Progress Report: Subcommittee Recommendations

December 3, 2012

COMMISSION MEMBERS:

Chairman: Jeffery Sayer

Members: John Chatburn, Senator Larry Craig, Senator Bart Davis, Mayor Jared Fuhriman, John Grossenbacher, John Kotek, Roger Madsen, Sylvia Medina, Dr. Duane Nellis, Dr. Mark Rudin, Chairman Nathan Small, Rep. Jeff Thompson, Dr. Arthur Vailas

Staff : Megan Ronk, Brian Whitlock

December 3, 2012

To the Citizens of the State of Idaho:

Industries in energy markets around the world are undergoing significant changes and very few are immune to the rapid changes confronting the nuclear industry. These changes in the nuclear industry directly impact Idaho and warrant very careful attention. Idaho National Laboratory (INL) is Idaho's most significant connection to the nuclear industry and forms an important economic asset to the state. INL is the nation's leading nuclear research lab and is one of Idaho's largest employers. In 2010, INL was responsible for over 24,000 direct and indirect jobs and over $3.5 billion in economic impact to Idaho.

In recognition of the important role nuclear activities play in Idaho's economic future, as well as the changes facing industry described above, Governor C.L. "Butch" Otter established the Leadership in Nuclear Energy (LINE) Commission in February 2012 through Executive Order 2012-01. The executive order tasked the LINE Commission with making recommendations to the Governor on policies and actions the state of Idaho can take to support and enhance the long-term viability and mission of the INL and the broader nuclear industry in the state. The Commission's final report to the Governor, outlining opportunities to achieve this objective, is due by January 31, 2013.

The Commission organized its approach to reach as far and wide as possible to maximize the information and opinions collected from both subject-matter experts and members of the public. The following summarizes the major steps taken:

- National and local experts were sought on every major topic. The Commission was fortunate to receive support and expert testimony from some of the highest ranking officials and industry experts in the nation.
- Meetings were held around the state (Boise, Idaho Falls, Twin Falls, and Moscow) to ensure the Commission was able to hear from citizens across all regions regarding their thoughts and observations.
- Public input was critical to the process. Time was extended in each meeting for public comment and a Commission website was established to encourage additional comment and to serve as a repository for all of the key documents associated with the Commission's work.

- Meetings were held in a public setting and, where possible, broadcast via live web streaming or made available via video conference technology to ensure the process was open and transparent.
- The Commission established subcommittees to perform the detailed research on key topics essential to the Commission's work. Non-Commission members with valuable knowledge and insight were invited to participate in the subcommittee process to extend the expertise available to the Commission.

While the findings and recommendations of the various subcommittees are preliminary, in keeping with its commitment to an open and inclusive process the LINE Commission believes public review and comment at this juncture will provide valuable insights necessary to complete a final report. Specifically, the Commission is looking for comments on the following set of issues to help guide the Commission's final report:

1. What is the strategic role the INL and Idaho's nuclear industry can play in the country's energy future?
2. In light of reduced federal spending, what impacts might affect INL and what role can Idaho play to protect INL research and cleanup funding?
3. What broad environmental risks are posed by nuclear technologies and what mitigating steps are reasonable to protect public health and the environment regarding current and future applications of nuclear technology in Idaho?
4. Where is nuclear technology going and what role and/or opportunities exist for INL and Idaho companies in those technology developments?
5. Given the Blue Ribbon Commission's focus on consent-based siting and the suspension of the Yucca Mountain repository, in what way can Idaho's 1995 Settlement Agreement protect the state's interests to support and enhance research and development at INL and complete the cleanup mission?
6. How can Idaho's universities influence, support and participate in the future of nuclear energy, nuclear workforce development, and advancements in nuclear technologies?
7. Following the impacts of the Fukushima tsunami and the recent market impact of expanded natural gas supplies, what future role will nuclear energy play in the nation's energy policies and what can Idaho do to prepare for that future?

The conversation about nuclear energy in Idaho is of utmost importance; thus, the entire state and interested national parties need to be included. Accordingly, the attached progress report is being released for public review to facilitate a productive conversation. The report contains a summary of the key issues analyzed by the Commission and, importantly, the report contains all the recommendations of each subcommittee.

It is also important to note, these subcommittee reports only reflect the respective deliberations and recommendations of each subcommittee to the full Commission, and <u>should not be construed as the final recommendations of the LINE Commission to the Governor</u>. The final recommendations will be based on these preliminary recommendations, public comment and

further deliberations of the full Commission. Moreover, the LINE Commission's final report to the Governor will be strictly advisory in nature. The Commission is not authorized to set policy for the state of Idaho.

Receiving meaningful feedback from interested parties will be a valuable resource for the Commission as it develops final recommendations to the Governor. The questions listed above have also been provided as a framework to facilitate public feedback. Please join the Commission in helping us answer the questions listed above.

Comments can be submitted to the Commission via the LINE Commission website at www.line.idaho.gov, or through the U.S. mail at:

LINE Commission
c/o Idaho Department of Commerce
700 W State Street
PO Box 83720
Boise, Idaho 83720-0093

Please submit comments by close of business on Friday, January 4, 2013. Comments received will be considered by the Commission as it prepares a final report to the Governor, which will be submitted by January 31, 2013. No extensions will be provided.

Sincerely,

Jeffrey Sayer
Chairman
Leadership in Nuclear Energy Commission

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IDAHO: A LONG-STANDING NUCLEAR LEGACY

The State of Idaho has deep roots in our nation's nuclear technology enterprise.

These roots stretch back to the late 1940s when, in the aftermath of World War II, the U.S. Atomic Energy Commission began searching for a site to host a National Reactor Testing Station (NRTS). The NRTS was to serve as a test-bed for the emerging concept of nuclear-generated electricity. In 1949 the AEC selected a former naval gunnery range and adjoining property west of Idaho Falls – about 900 square miles in all – to serve as the site for the NRTS. By late 1951, the Experimental Breeder Reactor-1(EBR1) at the NRTS became the first power plant to produce electricity using atomic energy, and in 1955 the nearby city of Arco, Idaho, became the first community lit by nuclear power.

In 1955, the city of Arco, Idaho became the first community lit by nuclear

Over the years, more than 50 experimental nuclear reactors, nuclear fuel reprocessing plant, scores of research facilities and several nuclear waste management and disposal facilities have been built on what is now known as the Idaho National Laboratory (INL) site. Most of the reactors and the original technology fuel reprocessing plant have long been shut down – and are being cleaned up – but the INL is still host to some of the most capable nuclear energy research, development and demonstration infrastructure in the world, including three operating nuclear research reactors (and another – the Transient Reactor Test Facility (TREAT) – under consideration for restart) and several facilities for the handling, examination and processing of radioactive materials. The INL site cleanup effort has seen great progress, but much work remains and some wastes, including several hundred metric tons of spent nuclear fuel, will remain on the site for decades.

IDAHO NATIONAL LABORATORY: A SIGNIFICANT ECONOMIC FORCE

The U.S. Department of Energy, which owns the INL, provides well over a billion dollars per year to pay for research, infrastructure, security and cleanup. The research mission has expanded far beyond nuclear energy; the laboratory now plays critical roles in areas such as cybersecurity, homeland security, and the development of renewable energy systems and advanced vehicle technologies.

The INL is a key driver of local and statewide economic activity. For example, since the INL was created in2005, the laboratory has awarded subcontracts throughout Idaho worth $886million, including $535 million in eastern Idaho, $162 million in the Treasure Valley and

$52million in northern Idaho.[1] During that same timeframe the other DOE contractors working at the INL site have issued subcontracts worth hundreds of millions of dollars more.

In 2010, Boise State University analyzed the statewide economic impact of the U.S. Department of Energy's activities and other contracts at the INL site.[2] The BSU study and others calculate that operations on the INL site generate significant economic impact including the following:

INL contributes more than 24,000 direct and indirect jobs and generates a total economic impact exceeding $3.5 billion.

- Responsible for more than 24,000 direct and indirect jobs
- Jobs accounts for 3.5% of total Idaho employment. Approximately 1 out of every 5 jobs between Pocatello and Rexburg.
- Total wages and salaries of $419 million. Over 30% of all wages in Bonneville County.
- Total fiscal effects account for over 6% of all Idaho tax revenues.
- Total economic impact in excess of $3.5 billion.

IDAHO NATIONAL LABORATORY: MISSIONS & FOCUS

The Idaho National Laboratory is the national flagship research facility in nuclear energy, and most of the money spent at the INL site each year is in support of research missions. The INL site is host to several key national assets and important facilities and activities, including:

- World-class research laboratory
- Idaho Cleanup Project
- Advanced Mixed Waste Treatment Project
- Naval Reactors Facility

IDAHO NATIONAL LABORATORY

The Idaho National Laboratory is one of the U.S. Department of Energy's ten multi-program national laboratories. With more than 3,900 scientists, engineers and support personnel, the lab also stands as one of

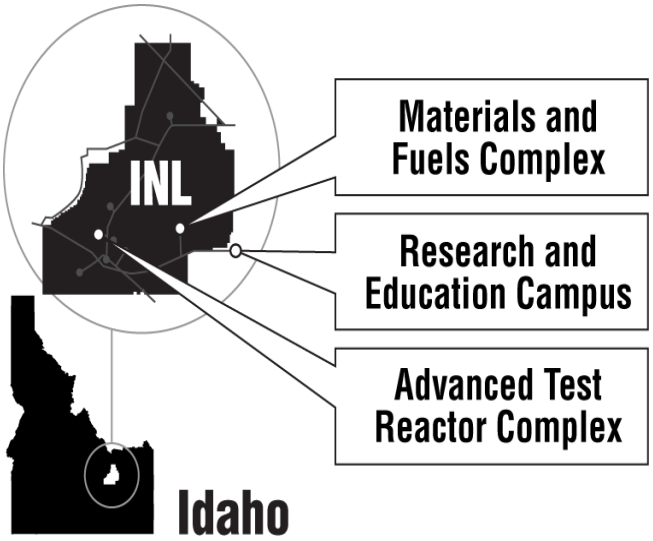

FIGURE 1: The INL Site

[1] BEA Procurement – Asset Suite reporting system
[2] http://cobe.boisestate.edu/files/2010/12/Impacts_Brochure-Web1.pdf

Idaho's largest employers and has an annual budget exceeding $800 million per year. At INL's three primary facility areas – the Advanced Test Reactor Complex, Materials and Fuels Complex, and Research and Education Campus – researchers perform work in support of DOE's mission to "ensure America's security and prosperity by addressing its energy, environmental and nuclear energy challenges through transformative science and technology solutions."

More specifically, INL serves as the United States' national nuclear laboratory. Day-to-day management and operation of the laboratory is the responsibility of Battelle Energy Alliance (BEA), which consists of Battelle, Babcock & Wilcox, URS Corporation, the Electric Power Research Institute, and a university consortium led by the Massachusetts Institute of Technology and the three Idaho research universities.

Energy and Environment

This INL directorate is focused on renewable and innovative energy technology development. The research includes development of "hybrid" energy systems, the integration of nuclear energy with other bio and fossil energy systems to create more efficient carbon utilization energy and hydrocarbon product producing systems. Hybrid systems creates a renewed focus on the abundant energy resources found in the Western Energy Corridor (Idaho, Montana, Wyoming, Utah, the Dakotas, and the Canadian provinces of Alberta and Saskatchewan) and expands the opportunities for regional cooperation and collaboration.

Additional examples of INL research in this area include electric vehicle battery development and testing, advanced biomass feedstock harvesting and developing techniques, and technologies for hydrogen production.

INL cyber security teams are considered among the best in the nation.

National and Homeland Security

This directorate develops innovative technology and other technical solutions to protect against threats to U.S. citizens, critical infrastructure and military personnel. INL efforts in this area have included the manufacturing of heavy armor for military combat vehicles, the development and testing of nuclear material detection devices, wireless communications, grid reliability and security and the creation of software and hardware to combat cyber-warfare in industry and critical national infrastructures. The directorate also plays an important role in training first responders in the handling of radiological incidents. As a result of work in this area, the INL cyber security teams are internationally recognized and considered among the best in the nation.

Nuclear Energy

This directorate is the largest of the three INL research priorities. In its role as the nation's lead nuclear energy research laboratory, the INL has a mission to develop advanced nuclear technologies that provide clean, abundant, affordable and reliable energy to the United States and the world.

The INL's work on nuclear energy systems includes:

- extensive work on nuclear safety;
- close collaboration with industry and the U.S. Nuclear Regulatory Commission;
- advanced analysis of radiation effects on materials for commercial and government users in the U.S. and abroad;
- advancement of nuclear operations, all aspects of the management and recycling of spent nuclear fuel;
- development and validation of advanced fuels and materials performance, computer models and simulations;
- development of new fuels, materials and reactor technologies.

INL teams helped develop the battery fueling the Curiosity rover on Mars.

INL teams in this directorate helped develop the battery currently fueling the Curiosity, the rover currently on the surface of Mars.

Advanced Test Reactor and TREAT

In carrying out this nuclear research, the INL makes extensive use of a broad suite of research facilities on the INL Site. Foremost among these is the Advanced Test Reactor (ATR). The ATR is globally recognized in the industry for its unique capabilities and ability to perform advanced fuel testing and is regarded as one of the nation's key nuclear assets. Named a DOE National Scientific User Facility, the ATR attracts researchers from leading universities, industrial firms and research institutions all around the world.

In addition, as the INL looks to further cement its status as a global center of nuclear excellence, it is considering the restart of the TREAT reactor – a reactor designed to test the safety and performance of advanced nuclear fuels. The TREAT reactor has been maintained in standby mode since the 1990s and is a much anticipated resource for the industry. The TREAT reactor will accelerate the industry's ability to advance research on safer and more efficient fuels for the industry.

IDAHO CLEANUP PROJECT

The Idaho Cleanup Project is focused on the cleanup of the INL site. The cleanup work is primarily directed at removing and safely containing the early nuclear waste generated by both DOE activities and World War II-era conventional weapons testing. The 10-year, $4 billion cleanup project, funded through the DOE's Office of Environmental Management, focuses on reducing risks to the public and the environment. Specifically, a key priority for the cleanup efforts is to protect the Snake River Plain Aquifer, the sole drinking water source for more than 300,000 residents of eastern and southern Idaho.

The Idaho Cleanup Project is managed for DOE by CWI - a team led by CH2M Hill and the Washington Division of URS Corporation. Premier Technology of Blackfoot, Idaho, is the small business partner on the contract and provides specialty design and fabrication services.

When the Idaho Cleanup Project contract was signed in 2005, the scope of cleanup work to be completed was extremely broad, and included tasks such as the demolition of old research facilities, the movement of spent fuel from pools into dry storage, and the exhumation of certain buried wastes. Today, some challenges remain (discussed later in report), but the vast majority of these tasks have been successfully completed, most on schedule and under budget, and the Cleanup Project is generally viewed nationally and in the state as a resounding success.

ADVANCED MIXED WASTE TREATMENT PROJECT

The Advanced Mixed Waste Treatment Project (AMWTP) is focused on retrieval, characterization, treatment and repackaging of transuranic waste currently stored at the INL site. (Note: transuranic waste in this context is the gloves, tools, clothing and other primarily plutonium contaminated items generated in U.S. nuclear facilities during the Cold War.) The vast majority of the waste processed at AMWTP was shipped to Idaho for storage in the 1970s and early 1980s and resulted from the manufacture of nuclear components at Colorado's Rocky Flats Plant. The AMWTP is operated by the Idaho Treatment Group, a consortium of Babcock & Wilcox, Washington Group International and Energy Solutions. The AMWTP has proven highly successful and is expected to complete its cleanup mission in 2015.

Transuranic waste is plutonium contaminated gloves, tools, clothing used in U.S. nuclear facilities during the Cold War.

The AMWTP is also a unique national asset and could potentially be utilized as a strategic resource for DOE. Once the AMWTP completes its mission relative to Idaho waste, the facility could be used to sort, characterize, and repackage similar waste at other DOE sites consistent with the1995 Settlement Agreement.

NAVAL REACTORS FACILITY

The Naval Reactors Facility examines and stores naval spent nuclear fuel and irradiated test specimens. The data derived from these examinations are used to develop new technology and to improve the cost-effectiveness of existing designs, and have played a crucial role in dramatically increasing the lifetime of naval reactor fuel cores. The Naval Reactors Facility is operated for the joint DOE/Department of Defense Naval Nuclear Propulsion Program by Bechtel Marine Propulsion Corporation.

IDAHO AND THE COMMERCIAL NUCLEAR INDUSTRY

While Idaho is not home to a commercial nuclear power plant, many Idaho companies still play significant roles in the nuclear industry. These companies are nationally recognized and provide

services ranging from engineering expertise to advanced manufacturing capabilities to research in medical isotope development. The presence of the INL has spurred and supported the growth of these and other nuclear-related businesses in Idaho.

During its public hearings the Commission heard testimony or otherwise received input from several companies that are based or have significant operations in Idaho:

- **Areva,** an international leader in the industry, provides services to INL contractors and has used the research capabilities at the INL for advanced nuclear fuel development. Areva has also announced plans to construct a major uranium enrichment facility outside of Idaho Falls, although the construction schedule for the facility has been delayed.

- **Diversified Metal Products** is an Idaho Falls company that employs about 100 people and provides mechanical contracting and fabrication services focusing on the nuclear industry. Capabilities include metal alloy component engineering, fabrication, and integration and installation of control systems for the nuclear industry.

- **International Isotopes** and its 25 Idaho-based employees develop and deploy technologies used in cancer therapy, medical diagnostics, and transport of nuclear materials. The Idaho Falls-based technologists at International Isotopes have also developed an advanced technology for the beneficial re-use of waste materials from the uranium enrichment process. The company recently announced a new facility in New Mexico to commercialize this technology.

- **The Northwind Group** was founded in Idaho Falls in the late 1990s and now employs more than 300 people across the U.S. North Wind is a leader in environmental, engineering and construction service industries.

- **Portage** was formed by several former INL employees in 1992 and now employs more than 400 skilled technical and professional personnel in the U.S. and abroad. Portage offers a wide range of technical and professional services including project management, environmental remediation, engineering, and information technology and database design; construction oversight and assessment; environmental planning.

- **Premier Technology** is a privately owned company based in Blackfoot. Premier was founded in 1996 with a focus on manufacturing for the nuclear and food processing industries. Since that time, Premier has grown to become a full service engineering, manufacturing and construction management company employing nearly 370 engineers, machinists, and other skilled professionals. As mentioned above, Premier is also the small business partner in the management of the Idaho Cleanup Project contract.

This is just a sampling of the nuclear industry firms with roots in Idaho, and underscores how the presence of the INL has helped Idaho grow competitive businesses in areas such as environmental remediation, technical services and advanced manufacturing.

NUCLEAR EDUCATION AND TRAINING IN IDAHO

Idaho's educational institutions have long helped to meet the need for engineers, technicians and other skilled workers to support the INL, Idaho's nuclear industry firms, and organizations nationwide. The Idaho universities all support the INL objective of becoming the premier U.S. national laboratory in nuclear science and engineering research and have active programs focused on nuclear energy. In recent years the universities have invigorated their nuclear programs and it is clear to the faculties and the administrations that the future of these programs is tied directly to INL success. Similarly, the universities believe that INL success in becoming the centerpiece of the nation's nuclear energy R&D hub depends to some degree on its association with the Idaho universities.

ISU has over seven operating accelerators – more than any university in North America.

In recent years Idaho schools have further broadened and strengthened educational offerings related to the nuclear enterprise. In nuclear science and engineering, collectively, the three Idaho research universities have nearly 15 faculty and 400 students in degree programs ranging from the Associate in Science (A.S.) to Doctor of Philosophy (Ph.D.) degree. Research areas include health physics, fuel cycle applications, nuclear physics, reactor physics, material science, nuclear forensics, and safety, security, and safeguards. The universities have a range of experience and capabilities in education, research and service in these areas.

IDAHO STATE UNIVERSITY

ISU offers a full range nuclear engineering and science program, offering nuclear engineering and health physics degrees ranging from the baccalaureate to the Ph.D. ISU's umbrella organization is the Institute of Nuclear Science and Engineering (INSE), which consists of the following programs and facilities:

- Idaho Accelerator Center (IAC)
- Research Innovation in Science and Engineering (RISE) complex
- ISU Nuclear Engineering and Health Physics Department (Research assets)
- Energy Systems Technology and Education Center (ESTEC)

- The **Idaho Accelerator Center** (IAC) was created in 1994 and is charged with undergraduate and graduate education, conducting applied physics research, creating new applications of accelerator physics and supporting the economic development of Idaho. The IAC has seven operating accelerators in five research facilities – more operating accelerators than any university in North America. These accelerators and facilities support a broad range of student driven research in nuclear science and engineering ranging from the production of medical isotopes to the detection and quantification of fissile materials. Through the IAC, ISU students and faculty collaborate with researchers at leading universities and national

laboratories in important areas such as nuclear material safeguards and proliferation detection.

- The **Research Innovation in Science and Engineering Complex (RISE)** is a multidisciplinary research center which houses numerous research and educational opportunities in nuclear science and engineering for students from southeastern Idaho to the intermountain west, the nation and the world. The RISE Complex caters to every educational level from technician and Associates level degrees to B.S., M.S. and Ph.D. Each of these levels works in concert to create world-class nuclear science and engineering degrees. The RISE Complex brings state-of-the-art technology to the classroom including accelerators, reactor technologies, simulators, as well as a full suite of nuclear materials science tools not found at any other academic institution in the world. The students leaving the ISU/INSE educational program are some of the most sought after students with real world, hands on experience needed in the industrial, governmental and academic settings.

- The **Energy Systems Technology and Engineering Center (ESTEC)** has both an instructional and an industrial focus. ESTEC trains graduates (technicians and technologists) to maintain existing energy infrastructure and to install and test components in new renewable, nuclear, and fossil-fueled energy facilities. Complementing ESTEC's instructional focus, the Center also conducts applied industrial research in support of the INL, electrical utilities, and energy systems-related product vendors. ISU partners with the INL and Partners for Prosperity in the operation of ESTEC.[3]

BOISE STATE UNIVERSITY

BSU's College of Engineering is committed to strengthening nuclear engineering and science education in Idaho. While Boise State University does not have a nuclear engineering program, BSU's Materials Science and Engineering Department has strong research collaborations with INL, and ISU and UI's nuclear engineering and science programs, and engages in extensive educational collaborations, such as course offerings and joint programs.

BSU's MSE department has grown rapidly during the past five years into one of the largest materials departments in the Pacific Northwest, with a focus on energy materials research and education. The department offers B.S., M.S., and M.Engr. degrees and added a Ph.D. program in 2012. In its first year, the PhD program has attracted12 highly qualified students. In 2012 the department hired six new faculty, four of which have expertise in energy materials and modeling. The most recent hire has a Ph.D. in Nuclear Engineering from the University of Michigan and is expected to contribute to both research and teaching in nuclear materials. These new faculty will build on the current synergy with INL and the Center for Advanced Energy Studies (CAES) partners and help future educational partnerships.

[3] Partners for Prosperity is a community-based organization with a mission to reduce poverty by building assets—including workforce development—for low-income and working people. See http://www.p4peid.org

Mechanical Engineering at Boise State offers B.S., M.S. and M.Engr degrees that provide fundamental knowledge that would allow a student to then move into Nuclear Engineering at the graduate level. The department is currently hiring a faculty member with a focus in an energy field including modeling, control and design. Another emerging focus at Boise State is computational science and engineering. A recent Major Research Instrumentation grant from the National Science Foundation will fund a new GPU/CPU cluster that will allow large scale modeling and visualization. This facility is planned as a state-wide resource with potential applications in Nuclear Engineering.

Overall Boise State's involvement in fields of nuclear engineering spans across the college. BSU's students have been awarded Nuclear Energy University Program (NEUP) undergraduate scholarships and graduate students have received Nuclear Regulatory Commission (NRC) fellowships. Several students a year participate in internships with INL and PNNL. In research, more than forty awards from grants, contracts and joint projects related to nuclear engineering have totaled more than $12 million over the last five years. In addition, faculty and staff in the Department of Materials Science & Engineering manage the Microscopy and Characterization Suite and the Advanced Material Laboratory at the Center for Advanced Energy Studies. These facilities are designed to accommodate collaborators across the state as well as nationally. Capabilities for handling radioactive materials in these facilities have expanded the capability and national importance of INL's Advanced Test Reactor (ATR) and DOE's National Scientific User Facility (NEUP).

UNIVERSITY OF IDAHO

The University of Idaho's Graduate Nuclear Engineering Program (NEGP) grants Master of Science and Ph.D. degrees. In recent years, the U of I has had approximately 12-15 full-time and 15-20 part-time MS and PhD students. Many of the full-time students are based at the Center for Advanced Energy Studies (CAES) in Idaho Falls.

The University of Idaho is working with the other Idaho research universities to integrate their advanced graduate programs with the nuclear engineering curriculum at Idaho State University and to develop closer curricular collaboration with the BSU MSE. The end goal is the eventual national ranking and international recognition of an Idaho Institute of Nuclear Science and Engineering in Idaho Falls that supports the missions of the Idaho National Laboratory.

CENTER FOR ADVANCED ENERGY STUDIES

CAES is a research and education partnership, formed in 2005, between Boise State University, Idaho State University, the University of Idaho and the INL. The center is an excellent example of the current collaboration that exists among the three universities and together with the INL is becoming a leading national resource for the development of innovative energy technology. The CAES facility in Idaho Falls – and the technical expertise housed within – is an additional

innovative mechanism Idaho's universities can employ to meet the research and nuclear workforce needs of the future.

CAES is committed to conducting research to address the country's and Idaho's energy challenges, with emphasis on nuclear energy, but also spanning materials science, bioenergy, carbon management, geothermal energy, energy policy, modeling and simulation and energy efficiency.

Federal CAES Funding: Third Highest in Nation

Idaho universities have become very successful in the competition for federal nuclear energy research funding. These research funds are awarded through DOE's Nuclear Energy University Program; of the states awarded NEUP funding since 2009, Idaho received the third highest amount, $13.8 million. Only Wisconsin and Texas received more funding at $16.8 and $14.7 million, respectively.

CAES nuclear research funding is third highest in the nation.

As a result of these and other successes, interest has been expressed in expanding both the physical CAES facility in Idaho Falls and the geographic reach of CAES, cementing the CAES role as a regional energy asset.

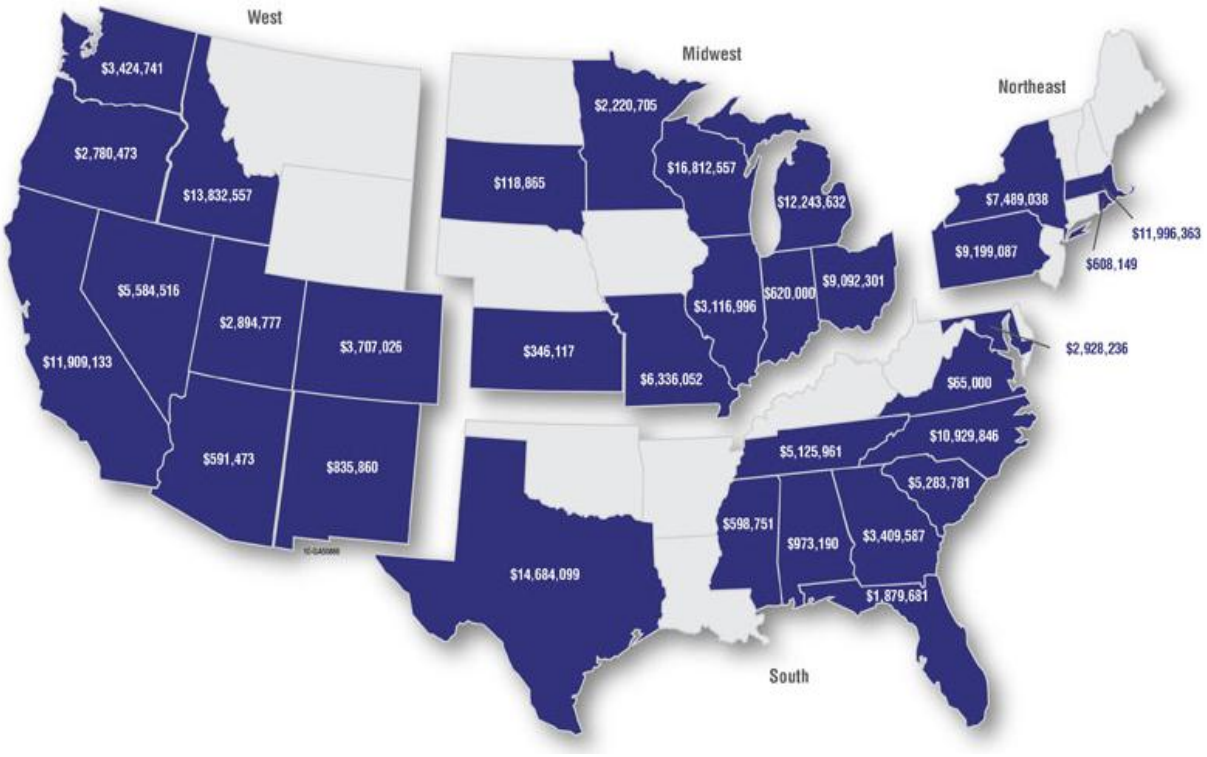

FIGURE 2: NEUP FUNDING – 2009-2011
SOURCE: https://inlportal.inl.gov/portal/server.pt/community/neup_home/600/fy11_announcement_arvhive

PROTECTING IDAHO'S ENVIRONMENT: A CRITICAL DISCUSSION

Understanding the benefits and burdens associated with nuclear energy has been a critical part of the Commission's work and review. In fact a core concern and question in the Commission's work has been - how does Idaho balance the undeniable economic and strategic benefits of the state's role in nuclear energy with the imperative responsibility to protect its environment and citizens?

Legacy Waste: Product of the Past

In the last 20 years, significant improvements in new technologies and more advanced capabilities have been introduced the nuclear industry. From the 1950s through the early 1980s, however, nuclear waste disposal and operational practices left an environmental legacy that did not receive sufficient attention until the 1990s. In Idaho, those prior practices created environmental issues that had to be addressed, including the risk created to the Snake River Plain Aquifer. Past activities at the INL site that ultimately posed the greatest risk to contaminating the aquifer were:

(1) use of injection wells to dispose of solvents and other wastes;

(2) pipes and valves that leaked radioactive liquid, and;

(3) contaminated material from Rocky Flats, Colorado that was disposed of by burial at the INL site.

These practices have all been stopped and actions continue to be taken to mitigate their impact. As a result, the risk to contamination of the aquifer continues to decline.

A critical priority for Idaho:

Protect the Aquifer

Idaho Takes a Stand: Protect the Aquifer

All of these earlier practices at the INL left many Idahoans with legitimate concerns about risks to public health and the environment. The impacts on the environment are particularly acute for Idaho as the INL resides directly above the Snake River Plain Aquifer, a very important water source for eastern and south central Idaho.

Out of respect for these issues, Governor Cecil Andrus became an advocate for protecting Idaho's interests and took an aggressive stance against the Atomic Energy Commission – and later the U.S. Department of Energy. Governor Andrus insisted on measures to protect Idaho's environment and main source of water. As a result of his leadership, and the significant efforts by Governor Phil Batt to negotiate and sign a settlement agreement in 1995 with DOE, legacy nuclear waste is now successfully being removed from the INL.

SETTLEMENT AGREEMENT: A LANDMARK EVENT FOR IDAHO

In October 1995, Governor Phil Batt and the Attorney General of Idaho, the U.S. Navy, and the U.S. Department of Energy reached agreement (often called the Settlement Agreement or the Batt Agreement) settling a lawsuit filed by the state to prevent shipment of spent nuclear fuel to the INL for storage.[4] The lawsuit stemmed from decades of frustration over the federal government's inability to make and keep commitments to the people of Idaho for the cleanup of what is now the INL site.

Leadership from Governor Andrus and Governor Batt created the Settlement Agreement. Signed in 1995.

Highlights of the agreement include:

- The state of Idaho will allow a total of 1,135 shipments of spent fuel to come to the INL for interim storage over a 40-year period. Of those shipments, 575 will come from the Navy. The rest will come from other DOE sites, foreign research reactors, university reactors and a specified amount from private companies directly supporting DOE R&D activities.

- DOE will remove all spent nuclear fuel from Idaho no later than 2035.

- DOE will treat all high-level waste at the INL (including calcine waste), in preparation for final disposal elsewhere, by a target date of 2035.

- DOE will treat transuranic and alpha-contaminated mixed waste now located at the INL. All transuranic waste will be removed from the state no later than Dec. 31, 2018.

- All spent fuel in wet storage will be placed in dry storage by Dec. 31, 2023, and such facilities will be placed, to the extent technically feasible, at a point not above the Snake River Plain Aquifer.

- The INL will become DOE's lead laboratory for DOE spent fuel management, and DOE's Idaho Office will be responsible for directing the research, development and testing of treatment, shipment and disposal technologies for all DOE spent fuel.

- If DOE fails to remove all spent fuel by 2035, DOE shall pay $60,000 per day for each day this requirement is not met. If DOE fails to meet any of the agreement milestones at any point, the DOE shall suspend any further spent fuel shipments to the INL unless the Court determines that the obligation has been satisfied.

- The agreement also forces the federal government to: 1) convert all highly radioactive liquid wastes currently stored in underground tanks on the INL site to a more stable dry form; and

[4] *Idaho Department of Environmental Quality, http://www.deq.idaho.gov/inl-oversight/oversight-agreements/1995-settlement-agreement.aspx;*

2) to remove spent fuel from storage pools and place the fuel into dry storage; both of which are intended to reduce risks to the aquifer.

1996 REFERENDUM ON THE SETTLEMENT AGREEMENT

In 1996, the citizens group "Stop the Shipments" put an initiative on the ballot (see text box) to nullify Governor Phil Batt's 1995 Settlement Agreement. Additionally, "Stop the Shipments" and other groups argued, "Any agreement to accept and store nuclear waste in Idaho must be approved by the legislature and by a vote of the people."[5] That consent mandate and nullification of the Settlement Agreement were rejected by 62.5% of Idahoans who voted.

Following is the language from the 1996 Referendum on the Settlement Agreement:

General Election

November 5, 1996

PROPOSITION THREE

INITIATIVE REQUIRING LEGISLATIVE AND VOTER APPROVAL OF AGREEMENTS FOR THE RECEIPT OF ADDITIONAL RADIOACTIVE WASTE AND NULLIFYING PRIOR AGREEMENT.

Initiative proposing new sections of Idaho law limiting the authority of state officials to enter into agreements for the receipt and storage of additional radioactive waste in Idaho. The initiative would require that any such agreement must be approved by the state legislature, and by the voters at the next biennial election before becoming effective. The initiative would nullify the prior agreement entered into by the State of Idaho and the federal government regarding receipt of radioactive waste, and would require that the Attorney General of the State of Idaho file a motion under the Federal Rules of Civil Procedure to set aside or vacate the federal court order which implemented the agreement. The initiative also defines certain terms used in the initiative. The initiative further provides that nothing in the initiative would limit the authority of the governor or the attorney general under the Federal Resource Conservation and Recovery Act ("RCRA") or the Federal Comprehensive Environmental Response Compensation and Liability Act ("CERCLA"). The initiative contains a severability clause.

Shall the above-entitled Measure proposed by Proposition Three be approved? Yes ☐

No ☐

[5] 1996 "Idaho Voters' Pamphlet", Published by Pete T. Cenarrusa, Secretary of State, State of Idaho.

CLEANUP AT INL: A SUCCESS STORY

With the defeat of the ballot initiative, Idaho became the only state in the nation with a court order mandating that federal nuclear waste leave state boundaries by a specific date. Even today, no other state in the nation has such a legally binding commitment. The Settlement Agreement – and the way in which it has transformed the state-federal relationship from one based on mistrust to one based on partnership – represent a true paradigm shift.

By any reasonable measure, the effort to clean up the legacy of the past at INL has been, and continues to be, a significant success story. For example, the Idaho site leads the nation in shipments of transuranic waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico. As of August 1, 2012, the Idaho site and its two primary cleanup contractors have shipped over 53,000 cubic meters of waste to WIPP for disposal and they are on target to beat the 2018 milestone by a significant margin.

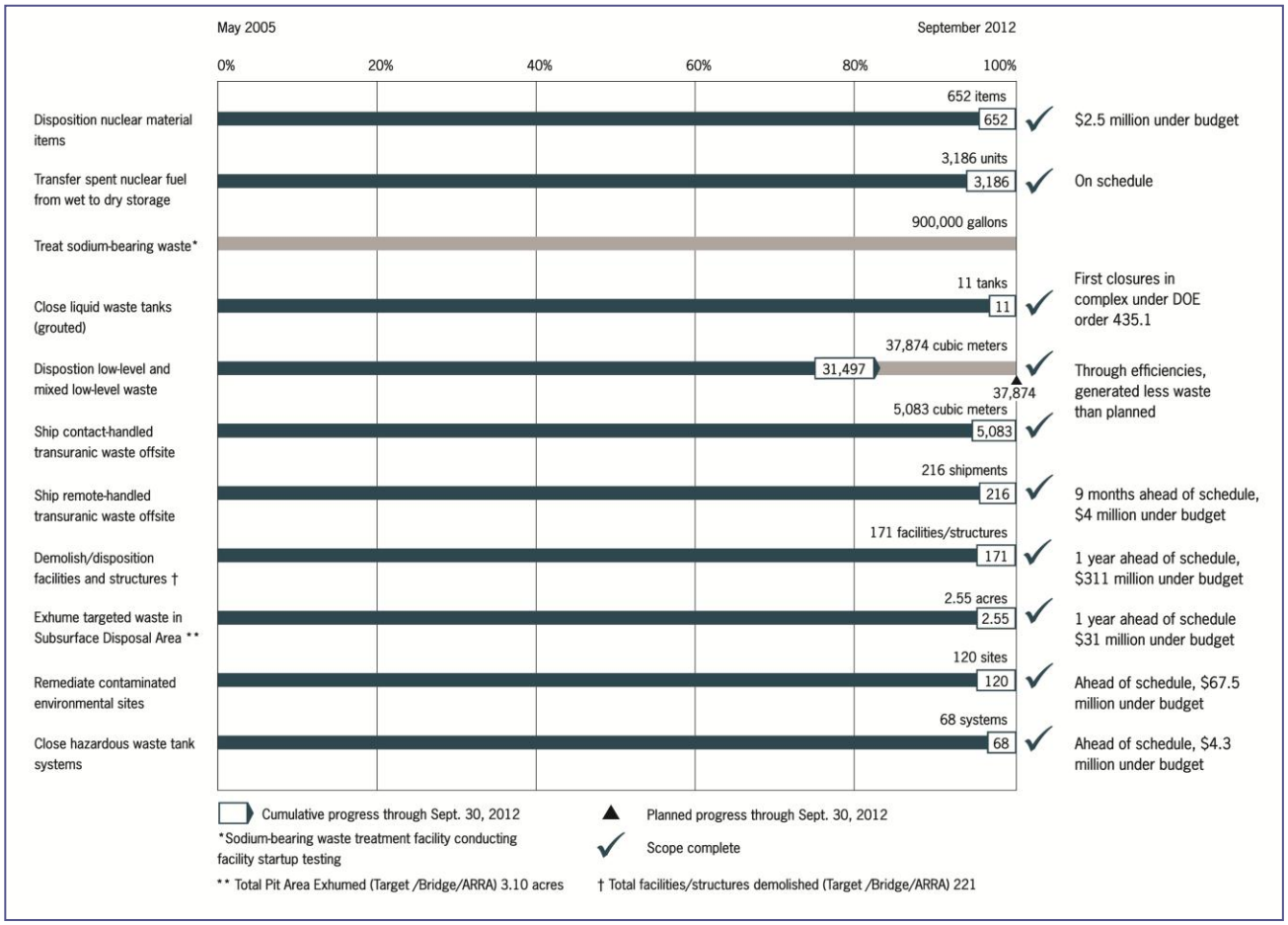

FIGURE 3: CLEANUP MILESTONES MET BY CWI
SOURCE: CWI

The Idaho site has completed 959 of the 963 enforceable milestones to date under the 1995 Settlement Agreement and other legal agreements between the State and DOE. The four milestones missed thus far were either renegotiated or rescheduled.

The cleanup contractor has made tremendous progress in the demolition of unused and contaminated facilities and significantly reduced the footprint of the site on the Idaho desert. Since 2005, over 200 buildings and structures of various sizes, encompassing over 2 million square feet, have been demolished, some of which were highly contaminated and required extremely complex processes for their removal.

In addition, the cleanup contractor has successfully closed seven of the eleven 300,000 gallon tanks that held high-level liquid wastes and will complete closure of the remaining four once the Integrated Waste Treatment Unit begins operations.

Most importantly, the LINE Commission received a presentation from the DEQ which confirmed that trends show decreasing concentrations of below limits contamination in the groundwater underneath the site which highlights the success of the Cleanup Project.

Researchers from the U.S. Geological Survey, State of Idaho, DOE Environmental Science and Research Foundation, and other institutions will continue to monitor for contaminants and their transport through the aquifer to assure the safety of this critical water resource. This long-term monitoring will be important to ensure the remaining cleanup activities successfully dispose of the legacy waste from the past.

Current INL activities are being managed under much higher environmental standards and are not producing new waste that poses significant environmental risk. Simply stated, past practices at the INL that led to low level contamination of the Snake River Plain Aquifer, such as injection of waste water and the dumping of transuranic waste drums into open pits, have ceased and would not be allowed under today's standards.

To maintain cleanup progress it will be important for the State of Idaho and the Idaho Congressional Delegation to work closely with DOE and the President's Office of Management and Budget (OMB) to maintain a consistent level of funding sufficient to expeditiously complete the remaining cleanup priorities.

STATE AND TRIBAL OVERSIGHT OF INL CLEANUP

The State of Idaho, the DOE, the Environmental Protection Agency, and the Nuclear Regulatory Commission (NRC) have regulations and requirements to ensure protection of public health and the environment during nuclear energy related operations. Concerns over the environmental impacts of INL operations led the Idaho Legislature to establish in 1989 a comprehensive, INL specific state oversight program to independently assess impacts from the INL. In 1990, Idaho became the first state in the nation to negotiate an agreement with the DOE to provide funding

for the independent monitoring and oversight of a DOE facility. This work is now carried out by DEQ's INL Oversight Program.[6]

The purpose of the INL Oversight Program is to "evaluate the actual or potential environmental and public health impacts of U.S. Department of Energy (DOE) activities at the INL. To do this staff regularly visit the INL site, review and comment on DOE planning and decision-making documents, and keep up-to-date on how facilities are managed."[7]

According to the Idaho Department of Environmental Quality, "the INL Oversight Program also tracks inventories of various types of nuclear waste at the INL and how they are handled. Information gathered through oversight activities helps determine where monitoring should be focused and may also be used to guide emergency planning efforts."[8]

The State of Idaho also plays several important roles in overseeing transportation of nuclear materials and waste and preparedness for emergency response. The transportation of nuclear materials and waste is expected to continue as part of normal INL operations, and may expand as industry locates near the INL or elsewhere. The Shoshone-Bannock Tribes also participate in oversight of radioactive waste shipments through the Fort Hall Reservation along I-15 southeast of the INL, as part of a tribal/DOE program to conduct oversight and monitoring of DOE activities at the INL site.

Shoshone-Bannock/DOE cooperation at the INL also includes a Cultural Resources/Heritage Tribal Office, formed when the Tribes entered into a cooperative agreement with the DOE Idaho Operations Office in 1992. The INL site is located on Shoshone-Bannock aboriginal lands, and the goal of the Cultural Resources program is to protect and monitor Tribal cultural resources on INL lands as well as aboriginal use areas. This is accomplished with regular site visits, monitoring, participating in archeological surveys and when necessary, data recovery. The program also oversees cultural resources projects on the Fort Hall Indian Reservation and works with other federal, state and private agencies to ensure cultural resources laws are complied with and the Tribes' cultural properties are protected.

INL CLEANUP: REMAINING CHALLENGES

Despite the tremendous progress of the cleanup efforts, the LINE Commission fully acknowledges that some challenges remain. Specifically, two key issues exist that are being addressed by both the state and DOE: the status and resolution of the remaining liquid waste disposal and the ultimate disposition of the calcine waste. Each scenario is important to understand.

[6] See http://www.deq.idaho.gov/inl-oversight.aspx
[7] ibid
[8] ibid

REMAINING LIQUID WASTE

The Settlement Agreement requires DOE to have all the remaining liquid waste in underground tanks treated by the end of 2012. Over the past several years a facility has been constructed – the Integrated Waste Treatment Unit (IWTU) – to treat the liquid waste. During the startup testing phases, critical IWTU equipment experienced technical difficulties and has delayed the scheduled processing. As a result, DOE has notified the State of Idaho that it will miss a Settlement Agreement milestone. Efforts are being made to remedy the situation and DOE plans to complete the waste treatment as soon as possible while ensuring worker and public. The Governor and state Department of Environmental Quality are carefully monitoring the status of this situation to ensure Idaho's rights and interests are protected.

CALCINE WASTE REMOVAL

The Settlement Agreement also requires the treatment of calcine waste so that it is ready to be shipped from Idaho by a target date of December 31, 2035. Calcine waste was created in the conversion of radioactive liquid waste and is a dry granular material, much like laundry detergent. The conversion to dry material stabilized the waste and reduced the contamination risk for future storage. Today, the calcine is stored in large stainless steel and concrete silos at the INL. The waste in its current form and current storage is stable and creates very little contamination risk. The Settlement Agreement directs DOE to treat the calcine so that it is ready for shipment outside of Idaho. A RCRA Part B permit application for calcine treatment is due to the State by December 1, 2012. Considerable amounts of capital will be spent preparing the calcine waste for disposal.

ONGOING FUNDING REQUIRED TO COMPLETE CLEANUP

The Settlement Agreement has given the state important leverage in its efforts to remove the legacy waste from the state. While DOE is required to request adequate funding to meet its obligations, there is no guarantee in the Agreement that the federal funding needed to meet waste cleanup commitments under the Agreement will be included in annual appropriations from Congress. Idaho's Congressional delegation has played – and must continue to play – a very critical role in aggressively securing the necessary funding for INL cleanup and other operations. With the significant budget challenges on the federal level, there are looming concerns that future funding could be in jeopardy. In addition, other states have the need to secure federal funds for their cleanup programs. Competition for limited federal dollars is expected to be a future challenge.

PROTECTING IDAHO'S ENVIRONMENT: OTHER IMPORTANT CONSIDERATIONS

ALL WASTE IS NOT EQUAL

The LINE Commission believes it is important to note that not all sources of nuclear waste pose a similar threat to the environment. The immediate situation illustrates the significance of this point: both buried transuranic waste and liquid tank wastes are receiving the highest priority for federal funding because they pose significantly more risk to the environment. Calcine and spent nuclear fuel, however, are far more stable and contained in their current storage configurations and pose little to no risk to the environment.

Differences in waste types are important to understand.

The table below summarizes the various forms of nuclear waste at the INL, the respective status of the corresponding efforts to dispose of them and the associated risk that must be addressed.

INL Site Waste Forms – At a Glance

Name	Description	Status (2005-2012)	Risk
Transuranic (TRU) wastes	Trash, tools, clothes and related materials contaminated by man-made elements that are heavier than uranium (e.g. plutonium); generated by the U.S. nuclear weapons complex during the Cold War; large quantities were shipped from the Rocky Flats Plant in Colorado and buried or stored at the INL site until the 1980s	Removed, examined, packaged and shipped >5,000 cubic meters of contact-handled TRU waste for disposal in the Waste Isolation Pilot Plant (WIPP) in New Mexico	Some TRU waste emits high levels of penetrating radiation; however, most do not. They pose a danger when small particles are inhaled or ingested. As long as this type of TRU waste remains enclosed and contained, it can be handled and shipped to WIPP safely.
Low Level Waste (LLW) /Mixed wastes	Radioactively contaminated industrial or research waste such as paper, rags, plastic bags, or water-treatment residues resulting from past and ongoing INL activities; some wastes are disposed of on the INL site while others are shipped to off-site disposal facilities	Disposed of more than 31,000 cubic meters of low-level and mixed low-level waste at the INL and offsite disposal areas	Radioactivity can range from just above background levels found in nature to very highly radioactive. Materials disposed at the INL and offsite are treated (as necessary), packaged and disposed in ways designed to reduce the threat to people and the environment.
Spent Fuel	Metallic plates, rods and rod bundles that have previously been used in a nuclear reactor; the INL stores spent fuel from past and ongoing on-site reactor operations, naval vessels, domestic and foreign research reactors, and small amounts of commercial reactor spent fuel	Transferred >3,100 units of spent fuel from wet to dry storage; fuel will remain in storage in Idaho	Though it exists in a solid, stable form, it is thermally hot and highly radioactive. Moving fuel from wet to dry storage reduces the risk that radionuclides will be released into the environment if the fuel loses its physical integrity.
Liquid wastes	Solutions resulting from past fuel reprocessing and decontamination work at the INL; 900,000 gallons of liquid wastes remain in underground tanks at the INL site	7 high-level liquid waste tanks have been closed and grouted. A facility designed to convert remaining high-level liquid waste to granular solid has been built and is being modified after a	It is highly radioactive and more challenging to manage long-term than solidified waste. Solidifying the liquid wastes will make the wastes far less mobile and will therefore greatly reduce the chances of these wastes entering the environment.

		failure during startup testing	
Calcine	Granular material, similar to dry laundry detergent, resulting from drying/volume reduction of high-level liquid wastes from INL reprocessing activities; ~4,400 cubic meters of calcine waste is stored in 6 active "bin sets" at the INL site	Existing calcine monitored, maintained in robust bin sets; RCRA permit application for calcine treatment due to the State on December 1, 2012	Though highly radioactive, it is stable and stored in concrete-encased stainless steel bins with 500-year design lives
Surplus buildings	INL buildings once used to house reactors & support facilities - determined to be unneeded for ongoing and future mission work	Demolished 221 facilities and structures – totaling more than 2.2 million square feet	Generally low to moderate risks from radioactive contamination and common industrial hazards such as asbestos.
Organics	Liquids, such as scintillation liquids and vials; organic lab liquids; sludges; and cleaning, degreasing, and miscellaneous solvents used in INL activities and disposed of in the past by injection wells	The vacuum extraction system that removes organic vapors from their underground locations and destroys them continues to operate	Moderate to high risks due to ability to migrate through soil.

SEISMIC CONSIDERATIONS

A concern expressed in the public comments received by the Commission is related to the safety of nuclear waste at the INL in the event of an earthquake. Seismic activity has occurred in the area near the INL as illustrated by the 6.9 magnitude earthquake near Borah Peak in 1983. In comparison, the 1989 earthquake in San Francisco with its considerable damage was also a 6.9 magnitude. In 1983, the INL, while adjacent to the Borah Peak quake area, experienced little impact to its facilities. Interestingly, the INL rests right above the Snake River Plain where subsurface and geologic conditions have a dampening effect on ground motion.

The Nuclear Regulatory Commission (NRC) continues to monitor the impact of earthquakes and the potential risk it creates for the safety of nuclear energy facilities. The NRC findings have stated that all operating nuclear power plants in the U.S. "remain safe and require no need for immediate action." The NRC requires that structures, systems, and components be designed to take into account the following:

- The most severe natural phenomena historically reported for the site and surrounding area. The NRC then adds a margin for error to account for the limited historical data accuracy (including earthquakes in early 1800's that registered as high as 7.7 magnitude)
- Appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena; and
- The importance of the safety functions to be performed.

The INL is also highly engaged in monitoring seismic activity around the site. The INL acquires earthquake data in real-time and uses it to evaluate seismic hazards and set facility specific design criteria for seismic safety of workers and the public. Given the considerable analysis and monitoring that has and continues to occur, the Commission does not see earthquake activity causing a material threat to the safety of nuclear waste stored at the INL.

PROTECTION OF NUCLEAR FACILITIES

In addition to seismic activity, the NRC also requires considerable safeguards to be in place to secure a facility from other forms of attack or threats. Safeguards must include threat assessments, extensive physical protection of facilities and immediate areas, intrusion detection and appropriate levels of response including armed response if necessary. These protections are required by the NRC for nuclear reactors, fuel cycle facilities, and spent fuel storage and disposal facilities.

The Commission found in its tours of the INL facilities and the information presented, the INL has and does carefully evaluate potential security risks and has demonstrated a consistent record of providing the appropriate security for its facilities and surrounding areas.

NEED FOR STORAGE AND DISPOSAL FACILITIES

As discussed later in this report, the Obama Administration's decision to terminate the Yucca Mountain project means there is no facility under development in which to dispose Idaho's spent fuel and high-level waste. In addition, there are no storage facilities being developed outside of Idaho that have a mission to accept spent fuel and high-level waste stored on the INL site. And even if the Yucca Mountain project were to be resurrected, the U.S. has already generated more spent fuel and high-level waste than can be disposed there under the current law.

SETTLEMENT AGREEMENT: A GUIDING FRAMEWORK TO PROTECT IDAHO

As stated above, the Settlement Agreement Idaho has with DOE is the only agreement of its kind in the nation and it has proven to be a very effective means of ensuring that federal commitments related to nuclear waste management are met. DOE's success in meeting Settlement Agreement milestones has made it possible for DOE to continue shipments of spent nuclear fuel to Idaho for storage, and has created an environment in which the State of Idaho has concluded it is in the state's best interest to exercise some of the flexibility built into the agreement as it pertains to commercial nuclear waste shipments.

As discussed earlier, the Settlement Agreement caps the amount of used fuel allowed to enter the state. The Navy has shipped 216 canisters of spent fuel and INL has received over 75 shipments of spent fuel under the Settlement Agreement. Also within the Settlement Agreement 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 allowed continuation of Navy operations beyond 2035, and clarified what is meant by removal of "all" transuranic waste. The Settlement Agreement continues to provide the framework and requirements that must be met to protect the state.

THE NATIONAL AND GLOBAL NUCLEAR LANDSCAPE

Nuclear energy currently provides nearly 20 percent of the nation's electricity production with more than 100 operating nuclear reactors. Due to low maintenance and fuel costs, and modest future capital investment, most existing nuclear power plants can currently compete favorably with gas-generated electricity. So while nearly all of these 100-plus operating reactors are in the latter-half of their initial 40-year licensed operation periods, most of these plants have applied – or are expected to apply – for 20-year license extensions.

> Nuclear energy currently generates nearly 20% of the nation's electricity.

Looking ahead, the low price of natural gas (and the relatively low capital burden associated with building natural gas-fired electrical generation capacity) is having a negative impact on investment in any other energy resource development in the U.S., including nuclear energy. While a variety of companies have proposed the construction of up to 26 new commercial nuclear power reactors in the U.S., due to the low

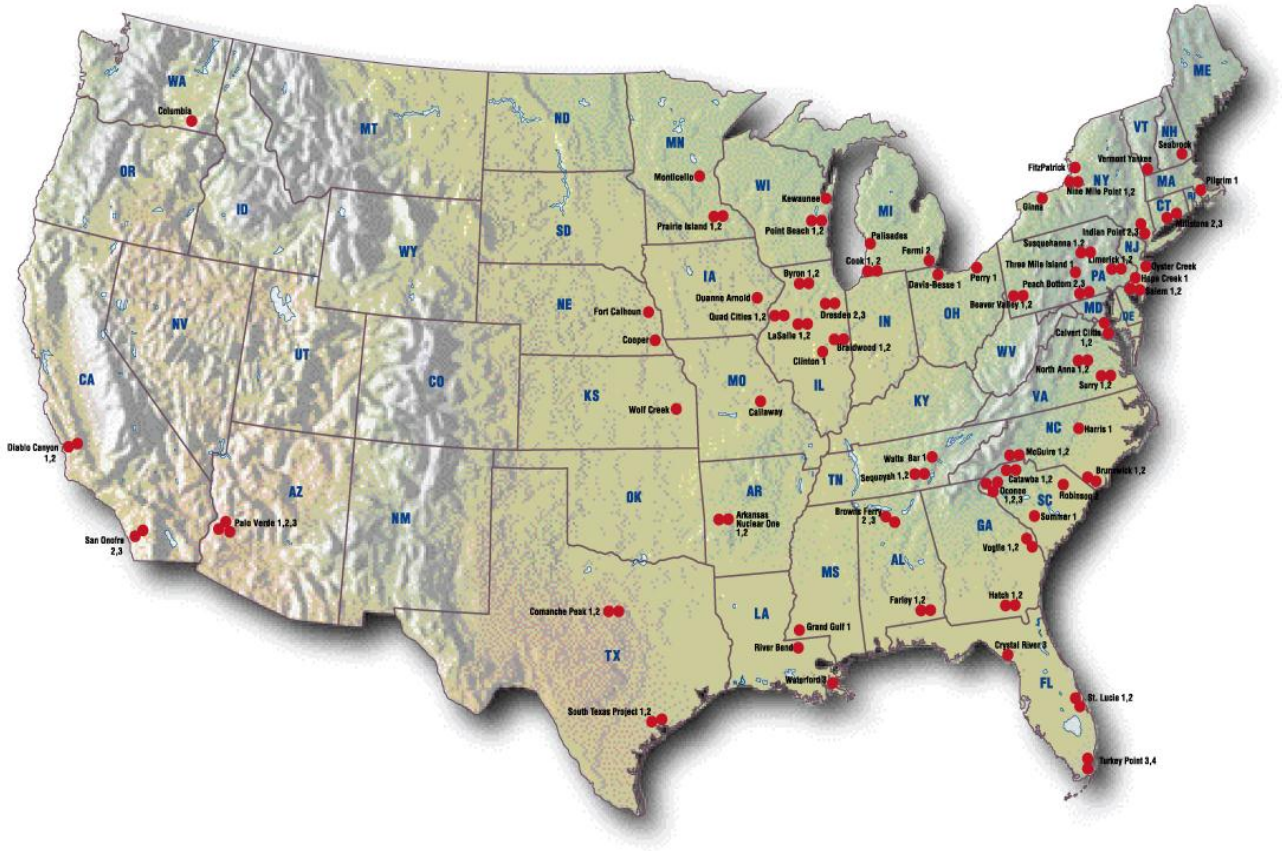

FIGURE 4: COMMERCIAL NUCLEAR POWER PLANS IN THE UNITED STATES
SOURCE: www.world-nuclear.org/info/inf41.html

cost of gas-fired generation and other issues,[9] it appears that only the two new reactors under construction in Georgia and the two being built in South Carolina are likely to proceed this decade.

The long-term viability and future of the current supply of cheap natural gas in the U.S. is currently uncertain. Factors such as environmental regulations, public opinion and the opening of natural gas export terminals could fundamentally alter the economics of the natural gas industry in the U.S. Keeping a balanced supply of diverse sources of energy is important to our nation's strength and its security.

PROS AND CONS OF NUCLEAR ENERGY

In addition, concern over air quality including greenhouse gases, is a major driver for clean energy alternatives. Nuclear currently produces 70 percent of all clean electricity in the US. It will remain an essential element of any effort to improve air quality and to reduce the carbon footprint of electricity generation.

Another advantage nuclear offers compared to other low-emissions alternatives is the ability to provide "baseload" electrical generation – generation that is available 24 hours a day, seven days a week. While baseload electrical supply is critical for electrical grid stability, U.S. baseload generating capability has fallen markedly over the past few years as coal-generating capacity has been retired.

Of course, all energy generating technologies have both advantages and disadvantages. The pros and cons of nuclear energy include:

	Pros	Cons
Economics	• Cheap electricity production by existing already amortized nuclear plants • Low operational costs and stable market prices (low volatility in the price of nuclear generated electricity) • High tech, high paying domestic jobs (at the plants and the service sector) • Production cost immune to potential carbon taxes • Growing international market for new nuclear plants that can create a strong industry in the U.S.	• Very high capital cost of new plants • Economic uncertainty associated with the regulatory process • Relatively inexpensive domestic alternative energy sources (e.g. natural gas) • Competitive international market for reactor vendors (France, Russia and South Korea) • Uncertainty in long-term storage and disposal of used nuclear fuel (UNF)

[9] These other issues include high construction costs, long construction timeframes, and the inability of the federal government to implement a workable loan guarantee program for nuclear power as established under the Energy Policy Act of 2005

Energy Security	• Reliance on primarily domestic resources (uranium) • A very good safety, reliability and operational availability record by domestic industry	• Increasing domestic fossil fuel resources • Negative public perception of safety post-Fukushima • Public concern about increasing volume of used fuel (stored at operating reactor sites)
National Security	• Maintaining U.S. leadership in technologies and applications during an increasing international demand on nuclear energy • U.S. leadership in non-proliferation and nuclear safety • Reduced reliance on non-domestic energy sources	• Concerns about the vulnerability of nuclear plants and fuel facilities to terrorism • Risks of the misuse of civilian technologies for proliferation of nuclear weapons
Environmental Impact	• High density clean energy with nearly zero green house gas emissions • Small plant footprints per unit energy	• Environmental impact of uranium mining • Water usage equivalent to any large thermal plant • Uncertainty in long-term disposal of used nuclear fuel

NEW TECHNOLOGIES: SMALL MODULAR REACTORS

One option for capturing the advantages of nuclear energy while addressing concerns about high capital cost is the potential development of Small Modular Reactors (SMRs). These reactor designs may be able to produce energy with a shorter construction timetable and with less upfront financial risk, but their overall economic viability is currently uncertain. An advantage offered by SMRs is that the current U.S. nuclear manufacturing infrastructure can be adapted or augmented to allow SMR manufacturing; this could offer an economic development opportunity to states with a favorable business climate and established nuclear capabilities.

The U.S. Department of Energy has launched a program intended to lead to the demonstration and commercialization of SMR designs. In January of 2012, DOE announced it is seeking applications for two SMR development grants, estimated to total $452 million over five years. The funds will pay up to half the cost of certifying the design of two SMR reactor designs.[10]

The Commission heard from several nuclear industry firms that are developing SMR technologies and whose plans include the eventual development of demonstration SMR reactors and SMR manufacturing capabilities to meet market demand in the U.S. and abroad.

[10] See http://www.platts.com/RSSFeedDetailedNews/RSSFeed/ElectricPower/3903791

A NATIONAL DILEMMA: SPENT NUCLEAR FUEL

Despite the advantages of nuclear energy, and looking beyond economic factors, one issue that could hold nuclear energy back in the U.S. is the management of spent nuclear fuel. While some have advocated that the U.S. reprocess their spent nuclear fuel to extract re-useable elements (as is done in France, Russia and Japan), the U.S. has turned away from reprocessing for economic, environmental and national security reasons. Instead, U.S. policy calls for direct disposal of spent fuel in an underground repository. From 1987 until recently, the U.S. planned to dispose of spent nuclear fuel and high-level wastes in a nuclear waste repository to be constructed at Yucca Mountain, Nevada. However, the Administration has decided to terminate the Yucca Mountain project and established a Blue Ribbon Commission (BRC) to make recommendations for re-formulating the U.S. nuclear waste management program. The Blue Ribbon Commission issued its recommendations in January 2012, and while legislative proposals have been advanced to implement recommendations from the Commission, none have advanced far in Congress. As for the Administration, it has taken no action to implement the Commission's recommendations. At the state and local level, communities in several states – most notably Eddy and Lea Counties in southeastern New Mexico – have expressed interest in hosting nuclear waste management facilities and are gearing up to participate in a consent-based siting process.

President Obama established the Blue Ribbon Commission to study solutions for storage of the nation's spent nuclear fuel.

Looking to the future, the opportunities for sustained DOE funding for nuclear research appear to be centered on the development of SMRs and on the nuclear fuel cycle, particularly in the development of advanced fuels and in the disposal and storage of spent nuclear fuel and other high-level nuclear wastes. States that are willing to engage in establishing or expanding storage facilities for spent fuel and high-level waste would appear to hold a competitive advantage for receiving research funds directed at these "back-end of the fuel cycle" activities. In particular, the BRC report highlighted a need for research to explore spent fuel degradation mechanisms in dry storage, "particularly since many current safety assessments are based on an examinations of fuel with lower burnup than is now "standard" and do not account for storage times of the length now being contemplated."[11]

INTERNATIONAL DEMAND REMAINS HIGH

Looking abroad, the nuclear industry is still growing internationally due to concerns about the environment and energy security. There are currently more than 430 nuclear reactors currently operating worldwide with about 60 under construction and another 150 new reactors planned. South Korea, China, India and Russia are moving forward aggressively with nuclear energy production and with the development of nuclear manufacturing, construction and operational expertise.

[11] Report of the Blue Ribbon Commission on America's Nuclear Future, p. 34

Blue Ribbon Commission on America's Nuclear Future

Overview and Recommendations

The Blue Ribbon Commission on America's Nuclear Future was formed by the Secretary of Energy at the request of the President, following the Administration's decision to terminate work on a planned nuclear waste repository at Yucca Mountain in Nevada. The Yucca Mountain project began in 1987, and the repository was intended to serve as the final resting place for much of the nation's spent nuclear fuel and other high-level. 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; by law, the repository was supposed to open by 1998, but at the time the project was terminated most estimates foresaw the repository opening in 2020 at the very earliest.

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 President directed that the 15-member Blue Ribbon Commission be formed to conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle and recommend a new strategy.

The nuclear waste management strategy recommended by the Blue Ribbon Commission includes eight key elements:

1. A new, consent-based approach to siting future nuclear waste management facilities.
2. A new organization dedicated solely to implementing the waste management program and empowered with the authority and resources to succeed.
3. Access to the funds nuclear utility ratepayers are providing for the purpose of nuclear waste management.
4. Prompt efforts to develop one or more geologic disposal facilities.
5. Prompt efforts to develop one or more consolidated storage facilities.
6. Prompt efforts to prepare for the eventual large-scale transport of spent nuclear fuel and high-level waste to consolidated storage and disposal facilities when such facilities become available.
7. Support for continued U.S. innovation in nuclear energy technology and for workforce development.
8. Active U.S. leadership in international efforts to address safety, waste management, non-proliferation, and security concerns.

Congress directed the Administration to submit an implementation plan for the Blue Ribbon Commission report by July 2012, but as of this writing the Administration has not complied. Legislation was introduced in Congress in 2012 to implement many of the recommendations of the Blue Ribbon Commission, but thus far none of these legislative proposals have become law.

Outside of Europe and Japan, the concerns raised by Fukushima are not diminishing this long-term international interest and demand for nuclear energy. Regulators in the U.S. and in other leading nuclear nations are responding prudently and putting necessary changes in place to deal with extreme external events and improve public confidence. While the safety of the global nuclear enterprise should become even better as result of these efforts, many of post-Fukushima recommendations had already been implemented in the U.S. after 9/11.

MAINTAINING AMERICAN INVOLVEMENT: A NATIONAL SECURITY ISSUE

Unfortunately, at present, U.S. firms are in a weakened position to meet the international demand for nuclear products and services. A combination of acquisitions of U.S. firms by foreign competitors, a two-decade hiatus in large-scale nuclear facility construction, insufficient export incentives and a tangled export approval process have left U.S. firms at a competitive disadvantage.

The future U.S role in nuclear energy is important to national security.

While still producing fuel, some core components and instrumentation and control systems, the capability of U.S. firms to design and produce many essential nuclear power plant components has declined significantly. Yet many observers believe it is in America's national security interest to be a leader in nuclear energy development. As more countries with less-developed safety and nonproliferation cultures, limited legal structures and a lack of skilled workers pursue nuclear energy production, safety and nuclear proliferation concerns could increase. As a result, many believe that reassertion of American leadership in the commercial nuclear energy sector and in nuclear energy research and development is critical to help address these concerns.

LINE COMMISSION APPROACH: BALANCED, TRANSPARENT, FOCUSED

In an effort to complete the task established by the Governor, the LINE Commission has carefully managed the time granted for the Commission's work to gather as much information as possible in a balanced fashion to appropriately address the complex, but significant relevance, of the nuclear industry in the State of Idaho.

The Commission's efforts have been guided by the principles listed and the steps outlined below:

- National and local experts were sought, when possible, on every topic addressed by the Commission. The Commission was very fortunate to receive support and expert testimony from some of the highest ranking officials and industry experts in the nation.
- Meetings were held around the state (Boise, Idaho Falls, Twin Falls, and Moscow) to ensure the Commission was able to hear from citizens across all regions regarding their thoughts and observations.
- Public input was critical to the process. Time was extended in each meeting for public comment, and a LINE Commission website was established to encourage additional comment and to serve as a repository for all of the key documents associated with the LINE Commission's work.
- Meetings were held in a public setting and, where possible, broadcast via live web streaming or made available via video conference technology to ensure the process was open and transparent.

The LINE Commission recognizes the strategic importance of INL's designation as the nation's lead nuclear energy laboratory and believes it is important the INL maintain that designation well into the future. Doing so, however, may require the State of Idaho to consider a number of critical questions regarding the research conducted at INL and the materials required to conduct that research.

Among the questions that must be considered by the State of Idaho are the following:

- What does it mean to be the nation's lead nuclear energy laboratory?
- Does the State of Idaho support that designation and want INL to maintain it?
- What kind of research will need to be done at the lead nuclear energy laboratory?
- The designation as the nation's lead nuclear energy laboratory requires INL to conduct research on various nuclear materials, including small quantities of commercial spent fuel and materials associated with research into high burn-up fuels. In order to fulfill its mission as the lead nuclear energy laboratory, what types of nuclear materials will need to be brought to INL for research?
- If bringing those research materials to Idaho requires changes to the 1995 Settlement Agreement, is Idaho willing to consider such changes?

- If Idaho is not willing to consider changes to the 1995 Settlement Agreement, is it instead willing to allow INL to lose its designation as the lead nuclear energy laboratory and see some or all of its research mission transferred to other DOE facilities?

By issuing this progress report, the LINE Commission is seeking public input on these critical questions and will welcome the input from all across the state on these important topics.

SUBCOMMITTEES: ADDITIONAL EXPERTS, STRATEGIC FOCUS

To support the development of recommendations to the Governor, the LINE Commission formed five subcommittees to address key issues important to the Commission's mission and scope of work. Each LINE Commission subcommittee was chaired by a Commission member, and subcommittee membership consisted of both Commission and non-Commission members who are subject matter experts who add valuable knowledge and expertise. The five subcommittees included:

- Safety and Environment
- Technology: Current & Future
- Education and Workforce
- Infrastructure
- National and Global Landscape

A framework was established for each subcommittee's scope of work to serve as a guide for the issues and topics to be discussed. The framework and a list of subcommittee members can be found at www.line.idaho.gov.

The subcommittees each prepared a report which included background, findings and recommendations for consideration by the full Commission. The recommendations of the subcommittees have been presented to but have not been decided upon by the full Commission. They are outlined here so that the Commission can receive and consider public comment on the recommendations prior to preparing a final report for the Governor.

Following is an outline of the five LINE Commission subcommittees and their respective scopes of work:

SAFETY AND ENVIRONMENT

- Summarize the current strengths and deficiencies present in the national and global nuclear industry as it relates to safety and protecting the environment.
- Identify the current strengths and deficiencies present in the state of Idaho as it relates to the state’s ability to support the expansion of its role in nuclear energy.
- Outline the potential environmental and safety risks that currently exist in the state of Idaho as it relates to the eventual cleanup of existing nuclear waste.

- Summarize the potential environmental and safety risks that may currently or potentially exist as it relates to the continuing nuclear research in Idaho. Recommend steps the state of Idaho could take to mitigate and/or eliminate these risks.
- Identify potential public/private partnerships or roles the state can play in supporting and strengthening the INL's safety capabilities.
- Identify any additional recommendations or observations that would be important for the state to consider in its efforts to maintain and strengthen its commitment to safety and environmental stewardships.

TECHNOLOGY: CURRENT & FUTURE

- Identify current and/or future technologies that will likely determine the direction of nuclear energy in the nation.
- Summarize those technologies and their potential influence on the nuclear energy industry, their potential role in the industry and the expected timing for their development.
- Identify the strategic opportunities for Idaho to participate in, influence, and/or benefit from those technologies.
- Identify potential opportunities for Idaho to lead the development or implementation of the technologies in a national and global environment.
- Recommend steps Idaho could take to influence, promote and effectively participate in these developments in a manner that promotes the mission and competitive position of the INL and Idaho's future economic opportunities.

EDUCATION AND WORKFORCE

- Identify Idaho's current strengths and deficiencies in the quality, availability and quantity of the necessary skilled workforce to support the INL and its role in nuclear energy.
- Summarize the challenges related to age of existing nuclear workers and impending retirements in both civilian and defense related nuclear establishments.
- Summarize the ability of domestic educational programs to produce qualified graduates and review any opportunities and/or requirements associated with expanding the number of foreign workers as part of the nuclear workforce.
- Summarize how Idaho's programs/institutions compare to other state and federal education programs or institutions that address workforce training for the nuclear industry.
- Recommend steps that need to be undertaken to correct any deficiencies or opportunities that may exist to strengthen Idaho's competitiveness in developing workforce solutions for the industry.
- Outline opportunities for the INL to enhance the development of new nuclear technologies in conjunction with Idaho's universities.

INFRASTRUCTURE

- Identify the critical elements required to effectively support the existing and future growth of nuclear energy in the state.
- Outline any existing or anticipated deficiencies within Idaho's current infrastructure and provide recommendations for correcting those deficiencies.
- Recommend any strategic opportunities that may exist to complete, develop or build additional infrastructure that would enhance the unique capabilities of the INL.
- Review INL security protocols in response to global threats and provide a summary of the INL capabilities or recommendations to maintain the focus on security as a high level priority.
- Review current scope of additional INL research areas (i.e. national homeland security, energy research, and other technological research) and outline any important future infrastructure needs.

NATIONAL AND GLOBAL LANDSCAPE

- Identify and summarize the national and global trends that currently or are anticipated to influence the direction of nuclear energy.
- Address the social, political, financial and regulatory impediments to future nuclear expansion.
- Summarize the national political activities that influence the development of or restriction of the use of nuclear energy in the nation's energy policy and future.
- Identify and summarize specific activities that other states are initiating or contemplating that could influence the future of the INL and its missions.
- Outline the global trends in nuclear energy and identify opportunities for Idaho to compete in the global arena and markets.
- Identify any strategic opportunities to influence future research opportunities in all areas of the INL's missions and research.
- Summarize and review the 1995 Settlement Agreement, milestones already met and progress toward future milestones under the Agreement.
- Summarize and review the role/impact of the Agreement on future cleanup activities, future research activities, and other potential opportunities amidst the national and global trends that may impact the INL.

PRELIMINARY SUBCOMMITTEE RECOMMENDATIONS

Each of the five LINE Commission subcommittees was tasked with developing a list of preliminary recommendations that provide guidance and insight on the key issues the subcommittee was asked to address. The following are highlights of recommendations from the LINE Commission subcommittees to the full LINE Commission. These recommendations are not listed in any order of priority, and some of the recommendations may be redundant or even contradictory across subcommittees. The full reports from each subcommittee, which includes additional background and analysis, are available at www.line.idaho.gov.

The subcommittee recommendations are currently being reviewed by the Commission.

These recommendations are not final. The subcommittee recommendations will be reviewed and discussed by the full LINE Commission. These recommendations, combined with testimony from experts and public input, will ultimately guide the Commission in developing and submitting a final report to the Governor in January 2013. These subcommittee recommendations are preliminary and are subject to modification, supplementation or deletion based on public input and continued discussion amongst the full Commission.

Final Commission recommendations will be issued after receiving public input.

SAFETY AND THE ENVIRONMENT

1. Continue to sustain and communicate the state's commitment to safety and the environment. This would include the creation of a focal point within the state for citizens to access information on nuclear energy, Idaho National Laboratory (INL) cleanup and operations, environmental monitoring, nuclear energy research, news and recent developments, transportation routes, emergency planning, etc. The appropriate location for this focal point may be the Governor's Office of Energy Resources.

2. The State of Idaho INL Oversight Program should continue to provide coordination of the state's role in transportation and emergency response. The interface between citizens and the state should be transparent and provide easy access to information. The state can coordinate the focus on future or expanded needs for the safe transport of nuclear materials through Idaho. Through the INL Oversight Office, Idaho State Police, Idaho Transportation Department, Idaho National Guard, and other federal, state, local, and county officials, interested Tribes and non-governmental organizations, can come together to identify future needs for transportation and public safety, pursue funding to fill those needs, and optimize coordination among the different groups.

3. Take opportunities to set the stage for future development of nuclear energy research and operations in Idaho. The state should take a lead role in water and the environment by making an early assessment of water demands of new energy developments to guide future development at the INL and elsewhere. Through its Office of Species Conservation, the state should address endangered species issues (e.g., sage grouse) that may potentially impact future nuclear development at the INL. The state should also maintain a dialogue with the Shoshone-Bannock Tribes about the potential development of nuclear energy facilities at locations in which they have an interest.

4. Utilize and expand the mission of CAES to address water quality issues. The Center for Advanced Energy Studies (CAES) is a partnership of INL, University of Idaho, Idaho State University, and Boise State University to advance energy science in Idaho. The state should utilize and expand the mission of CAES to develop ways of addressing water quality issues. This mission should provide solutions to protecting water, including ground, surface, and storm water, and water used in any processes at the INL. This research should also address issues with transportation, spills, fire, and areas where water might be used in suppression of fire or hazardous clean-up. Transferring and adopting this technology to other industries and uses should be part of this mission.

5. Expand the role of CAES to include a focus on education and training for nuclear and workplace safety, including the development of partnerships with national organizations and academies, engineering societies, safety professional societies, among others.

6. Convene an international conference on nuclear safety, in cooperation with national academies, engineering societies, safety professionals, and other organizations and individuals.

7. Assure the availability of a workforce that is educated, trained, and following world class safety standards needed for nuclear energy-related construction, research, and operations. The Subcommittee recommends that we leverage the scientific strength of the major universities in the region to ensure a steady pipeline of safety and environment professionals educated and credentialed in the disciplines needed to protect the public, the environment and the workforce from the hazards of nuclear material. Career opportunities in safety and the environment in the nuclear field need to be addressed in high schools throughout Idaho so that students have some idea of available programs as they consider and prepare for their future.

8. Form a Science Advisory Group to focus on nuclear energy facility siting issues. The Science Advisory Group will determine if the existing requirements are holistic and robust enough to assess the future challenges and meet stewardship goals for siting and operating a nuclear facility while simultaneously protecting human health and the environment. The Science Advisory Group will also assess plans and proposals for construction, transportation,

and long-term stewardship, to include end-state status when programs have been completed, as appropriate.

9. Consider appointing a Science Advisor in the Office of the Governor to evaluate a myriad of complex technical, energy, environmental, and public issues facing Idaho. Another function of the Science Advisor would be to serve as the Governor's principal liaison to the INL. In that capacity, the role of Science Advisor would not be to duplicate DEQ's INL Oversight Office, but rather provide an independent understanding of the role and importance of the nuclear energy research and operations at the INL and elsewhere within the state, and help explain that critical role and responsibility to Idahoans. A third, and no less important role of the Science Advisor, would be to elevate the discourse on the importance of science, technology, engineering, and mathematics (STEM) education to Idaho's and the nation's future.

10. Highlight the role of the State of Idaho DEQ INL Oversight Office. When the general public brings into question environmental or safety issues at the INL, the state should engage the DEQ INL Oversight Office to investigate and explain those concerns to the public.

11. Communicate with the public about the 1995 Settlement Agreement. The state should communicate with its citizens about the purpose and status of the Settlement Agreement, especially if there is a possibility that the role of, and activities at, the INL will change in the future.

12. Support potential research and development projects that can be conducted in a safe and protective manner, such as the High Burn Up Fuel Storage Demonstration. Research and development projects which can be conducted at INL in a way that protects the health and safety of the public and the environment, including the Snake River Plain Aquifer, should be supported by the State. The High Burn Up fuel storage demonstration (involving 15.5 metric tons of used nuclear fuel) presented at the October 2012 LINE Commission meeting is an example of such a project.

TECHNOLOGY: CURRENT & FUTURE

1. The State should endorse the following facilities, capabilities and programs coming to INL. The State should provide the necessary and appropriate enablers and advocacy for these investments.

Facility/Capability /Program	Benefits to Idaho	Enablers
Advanced Post-Irradiation and Characterization Facility	• Additional ~20 good paying jobs at INL (scientist and technicians) • User facility concept will bring visitors (users) to town continuously benefiting local economy (hotels, restaurants)	• Continued operations of ATR • Ability to bring commercial used fuel at research quantities for

	• Construction jobs for the facility • Spinoffs commercializing innovative technologies	examination • Specialized INL workforce and infrastructure
Transient Testing Reactor (TREAT) Restart	• Additional ~40 - 50 good paying jobs at INL (scientist, reactor operators and technicians) • User facility concept will bring visitors (users) to town continuously benefiting local economy (hotels, restaurants) • Reactor refurbishment jobs during restart • Spinoffs commercializing innovative technologies	• Continued operations of ATR • Ability to bring commercial used fuel at research quantities for examination • Specialized INL workforce and infrastructure
Facility/Capability/ Program	**Benefits to Idaho**	**Enablers**
Used Fuel Storage Demonstration	• Additional ~20 good paying jobs at INL (scientist and technicians) • Additional investments for characterization capabilities at the site	• Requires permission to bring larger than research quantities of used fuel to the site
Pilot US Regional Interim Storage Facility	• As the lead US Regional Interim Storage facility, demonstrate full scale technology, licensing, and operations for the nation's regional used fuel storage facilities. • Considerable investments (100s of million dollar) into RD&D infrastructure at the site with additional jobs • Investments into fuel cycle options demonstrations at engineering scale (100s of jobs) • Spinoffs commercializing innovative technologies	• Requires support and a revised consensus based partnership with the state to bring used fuel to the site from regional reactors for storage until disposal
Nuclear Hybrid Energy Demonstration at the Site or Hybrid Demo Using a Non-nuclear Heat Source	Hundreds of new permanent jobs at the site • Temporary construction jobs • Additional clean energy for Idaho (≤100 MW) • Spin-off small businesses for component manufacturing and maintenance	• Construction of a commercially funded advanced SMR at the site • Land • Site infrastructure (including the local grid)
High Performance Computing Center	Additional jobs • Competitive advantage to state universities • Spin-off small businesses with specialized software development for multiple applications	• INL workforce specializing on flexible HPC software platform development • State support through partnership with state universities

2. Develop a proposal for state to commit – at least startup investment/expedited permitting – to joint industry/federal/state-funded "national reactor testbed" to meet needs of regulators and industry to conduct at-scale "hot" testing of developmental/pre-commercial reactor

components and systems (individual Small Modular Reactors, multiple-SMR modules, High Temperature Gas Reactor, Sodium Fast Reactor, Traveling Wave Reactor, etc.). This capability should address dynamics and controls for reactor load following process heat applications and use in hybrid energy systems.

3. Pursue DOE designation of and funding for establishment of a formal Nuclear Materials Treatment, Packaging and Aging Assessment Center to meet industry and regulatory agency "back-end" process/technology development and validation needs and to fully leverage distinctive Idaho capabilities resident at INTEC.

4. Create – through the Higher Education Research Council/Experimental Program to Stimulate Competitive Research – an Idaho Energy Storage Center of Excellence to lead research into more efficient/cost-effective solutions (e.g. sodium sulfur storage battery, reduction/oxidation flow battery, 2-way fuel cells, etc.) for back-up nuclear station power & renewable energy load-leveling. This could and should leverage assets associated with INL's new Energy Systems Laboratory.

5. Establish streamlined mechanism to facilitate stronger/more fluid working relationships between INL/Idaho universities and Utah universities/Utah industries with established strengths and interests in high-performance ceramics (e.g. Ceramatec) and temperature-sensitive industrial processes (e.g. Huntsman Chemical) to build greater awareness of Intermountain West's leading capabilities in support of High Temperature Steam Electrolysis, Thermo-chemical Hydrogen Production, Biomass Hydrothermal Gasification and related industrial applications of process heat from High Temperature Gas Reactors. This approach should be expanded to include an Idaho led regional energy technology leadership council.

6. Leverage one or more existing State Board of Education "Funded Research Centers" or create Idaho's 8th "Funded Research Center" to focus on ways for the state to take advantage of substantial thorium/rare earth element deposits at Diamond Creek, Hall Mountain and Lemhi Pass to enable continued/accelerated Idaho, national and international R&D on thorium power systems (e.g. the Gates-supported TWR, and the liquid fluoride thorium reactor) as well as electric vehicles, renewable energy systems, energy-efficient lighting, and national defense systems that are reliant on rare earth elements.

7. Develop a "positioning letter" carrying the signatures of the Governor, legislative leaders, all members of the delegation, Butte/Bingham/Bonneville/Bannock commission chairs and Idaho Falls mayor supporting the addition of new and renewal of existing national nuclear capability facilities at INL, including – but not limited to – the Advanced Post-irradiation Examination (APEX) facility and the Transient Reactor Experiment and Test (TREAT) facility and other previously identified facilities, capabilities and programs.

8. Through CAES, develop a partnership with Lab / Dept of Commerce / University to identify areas where nuclear energy RDD capability can be leveraged to non-nuclear global energy

markets from Idaho-based corporations. This should include a council (could be part of the regional energy leadership council mentioned above) that develops a sound process to identify and prioritize these targets of leverage. The council should provide recommendations on incentives (tax credits, etc) and associated value propositions to target the most promising areas of opportunity (e.g. leverage separations expertise to rare-earth industry; leverage nuclear fuel modeling and simulation to unconventional fossil energy extraction needs, etc.).

9. The Subcommittee strongly supports the work being done at the Naval Reactors Facility (NRF) and their approach to dry storage of used fuel. Given the important national security dimension of their work and the high standards of safety and environmental stewardship we observed, the state should strongly endorse and advocate for the continuation of NRF's mission at the INL site. The state should also endorse and advocate for the proposed recapitalization of NRF facilities.

10. The Subcommittee was impressed by the capability demonstrated at the Advanced Mixed Waste Treatment Project (AMWTP). The AMWTP facility can continue processing waste after the cleanup in Idaho has been completed in accordance with the 1995 Settlement Agreement.

11. The technical issues of the Integrated Waste Treatment Unit that resulted in its aborted start up and the consequent delay in processing the remaining radioactive liquid waste stored in Idaho are of concern. These technical issues do not at this stage seem insurmountable and the liquid waste is safely stored in tanks that will contain it and protect the environment for a considerable period of time. Recommend the state closely monitor progress at the IWTU and take firm action under the appropriate agreements and orders if start up and liquid waste processing does not proceed in a 2013 – 2015 timeframe.

12. The Subcommittee supports the Radioactive Waste Management Complex (RWMC) and the approach being taken to exhume, sort, categorize and ship buried waste out of the state. The Subcommittee recommends that the state continue to endorse this approach and advocate for continued DOE funding to complete this work and install a cap over the area promptly as has been planned and committed to. In addition, the state should require a formal follow up on monitoring and appropriate research effort, conducted in Idaho, to ensure that the cap and other remediation techniques that have been employed remain effective in protecting public health and safety.

13. The state should endorse and advocate for INL's wireless test bed designation as an official DOE National User Facility. This designation will support national missions in smart grid and spectrum allocation research, and increase federal/commercial funding in INL's research. The state of Idaho will benefit economically from industry collaboration as major carriers access the INL as well as small business incubation in a newly evolving technological area.

14. Pacific Northwest Cyber Center (PNCC) is 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. Fundamentally, PNCC would be an INL-located, Idaho-led initiative to provide surrounding states and their infrastructure asset owners (utilities) access to actionable intelligence on industrial control system cyber security threats. The immediate and tangible benefit to Idaho would be protection of Idaho's critical infrastructure leveraging INL assets as well as assuming a regional leadership role. The surrounding state CIOs have shown a high level of interest, as well as has the DOE CIO in pursuing this leadership opportunity. The state should endorse and advocate for establishment of the PNCC.

15. The INL grid and grid testing expertise represents a national asset for grid reliability and security research. The state should endorse designation of the INL grid as a national user facility and advocate for its designation.

16. First Responder Training is important to ensure cities and states are protected against radiological threats and that responders are proficient in threat mitigation. The state should advocate for INL to provide first responder training regionally to hospitals, medical facilities and industrial sites.

17. INL, in collaboration with the state universities and the Idaho Regional Optical Network (IRON), has formed the Idaho Computing Consortium intended to share research level supercomputing across all institutions for collaborative research and to gain economy of scale on these very large investments. The INL computing center is now at capacity. An additional $6-10M will more than double INL's and the Idaho Computing Consortium's capacity enabling the next 10 years of simulation, modeling, and general research. The state should endorse this expansion and seek the resources to make this investment in the ICC. The state should also consider expanding the ICC regionally.

18. Broadband infrastructure is provided at INL today through INL's own 72-mile fiber loop for internal communication and association with the Idaho Regional Optical Network (IRON) for external worldwide very high speed access. The state of Idaho should consider partnering with IRON and INL for nonprofit, education, virtual rural health care, and statewide research to expand high speed bandwidth to all communities in central and southern Idaho. This would leverage all related bandwidth investments into a coordinated and highly leveraged research, economic, and educational engine for Idaho.

19. The state should consider expanding the role of the LINE Commission in the future to more broadly address "Leadership in Energy Technologies" (LIET) as opposed to just nuclear. All parties should use this broader energy technology mission to build upon the assets already in place and offered through state colleges, universities, ESTEC, CAES, and vocational training centers.

20. The state and INL should 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. This will both ensure that the U.S remains engaged in

development of cutting edge nuclear technologies regardless of the lack of nuclear expansion in the U.S., and it will provide further diversification of INL funding sources.

21. Most of the INL work in nuclear technology seems to be focused upon fuels and materials since that has been the areas of historical expertise. INL should consider taking a broader look at the nuclear industry and address other R&D opportunities in areas such as uranium in situ recovery, uranium conversion technologies, engineering design of plant equipment, and interim fuel storage to name just a few.

22. The state should assist INL in recruiting government agencies such as NRC, DOT, EPA, and FAA to consolidate their research, testing, training, and inspection program work at the INL. The state should advocate for INL to support regional regulators.

23. In the LINE Commission's June 29 meeting, both former Governors Andrus and Batt indicated it is unlikely the country is going to have a permanent repository by the 2035 deadline which means Idaho's dry used nuclear fuel and calcined high-level waste has nowhere to go. The Obama Administration's decision to terminate the Yucca Mountain project creates a strategic decision that this subcommittee and the full Commission grappled with. The state may want to evaluate the 2035 deadlines for removal of dry stored used nuclear fuel and the processing of calcine into a "repository ready" form. The calcine presents very little risk and processing the material to change it into a different form suitable for a yet-to-be identified and characterized repository may not be the best use of taxpayer's dollars.

EDUCATION AND WORKFORCE

Building on existing strengths of collaborative programs involving the state's three research universities and multiple technical colleges, appropriate $5 million from the General Fund to expand the reach and scope of Idaho's STEM channels for nuclear energy education and workforce development. The funding will be used, in coordination with the Higher Education Research Council (HERC) and the Council on Academic Affairs and Programs (CAAP), to develop an organized system for ongoing advancement of the industry-education-workforce interface. This will lead to improvements in nuclear workforce cultivation, education and availability in the face of impending retirements; additional faculty fellowships, university and technical college student internships and scholarships; additional, relevant post-secondary coursework and infrastructure; productive engagement with regional nuclear business and industry; and the integration of existing learning opportunities for K-12 teachers and students with the goal of improved focus on nuclear energy occupations. Recommended avenues for accomplishing this include:

1. Using the Center for Advanced Energy Studies (CAES) as a focal point for information and action, evaluate methods and implement approaches to: 1) best inform state policy makers and agencies on energy issues including nuclear; 2) share nuclear best practices, lessons learned and related data with industry, industry support organizations and government

entities; and 3) explore/create, in conjunction with the state's universities and technical colleges, the need for additional science, engineering and technology degree programs, unique staffing and/or associated equipment. Within this context, the following activities are recommended:

a. Develop and implement 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 support the upgrade of the two remaining ESTEC energy technician programs (Electrical and Mechanical Engineering Technology) to national Nuclear Uniform Curriculum Program standards.

b. Assess the facilities, instrumentation, equipment and other infrastructure currently available to support nuclear science, engineering and technology programs at Idaho's universities and technical schools and develop and implement an upgrade plan that will facilitate world class undergraduate and graduate education.

c. Assess the long-term feasibility of establishing the "Idaho Polytechnic Institute," a statewide educational collaboration between Idaho's universities and its community and technical colleges with the goal of providing applied science and technology degree options at all levels. This non-degree-granting institute would provide a focus for the integration of engineering and technology coursework in an effort to provide market-sector focused degree programs and research.

d. In cooperation with organizations such as the International Atomic Energy Agency and the World Association of Nuclear Operators, determine the role of Idaho's two- and four-year institutions in providing nuclear curriculum and instructional expertise to emerging nuclear power countries.

2. Establish an industry-driven Nuclear Talent Task Force as a singular focal point for defining and resolving workforce issues and challenges unique to the rigor, discipline and requirements of Idaho's nuclear research, development and operations community.

3. Leverage and systematically integrate existing K-12 and STEM education initiatives throughout the state with efforts described in the above recommendations to improve post-secondary nuclear science, engineering and technology education and the readiness of students to enter these programs.

INFRASTRUCTURE

1. The State of Idaho, Bonneville County, City of Idaho Falls, and private developers should work together to develop a Science and Technology Park north of the existing University Place and the University Boulevard Campus.

a. Such should assess and implement a process to acquire suitable land immediately north of University Boulevard Campus and University Place for the purpose of constructing a Science and Technology Park that augments and complements the INL's missions.

b. This Science and Technology Park would facilitate business development efforts by providing the private sector with close access to research capabilities not available elsewhere.
c. Idaho State University and the INL should assess and consider the construction and operation of on-campus and visitor residential housing.

2. Methods should be formalized that protect INL desert operations site from noise-generating external infrastructure to the maximum extent possible.

    a. The INL is a secure and expansive desert operations site as currently constituted, and is both a state and national resource of nearly immeasurable value – due in large part to its great expanse of contiguous land, which is largely free of electronic noise sources. To enable continued national priority service and maintain its unique capabilities as an electric grid, advanced wireless telecommunications and cyber security test bed, incursion onto the INL desert operations site by noise-generating external infrastructure should be limited or precluded to the maximum extent possible.

3. Establish the state's ability to provide input regarding the use of decommissioned facilities on the INL desert operations site.

    a. Facilities on the INL's desert operations site that are currently owned on behalf of the American public by the DOE Office of Environmental Management may have future mission relevance for INL's ongoing nuclear energy research mission. These facilities should be evaluated, maintained and where warranted transferred to DOE's Office of Nuclear Energy to allow full use by INL.

    b. The State of Idaho's input and recommendations should, where appropriate, be requested and considered by the INL's Office of Environmental Management.

4. Support the expansion of the CAES as capacity needs grow.

    a. Idaho should commit to the same type of hybridized funding/construction/operation model used for the original Center for Advanced Energy Studies to construct a CAES-II facility, adjacent to the current CAES facility in Idaho Falls, to relieve crowding at the original CAES facility and to, potentially, serve as the home of the INL's ATR National Scientific User Facility activities.

5. Establish an Advanced Nuclear Manufacturing Research Center in Idaho.

a. This Manufacturing Research Center could be modeled after the Nuclear Advanced Manufacturing Research Center recently established in the United Kingdom. The Center could be led by the CAES partners (BSU, INL, ISU, UI) and a consortium of industrial partners (AREVA, GE, Westinghouse, etc.) that works with members to develop advanced manufacturing solutions to meet the needs of both current and future nuclear reactors, to help members join the international nuclear supply chain, and to support skills development and quality management. In this new Idaho NAMRC, solution developers work hand-in-hand with university and national lab researchers to provide the scientific basis that satisfies regulatory requirements and to generate intellectual property. This new Center would also benefit the development of nuclear in Idaho by providing an advanced manufacturing capability to support new product development in particular and statewide economic development in general.

6. Pursue a suitable, acceptable, and financially prudent method of providing both a roadway crossing and walkway crossing across the railroad between the University Boulevard Campus and University Place in Idaho Falls.

    a. INL has explored opportunities for funding a railroad overpass over the past five years. CAES opened in February 2008 as a joint partnership between the state universities and the INL, but without a way to cross the railroad tracks it becomes difficult to commute between the two facilities.

7. Establish the Advanced Mixed Waste Treatment Project as the facility of choice for radioactive waste processing.

    a. The Department of Energy's Advanced Mixed Waste Treatment Project has proven to be a valuable asset in our nation's quest to safely and compliantly dispose of legacy transuranic and mixed low-level radioactive waste. More transuranic waste has been processed and shipped from AMWTP to the Department's Waste Isolation Pilot Plant than any other site in the DOE Complex. To save taxpayer's dollars from building similar treatment facilities at other sites, and to take advantage of an existing world-class workforce that has a proven record of performance for safely and efficiently treating and shipping these types of legacy wastes – in full compliance with the terms and conditions set forth in the Idaho Settlement Agreement – we recommend AMWTP should continue to be the facility of choice for similar radioactive waste processing operations for the DOE's Environmental Management program.

8. Continue efforts to establish air service between Idaho Falls and Boise.

    a. Air service between Idaho Falls and Idaho's Capital, Boise, is important so that INL can maintain connectivity with state leaders, the legislature, and among INL's employees. It is recommended that the Idaho Department of Commerce continue to assist the City of Idaho Falls and other community leaders in securing reliable and

continued air service connecting these two cities. It is further recommended that tax and other investment incentives be explored to secure this air service.

9. Recapitalize the Naval Reactors Facility in preparation for a future role in nuclear fuel research.

    a. The state of Idaho should support the recapitalization of the Nuclear Naval Propulsion Program's existing Expended Core Facility infrastructure. Recapitalization will support the vital transfer, handling, examination, and packaging of naval spent nuclear fuel removed from nuclear-powered aircraft carriers and submarines, as well as from land-based prototype reactors for at least the next 40 years. The NNPP's mission provides reliable operation of the naval nuclear powered fleet.

    b. The NRF capabilities ensure safe and environmentally responsible operations of ECF. Deterioration of the 50 year old ECF infrastructure could immediately and profoundly impact the NNPP mission, including the NNPP's ability to support refueling and defueling of nuclear powered submarines and aircraft carriers.

10. Assess and consider locally produced nuclear power through Small Modular Reactor (SMR) technology.

    a. Idaho should consider and encourage the construction of a suitable SMR that meets the needs of the INL, and provides research, educational, and power resources for both the INL and Idaho's universities.

11. Ensure consistent, long term, adequate and reasonably priced power.

    a. Current estimates suggest a 50 percent increase in power needs between 2012 and 2022. Reliable, consistent, reasonably priced and adequate power generation needs that includes a forward-thinking review of projected needs that could well double in the next ten years with consideration of power needs including Areva's operations.

    b. Predictability is also very important. Periodic review of those projected needs by the INL, power providers, and the State of Idaho are essential to meeting those needs. INL's annual budget does require consistent and reasonably priced power. It should be noted that power needs at INL could increase in a substantial way.

12. In preparation for increased power needs, the INL should perform a comprehensive assessment of the capabilities and capacity of its internal electric grid, and the state should provide a supportive role in the process.

    a. A comprehensive assessment would ensure the adequate capacity and reliability of power transmission inside the INL grid system. This proactive approach, with state

partnership, will help to meet increasing long term power needs and hedge against barriers for future growth.

13. Improve safety and traffic congestion problems along Highway 20 between Idaho Falls and INL Gate 1.

    a. The INL needs a four-lane highway from Idaho Falls to INL Gate 1 on Highway 20. If four lanes are not reasonably foreseeable, Idaho should initially consider a tiered approach that includes:
        i. Installation of a Connected Vehicle System. With the use of various technology driven devices, traffic flow and roadway safety can be maximized at a reduced investment level. This system would include animal detection sensors that would increase driver awareness of animal movements. These sensors have proven to reduce the animal/vehicle crash rate which results in 19% of the total crashes on the roadway.

        ii. Construction of turn bays at targeted locations to provide for unrestricted traffic flow for through traffic movements. These can be implemented as required to address site specific issues.

        iii. Install passing lanes when peak hour capacity exceeds 3,200 vehicles per hour and the platooning of vehicles results in delays that approach 60%. The location of the passing lanes has been studied by the Idaho Transportation Department and would be constructed as warranted.

14. Idaho and INL should investigate, and if feasible implement, an agreement where the Idaho Transportation Department would assume full responsibility to maintain INL's primary roads, exits, on-ramps, and underpasses.

    a. Such an arrangement would leverage the skill, knowledge, and experience base maintained by the ITD to improve the condition, service life, and cost of maintaining these critical resources to the success of the INL research and development and cleanup missions. The larger size of ITD's investments with Idaho pavement contractors could also offer economy-of-scale cost benefits to maintaining INL roads.

15. Ensure and protect right of way interests on roads that run through INL land.

    a. ITD should maintain a current understanding of the DOE-ID/ITD restrictions that exist in the stipulation regarding access to and development of rights of way and easements along highways and roads crossing the INL. The Idaho Transportation Department should ensure a process is in place to include DOE-ID in the review and approval of any right of way and/or easement request, consistent with the stipulation.

16. Assess and fulfill identified needs related to capacity, inventory, and resources associated to broadband and data storage.

    a. ITD should maintain a current understanding of the DOE-ID/ITD restrictions that exist in the stipulation regarding access to and development of rights of way and easements along highways and roads crossing the INL. The Idaho Transportation Department should ensure a process is in place to include DOE-ID in the review and approval of any right of way and or easement request, consistent with the stipulation.

17. As appropriate, utilize opportunities to locate fiber optic during road construction.

18. Encourage improved communication and interaction between INL security forces and state and local law enforcement targeted towards physical security, cyber security, critical infrastructure protections, and interoperability connectivity.

    a. INL security forces routinely interact with state law enforcement officials. INL is interested in enhancing these interactions by meeting annually with the State Chief Law Enforcement Official; establish ways to routinely share training practices, security systems information for access controls, intrusion detection, systems maintenance and performance testing. Additionally, INL would be interested in participating in future exercises where local, state and INL entities can work together to ensure seamless response to emergencies.

19. Consider and adopt legislation to create appropriate competitive tax policy that encourages investment in Idaho – including within the nuclear industry.

    a. Assemble and aggressively market an "Idaho Energy Research Incentive Package" highlighting the state's enhanced Investment Tax Credit, Real Property Improvement Tax credit, R&D credit, possibility of county-authorized property tax exemptions, industrial revenue bonds and potentially – authorization from DOE NE to offer facilities/resources as a "Nuclear Energy Park Initiative" test bed.

NATIONAL & GLOBAL LANDSCAPE

1. Idaho should establish a permanent Nuclear Energy Commission or Council. This entity would provide periodic review of, and make recommendations regarding the burdens and benefits of the INL, the commercial nuclear sector, and nuclear energy policy to the Governor. Such a council or commission will create a competitive advantage for the state of Idaho relative to other Department of Energy facility-hosting states.

2. The state should aggressively highlight the importance of the INL to our nation's energy future. To accomplish this goal, the Governor should take the following actions.

a. Work with Idaho's Congressional Delegation to persuade policy makers of the advantages of consolidating nuclear energy research at the INL. Idaho must make the case to Congress, Office of Management & Budget (OMB), and Department of Energy (DOE) that federal fiscal responsibility and broader national interests are best served by concentrating and consolidating the nation's nuclear energy research capability, to the maximum extent practicable, in Idaho at INL. Specific points of emphasis should include, but not be limited to, the unique capabilities of INL, the strong statewide and regional support for nuclear energy and INL, and the exceptional history of the DOE's work in eastern Idaho - including the role Idaho has played in accepting, managing, and storing federal government owned used nuclear fuels.

b. Visibly engage in the American Nuclear Society's Global 2013 conference. Through the planning, promotion and staging of this event that will be held in Salt Lake City commencing September 29, 2013, the state can increase its visibility as a leader in nuclear energy.

c. Develop a communiqué on INL's benefits. This communiqué would be helpful to express the findings of the LINE Commission that INL's national nuclear capabilities and distinctive service as "The National Nuclear Laboratory" merits continued assignment of, and funding for associated national security and nuclear nonproliferation work.

d. In conjunction with the INL, Idaho could host a Western Regional Energy Summit to promote a strong political voice for a "Western Energy Corridor" made up of Idaho, Montana, North Dakota, Utah, Wyoming, Alberta, and Saskatchewan to become energy providers for more populous states and provinces. This effort could help expand access to the INL as a Research and Development enterprise for the entire region.

e. Explore the possibility of the state becoming a member of the Nuclear Energy Institute (NEI) and/or World Nuclear Association (WNA). Through its Nuclear Commission/Council or through the Department of Commerce, the state could enhance its voice nationally on nuclear energy issues if it had membership within these organizations.

3. Idaho should closely monitor private and community efforts going on nationally that seek to house spent nuclear fuel. Idaho should encourage federal legislative efforts to implement the recommendations of the Blue Ribbon Commission on America's Nuclear Future to adopt a consent-based sitting process for spent nuclear fuel management facilities. Such legislation should include creation of an entity with the ability to make binding commitments to states and communities without dependence on the annual appropriations process to secure the necessary funding to uphold those commitments. While it is too early to make a recommendation regarding an expanded future role for Idaho in commercial spent nuclear

fuel storage and management, any such role must be considered in the context of a consent-based process – period.

4. Expand the role of Idaho's universities in INL activities. Idaho universities could help INL advise and assist nations that want to start or expand a peaceful nuclear energy program. 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 the elite echelons of nuclear engineering education.

5. Support new processes for Research, Development, Demonstration and Deployment (RDD and D) and Public-Private Partnerships (PPP). RDD and D of nuclear energy technologies require significant government involvement. The short-term costs, industrial risks, potential for misuse and stringent regulatory requirements necessitate this. Additionally, the contributions nuclear energy makes to national security, energy security, environmental security and economic competitiveness are all long-term and outside the domain of short-term market forces. DOE facilitates public-private partnerships in RDD and D through contractual mechanisms called Cooperative Research and Development Agreements (CRADAs) and Work for Others (WFOs). These mechanisms only partly facilitate nuclear PPPs because of their limitations in financial risk sharing, indemnification, intellectual property rights and other typical commercial terms and conditions. DOE recently created a mechanism called Agreements to Commercialize Technology which offers little potential to improve this situation as it applies to nuclear technology. The state should encourage its Federal delegation to examine this issue and create some new mechanisms to support PPP in RDD and D of nuclear energy technologies.

6. Pursue SMR investment. One of the greatest opportunities for Idaho seems to be in the field of Small Modular Reactors (SMRs). SMR designs have been developed in recognition of the fact that not all energy markets are well suited to the one thousand megawatt and above capacity offered by a typical reactor design. SMRs are intended to serve both U.S. and global need for nuclear energy systems with smaller electrical output. Because states that get involved early will have a competitive advantage in attracting manufacturing investment if SMR markets materialized, Idaho should charge the Department of Commerce to work 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 or an SMR manufacturing facility. As part of these efforts, the department should explore the implementation of clean energy and other incentives. Such incentives will be most effective if they can lower the cost of the up-front capital needed to construct a demonstration plant.