



EXECUTIVE SUMMARY | JANUARY 2013

Nuclear energy currently accounts for nearly 20 percent of electricity production (and for nearly two-thirds of all low-carbon electricity production) in the United States. There are 104 operating nuclear power plants in the nation, more than 430 nuclear reactors worldwide, roughly 60 under construction and another 150 new reactors planned across the world.

EXECUTIVE SUMMARY

Nationally, low natural gas prices and heightened public concerns following the Fukushima accident have slowed the rate of deployment of nuclear reactors in the U.S. Only four new nuclear plants of the 26 contemplated in the early 2000s are under construction. Conversely, despite the economic impacts of low natural gas prices, most of the nation's 104 operating nuclear plants have been able to compete favorably with gas-generated electricity and most have applied — or are expected to apply — for 20-year license extensions.

Outside the U.S., the nuclear industry is still growing in some parts of the world, with several countries planning to build new reactors. In recent surveys, a strong majority of the U.S. public believes the nation should maintain a presence in nuclear safety and nonproliferation. Additionally, public support for nuclear energy has increased steadily. Whether natural gas will continue to be plentiful and cheap in the U.S. is currently uncertain and in light of this uncertainty, many experts argue that maintaining a balanced and diverse supply of energy sources is important to our nation's long-term economic strength and energy security.

The LINE Commission agrees. The U.S. should continue conducting research in nuclear technology and remain involved in nuclear issues, and the Commission sees considerable opportunities for Idaho and the Idaho National Laboratory (INL) to capitalize on the required research capabilities the nation and the world will need. Accordingly, at the heart of this report, the LINE Commission believes it is in the best interest of Idaho to strengthen and capitalize on its nuclear competencies.

The nuclear energy industry has deep roots in the State of Idaho and to this day plays a large role in the Idaho economy. Since its creation in 1949, the INL site — an 890-square mile facility located in and west of Idaho Falls — has hosted dozens of nuclear research reactors, including a full-size prototype of the one used in the world's first nuclear-powered submarine and another that enabled Arco,

IDAHO NATIONAL LAB

A SIGNIFICANT STATE ASSET

Idaho to become the first city lit by nuclear power. In short, INL is the nation's flagship research facility for nuclear technology.

Beyond nuclear research capabilities, INL is known worldwide for its expertise in leading energy technology and research including:

- "Hybrid" energy systems;
- Nuclear power systems, including the one powering the Curiosity rover on Mars;
- Wireless communications, grid reliability and security; and
- Software and hardware to protect critical national infrastructure from cyber attack.

Several major private companies operate in the state, providing materials, equipment and professional services to the U.S. Department of Energy (DOE) and DOE contractors that conduct work at the INL site. In fact, according to a recent study, INL alone is responsible for 24,000 direct and indirect jobs in Idaho — or 3.5 percent of the state's overall employment — and contributes more than \$3.5 billion to the state's economy on an annual basis.¹



The state-of-the art CAES facility provided a nearly 6:1 return on Idaho's investment in its operation in 2012.

¹http://cobe.boisestate.edu/files/2010/12/Impacts_Brochure-Web1.pdf.

²The state's three research universities are the University of Idaho, Idaho State University, and Boise State University.

Directly associated with INL are well-respected programs in nuclear engineering and related fields at Idaho's leading universities. The three Idaho research universities have over 20 faculty members and 400 students in degree programs ranging from the Associate in Science (A.S.) to Doctorate degrees (Ph.D.).²

Since its reorganization in 2005, INL has been the nation's leading facility for nuclear energy research, development, and demonstration. It is one of ten large, multi-program national laboratories owned by the U.S. Department of Energy (DOE) and is host to a multi-billion dollar, decades-long effort for the advancement of nuclear energy research, mitigation and prevention of environmental contamination, and the development of leading non-nuclear energy technologies. Cleanup and waste management are conducted under two separate contracts: the Idaho Cleanup Project and the Advanced Mixed Waste Treatment Project. The Navy also has operations on the INL site, managing its spent nuclear fuels.

INL is responsible for 24,000 jobs in Idaho and contributes over \$3.5 billion to Idaho annually.

NUCLEAR AND ENERGY TECHNOLOGY RESEARCH

INL is well-positioned to capture a significant share of DOE funding directed at nuclear energy and nuclear technologies. Specifically, INL benefits from these key assets:



INL's TREAT facility is maintained in cold standby



One of INL's biomass research labs

- **Advanced Test Reactor and Supporting Facilities:** Foremost among INL's research facilities is the Advanced Test Reactor (ATR), which has been named a DOE National Scientific User Facility and is globally recognized for its unique capabilities with respect to the development of new fuels and materials.



The Advanced Test Reactor

- **TREAT Reactor:** The Transient Reactor Experiment and Test Facility (TREAT) is another national asset. The TREAT reactor, on standby since the 1990s, is designed to test the safety and performance of advanced nuclear fuels that enable safer and more efficient nuclear power generation.

- **The Naval Reactors Facility:** The Naval Reactors Facility examines and stores naval spent nuclear fuel from the nation’s nuclear submarines and surface ships.
- **National and Homeland Security Capabilities:** Amid a broad array of capabilities in this area are a national wireless user facility and an independent electric grid, both of which support research on infrastructure security.
- **Energy and Environment Research:** Research being done in this area encompasses battery research, hybrid energy systems, bio-fuels, and clean energy and water technologies.

ENVIRONMENTAL CLEANUP AND RESTORATION

Often referred to as the “Idaho Cleanup Project,” this significant undertaking encompasses efforts to remove and safely contain nuclear waste generated by legacy nuclear activities and by World War II-era conventional weapons testing on what is now the INL site. This 10-year, \$4 billion cleanup project is removing the legacy waste from the ground and ultimately



The Integrated Waste Treatment Unit

protecting the Snake River Aquifer, which lies beneath the INL site and is a major water resource for southern Idaho.

While some challenges remain (see IWTU below), the vast majority of these tasks have been successfully completed — in most cases on schedule and under budget. Hence the Cleanup Project is generally viewed as a resounding success. An important feature within the Idaho Cleanup Project is the Integrated Waste Treatment Unit (IWTU):

- **IWTU** – Under an agreement between the State of Idaho and DOE – discussed in more detail below – DOE is required to treat all remaining liquid waste by the end of 2012 and the IWTU is the facility built for that task. Critical IWTU equipment experienced technical difficulties and has delayed the scheduled treatment of liquid wastes, prompting DOE to notify the State of Idaho that it will miss a Settlement Agreement milestone. (See the final report for more details). Efforts are being made to remedy the situation and DOE plans to complete the waste treatment as soon as possible without sacrificing safety or quality.

Another important contract to manage waste is the Advanced Mixed Waste Treatment Project (AMWTP):

- **AMWTP** – This project and its facilities are designed to retrieve, characterize, treat and repackage the transuranic waste stored at the INL site. (See subsequent pages for a description of waste types). These cleanup efforts have been very successful and are expected to be complete in 2015. The distinguishing feature of the AMWTP is its unique capability to process hazardous material. As this facility is a national asset, it could potentially be used inside the DOE complex as a strategic resource — for example, to sort, characterize, and repackage similar mixed waste at other DOE sites — once the INL site cleanup effort is completed.

To ensure that INL's status as the flagship research facility is maintained and enhanced, Idaho Governor C.L. "Butch" Otter established the Leadership in Nuclear Energy ("LINE") Commission to make recommendations on policies and actions the state could undertake to support the long-term viability of INL.

LINE COMMISSION

A GOVERNOR'S FORESIGHT

The Governor recognized that recent national developments in the nuclear energy sector will cause the State of Idaho to face important strategic choices in the future and that he needed to better understand the options available.

To fulfill this charge, the Commission grappled with several recent national developments outlined later in this summary to best position Idaho and the lab going forward:

- Increasing pressure on federal budgets, which could lead to reduced funding for federal energy research and cleanup work across the national laboratory system, including at INL.
- The federal government's decision to withdraw its license application for a permanent nuclear waste repository at Yucca Mountain, which leaves spent nuclear fuel and high-level waste currently being stored at INL with no place to go.
- Aggressive and renewed efforts by other states to establish competencies that will compete with INL and with programs offered by Idaho universities.
- The opportunity to redirect funds from cleanup to research as the cleanup process winds down.³

These developments create challenges as well as opportunities for Idaho. For example, the Yucca Mountain decision affects Idaho in two ways. First, it means that spent fuel at locations across the country will remain in storage for much longer periods than initially anticipated, including in Idaho. As discussed in more detail below, DOE's latest plan calls for a spent fuel repository to be available in the year 2048, decades after the repository at Yucca Mountain was supposed to be open, thus potentially undermining one of the core assumptions of Idaho's Settlement Agreement.⁴ Second, it creates an opportunity. INL is ideally suited to host the new research efforts that will



Aerial view of dry waste storage facilities at INTEC

be needed to study the behavior of spent nuclear fuel over long periods of time in dry storage. DOE's revised deadline accelerates the need for that research.

This report describes these challenges, makes certain findings, and outlines recommendations developed by the LINE Commission from February 2012 through January 2013. The Commission worked carefully to provide all interested parties the opportunity to participate and be included. The Commission followed a deliberately transparent and inclusive process — including a public website, extensive opportunities for public comment, and multiple meetings held across the state — to ensure that its deliberations benefited from as many opinions, ideas, and recommendations as possible. The Commission extends sincere appreciation to all those who participated in and supported this effort.

Early in the process, the Commission created subcommittees in an effort to address strategic questions in a substantive and timely manner. The subcommittees added additional subject matter experts to assist in this effort. The subcommittees issued their findings to the full Commission in November 2012, and in December 2012 the LINE Commission issued a "progress report" summarizing the scope of issues reviewed and the recommendations developed by the five subcommittees.

The final recommendations of the LINE Commission, contained in this summary and the accompanying full report, draw from the recommendations of the subcommittees, public comment and the deliberations of the full Commission. More information on the LINE Commission's membership and deliberative process is available in the full report and at www.line.idaho.gov.

³See letter from Robert M. Card, Under Secretary of Energy, to the Honorable Mike Simpson, February 5, 2004.

⁴*Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*, U.S. Department of Energy, January 2013.

To provide context for the Commission’s recommendations, it is imperative to have a sound understanding of Idaho’s current policy framework. Obviously, the beginning point for this conversation is the 1995 Settlement Agreement.

LINE COMMISSION FINDINGS

The Settlement Agreement sets legally enforceable deadlines for the handling, treatment, and shipment of nuclear wastes and legacy materials from the INL site, along with financial penalties if the deadlines are not met. In exchange, it allows DOE and the U.S. Navy to ship defined quantities of spent nuclear fuel into the state for interim storage, provides funding for economic development, and establishes INL as the nation’s lead laboratory for research on spent fuel management and disposal.



Waste shipment headed out of Idaho

As we approach the midpoint of the 40-year Settlement Agreement, the LINE Commission took stock of cleanup progress achieved under the Agreement. So far 959 of 964 cleanup milestones for the INL site have been met on time, thousands of shipments of nuclear wastes buried at the site have been sent to New Mexico’s Waste Isolation Pilot Plant facility for disposal, and spent fuel on site has been transferred from wet to safer and more robust dry storage. Overall, environmental risks at the INL site have been dramatically reduced and much of the waste that remains on site is now in forms and storage configurations that provide more secure isolation from the environment.

Our analysis of this framework resulted in a series of findings or guiding principles that informed the LINE Commission’s recommendations.

FINDING NO. 1: SAFETY AND ENVIRONMENTAL PROTECTION ARE NON-NEGOTIABLE

The LINE Commission believes that safety and environmental protection are non-negotiable preconditions for the nuclear energy industry’s future success in Idaho but also nationally and globally. To this end, the State of Idaho fought hard to force DOE to clean up the INL site and succeeded in negotiating a Settlement Agreement that has already proved effective as a mechanism to ensure the federal government meets its cleanup commitments to the people of Idaho. The first priority — ensuring that cleanup efforts are completed — will always remain the state’s top priority.

It is important to recognize that in light of the federal government's fiscal challenges and expected reductions in the DOE budget, steps need to be taken to ensure that continued funding for the cleanup is not decreased or jeopardized. The federal government has cleanup obligations at other federal sites that also demand attention and will compete with INL for cleanup funding; the potential exists for Idaho Cleanup Project funds to be redirected to meet those other obligations.

FINDING NO. 2: STORAGE AND DISPOSAL TECHNOLOGIES HAVE MARKEDLY IMPROVED

To more fully understand the context of discussions about waste cleanup funding and timelines, several key distinctions need to be made.

For example, it has become a common practice to refer to several very different radioactive materials as "waste." That terminology lumps together radioactive material that has no future value or use with used nuclear fuel that has no current use but could potentially be utilized in the future. Even the very valuable used nuclear fuel with which INL conducts research and development work is often referred to as "waste" in the public dialogue.

In addition, there is a dramatic difference between nuclear waste being *disposed* of versus nuclear waste being *stored*.

- **Nuclear Waste Disposal:** Represents a permanent placement of nuclear waste with no intention of ever retrieving the material. The most well known modern disposal site is the Waste Isolation Pilot Plant (WIPP) in New Mexico. There, in natural salt beds, transuranic nuclear waste is permanently disposed of with no expectation of future retrieval. Additional, private and DOE facilities exist across the U.S. for the disposal of low-level radioactive waste.
- **Permanent Nuclear Repository:** Represents a permanent *disposal* site for DOE spent fuel and high-level waste and for spent nuclear fuel from commercial reactors. Yucca Mountain was selected by Congress in 1987 to host a permanent repository; unless the Yucca Mountain project is resurrected, the nation has no identified repository site.

There is a **dramatic difference** between nuclear waste *disposal* and used nuclear fuel *storage*.

- **Spent Fuel Storage:** Represents the temporary, and likely long-term, storage of spent nuclear fuel. These facilities – both spent fuel pools and dry storage casks – are located across the nation and are designed with robust technology that enables safe storage that can be utilized for decades and longer. Current fuel storage capabilities allow for future retrieval of the spent fuel.

IDAHO'S LEGACY WASTE: AN EARLY DUMPING GROUND

For decades, the nation's environmental standards for disposing of radioactive materials and chemical wastes were based on principles of isolation, dilution and minimizing exposure. In short, it was viewed as acceptable to dispose of certain nuclear waste in drums and boxes, buried in the ground, in remote areas.

As a result of those policies, Idaho and INL became the destination for significant quantities of waste from Rocky Flats, a Colorado facility for nuclear weapons component production during the Cold War. That low-level waste was disposed of in Idaho with varying degrees of discipline. In the early days, the practice was to dig pits and trenches, dump the waste and then cover it with dirt. Later, an asphalt pad was constructed and barrels and boxes of waste were stacked in anticipation of being moved at some point in the future to a permanent disposal facility outside of Idaho.

Another accepted disposal practice of the day was to inject no longer useful organic solvents into the ground. That disposal practice has long since become obsolete and has resulted in on-going groundwater monitoring at each of these injection well sites to verify that mitigation of these chemical contaminant sources is effective.

The following photographs illustrate prevailing disposal practices of their time. Considerable advances in hazard understanding and risk mitigation technologies have occurred since the 1970s and today, INL activities are being managed to new and much higher environmental standards. *To be clear, these old disposal techniques would now be against the law!*



Above: A load of debris-laden drums is emptied into an unlined pit in 1969.



Left: Workers unload barrels of waste from Colorado's Rocky Flats Plant in 1961.

IDAHO CLEANUP PROJECT

As a result of 1960s and 1970s era practices, Idaho currently carries the burden of “legacy waste.” As part of the Idaho Cleanup Project, organic materials and other waste that posed the greatest risk to the aquifer are being removed and safely disposed. The remaining areas will be safely secured and capped, and then closely monitored so that any residual materials that are impractical to retrieve and technically acceptable to remain in an engineered disposal site will not threaten the aquifer. As previously noted, the cleanup project is viewed as largely successful to date.

CURRENT INL WASTE: DRAMATICALLY DIFFERENT

Today, the technology surrounding nuclear energy has dramatically advanced to where risks to the environment are

significantly lower. Advances have occurred in both waste disposal and storage.

The following is a brief summary of the main types of nuclear materials currently present at INL, how they are stored and how they are being, or will be, disposed of.

- **Low Level Waste (LLW):** Low level waste consists of radioactively contaminated items such as paper, rags, plastic bags, or water-treatment residues resulting from INL activities. Levels of radioactivity are often just above normal levels found in nature. If this waste remains enclosed and contained, it can be safely handled, shipped and disposed. Today, we have no low-level waste coming from outside the state for disposal at INL. Some radioactive material resulting from research at INL is disposed of on site in engineered facilities that are designed to isolate the materials and protect the Snake River Aquifer, while other low-level wastes are shipped out of state for disposal.

- **Liquid Waste:** This category includes liquid waste resulting from past fuel reprocessing and decontamination work at INL. Currently 900,000 gallons of liquid waste are being safely stored in tanks awaiting final processing. This liquid waste is highly radioactive and more challenging to manage for the long term than solidified waste. Once solidified, this waste will be stored in robust concrete and steel containers at INL until disposed of in a repository or in a facility like the Waste Isolation Pilot Plant in New Mexico.
- **Calcine:** Calcine is a granular material, similar in texture to dry laundry detergent, that results from the drying of

high-level liquid wastes from INL reprocessing activities. Though calcine is highly radioactive, it is stable and currently stored in concrete-encased stainless steel bins designed to be effective for 500 years. It will be disposed of



A preferred practice today is to place sufficiently cooled used nuclear fuel in physically robust steel and concrete casks that can be stored either vertically or inserted horizontally into reinforced concrete bunkers.

in a repository or facility like the Waste Isolation Pilot Plant in New Mexico.

- **Spent Nuclear Fuel (SNF):** Spent or used nuclear fuel is composed of the metallic plates, rods and rod bundles that have previously been used as fuel in a nuclear reactor. The properties of SNF make it stable and straightforward to store. The storage of SNF in Idaho presents a small environmental risk. Spent fuel that has been shipped to Idaho was never intended for disposal at INL. It is stored by various means.

Typically, spent fuel is stored in water for cooling and shielding purposes for a period of time and then put into dry storage containers. As technologies have improved, the storage methods for spent fuel at INL have improved. This fuel will be disposed of in a repository.

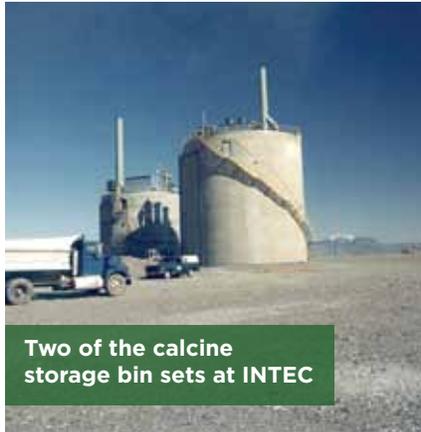
SPENT NUCLEAR FUEL STORAGE: DISTINCTLY DIFFERENT THAN DISPOSAL

Today, the nuclear industry continues to advance technology and storage techniques. Idaho, INL and the industry all benefit from these modern techniques. The pictures on preceding pages illustrate current technology surrounding the management of spent nuclear fuel. Any risks to the environment and surrounding areas created by modern forms of storage are dramatically lower than the risks created by now prohibited disposal techniques used in Idaho prior to 1995.

SPENT FUEL STORAGE DOES NOT EQUATE TO WASTE DISPOSAL

As outlined in the preceding pages, there is a significant difference between nuclear waste *disposal* and spent fuel storage. If Idaho were to allow nuclear waste disposal, our state would risk becoming the nation's spent fuel repository. As the Governor has stated, this would not be acceptable.

The LINE Commission, however, believes nuclear fuel storage technology enables the state to have confidence in current methods of spent fuel storage at INL while also gaining the experience to consider future opportunities involving spent fuel *storage*. Specifically, INL may need the ability to receive and store additional amounts of



spent fuel to support research in long-term fuel storage technologies. The LINE Commission believes these would be reasonable and appropriate opportunities to consider and would not risk making Idaho a nuclear dumping ground.

FINDING NO. 3: THE DECISION ON YUCCA MOUNTAIN DEMANDS THE STATE'S ATTENTION

National legislation passed in 1987 designated Yucca Mountain in Nevada as the sole site to be considered for a permanent repository to dispose of spent nuclear fuel and high-level waste. However, the State of Nevada never consented to host the repository, and stiff resistance from the state contributed to extensive delays in completing the project. Though originally required by law to open in 1998, later estimates foresaw the repository opening in 2020 at the very earliest. In 2010 the Obama Administration decided to terminate work on the Yucca Mountain project and directed a 15-member "Blue Ribbon Commission" to develop a new plan for getting the nation's nuclear waste management program back on track. All told, at the time of the Administration decision more than \$10 billion had been spent on investigations, repository design, license application development and other Yucca Mountain project activities.

The nuclear waste management strategy subsequently recommended by the Blue Ribbon Commission called for a new, consent-based approach to siting future nuclear waste management facilities; the creation of a new organization dedicated solely to nuclear waste management; changes to the mechanisms being used to fund nuclear waste management activities; and prompt efforts to develop one or more geologic disposal facilities and one or more consolidated storage facilities along with continued support for nuclear technology innovation and international leadership in the areas of nuclear safety, non-proliferation, and security. Fully implementing these recommendations will require legislative action by Congress; in the meantime, DOE has released an implementation strategy that calls for a nuclear waste disposal repository to be sited by 2026 and licensed and in operation by 2048.

What does all this mean for Idaho? Given the Administration's recent strategy, it is becoming increasingly likely that DOE will not make the 2035 deadline. Naturally, the next inquiry focuses on the state's recourse. Per the Settlement Agreement, the state would be entitled to collect \$60,000 per day. It is important to note, however, that this money is dependent on an appropriation from Congress. In addition, the fine is not adjusted for inflation.

In summary, the LINE Commission, like the Governor, recognizes that the Yucca Mountain decision challenges one of the core assumptions of the Settlement Agreement.

FINDING NO. 4: A SIGNIFICANT INDUSTRIAL OPPORTUNITY

An important aspect of Idaho's nuclear science and engineering leadership relative to other states is the impressive array of Idaho companies that provide goods and services to the nuclear industry. These companies range from manufacturers, engineering service companies and large-scale contractors to companies in the medical isotope sector. These companies have both started and located in Idaho, yet do a significant amount of business with out-of-state companies and the other federal labs across the nation. Clearly, INL has provided the firm foundation on which Idaho's broader nuclear industries sector has been built.

Four distinct categories of nuclear-related industrial opportunity exist in Idaho:

- **Existing Idaho Companies with Nuclear Specialties:** Protecting and supporting Idaho's companies will always be an important priority. The LINE commission

believes the state needs to maintain a close relationship with these companies and carefully support them as they experience growth. Supporting INL and its future growth will be a key factor in retaining our existing commercial nuclear expertise.

- **Out-of-State Companies Interested in Idaho:** As best exemplified by Areva's decision to locate its Eagle Rock enrichment plant in Idaho, there are other industrial partners that would be interested in participating in Idaho's nuclear sector as INL continues to grow. The Department of Commerce and the state need to pay close attention to those possible economic partners.
- **Nuclear Related Industries:** The medical isotope industry, for example, is creating promising medical solutions using nuclear technologies. Idaho has both companies with that expertise as well as significant research capabilities in the state's universities and INL. The state needs to pay close attention to supporting and

"Gigantic Industrial Opportunity"

Dr. Peter B. Lyons, DOE Assistant Secretary for Nuclear Energy, offered this description of what awaits states that embrace broader engagement in the nuclear energy sector.

expanding medical-related expertise and other potential applications for nuclear technology.

- **Consent-Based Interim Storage:** The Administration's recent nuclear waste management strategy emphasizes the need for states to partner with DOE in siting an interim storage facility. Should Congress act on this recommendation and provide access to the \$28 billion balance in the Nuclear Waste Fund, this could be a "gigantic industrial opportunity" for interested states.

In light of the findings articulated above, the LINE Commission considered whether certain provisions of the Settlement Agreement align with the state’s interest in advancing the mission of INL as well as Idaho’s other nuclear industries. Acutely aware of the sensitivities surrounding this inquiry, Governor Otter has made the point that Idaho is not

SETTLEMENT AGREEMENT

SHOULD CHANGE BE CONSIDERED?

interested in serving as a replacement for Yucca Mountain. The LINE Commission used the Governor’s position as an immovable goalpost. By the same token, however, the LINE Commission strongly believes the state must exercise leadership and adapt to the changes that have occurred over the past two decades.

HISTORICAL FLEXIBILITY IN SETTLEMENT AGREEMENT

The success of cleanup efforts, and the trust this success has engendered over nearly 20 years of federal-state cooperation since completion of the Agreement, have allowed the state and DOE to interpret or modify the Settlement Agreement to reflect changing circumstances — with benefits for both parties. DOE’s success in meeting Settlement Agreement milestones contributed to an environment where the State of Idaho decided to exercise some of the flexibility built into the Agreement:

- The Settlement Agreement caps the amount of spent fuel allowed to enter the state. Within those caps, the state agreed to allow small quantities of commercial reactor fuel to be shipped into Idaho for research purposes.
- Two modifications to the Settlement Agreement have been agreed to by the state and the federal government:
 - One modification allowed continuation of Navy operations beyond 2035.
 - A second modification clarified what is meant by removal of “all” transuranic waste.

The LINE Commission recognized this precedent. While the LINE Commission does not recommend any immediate change to the Settlement Agreement, there are discrete provisions — concerning calcine treatment and research quantities of spent fuel — that appear to fit with the state’s past precedent and warrant further consideration. In the opinion of the Commission, these areas present opportunities to fundamentally advance the mission of the lab.

1995 SETTLEMENT AGREEMENT

ENDURING STRENGTHS (Non-negotiable)

CONSIDERATIONS FOR CHANGE

AGREEMENT PROVIDED NECESSARY LEVERAGE TO INITIATE CRITICAL, AND LARGELY SUCCESSFUL, CLEANUP WORK.

1. Stopped disposal of other states' nuclear waste at INL.
2. Accelerated remediation of threats to Snake River Aquifer.
3. Substantially mitigated further contamination to the environment.
4. Initiated use of engineered landfills and other disposal strategies to protect the aquifer.

FAILURE TO LICENSE THE YUCCA MOUNTAIN REPOSITORY MAY JEOPARDIZE IDAHO'S INTERESTS WITH REGARD TO NUCLEAR WASTE MANAGEMENT:

1. Recent policies confirm the federal government will not likely have a repository for Idaho waste by 2035.
2. May relegate Idaho to a "de facto interim storage site" without meaningful financial rewards in return.

PRIORITIZED THE PROTECTION OF IDAHO'S ENVIRONMENT AND THE SNAKE RIVER AQUIFER.

1. Established priorities and deadlines for removal of highest environmental risks.
2. Initiated predictable provisions for moving forward.
3. Created permanent focus on the Snake River Aquifer and its current and future beneficiaries.

THE FINANCIAL PENALTY IS SUBJECT TO CAVEATS.

1. Fine is not guaranteed; subject to appropriation by the federal government.
2. Could create significant court and legal costs for Idaho to enforce.
3. Fine is not adjusted for inflation. By 2035, deterrent value will be significantly diminished.
4. A diminished fine may create incentive for federal government to not remove waste.

ESTABLISHED LEGAL, CONTRACTUAL PROVISIONS FOR IDAHO TO HOLD THE FEDERAL GOVERNMENT ACCOUNTABLE.

1. Established fixed timeframes and milestones for cleanup activities.
2. Established a financial penalty to benefit Idaho for non-performance.
3. Allowed mission critical fuel shipments to continue (Navy, DOE).
4. Enables state to block future shipments if deadlines are missed.

TO CONTINUE INL'S ABILITY TO PERFORM NEW RESEARCH, ADDITIONAL ACCOMMODATIONS, BEYOND THE CURRENT RESEARCH ALLOWANCES, MAY BE NECESSARY.

1. Future research missions will likely include fuel storage safety and technology. Research quantities would exceed current allowances.
2. Calcine waste is stable in its current state. Future funding intended for "repackaging" could be redirected for additional research missions.

Recognizing that the nuclear energy industries sector faces significant challenges, the LINE Commission nonetheless believes that a proactive approach to strengthening and leveraging its existing nuclear competencies could be of substantial long-term economic and strategic value to the State of Idaho.

LINE COMMISSION RECOMMENDATIONS

In particular, the LINE Commission fully supports the lead laboratory designation and believes strongly that the state should endeavor to protect the designation and the lab's enduring nuclear mission.

The LINE Commission has studied the burdens and benefits to the State of Idaho that accompany the nuclear research mission of INL. We are confident the significant benefits outlined elsewhere in the report far outweigh the limited, and manageable, burdens that arise from the presence of INL in Idaho.

Actions recommended by the Commission are grouped according to six, overarching strategic priorities that form the core of the Commission's recommendations. We believe the State of Idaho should:

- Continue to work cooperatively with the U.S. Department of Energy and other impacted states to address remaining environmental risks and continue cleanup at the INL site.
- Exercise leadership as the U.S. formulates federal energy and nuclear waste management policies.
- Capitalize on Idaho's nuclear technology competencies by supporting the growth of existing nuclear businesses, the corresponding infrastructure, and the attraction of new nuclear businesses.



- Invest in its infrastructure to enable INL and Idaho universities to successfully compete for U.S. and global research opportunities.
- Develop and promote the Center for Advanced Energy Studies as a regional, national and global resource for nuclear energy research.
- Strengthen and expand nuclear education and workforce training offerings.

CONTINUE TO WORK COOPERATIVELY WITH THE U.S. DEPARTMENT OF ENERGY AND OTHER IMPACTED STATES TO ADDRESS REMAINING ENVIRONMENTAL RISKS AT THE INL SITE

In short, the state should continue to work with the federal government to complete the cleanup efforts initiated by the 1995 Settlement Agreement. Idaho continues to benefit from the cleanup efforts that are currently underway at the INL site. In particular, the Settlement Agreement has given DOE and the Idaho Congressional Delegation substantial leverage in ensuring that Idaho secures its share of federal cleanup dollars. The Settlement Agreement also had the effect of raising environmental awareness at DOE and among its contractors and employees, which has helped foster a culture of ongoing environmental improvement at the INL site.

As we heard consistently throughout our investigation, Idaho’s environment – particularly the Snake River Plain Aquifer – must be protected. We agree. Working closely with DOE to secure the necessary funding to complete the remaining cleanup efforts and to continue the highest level of safety going forward, is a prerequisite to ensuring the long-term viability of INL and of nuclear activities in Idaho. Protecting Idaho’s environment and the Snake River Plain Aquifer has been and must remain the highest priority for the state.



One of INL's used fuel pools

Of course, and consistent with Finding No. 2, not all wastes present the same level of risk to people and the environment. The Settlement Agreement placed the cleanup focus where it belongs – on getting the riskiest wastes (such as liquid tank wastes, buried transuranic wastes and spent fuel in long-term wet storage) into safer configurations; removing and solidifying tank wastes, exhuming and stabilizing buried transuranic wastes, and moving spent fuel from wet to dry storage for the long-term. The full report summarizes the status of, and the important differences among, the waste forms being managed at the INL site. A factual understanding of these various wastes, and of the dramatically different level of hazard they present to people and the environment, will be essential to future decision-making.

As noted above, cleanup efforts to date have advanced steadily and largely on track. Technical issues at ICP’s Integrated Waste Treatment Unit (IWTU) have delayed the treatment of some liquid wastes, but these issues do not seem insurmountable and the liquid waste is being safely stored in the interim. The Commission recommends that the state closely monitor progress at the IWTU and take firm action, including penalties if necessary, under existing agreements if start-up and processing does not commence in a 2013–2015 timeframe.

More broadly, the Commission recommends that the state continue to sustain and communicate its commitment to safety and the environment. This could include an effort to highlight the important and effective role played by the Settlement Agreement and by the Idaho Department of Environmental Quality’s INL Oversight Program. The latter agency is the appropriate body to investigate and respond to concerns raised by the public; it also plays an important role in coordinating the state’s role in transportation and emergency response measures for the INL site.

With regard to current activities at the INL site, the Commission believes the State of Idaho should continue to support:

- The work being done at the Naval Reactors Facility (NRF), including the NRF’s approach to implementing dry storage for used nuclear fuel. Given the important national



security dimensions of this work, the Commission endorses and advocates for continuing the NRF's mission and recapitalizing its facilities as proposed.

- The continuation of the Advanced Mixed Waste Treatment Project (AMWTP), to process other DOE wastes after fulfilling its cleanup obligations under the Settlement Agreement. Over \$1 billion has been invested in this facility, which is a national asset. Once the Idaho cleanup efforts are completed the facilities at the AMWTP could be effectively used to assist in the characterization and cleanup being performed at other national locations.
- The approach being taken at ICP's Radioactive Waste Management Complex (RWMC) to exhume, sort, categorize and ship buried waste out of Idaho. To follow up on this project, the state should require a formal monitoring and research effort, conducted in Idaho, to ensure that planned remediation measures, including a future cap over the site, remain effective in protecting public health and safety.

As noted in the preceding Settlement Agreement section, one aspect that may warrant further investigation is the 2035 deadline for processing calcine waste into a "repository ready" form for disposal or storage outside of Idaho. Industry experts acknowledge this type of waste poses very little risk to the environment in its current form.

The state should be mindful of past precedent where the Settlement Agreement has been modified in negotiating arrangements that are in the state's best interests and advance the fundamental mission of the lab. Thus, the state should be open to alternative approaches for the calcine; this could include the possibility of keeping the calcine in its current, safe storage configuration so long as any change in plans brought commensurate value to the state of Idaho, such as redirecting the funds saved to other INL projects.

EXERCISE LEADERSHIP AS THE U.S. FORMULATES FEDERAL ENERGY AND NUCLEAR WASTE MANAGEMENT POLICIES

Monitor, Influence and Act on Federal Nuclear Policy

Federal nuclear waste policy is in flux. While this uncertainty raises very real questions about the fate of the spent fuel and high-level waste already being stored in Idaho, it may also present opportunities for both the private and public sectors in the state. (See Finding No. 3.) The state should seek to participate in, influence, and capitalize on nuclear waste policy formulation and implementation over the coming years and decades.

For example, the Commission believes that INL should lead any federal research effort on long-term dry fuel storage research; such research



is both a natural extension of ongoing work at the lab and is consistent with the provision in the Settlement Agreement that names INL the lead DOE lab for spent fuel research. Such an effort may include the addition of a few commercial spent fuel storage casks to the dozens of dry storage casks already located at the site.

Given the significant and growing competition among DOE laboratories for limited research funding, the LINE Commission believes the lab's long-term viability would be significantly harmed by an inability to acquire appropriate and necessary research materials. Therefore, the LINE Commission concludes the state should be open to limited waivers of, or changes to, the Agreement to enable INL to fulfill its lead laboratory mission. The LINE Commission points to the 2011 agreement on small research quantities of spent fuel as an example of the type of modest accommodation that may be needed again in the future to facilitate the ongoing mission of the laboratory.

As mentioned in Finding No. 3, the BRC recommended consent-based interim storage sites. The Obama Administration recently endorsed this path forward and will be seeking legislation. Some commercial interests and local governments have suggested that Idaho explore the possibility of hosting of a consolidated commercial spent fuel storage facility. The Commission believes consolidated interim storage could be conducted safely and securely within Idaho's boundaries, and that, as stated to the Commission by DOE Assistant Secretary Pete Lyons, such a storage facility represents a substantial economic opportunity.

While the Commission believes consolidated storage can be (and is) conducted safely and securely within Idaho, current federal waste management policy has not evolved to the point that gives state governments enough clarity or sufficient leverage to negotiate and enforce siting agreements with the federal government. This position represents a change from the Progress Report.

The Commission notes its decision to exclude from its recommendations a provision contained in the progress report related to a Pilot U.S. Regional Interim Storage Facility. The Commission heard both support and opposition to that idea during the public comment period, but, as stated previously, believes federal policy has not evolved sufficiently to consider such a decision.

Idaho's interest in the lab needs to be protected. To ensure that the nation benefits from Idaho's 60 years of experience in nuclear energy technology, the state should exercise leadership as the U.S. considers changes to its nuclear waste management policies. This can best be achieved by forming a standing Nuclear Advisory Council that would monitor and periodically review federal developments and make recommendations regarding federal nuclear waste policy. The Council could also, at the request of the Governor, review the burdens and benefits of hosting INL, identify commercial nuclear sector opportunities, and coordinate with the Governor's Idaho Strategic Energy Alliance to provide advice on nuclear energy policy and related scientific and technical issues.

Elevate the Conversation with the Citizens of Idaho

The following comment received from the League of Women Voters of Idaho highlights another very important leadership role the state needs to provide:

"Citizens who lack full information or access to a robust and entirely open dialogue will always move to a less productive position. The citizens of Idaho need time, spaces and means to learn, frame, and consider the inevitable choices and their pros and cons. Sound public process will require access to balanced information and opportunities for the citizens of Idaho to generate and own their choices.

"At the end of the day, we have all been beneficiaries of nuclear power. As such, we all have the related obligation to be part of an informed search for a responsible approach to the management of the waste. This is truly a national challenge that crosses state boundaries, but the existence and work of the LINE Commission has brought this search to our state. It is time to provide a public process respectful of the citizens of Idaho. The recommendations from the LINE Commission can and should provide the starting point."⁵

We agree. The nuclear industry and its legacy in Idaho, coupled with the opportunities and related challenges, presents one of the most important issues in the history of the state. The citizens of Idaho need ample time and the ability to continue a balanced discussion regarding these issues. Important decisions for the state were finalized in 1995 by Governor Batt. As mentioned in the Findings section above, significant shifts have occurred in federal policy, technology has advanced, and change continues to require adjustments within the industry. These changes have created new questions and warrant the state's renewed attention. These new and important questions on both the near horizon and the long-term horizon need to be addressed for the state to effectively support INL and determine the appropriate policy for the state.

The Commission recommends the Governor initiate and monitor an effort to provide "access to balanced information and opportunities for the citizens of Idaho to generate

⁵Public comment received via LINE Commission website from League of Women Voters on January 1, 2013.

and own their choices.” These duties could be delegated to the Nuclear Advisory Council recommended previously or another comparable group to facilitate these efforts. Regardless of how it is provided, the citizens of Idaho deserve ample time and information to understand these complex and critical issues and make choices on the basis of balanced and accurate information.

In addition to advising the state’s political leadership, the Council could:

- Work with Idaho’s Congressional Delegation to persuade federal policy makers — including Congress, OMB and DOE — that the nation’s fiscal interests are best served by concentrating and consolidating nuclear energy research capabilities, to the maximum extent practicable, in Idaho at INL.
- Pursue increased collaboration and funding for R&D from foreign governments and overseas commercial businesses in those countries that have active nuclear power expansion initiatives.
- Coordinate the State of Idaho’s involvement in planned and proposed events like the American Nuclear Society’s Global 2013 conference, an international conference on nuclear safety, and a Western Regional Energy Summit to promote a strong political voice for our energy-rich region of North America.

CAPITALIZE ON IDAHO’S NUCLEAR TECHNOLOGY COMPETENCIES BY SUPPORTING THE GROWTH OF EXISTING NUCLEAR BUSINESSES, THE CORRESPONDING INFRASTRUCTURE, AND THE ATTRACTION OF NEW NUCLEAR BUSINESSES

Idaho’s nuclear-trained workforce and its commercial, research, education and training activities represent a key Idaho competency and a major economic driver. The nuclear sector also plays an important role in the diversification of Idaho’s economy, which has traditionally been highly reliant on agriculture, forestry and mining. The Commission recommends the state take several steps to set the stage for future investments in nuclear energy research and operations in Idaho.

- Support new options for promoting research, development, demonstration and deployment (RDD&D) and public-private partnerships. DOE’s ability to facilitate such



partnerships for nuclear energy RDD&D is constrained by contractual limitations in financial risk sharing, indemnification, intellectual property rights and other typical commercial terms and conditions. The state should encourage its federal delegation to examine this issue and create some new mechanisms to support public-private partnerships to advance nuclear energy technologies.

- Encourage investment in small modular reactors (SMRs), which may present the most promising new nuclear technology opportunity for the industry and for Idaho. Because states that get involved early will have a competitive advantage in attracting manufacturing investment if markets for SMRs materialize, Idaho’s Department of Commerce should be charged with working directly with SMR developers to tout Idaho’s advantages (including a skilled nuclear workforce, low energy costs, pro-business environment and access to road, rail and barge transportation) and to explore the types of incentives that would make the state more attractive as the host of an SMR demonstration project or an SMR manufacturing facility. The department should also be charged with exploring clean energy and other incentives that could help lower the amount of up-front capital needed to construct a demonstration plant.

- Consider and adopt legislation to create appropriate, competitive tax policies, and promote a stable regulatory environment aimed at promoting investment in Idaho’s nuclear industry. This could include assembling and aggressively marketing an “Idaho Energy Research Incentive Package” that includes an enhanced state investment tax credit, real property improvement tax credit, and R&D credit, while possibly also including county-authorized property tax exemptions, industrial revenue bonds and – potentially – authorization from DOE to offer some of its facilities/resources as a “Nuclear Energy Park Initiative” test bed.



INL’s Wireless Test Bed is now a national user facility

INVEST IN INFRASTRUCTURE TO ENABLE INL AND IDAHO UNIVERSITIES TO SUCCESSFULLY COMPETE FOR U.S. AND GLOBAL RESEARCH OPPORTUNITIES

Advance Existing Nuclear Specialties



“Fission” is INL’s newest supercomputer

Existing research infrastructure at INL and at the state’s universities includes some of the best and most versatile nuclear and critical infrastructure testing facilities in the world. This infrastructure represents many billions of dollars of investment, primarily of federal and state taxpayer funds, and many of the facilities in Idaho are one-of-a-kind or would be prohibitively expensive to replace. Maintaining and building on this capability will require investments from the federal government, the state, and private entities. Having

reviewed this infrastructure and sought expert input, the Commission believes the State of Idaho should charge the proposed Idaho Nuclear Advisory Council with reviewing and, as appropriate, identifying avenues and means for

the state to support, through advocacy and appropriate investment incentives, efforts to bring additional facilities, capabilities, and programs to INL. This could include new or restored reactor, post-irradiation examination, energy system demonstration and computing capabilities.

Additionally, the state should work to establish an Advanced Nuclear Manufacturing Research Center in Idaho, modeled after a similar center recently established in the UK. The purpose of this new institution would be to develop advanced manufacturing solutions for current and future nuclear reactors, help members be part of the international nuclear supply chain, and support skills development and quality management.

Advance Non-Nuclear Capabilities

Beyond support for nuclear research, the state should advocate for designation of the INL site electrical grid as an official DOE National User Facility – a move that would support national missions in smart grid research, increase federal and commercial funding for INL research, and encourage incubation of new small businesses in an evolving technological area. The state should also encourage establishment of the Pacific Northwest Cyber Center (PNCC), a new Idaho-centered concept intended to address the national challenge of sharing national security information between the U.S. government and infrastructure asset owners such as utilities.

From a capability consolidation and operational collaboration perspective, the state – through the Nuclear Advisory Council

– should advocate as appropriate for non-nuclear capabilities and infrastructure improvements and for expanded use of INL facilities by other federal agencies in diverse areas such as emergency first response training, regulatory support, physical and cyber security, and supercomputing.

Finally, from a physical facilities standpoint, the State of Idaho should investigate working with Bonneville County, the City of Idaho Falls, and private developers on the development of a Science and Technology Park north of the existing University Place and the University Boulevard



Aerial view of INL's research campus in Idaho Falls

Campus. The state should also investigate transportation improvements at the INL site, including options to expand Highway 20 or take other actions to improve safety and reduce congestion; the possibility of transferring responsibility for road maintenance on the INL site to the Idaho Transportation Department; protection of right-of-way interests on roads that run through INL; opportunities to locate fiber optic cables during road construction; and improved pedestrian access among facilities at University Place and the University Boulevard Campus.

DEVELOP AND PROMOTE THE CENTER FOR ADVANCED ENERGY STUDIES AS A REGIONAL, NATIONAL AND GLOBAL RESOURCE FOR ENERGY RESEARCH

The Center for Advanced Energy Studies (CAES) partnership among Idaho's research universities and INL has proven to be one of the most successful collaborations among federal and state government and private industry. Other states, such as Tennessee, Illinois, and New Mexico, have a long history of working collaboratively with the federal government on national laboratory-related projects that can benefit both the

federal government and the state (particularly state-funded universities). The capabilities at CAES provide numerous opportunities to implement research and education programs that advance Idaho's role in energy research and collaboration.

The Commission recommends that the Governor enter into discussions with neighboring states to expand the role of CAES into a regional research facility and establish joint funding and research collaboration with those states. Aligning the collective capabilities and resources of the intermountain states would strengthen the strategic role the intermountain region could play in energy research and elevate the capabilities of CAES under an expanded collaboration.

In addition, the Commission recommends using CAES as a focal point for several new initiatives, including efforts to upgrade nuclear research infrastructure at Idaho schools and universities (including assessing the feasibility of establishing a non-degree-granting "Idaho Polytechnic Institute"), identify areas where Idaho-based educational and nuclear RD&D capabilities can be leveraged to meet needs in non-nuclear global energy markets, and integrate existing K-12 and STEM education initiatives throughout the state to improve post-secondary nuclear science, engineering and technology education and the readiness of students to enter these programs.

STRENGTHEN AND EXPAND NUCLEAR EDUCATION AND WORKFORCE TRAINING OFFERINGS

Idaho's universities and colleges have long played an essential role in meeting the workforce needs of INL and other Idaho concerns. The Commission believes this important capability can be augmented by the appropriation of \$5 million from the Idaho General Fund to build on existing collaborations between the state's research universities and technical colleges and to expand the reach and scope of Idaho's STEM channels for nuclear energy education and workforce development. Specific actions could include:

- Implementing a sustainable funding model for the Nuclear Operations/Engineering Technology Associate in Applied Science Degree Program at Idaho State University's Energy Systems Technology and Education Center (ESTEC) and upgrading the two remaining ESTEC energy technician programs.

- Expanding the role of Idaho’s universities in INL activities. The universities could also take advantage of INL’s cutting-edge research to develop unique nuclear science and technology courses that could help catapult Idaho into leadership in nuclear engineering education.
- Facilitating stronger/more fluid working relationships between INL and Idaho universities and between Utah and other regional universities and industries with complementary technical strengths and interests.
- Creating Idaho’s eighth “Funded Research Center” to focus on ways the state could take advantage of its substantial thorium/rare earth element deposits to accelerate R&D on rare earth and thorium utilization including power systems, electric vehicles, renewable energy sources, energy-efficient lighting, and national defense systems.
- Establishing an Idaho Energy Storage Center of Excellence to lead research into more efficient/cost-effective grid stabilizing energy storage systems.

RECOMMENDATIONS: FUNDING AND TIMING

The table above summarizes the LINE Commission’s recommended action steps and the rationale for each recommendation. Most of these recommendations can be accomplished by existing organizations without the expenditure of additional state funds. However, several of the recommendations – particularly those related to educational and facility infrastructure improvements – may require investments by the state. While the Commission sees value in the broad categories of investment it recommends and is aware of multiple sources of funds that could be accessed, it has not conducted a detailed cost-benefit analysis of each of the many possible projects in which the state could invest.

In particular, members of the Commission had occasion to spend time conferring with the Idaho Congressional Delegation on the issue of federal funding. We are confident that Idaho’s Congressional Delegation is well-positioned to advance the state’s interests in INL’s future.

Further, we are mindful of the numerous promises made to the Idaho Congressional Delegation – beginning in 2002 and continuing through the re-competition of INL’s management contract – that savings achieved from the completion of cleanup activities would be re-invested in INL. In numerous documents obtained by the Commission, DOE directly, and repeatedly, pledged to turn cleanup savings over to INL.

ACKNOWLEDGEMENTS

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