to the kind of concerns that we heard voiced in the past. We had Snake River Alliance as well which is a local environmental interest group that was pretty vocal and concerned about progress back then, and today they'll be the first ones to stand up and say, 'Hey they've done it right out there.' They're pretty much an advocate for what we've done on the cleanup side and they've shifted their focus to other things. They still stay involved because they're interested in the site and this part of the country, but they don't have the same level of concern that they've had in the past. It took a lot to get there but I think we've established that trust and confidence. And that's something we wanted to do, to deal with that past legacy but also create opportunity for the lab. So it's worked out very well."

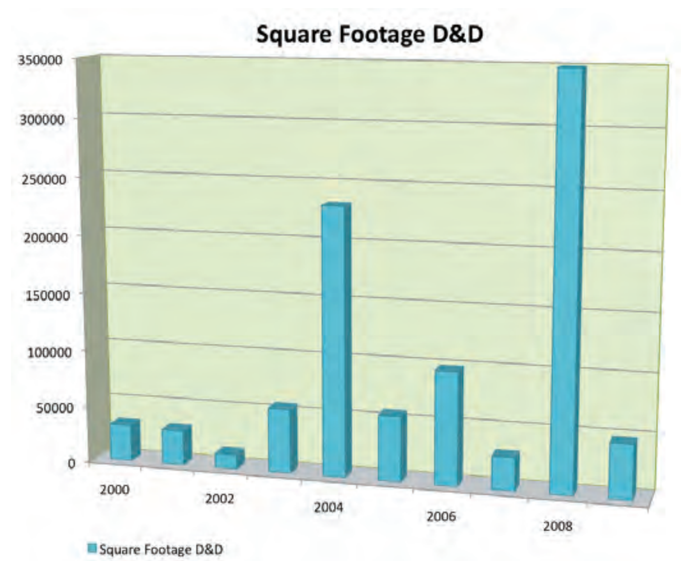
Rick Provencher, 2010

Editor's Note: This interview was originally conducted in 2010 and reflects on the time when Rick Provencher was the Deputy Manager for the Idaho Cleanup Project.

ISO Certification

Environmental management is not just an empty phrase at the INL. It is part of a system that has been recognized internationally. More specifically, it is part of a comprehensive "Environmental Management System" or EMS. At INL, this environmental management system is designed to recognize environmental protection, compliance, pollution prevention, and waste reduction, and incorporate these issues into present and future work throughout the INL. The successful prosecution of these issues has allowed the INL to win certification of its EMS through the International Organization for Standardization (ISO) EMS Standard, known as ISO 14001 certification. This certification is based on the five principles of a good EMS: policy; planning; implementation and operation; checking and corrective action; and management review. The INL received its ISO certification effective November 24, 2005, based on a three-stage examination that was completed by a refereeing third party. INL has maintained its ISO 14001 certification since that time.[3]

The demolition of facilities at the Laboratory peaked in 2004 and 2008. In 2004, 232,140 square feet of facilities were subject to D&D. In 2008, 348,742 square feet of facilities were demolished. It has been estimated that between May of 2005, the beginning of the CWI contract,



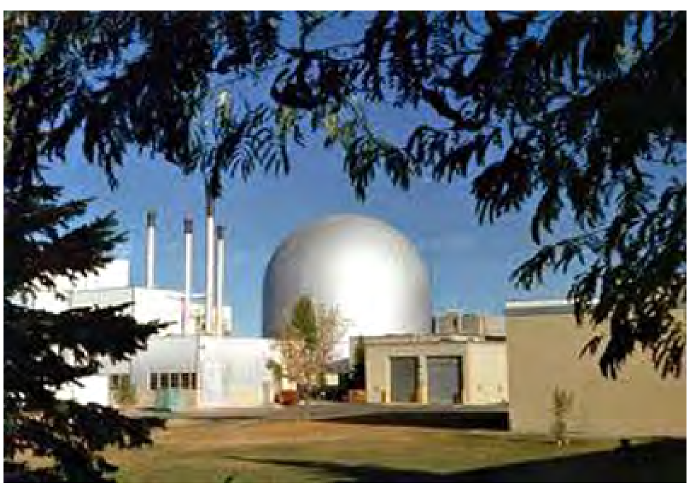
D&D activities 2000-2009

and 2009, some 158 structures out of 218 selected for demolition have already been taken down. The rest are scheduled to follow by the end of 2011.[9]

The demolition of excess facilities is just one of the programs of the Idaho Cleanup Project. The other programs include the retrieval of buried waste, removal of subsurface contamination, and the treatment of groundwater.[10] Much of this work is centered on the Waste Area Groups (WAGs) established in the 1990s to facilitate the cleanup of waste and excess facilities.[11] The first nine of the 10 WAGs correspond to site operational areas, while the tenth encompasses a larger area dealing with the Snake River Plain Aquifer.[12]

Building demolition and cleanup have concentrated in a number of the old Laboratory areas. The most prominent has been in Test Area North (TAN), but there have been a number of other ones: Idaho Nuclear Technology and Engineering Center (INTEC), the Radioactive Waste Management Complex (RWMC), ATRC, CITRC, and the Power Burst Facility.[13]

Test Area North, or TAN, began in the 1950s with a mission to support the jointly sponsored AEC/U.S. Air Force in the development of a nuclear-powered aircraft, the Aircraft Nuclear Propulsion (ANP) program that was terminated in the early 1960s. In the years that followed, TAN attracted other uses and facilities. These included the Initial Engine Test Facility, the Water Reactor Research Test Facility (part of the ANP program), the Technical Support Facility, and the Contained Test Facility built for the ANP program. The last of these contains Specific Manufacturing Capability, which does armor work for U.S. Army tanks. This is the only function that is still current at TAN.[14]



Demolition of the Experimental Breeder Reactor (EBR) II led to the development of a safe treatment for the removal of a highly reactive sodium in nearly two miles of the reactor's cooling system. DOE has acknowledged the accomplishment, allowing CWI a provisional patent application for the sodium treatment process.

Cleanup work at Test Area North (TAN) began in the 1980s and will continue until completed. This was a particularly large program for the Idaho Cleanup Project, and one of the first to be implemented. The importance is indicated by the numbering system adopted for the various "Waste Area Groups" (WAGs) established for the Laboratory; TAN was designated WAG Number 1.[15]

The goal at TAN was to remove buildings and other facilities that had no future mission, remove the electrical utilities and the aboveground portions of the unwanted buildings, and finally re-grade the site to resemble the original configuration.[16] Among the first facilities to be demolished at TAN were the Loss-of-Fluid Test Facility (LOFT) and the Technical Support Facility (TSF). Other buildings torn down include TAN-607 touted as the "World's Largest Hotshop"; 607-A, 630, 603, and 633. In fact, most of the TAN footprint is now gone.[17]

INTEC had some 118 buildings and other facilities, all of which were under the management of the Idaho Cleanup Project. The cleanup tasks at INTEC include dealing with sodium-bearing waste, closure of the tank farm, dry-storing spent nuclear fuel, dealing with the radioactive waste calcine, soil and groundwater remediation, and the removal of the buildings themselves.[18]

The RWMC was established to handle the interim storage of TRU waste, as well as the disposal of low-level waste. TRU waste is shipped out of state after being processed at the Advanced Mixed Waste Treatment Facility.[19] Ninety-eight shipments arrived at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico, from the Laboratory in 2007.

MFC Boiler Stack Removal Crew

At the ATRC, buildings and facilities were torn down in two specific areas: the ETR and the MTR. The ETR, or Engineering Test Reactor, located in the ETR Building, TRA-642, had been deactivated since the 1980s. The building itself was scheduled for demolition in 2007 and the reactor tank grouted and disposed of about the same time.[20] The MTR, located in Building TRA-603, was a multi-tank reactor vessel located inside a three-story building. This high flux, pressurized light water reactor first went critical in 1952. The demolition of this facility was agreed upon in 2007.[21]

Reactor vessels were disposed of at the Idaho CERCLA Disposal Facility (ICDF) Waste Disposal Area. This was an on-site disposal facility constructed in 2003 for CERCLA waste. It was located just south of INTEC.[22]

The Integrated Waste Treatment Unit (IWTU) is a new facility designed to treat liquid high-level waste remaining in the underground tank farm in INTEC. The liquid waste is a legacy of cleaning out facilities used in spent nuclear fuel reprocessing. Construction of the one-of-a kind, 53,000 square-foot facility began in 2007 and 92 percent of the construction was completed in 2010. The concrete building, designed to stringent seismic criteria, is scheduled to begin operations in 2012.[23]

Other waste management work took place at the MFC and specifically at the Hot Fuels Examination Facility (HFEF). Waste was shipped from here for processing prior to shipment to WIPP. Another area subjected to

We take pride in what we do.

I got involved with the Decontamination and Decommissioning (D&D) project in the 2003 timeframe. At that time the Department of Energy was moving from a "maintain posture" to a real focus on cleaning up the legacy waste and reducing the Government's liabilities. We began actual site cleanup by starting on small facility removals under the contractor, Bechtel. Additionally, we worked to improve the Departments relationship with the regulators. We were proving that we could actually D&D the INEL's facilities. This was a significant step for us, in previous years we had not demolished any of our facilities; we were maintaining them. With our new initiative to significantly reduce the Government's liabilities, we successfully demolished the Loss of Fluid Test (LOFT) facility in 2006, a high-risk nuclear facility.

During the LOFT demolition project, we went through a new competitive contract process for the (Idaho Cleanup Project) and in May of 2005 CWI (CH2M Hill Washington Idaho Group) was selected as our contractor for cleanup, to reduce the Government's liability at the Idaho National Laboratory (INL). With our new contractor, we continued with the LOFT D&D Project. We began a new process for the D&D of INL nuclear facilities called the Non-time Critical Removal Action (NT CRA). This was a Comprehensive Environmental Response Compensation and Liability Act (CERCLA) process, which allowed us to define alternatives for the final end state of the nuclear facilities we were planning to D&D. That process required the Environmental Protection Agency (EPA) and the Department of Environmental Quality (DEQ) to concur on our D&D plan, which included the final end state for a given facility. DEQ is the Idaho regulatory agency that oversees our work and their primary focus is on Resource Conservation Recovery Act (RCRA) actions whereas, EPA focuses on and oversees CERCLA actions…. In each nuclear facility, there is a mixture of industrial, CERCLA, and RCRA waste constituents. As we started this new process, neither regulatory agency really wanted to give up its responsibilities and so to get the first D&D NT CRA document approved… it took us about a year-and-a-half to find an acceptable format that all parties could agree too. However, once we settled on a clear path forward… all the agencies signed off on the first CERCLA Non-time Critical Removal Action for the final demolition of the LOFT Reactor.

As we proceeded through the actual demolition, we realized… this was the first time the site was able to take a high-risk, highhazard, high-radioactive facility and take it to the ground , dispose of all the hazardous waste streams offsite. I believe both agencies took a step back because of what we actually accomplished … and were just dumbfounded that we had gone from "maintaining" these facilities, to proving we could successfully work with our regulators, and actually deliver on the Government's promise in a short period of time. As time passed, we moved through the CERCLA planning process for other nuclear facilities. We planned and completed the Test Area North (TAN) Hot Shop D&D. The TAN Hot Shop contained the largest hot cell in the world for doing remote high radiation operations or for investigation of high-radiological materials.

The TAN Hot Shop examined the Three Mile Island reactor debris to determine what triggered the Three Mile Island accident. So within the TAN Hot Shop facility there was a combination of industrial, chemical, and radiation hazards. We basically removed all of the hazardous materials from the facility and took the TAN Hot Shop to the ground as a clean closure site. All the radioactive and industrial wastes removed from the facility were disposed at a licensed disposal facility.

One of the biggest accomplishments associated with the Environmental Management cleanup program at Idaho is our safety record. We've not had a serious accident and our performance records are far below the industry safety standard. It's just amazing, when we D&D an old facility, we don't always know what is in one pipe section to another; or what is imbedded inside a concrete wall or in a hot cell. We always seem to find surprises when we go through these old facilities to investigate what types of hazards are there and how much. These old facilities and their historical documentation as to what they should have never seem to match up. People leave things behind; back in the fifties and sixties thinking about where they placed different types of wastes did not have the same attention and concern that we have in the 21st century, Wherever they could find a place to store the waste, on that was often where the waste remained for forty or fifty years. During the planning process for the facility's D&D, we discover these little hidden gems as we go through and characterize these facilities to determine what needs to be done to achieve the final end state.

I believe we, DOE-ID and CWI, have done an outstanding job identifying the risks in each of the facilities targeted for D&D and incorporating mitigation actions for each of the risks. In most cases, each risk was not only mitigated but removed from the facilities during the D&D process; which resulted in a clean facility closure end state. We have been commended by the Shoshone-Bannock Tribes for the clean closure end states we have achieved on the nuclear facilities D&D work…. The tribes want the land to be returned back to its original condition, prior to the INL's existence and to have the tribes recognize our D&D work as a positive attribute is amazing for the Idaho Cleanup Project.

Starting with the completion of LOFT and the TAN Hot Shop D&D in 2007, every high-risk facility decommissioned at the INL proved we could clean up the legacy wastes generated by the Government's nuclear weapons and nuclear energy research programs. We have earned total support from the tribal members, DEQ, EPA, and the local communities by meeting our promises on these CERCLA Non-time Critical Removal Actions. These organizations have become our partners on the Idaho Cleanup project. This teaming happened only because we did what we said we were going to do, and proved that they can trust us. We have worked hard to earn their trust and they have confidence in us when we say we're going to do something that it will actually be done.

I believe a lot of the new facilities you see around the INL, the new laboratories along University Boulevard in Idaho Falls, wouldn't be here without us proving that legacy waste can be remediated and removed from the environment. We've been doing that for almost eight years now; proving to the public and to the local citizens we can do a good job in remediating legacy waste and in being good stewards of Idaho's precious environment. In so doing, I believe confidence is building in Washington to provide funding to build new laboratories and facilities because they know based on our record of achievement that when these facilities are no longer needed, we can D&D those facilities and eliminate any environmental and personnel risks!

I think we've really set a precedent here in Idaho with regards to how cleanup is done. We've been recognized throughout the DOE complex as probably one of the best sites for remediation work. We've received compliments from headquarters and congressional staffers. We take pride in what we do for the Government and Idaho

Jim Cooper, 2010

Construction of the Integrated Waste Treatment Facility

Nothing builds credibility like doing what you say you are going to do.

There was so much controversy and conflict in the late eighties and early nineties over waste. And then the buried waste issue continued to linger until the mid-2000s when we finally signed an agreement that said, Yes, this is how we will remediate the buried waste. There were always people who wanted us to dig up every molecule. That just wasn't practical. And we were able to reach an agreement with the state that said, We're going to dig up the largest concentrations of plutonium, we're going to eliminate the largest sources of volatile organic chemicals which have actually reached the aquifer. We're going to do this. We're going to do it in a timely and safe manner. And we're doing it. We are in the process of doing it. And nothing builds credibility like doing what you say you're going to do.

Brad Bugger, 2010

Retrieval Enclosures Construction Over Exhumation Area cleanup was the Subsurface Disposal Area (SDA), which was used from 1954 to 1970 as a burial ground for radioactive waste.

The SDA has been the focus of the Accelerated Retrieval Project (ARP). This program is responsible for the retrieval and processing of TRU waste for shipment to the WIPP. In 2010, crews retrieved 0.76 acres of buried waste and packaged 4,266 drums of waste for eventual arrival at the WIPP. CWI notes in their 2010 annual report that this effort constitutes the largest single year of progress in buried waste retrieval since the project's start. Key factors that enable this accelerated retrieval include having the right equipment, lessons learned, and the identification of key project needs to allow continuous operations. An example of the latter is the construction of retrieval enclosures around waste areas to protect workers from airborne contaminants. Six of these will be needed. The construction and the actual exhumation need to be synchronized so that as exhumation draws to a close in one area, construction of the next enclosure is underway. Using integrated project planning, crews have built five enclosures and removed two acres of waste. The final enclosure will be completed in 2011 and CWI's objective is to reach an exhumation goal of 2.55 acres by early 2012.

Other waste that has been removed includes Spent Nuclear Fuel (SNF), which has been taken from wet storage in pools to interim dry storage, which is safer and more stable. Between 2005 and 2010, ICP workers transferred 3,186 spent fuel elements in 14 campaigns, completing the fuel transfer objective.[25] This included 21 different fuel types. Examples of some of the fuels that have been moved: the spent fuel from Shippingport, which has been in storage locally for 19 years, and fuel from the ATR.[26]

Another aspect of the Idaho Cleanup Project is the long-term stewardship of contaminated areas that for one reason or another cannot be returned to their original status through regular remediation methods. These areas will require constant monitoring well into the future.[27]

Between 2005 and 2010, the ICP has accomplished a great deal towards advancing DOE's cleanup goals. It has also done this safely. In 2010, the ICP recorded one million hours without a recordable injury and also reduced recordable injuries by 20 percent over the previous year. The company also received DOE's Star of Excellence Award for outstanding performance in safety and health and capped that with DOE's highest safety honor, the VPP Legacy of Stars, for three consecutive years as a "Star of Excellence" site in 2010.[28]

Workers Retrieve Fuel from Underwater Storage Pool

FORGING COMMUNITY RELATIONSHIPS

Back in the 1950s, nuclear research was a secret thing, something known in detail only to the small world of nuclear scientists and some government officials. Idaho's contributions to reactor research and its contributions to Eisenhower's Atoms for Peace program were not well publicized, and certainly not in detail. The regulations spawned by the environmental movement have instilled value in being open with the public about shared environmental issues. These changes in the late twentieth century have become policy in the twenty-first century.

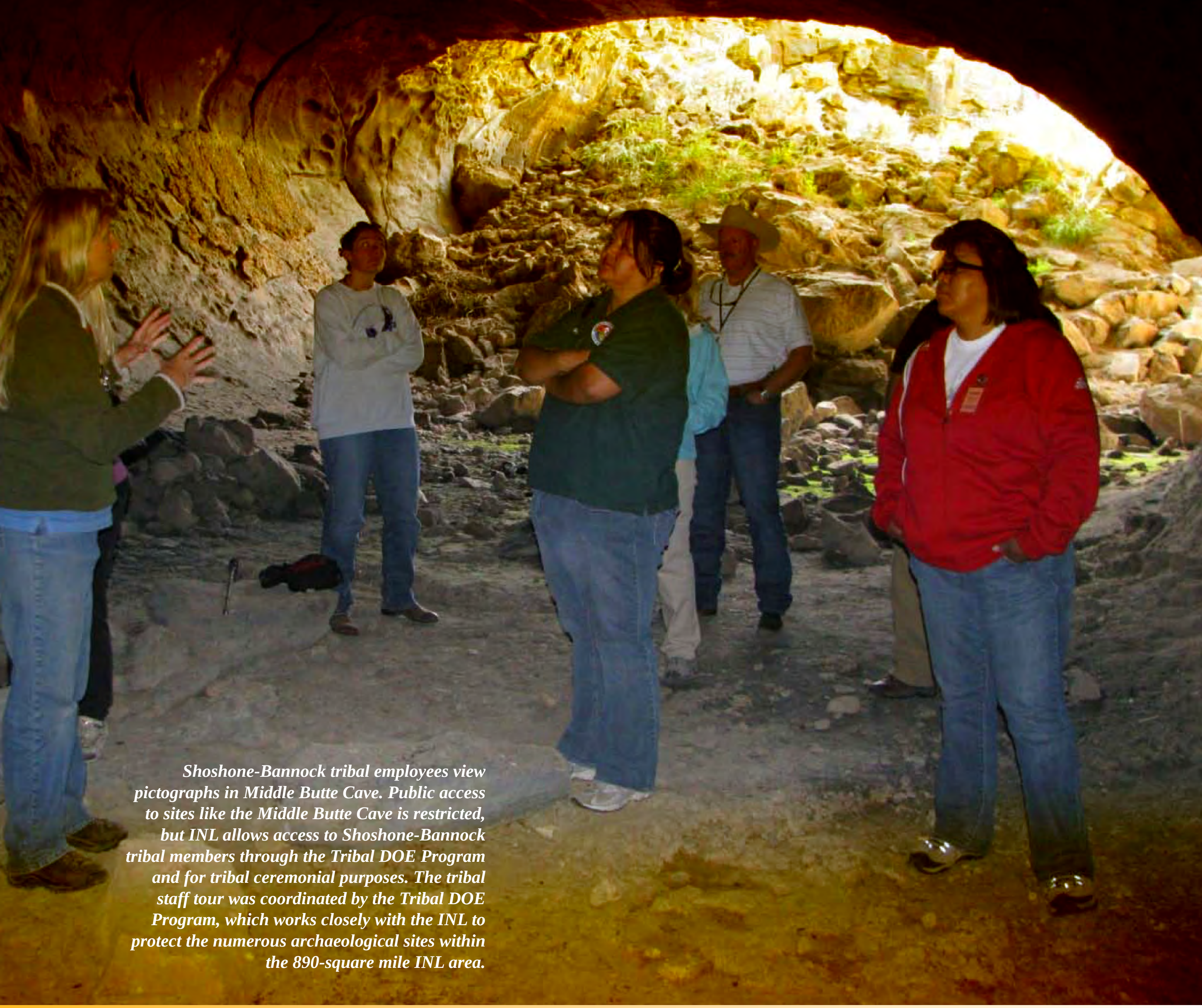
The Laboratory does a "very good job of public relations."[29] It is now understood that public involvement, spearheaded by public outreach and operational transparency, are essential to the success of the site.
In addition to public meetings to explain what the Laboratory is doing, there are also regular meetings with the editorial boards of regional newspapers.
This is also the approach that has been taken with the local Shoshone-Bannock Tribes. The Laboratory has a number of programs in place to see that the Shoshone-Bannock tribes are fully informed about new missions and research directions at the site. The Shoshone-Bannock also have the right to access parts of the Laboratory for cultural and religious reasons.[30] The cornerstone of the new compact between the Laboratory and the Shoshone-Bannock is the "Agreement in Principle," first effected in the early 1990s, but renewed and improved in subsequent years. The main purpose of the agreement is to provide the tribes with a clearer understanding about activities at the Laboratory and how these activities can be done in the interests of both the tribes and the Laboratory, providing environmental management, environmental monitoring, and even tribal employment. The Laboratory also works with the tribes to protect historic resources important to the Shoshone-Bannock. Many smaller groups have come out of this agreement or been influenced by it, such as the Cultural Resources Working Group, the Heritage Tribal Office, and the State and Tribal Government Working Group. Some of these were the first of their kind within the entire DOE complex.[31] Finally, one member of the Shoshone-Bannock Tribes sits on the Citizens Advisory Board, a voluntary advisory group established in 1994 as part of the Federal Advisory Committee Act to offer independent advice on issues that affect the Environmental Management program on site.

ENVIRONMENTAL STEWARDSHIP

Aside from the specific stewardship of contaminated areas, the Laboratory has a responsibility for the overall environmental health of the entire site, an area that encompasses 890 square miles or 569,135 acres of high desert land. Despite the eight former facility areas scattered across the landscape, the vast majority of this land is open range.[32]

Protection of the overall environment is a responsibility that needs to be balanced with mission needs. As Roger Blew, Deputy Manager Environmental Surveillance, Education and Research at the Laboratory, stated in a recent interview:

> *Our stated goal for the Conservation Management Plan is to minimize the impact of conservation actions on DOE's mission*



Shoshone-Bannock tribal employees view pictographs in Middle Butte Cave. Public access to sites like the Middle Butte Cave is restricted, but INL allows access to Shoshone-Bannock tribal members through the Tribal DOE Program and for tribal ceremonial purposes. The tribal staff tour was coordinated by the Tribal DOE Program, which works closely with the INL to protect the numerous archaeological sites within the 890-square mile INL area.

…for a lot of years this thing was a hushed up project out here. Nobody from the reservation knew about it.

Willie Preacher, Director for the Shoshone-Bannock Tribal DOE Agreement in Principle Program -

... in 1995, the Tribe stopped a fuel shipment, and it had to do with the Settlement Agreement. The Settlement Agreement between the State of Idaho and Department of Energy was developed and implemented, but the tribes felt that, ‘why is the state having an agreement with the Department of Energy even though they (the Tribes) are a sovereign nation? The reservation boundaries are within the State of Idaho and these shipments are coming by rail… or they’re coming by truck through the reservation and nobody knows what these shipments are about?’ So the Business Council at that time decided to stop the shipment to get some answers.

They wanted to know what was going on; why did the State of Idaho have a settlement agreement; and why weren't they (the Tribes) included in that, because they [were] considered maybe even more of a sovereign nation than the state would be, and the possibility of violating the trust responsibility between the federal government (DOE-ID) and the Tribes. Well, once they stopped the shipment, then all kinds of important people from headquarters came in and met with the Tribal business council and eventually things got settled down and agreements were developed. That's when DOE and INL began being more informative to the Tribes on what exactly is coming through. For a lot of years, this thing was a hushed up project out here on the site. Nobody from the reservation knew about it. It was always referred to in Blackfoot, Pocatello, and Idaho Falls as the "nuclear site" out here. So that was the term, the site… or the AEC (Atomic Energy Commission).

So during that time I sat in on one of the hearings. I told my boss, 'I'd like to go and listen to those hearings.' I listened to the Tribal members' comments and I listened to what DOE, the contractors, the Navy, and all of them had to say about their programs. After the meeting, I talked to the Department of Energy Field Office here in Idaho about what was just commented on by the Tribal people, and stated that, 'they need to have someone to come down to the Tribes and explain what these shipments are and what is going on at the site.' If you're really interested -- -I mean, if you're really going to honor the commitment that you're going to be more transparent with what's going on -- you need to have someone come down and talk to them about what each shipment's about. Where is it coming from? How safe is it? Why is it going to the INL? What's going to happen in the future and what is happening at the Site now? There were a lot of people that said that they were concerned with all the radioactive shipments going through the reservation.

…. . I knew that the shipments were safe in one way due to my work with the site. They only traveled through the reservation at 35 miles an hour. They had these robust containers that if they did fall I think the only way that someone would maybe get hurt is if they fell on you or an accident happened with a vehicle on the rail or the I-15 Corridor. But I think everything would remain intact within the shipping container. So anyway, then I talked to Ron King and Jerry Lyle, and later Ron approached me and asked me if I would consider being a liaison between the contractor and the tribes. And so I told him, 'Yeah, sure I would.' But he said one of the things he was concerned about was, who would I represent (laugh)? Ron asked me, Where would your loyalty be to your job or to the Tribes?' I told him, 'well the loyalty's going to lie in the truth.' Then I said, 'If I'm (going to be the liaison) that means I'm going to tell the truth regarding shipments or what is happening at the INL.'

... I would see presentations that were brought to the Tribe. I would go to the public meetings in Idaho Falls, usually at the Shilo Inn, and listen to some of their presentations. They would have this huge roomful of presentations, boards, and all kinds of visuals. If the same public meeting was to be at the Tribal center, it was just one or two people that would come down and do the presentation and very few visuals. I finally asked them one time after I was liaison, 'Why is that?' They said, 'Well, we just felt that they weren't interested.' And I said, 'You come to Idaho Falls you may only have four or five people that come: the whole City of Idaho Falls may not be interested apparently because they're not willing to come. But you have a specific audience with the tribe, with the seven members of the council that you need to convey the message on what you're doing. Because later it may come out, 'What is that project?' And they'll ask me and then I'll have to tell them. So anyway, they kind of changed their attitude. After that, we started bringing a lot of briefings down to the tribe regarding some of the concerns that the Tribe had.

We took a lot of tours out to the site with the elders and a lot of the tribal members. They were concerned with what was going on out there. There was a place … -- where I told you about where I worked. It was the RWMC, Radioactive Waste Management Complex -- and it was considered and coined a long time ago as 'The Burial Ground'. We took a tour of elders out there one time and we told them that they were going to see where waste was buried at the burial ground. It was really quiet on the way out. And then when we got out there, we did a bus tour. We didn't go inside, we went around the outside. We were going to have a drive by of the burial grounds and we were also going to tour where the (Advanced Mixed Waste Treatment Project) AMWTP was going to be built. So we took the bus around and we went around the perimeter of the fence and toured everything in that area.

And then at one point we stopped and then there some people walking through in the facility with civilian clothes on. And it shocked the elders because they thought, "How come they're not dressed up in weird suits and stuff?" And we just explained that everything's fairly clean wherever they're at. And they were impressed.

We did explain to them that a lot of the radiation waste, radioactive waste and whatever, is underground. Some are in boxes, some in drums, some are just stored underground. And so they was okay, and on the way home they were laughing and joking and stuff. But before they were like, Are we going to our doom or something? (laughter) I heard them say, We're going to a burial ground. We don't know what that's going to be. We may not come back (laughter).

Future INL Researchers? DOE and other federal agencies have a trust responsibility to federally recognized tribes. A significant part of that agreement is promoting self-sufficiency. These photographs show the agreement in action. Shoshone-Bannock High School students interested in learning CAD visited the Center for Advanced Energy Studies (CAES) where they were able to tour the computer-assisted virtual environment (CAVE).

activities. [We recognize] …that the only reason that we have this great piece of sagebrush-steppe habitat left is because of DOE's mission activities, and ensuring that that role for DOE's mission can continue is as important—perhaps as important to maintaining this one little piece of great sagebrush-steppe as any of the conservation efforts that we would be doing on any other land ownership. And being able to provide and support DOE's mission is really what my program is about.

Our ecological support program is about finding ways to do both—to provide for the conservation of the species but also to provide for the needs of DOE's mission. If we have an endangered species out here that the conservation of it, the management strategy for it is so rigid or so limiting that DOE can't do its work, then it makes INL less of an attractive place to bring a big program like a new reactor or like some of these National Homeland Security sort of programs that also need the space to do the things that they need to do that really are important to all of us. It makes conservation management a greater challenge, I think, on the INL than on other lands because there is this other mission that really must be provided for somewhere, and to find a way to accomplish both without compromising either is a challenge and that is exciting as well. That is again I think something that is more challenging than if we were doing this on any other land that was being managed for the land, like BLM or the Forest Service or Wildlife Refuge. It is none of those things. It is an energy research laboratory. So maintaining that capability is the key goal for our ecological conservation strategy, so that provides for a very different approach to conservation management.

Changes in the DOE mission provide constant challenges to environmental work at the Laboratory. The shrinkage of the Laboratory footprint, from eight work areas to just two, provides more open land to be monitored environmentally. At the same time, the expansion of the National Security Test Range and related facilities provides new challenges to the overall environment of the site, with a range of disturbances that could be potentially greater than anything experienced in the first decades at the Laboratory.[34]

As noted the Laboratory has been designated a National Environmental Research Park (NERP). A large part of this is the Sagebrush-Steppe Ecosystem Reserve (SSER), established in 1999. This reserve was established in response to a determination by the National Biological Service four years earlier that the entire range of the sagebrush-steppe ecosystem across the West was endangered. The SSER was created to be a natural laboratory where key elements of the natural ecosystem could be preserved and studied, with additional attention to cultural resources and current Native American tribal values.[35] The SSER is also an ideal place to study the effects of fire on the sagebrush ecosystem. Most of the studies on the reserve are ongoing and are not funded by the DOE.[36]




INL's Sagebrush-Steppe Ecosystem Reserve (SSER)

The SSER, which covers about 115 square miles within INL, was designated by Secretary of Energy Bill Richardson in 1999 to address the conservation of this portion of the unique ecosystem under federal control.

A management plan for the reserve was established in 2004, leading the way for baseline studies to inventory and study the vegetation and its animal inhabitants.

the greater sage-grouse, pygmy rabbit, ferruginous hawk, and burrowing owl are ubiquitous to the Site. The U.S. Fish and Wildlife Service has reviewed the status of these resident species under the Endangered Species Act and determined they are not warranted for listing or are warranted but precluded from listing due to other higher priority species. Threatened and Endangered Species List (SL 06-0293; March 1, 2006).

"The Sagebrush Steppe Ecosystem across its entire range was listed as a critically endangered ecosystem by the National Biological Service in 1995, having experienced greater than a 98% decline since European Settlement… Conservation management in this area is intended to maintain the current plant community and provide the opportunity for study of an undisturbed sagebrush steppe ecosystem...". ***- SSER Proclamation, 1999***

Mule Deer on Range

INL's **Firefighters**

One of the main pillars of support for the sagebrush environment is the team of firefighters that police the grounds of the INL. INL has three fire stations and has 22 firefighting staff on hand at all times. Its complement of equipment includes four heavy wildland fire engines, as well as other gear, and its force contains 75 qualified wildfire firefighters. Each year, the INL Fire Department prepares for the next wildfire season that could impact its 890-square miles of high desert land. In 2000, a wildfire consumed over 30,000 acres near the ATR complex and in 2007 the Twin Buttes fire took 9,434 acres. 2008 brought nine wildfires that took 1,454 acres. The Jefferson Fire consumed 109,467 acres in 2010. During the largest wildfire within the last decade, 300 INL and BLM firefighters worked the Jefferson Fire from four fronts. High winds spread the fire initially but firefighters got it under control using 28 fire engines, nine bulldozers, a helicopter, five air tankers and an air attack plane to try and stop the fire from spreading further.[39]

Jefferson Fire

Middle Butte Fire

The importance of the Laboratory to the study and protection of the sagebrush-steppe ecosystem is difficult to overstate. Sagebrush-steppe covers much of the land surface in the American West, but in most places it is not in good condition due to overgrazing and other uses. This is not the case at the Laboratory, where the natural environment has been protected. This has important implications for sagebrush wildlife. As Roger Blew stated:

> *Both sage grouse and pygmy rabbits eat sagebrush leaves as a major part of their diet, especially in the wintertime. Pygmy rabbits eat almost nothing but sagebrush. So having good healthy stands of sagebrush became important for both of these species. There are a number of other species that are sagebrush-obligate species, and the same kind of threats apply to them. Most of this is related to loss of habitat. Sagebrush-steppe covers about 15 percent of the North American continent, but very little of it is in good condition. The INL is probably the best-conditioned habitat for those two species, as well as the other sagebrush obligates anywhere. So it provides an interesting opportunity for conservation, having some of the best quality habitat, providing DOE with some really interesting opportunities to conserve them.*[37]

In addition to studying the environment and the wildlife that it supports, the Laboratory is also committed to the preservation and study of the cultural resources found on the site. Under a variety of laws such as the National Historic Preservation Act, federal agencies are required to identify and protect the cultural resources they steward. BEA's Cultural Resource Management Program oversees and manages the resources for DOE. In addition, the Laboratory has a wealth of resources that range from prehistoric lithic scatters to experimental test reactors, and everything in between. More specifically, cultural resources at the Laboratory include archaeological sites and materials, structures, buildings, and objects over 50 years of age, facilities that are exceptionally significant and that are less than 50 years of age, and cultural sites and natural places important to American Indians and other groups. There are Pleistocene artifact assemblages that date to the end of the last ice age, early homesteads from the late 1800s, concrete water diversion structures that date to the early 1900s, and reactor sites from the early days of nuclear energy.[40]

As part of the Laboratory's preservation planning and in compliance with the National Historic Preservation Act, over 500 Laboratory buildings have been surveyed and assessed for eligibility to the National Register of Historic Places. Nearly 300 of these have been identified as historic and potentially eligible to the National Register. As of 2005, the EBR-I reactor was the only resource listed as a National Historic Landmark. Fifteen other Laboratory properties have been identified as "signature properties," a term used by DOE-Headquarters to designate the complex's most historically significant properties and those with the greatest tourist potential.[41]

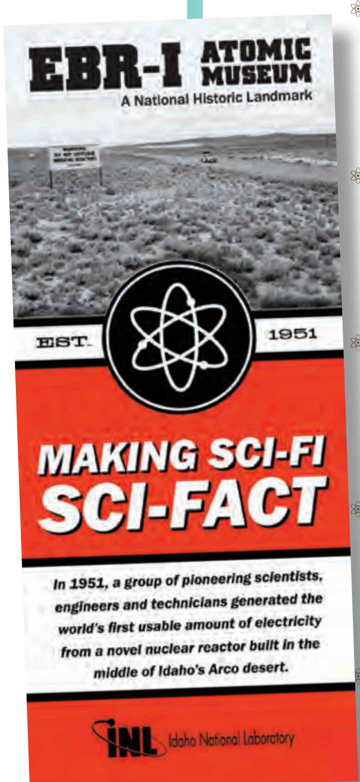
EBR-I was the first reactor built at the Laboratory, going critical for the first time on August 24, 1951. It produced the first electricity from atomic energy later that same year. In 1953, it became the first reactor to demonstrate that it was possible to breed more fuel than it expended.

EXPERIMENTAL BREEDER REACTOR-I

Visiting a National Historic Landmark

EBR-I Fast Facts:

- On December 20, 1951, EBR-I became the first power plant to produce usable amount of electricity from atomic energy.
- EBR-I was the first reactor built in Idaho at the National Reactor Testing Station (forerunner to today's INL)
- In 1953, testing at EBR-I confirmed that a reactor could create (or breed) more fuel than it consumes.
- This pioneering reactor operated for 12 years before being shut down for the last time in December 1963.
- President Lyndon Johnson visited the Site and dedicated EBR-I as a National Historic Landmark in 1966.



Decommissioned in 1964, it was made a National Landmark in 1966 and was opened to the public nine years later for visitation.[42] Today, visitors learn about EBR-I's significant contribution to our nation's history by self-guided or guided tours, as well as virtual tours. In 2011, the exhibits are to expand with interpretation of EBR-I's sibling EBR-II. EBR-II safely furnished most of the power for the site, using a new design - a closed fuel cycle.

Other historic reactors and buildings were not preserved and some were adapted for reuse. Those considered historically significant were photographed, researched, and documented. The level of documentation was specified in the "Cultural Resource Management Plan" as legitimized through a 2004 Programmatic Agreement between the DOE and the Idaho State Historic Preservation Office[43] Highly significant resources such as the MTR, which has been dubbed the "mother of all American power plants," were photographed and documented, with the information preserved in a formal HAER (See overleaf).[44] A HAER report contains a historical narrative about a resource, photography of its end state and historic photography of its construction and years of operation as well as copies of select engineering and architectural resource drawings. The HAER documentation preserves what is significant about a resource and the report is archived at the Library of Congress where it is available to the public. Facilities such as the hangar in TAN that

PRESERVATION REALITIES

When I first started the INL History program in 1993, my vision was, that we're going to save everything and we will have tours through the buildings, we'll be able to do these things. But reality set in and I realized that triage was necessary for a variety of reasons. I mean, the challenges of preserving historic buildings on an active nuclear site, are many.

... But the other thing is, the Site is closed off to the public and so you're preserving them for who? Even though you look a hundred years down the road the maintenance of these properties is very, very expensive. You're on a nuclear site that has to be run and maintained as a nuclear site and so there are certain rules and regulations that apply to it. The Settlement Agreement mandated DOE to get rid of the waste here.

To further complicate matters, the cleanup contractor – and I don't know if this is still true but in the beginning they were paid fee by the square foot, and so for every square foot demolished they earned money. ... A lot of time asbestos was used as the reasons to take buildings down. So it ended up that we have identified nearly three hundred buildings onsite that are eligible for listing on the National Register. Of those probably at least half of them are gone now. Some of them were the biggest, oldest, most important buildings onsite. ... And so when you think about that and the fact that this facility has been here since the beginning of the site it's really sad for a preservationist to consider that it's gone. I mean for us, for preservationists, it's something near and dear to our hearts that we know when the tangible evidence of this program is gone, it's gone forever. For other people the buildings are landmarks. They drive by them everyday and they see them everyday. The changes to the historical and cultural landscape are huge.

Julie Braun-Williams, 2010
INL Cultural Resource Management Program
Technical Lead

were not demolished but were adapted for reuse in a way that changed their historic fabric were also similarly documented. Many other historic reactors and reactor buildings at the Laboratory have been documented to HAER standards before their demolition or adaptation for reuse.

Copies of HAER reports and many other data are stored in the emerging INL Archive Center. The INL Archive Center is now a formal responsibility of the DOE-Idaho Office, and is an important means of preserving the history of the Site.[45]

Balancing the needs of the garden and the machine is a full time job at the Laboratory requiring workers with various backgrounds and training. While the ICP is a large and visible part of this environmental mix, the regulatory requirements that made cleanup happen also put other players on the field to assure that our natural and cultural environment is stewarded. This tension is perhaps the Laboratory's strong card, producing teams that value both the future and the past.

HAER DOCUMENTATION
Materials & Engineering Test Reactors

- **Title:** Idaho National Engineering Laboratory, Test Reactor Area, Materials & Engineering Test Reactors, Scoville vicinity, Butte, ID
- **Creator(s):** Historic American Engineering Record, creator
- **Related Names:** Blaw-Knox Construction Company Kaiser Engineers Hummel Hummel & Jones Fluor Construction Arrington Construction United States Department of Energy Stacy, Susan M. , Historian
- **Medium:** Photo(s): 467 (4x5 and 8x10) Data Page(s): 176 plus cover page Photo Caption Page(s): 92
- **Reproduction Number:** [See Call Number]
- **Call Number:** HAER ID-33-G
- **Repository:** Library of Congress, Prints and Photographs Division, Washington, D.C. 20540 USA
- **Notes**: Survey number HAER ID-33-G
- **Building/structure dates:** 1950 initial construction
- **Building/structure dates:** 1956 initial construction
- **Significance:** After World War II, one of the highest priorities of the Atomic Energy Commission was nuclear reactor research. The Atomic Energy Commission needed a “high flux” research reactor, an instrument subjecting materials to intense radiation: the MTR. Scientists used the MTR to learn how radiation affected materials potentially useful for cooling systems, fuels and structural support for later reactors. The Atomic Energy Commission applied MTR findings to propulsion reactors for warning systems and to commercial power plants, which required reliable, continuous, and safe operation in locations near populated urban areas. One of the first projects built at the new Nation Reactor Testing Station in Idaho, the MTR operated between 1952 and 1970. The MTR subjected every conceivable substance to neutron flux in its test holes and loops, logging 125,000 hours and 19,000 irradiations. It “mothered” most of the military and commercial reactors subsequently built in the United States (and many other countries). Demand for higher neutron flux and larger test holes, particularly by the U.S. Navy, resulted in the ETR, built next to the MTR, which continued and refined the materials testing mission. It operated between 1957 and 1981.

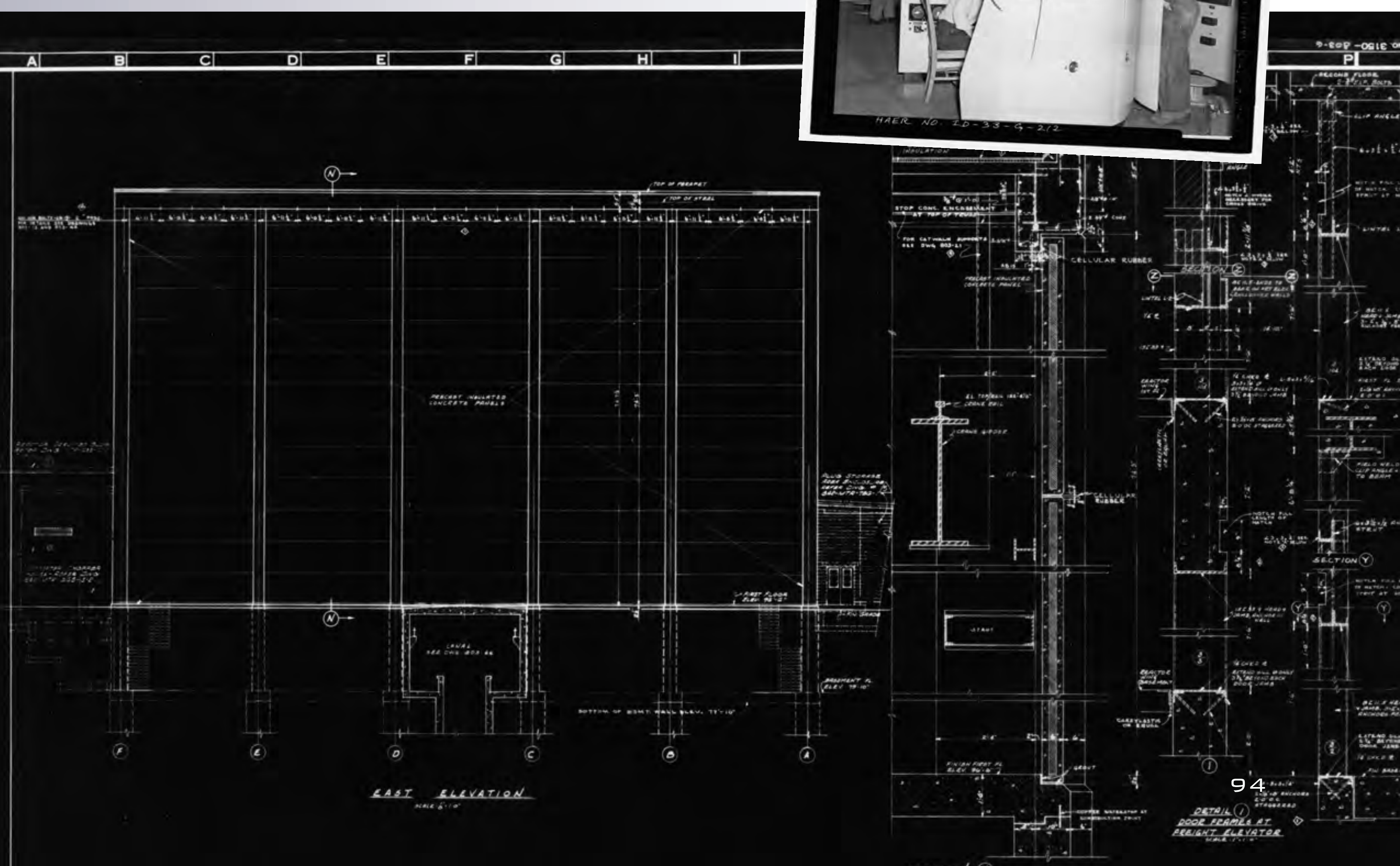
Aerial View

Building Elevation

Historic Views of Control Room during and after construction

HAER documentation typically includes a historical narrative that explains the significance of the resource, photography of the resource at the time of study and, its drawings, and historic views. Through research and photography, it identifies and preserves what is significant about a resource.

(Below) As Built Drawing Showing East Elevation, Blaw-Knox Construction Company, 1950



6 FUTURE **VISION**

…THE DRIVING MOTIVATION IS to make a difference. And that's how you should be measured in the end, Are you making a difference to society?
-Dave Hill, 2010

The need to make a contribution to the future of nuclear research is one of the reasons that nuclear scientists get up in the morning. As Dave Hill, Deputy Laboratory Director of Science and Technology at INL recently stated:

> *It won't be us alone [at the INL]-- we're a small part of what is a very big problem. But if we can contribute to that we'll have made a difference. A reasonable question is, Why do scientists, engineers, people like me, work at national labs? Usually you get people who want to make a difference. They really don't think that designing a better razor blade is a path to fulfillment. And we're able [to make a difference] because a national lab is very large. You can do much larger things [here] than you can do at universities, and you do it in groups, with equipment that can cost millions and millions of dollars and facilities that have got billions of dollars in replacement cost. So you have an opportunity to do what few people in the world could do. Every scientist wants to play - he's just a kid with toys really - but the driving motivation is to make a difference. And that's how you should be measured in the end, Are you making a difference to society? Is there some return on this investment? Not economic return but societal return. That's what drives people to work at places like this and do these sorts of things.*[1]

The visible footprint of the INL site may be shrinking, from eight work areas to two, but these numbers can be deceiving. The two remaining work areas on the INL Site, the ATRC and the MFC are essential for the new mission of the INL, and they will expand in the future. The new INL mission is once again oriented to the advancement of nuclear energy. Unlike the experimental and often secret nuclear research that was done in the 1950s, most of this new work will concentrate on nuclear energy for a growing global power demand. This entails the generation of both electrical power and industrial process heat. To demonstrate the greater openness of the new nuclear mission, the third campus of the INL is not even on the site but rather is situated in Idaho Falls. This third campus is operated in conjunction with Idaho's three major universities and is open to private business.[2]

There are many functions carried out at the INL, but it is recognized that the site's main mission must be to help provide the nation, and by extension the world, with safe and affordable nuclear energy. The ancillary mission is also to guarantee the security of that energy. With these tasks in mind, INL's vision for the future is to become the nation's pre-eminent nuclear energy laboratory, housing world-class staff and facilities, and supporting working partnerships with private industry and the international nuclear community. The INL is now poised to become that nuclear energy laboratory.[3]

More than a dozen mission objectives have been identified as pertinent to the INL in the coming years, and direct improvements to nuclear energy are always at the top of the list; most of the other objectives still have a connection with nuclear energy, in one form or another.[4]

One of the chief objectives for the future is the creation of a new nuclear fuel cycle. The goal of this research is to create a safe and efficient fuel cycle that would generate a minimal amount of radioactive waste. Often referred to as a closed fuel cycle, it would also help with the issue of nuclear non-proliferation. Work will also be done on improving the condition and use of existing light water reactors, extending the life of existing reactors and constructing new ones.

A closely related objective is work on advanced nuclear reactor systems. Most of this is associated with research and development of the new reactors for the twenty-first century, the so-called Generation IV reactors. The goal here is to develop the most promising technology for future power reactors. So far, this work has concentrated on fast-spectrum, sodium-cooled reactors (SFR) and high-temperature, gas-cooled reactors (VHTR). These could provide electricity for general use and high-temperature process heat for industry. The VHTR in particular would be ideal for providing the extra energy needed to produce hydrogen to power the cars of the future. The VHTR has also been designated the Next Generation Nuclear Plant (NGNP) which was specifically authorized by the Energy Policy Act of 2005.[6]

To further the nuclear agenda, both in this country and around the world, INL proposes to champion the global nuclear energy agenda through participation in the Global Nuclear Energy Partnership (GNEP) and the Generation IV International Forum (GIF). GIF was first created in 2000 to provide a common ground for the nations most active in nuclear research and development. In 2005, GIF established a Framework Agreement, "a treaty-level document for the nations acceding to it—enabling multi-national research and development cooperation on a scale not seen since the reactor safety programs of the 1980s." In the years since, GIF has expanded the number of member nations to include both China and Russia. U.S. participation in GIF is designed to increase this country's stake in the nuclear renaissance. In addition, the INL will further this goal by working closely with both the U.S. nuclear industry and the government, building relationships with U.S. nuclear industry organizations and government regulators, specifically the Nuclear Regulatory Commission.[7]

Safeguarding the nation's energy infrastructure, work that is being done through the Department of Homeland Security is another important plank in INL's future missions. The remote location of INL and its pre-existing electrical grid system make it an ideal place to test our defenses against potential attacks on the nation's electrical infrastructure. New energy sources will do little good if they cannot be protected.

Another way to provide for our nation's energy security is through energy independence. Nuclear energy in general would help make this possible, but the real solution would be to find a means of powering our automobiles with something other than petroleum. The most promising technology to date is a hydrogen-based transportation system, fueled by hydrogen gas produced by nuclear power.[8]

Providing nuclear power for U.S. space exploration is an auxiliary but important site objective. Space vehicles need reliable power and they are usually too far from the sun to rely on solar electricity, so they have to bring their own power source. The best source for this power has proven to be "radioisotope thermoelectric generators" or RTGs. These are nuclear power sources that produce heat, which is then converted to electricity. Years of space missions have determined that plutonium-238 is the best isotopic heat source for RTGs. Since most production reactors in the U.S. have been closed since the 1980s, plutonium-238 is now in low supply, and one of the future objectives for the INL is to resume and supervise production of this isotope.[9]

The other objectives for the future are related to those that have previously been stated. They include maintaining a strong scientific and engineering base, which would be an essential platform for carrying out basic and advanced research work. It is also important to revitalize education and training in nuclear science, which has been allowed to atrophy in recent years. In a more general sense, it is also important to foster public trust in the potential of the INL and the nuclear industry in general. The new INL campuses, including the public one in Idaho Falls, are integral to this effort.[10]

Between 1995 and today, INL has changed more than its name. It has transformed itself. Once a confederation of nuclear research *fiefdoms,* it has become a single entity, a full and productive national laboratory. It has returned to nuclear research yet has maintained or developed other missions that give back to the American public from R&D to homeland security. The strategy for the future makes clear the site's driving motivation – to make a difference.

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[9] Enge, *INL Strategic Plan*, 2006, p. 4.

[10] Enge, *INL Strategic Plan*, 2006, pp. 10-11.

APPENDIX A.
INL MANAGERS & CONTRACTORS

DOE-ID MANAGERS, 1999-2011

Beverly A. Cook	May 1999 – September 2001
Mark W. Frei (Acting)	September 2001 – February 2002
Warren Bergholz (Acting)	February 2002 – April 2003
Elizabeth A. Sellers	April 2003 – January 2009
Dennis Miotla (Acting)	January 2009 – May 2010
Richard B. (Rick) Provencher	May 2010 –

APPENDIX B.
PRIME OPERATING SITE CONTRACTORS & OFFICIALS

1999 – 2005 Bechtel BWXT Idaho, LLC

Bernard L. "Bernie" Meyers, president and general manager, 1999-August 2001.

Bill Shipp, INEEL director and deputy general manager, 1999-August 2001. INEEL director, president, and general manager, August 2001 – October 2003.

Paul Divjak, president and general manager, October 2003 – 2005 transition

Paul Kearns, acting INEEL director, October 2003 – May 2004. INEEL director, May 2004 – 2005 transition.

2005 - Battelle Energy Alliance [BEA] (for INL)

John Grossenbacher, INL director and BEA president, February 2005 -.

2005 - CH2M-WG Idaho, LLC [CWI] (for Idaho Cleanup Project)

Alan M. Parker, president and chief executive officer, March 2005–June 2006.

Robert C. "Bob" Lotti, president and chief executive officer, June 2006-.

APPENDIX C.
SPECIAL PROGRAMS

Advanced Mix Waste Treatment Project (AMWTP)

December 1996–2005	British Nuclear Fuels (BNFL Inc.)[Construction of main facility began, August 2000]
2005-	Bechtel BWXT Idaho. Frank Russo, president and general manager, May 2005 – August 2006. Paul Divjak, president and general manager, August 2006 – November 2007. Jeffrey D. Mousseau, president and general manager, November 2007-.

Argonne National Laboratory-West (ANL-W)

1999–2005	University of Chicago

Specific Manufacturing Capability (SMC)

1999–2005	Bechtel BWXT Idaho, LLC
2005-	Battelle Energy Alliance (BEA)

Naval Reactors Facility

1999–February 2009	Bechtel Bettis, Inc.
February 2009-	Bechtel Marine Propulsion Corporation (BMPC)

APPENDIX D.
REACTORS & REACTOR FACILITIES IN OPERATION

Advanced Test Reactor (ATR) and ATR Critical Facility (ATRC)

The Advanced Test Reactor (ATR) and the ATR Critical Facility are located in the Test Reactor Area of INL. The ATR is a materials test reactor with an extremely high neutron flux. This versatile reactor has a unique design with four lobes that allow for several experiments to be conducted simultaneously. It was first started in 1967 and has been upgraded and refurbished several times over the years. It is the only reactor at INL for which there are any future plans, and it is integral to the new nuclear mission at the INL. Universities and other private groups now use the ATR for testing and experiments associated with the new mission. The ATR Critical Facility (ATRC) works in support of the ATR to verify the effectiveness of reactor controls and power distribution within the main reactor.

Neutron Radiography Facility (NRAD)

The Neutron Radiography Facility (NRAD) is located in the Hot Fuel Examination Facility at what is now the Materials and Fuels Complex (MFC), formerly the Argonne National Laboratory-West (ANL-W) campus. A non-destructive examination facility, NRAD can produce neutron radiographs that show the internal condition of irradiated test samples without having to cut the samples open mechanically. NRAD also serves as a neutron source for the production of isotopes, and can determine the effects of radiation on reactor materials. NRAD is useful for post-irradiation studies on materials that come out of the ATR.

APPENDIX E.
HAER DOCUMENTS FOR INL

Test Area North: Idaho National Engineering Laboratory, Test Area North, Hangar No. 629, Scoville Vicinity, Butte, Idaho. HAER ID-33-A.

Advanced Reentry Vehicle Fusing System: Idaho National Engineering Laboratory, Advanced Reenetry Vehicle Fusing System, Scoville Vicinity, Butte, Idaho. HAER ID-33-B.

Old Waste Calcining Facility: Idaho National Engineering Laboratory, Old Waste Calcining Facility, Scoville Vicinity, Butte, Idaho. HAER ID-33-C.

Army Reactors Experimental Area: Idaho National Engineering Laboratory, Army Reactors Experimental Area, Scoville Vicinity, Butte, Idaho. HAER ID-33-D.

Test Area North: Idaho National Engineering Laboratory, Test Area North, Scoville Vicinity, Butte, Idaho. HAER ID-33-E.

SPERT-I & Power Burst Facility Area: Idaho National Engineering Laboratory, SPERT-I & Power Burst Facility Area, Scoville Vicinity, Butte, Idaho. HAER ID-33-F.

Test Reactor Area, Materials and Engineering Test Reactors: Idaho National Engineering Laboratory, Test Reactor Area, Materials and Engineering Test Reactors, Scoville Vicinity, Butte, Idaho. HAER ID-33-G.

Idaho Chemical Processing Plant: Idaho National Engineering Laboratory, Idaho Chemical Processing Plant, Fuel Reprocessing Complex, Scoville Vicinity, Butte, Idaho. HAER ID-33-H.