The Idaho Universities' Role with the New Idaho National Laboratory

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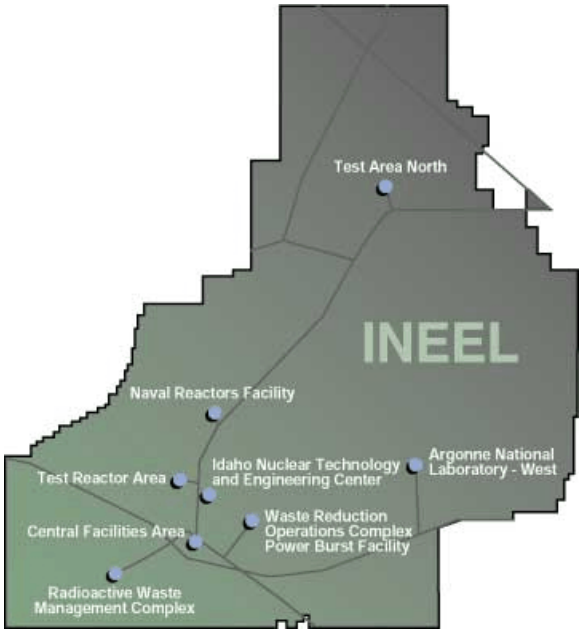
PURPOSE and GOALS:
The goal set by the U.S. Department of Energy is that the Idaho National Laboratory (INL) is to become the preeminent, internationally recognized nuclear research, development and demonstration laboratory for nuclear energy. It is the intent of the Idaho Universities to partner with the INL so as to assist in achieving this mission, for the benefit of nuclear energy to the nation and the world, and for the benefit of the local economy.



" Rexburg (25,000)

" Idaho Falls (61,000)

University Place

" Blackfoot (27,000)

35 miles

Figure 1 - The Idaho National Laboratory

(Regional population ~270,000)

" Pocatello (62,000)-**Idaho State Univ.**

Currently the INL consists of an 890 square mile site in Eastern Idaho (Figure 1) located 32 miles

west of Idaho Falls, containing a number of nuclear facilities. In addition the INL includes headquarters offices, engineering offices, and research laboratories located within the city limits of Idaho Falls.

BACKGROUND and HISTORY:
The INL was initially established in 1949 as the National Reactor Testing Station. It was the location for the first two civilian nuclear reactors in the Atomic Energy Commission program. Both the Experimental Breeder Reactor (at the first Argonne National Laboratory site) and the Materials Test Reactor (at the Test Reactor Area) began operation in 1951. The National Reactor Testing Station (now the INL) has gone through several name changes since that time. In 1973 it was designated the Idaho National Engineering Laboratory, and in 1994 the Idaho National Engineering and Environmental Laboratory. The current name (INL) was adopted in February 2005. Since the inception of the laboratory, there have been more than 50 different nuclear reactors, of a variety of designs and purposes, built and tested at the "site."

For its first 27 years, the city of Idaho Falls was merely the office location of the Atomic Energy Commission's (AEC) Idaho Operation's Office. Busses transported the employees to the various locations of the facilities at the INL. Approximately 100 busses operated each working day between the cities of Idaho Falls, Blackfoot, Pocatello, and Rexburg (all along the I-15 corridor, a stretch of 80 miles between the northern most (Rexburg) and southern most (Pocatello) cities. The distances traveled by these busses is as much as 75 miles, and as short as 35 miles, to the various facilities at the site.

At its peak employment level in the 1960s, there were over 11,000 employees. Current employment is in the 6000 range. For purposes of simplification, the facilities on the 890 square mile government owned reservation plus those related facilities in the city limits of Idaho Falls will be referred to as the "site."

The AEC was renamed the Energy Research and Development Administration in the early 1970s and in the late 1970s took on its current name of the U.S. Department of Energy (DOE). Beginning in 1976, the DOE decided that a portion of the work could be accomplished within the city limits of Idaho Falls, eliminated the time and expenses of transporting a significant fraction of the employees to the site facilities. Currently there are three main buildings/facilities located in the northern part of the city of Idaho Falls, either adjacent to or within one half mile of the joint Idaho Falls campus of Idaho State University and the University of Idaho.

There are several contractors currently operating the facilities and programs at the INL. The main contractor is Battelle Energy Alliance (BEA), which has the principal R&D and operational responsibility. There are also contractor(s) with designated responsibilities for decontamination, decommissioning, and restoration. These contracts will be awarded in the spring of 2005. BEA provides the primary infrastructure for the site operations.

The IDAHO UNIVERSITIES' ROLE:
Beginning in 1954, the University of Idaho began offering night classes at the graduate level in the principal engineering fields of mechanical, chemical, and electrical engineering. These expanded to include allied fields of metallurgical engineering and civil engineering. These courses were conducted primarily at the local junior high and high schools in Idaho Falls. However, in 1980, the University of Idaho (UI) purchased what had been a science center for the purposes of conducting classes closer to the newly established office facilities in Idaho Falls. This new building was designated University Place. In the 1980s Idaho State University (ISU), having its main campus in Pocatello, 50 miles to the south, began offering classes in this building, as did Ricks College, a privately owned junior college headquartered in Rexburg, 30 miles north. The State of Idaho built a special classroom building adjacent to this first "University Place" building in 1994, and in 2001, Idaho State University built a student union/student services building. In 2004, Idaho State University purchased the original University Place Building and now operates the entire campus, currently consisting of the three buildings plus several other small nuclear research laboratories at other locations in Idaho Falls. Presently about 3000 students attend classes on this Idaho Falls campus, about 2500 enrolled as ISU students, the remainder as UI students. ISU conducts a seamless enrollment and records system for both universities at this campus.

In the 50 years since the evening educational program was initiated in Idaho Falls, approximately 700 masters degrees (either Masters of Science or Masters of Engineering, ~100 were in nuclear), and approximately 40 PhD degrees (9 of these in nuclear) have been awarded to INL employees through this program. The principal doctoral program in nuclear engineering (for UI) and nuclear science and engineering (for ISU) was initiated in 1990, primarily through the funding provided by the U.S. DOE. So as to mitigate unnecessary duplication, the program responsibilities are primarily allocated as follows:

- MS and PhD programs in electrical, mechanical, and chemical engineering and computer science to UI
- MS and PhD programs in nuclear science and engineering and environmental engineering to ISU
- BS engineering programs to ISU
- BS computer science programs to UI
- Essentially all other traditional BS and BA programs are the responsibility of ISU.

The Idaho Falls campus has expanded so that the vast majority of the students now enrolled are not site employees. Currently INL employees comprise only about 400, 13% of the student body. However, the majority of the graduate courses in engineering are offered at night or on Friday afternoons, for the convenience of the site employees, many of whom work four 10hour day shifts, or have every other Friday off.

The relationship between the Idaho Universities (University of Idaho and Idaho State University) and the INL to date has been one of a subcontractor arrangement, in which the contract to each of the two universities was placed to cover the nominal expenses of the universities in offering

classes in Idaho Falls and providing graduate student advising services for the employees of the INL. Note that the main campus of the University of Idaho is in Moscow, 550 road miles to the northwest There is no direct air service between the two cities.

The Vision

The future relationship between the INL and the Idaho Universities needs to be one of a partnership to achieve the goals for the INL, which includes the revitalization of nuclear engineering education in the USA. It has been clear that from the early 1980s until the turn of the century, nuclear engineering was not a popular discipline for the nation's college students. The number of nuclear engineering programs in the country had shrunk to less than 30 viable programs, and the majority of the graduate students in these programs were foreign nationals.

Now it is clear that nuclear engineering education has had a rebound of interest from students, in part because of the shortage of nuclear engineers in the work force, resulting from retirements. Nations, even the U.S., are recognizing that nuclear power is the only proven non-polluting option that can economically mitigate the seemingly inexorable increase in carbon dioxide concentrations in the atmosphere, with the resultant observed effect of global warming.

The Idaho Universities have developed a vision of how they can best serve the INL and the nation, and at the same time assist in the revitalization of nuclear engineering education in the USA. This goal should appropriately include the universities with established and well recognized nuclear engineering programs, as well as other universities who might see a need for developing such programs in the future. There are two main functions that the universities should serve in this regard:

- The research agenda, in collaboration with the INL research and development programs, including the research expertise of the Nuclear University Consortium team of BEA (5 research universities from around the nation).
- The education agenda, in two ways
  1) to serve the employees of the INL in advancing their education
  2) to participate, with the other universities in the nation, in revitalizing nuclear engineering education, implementing the participation of the INL management team in this effort.

In working toward an agenda that would achieve these goals, the following actions have occurred:

- Idaho State University established, in 2003, an Institute of Nuclear Science and Engineering under the Office of Research. The Institute is housed at University Place in Idaho Falls, and currently has three faculty members, all on joint appointments with the INL, and all of which have part-time faculty appointments in the College of Engineering.
- ISU invited the University of Idaho and Boise State University (BSU) to be partners in the Institute for Nuclear Science and Engineering. The three universities have nominally designated lead roles for each entity, as follows:
  ISU - Nuclear engineering and science, environmental engineering
  UI - Chemical engineering, materials science
  BSU - Public policy

- ISU formally established a BS degree in nuclear engineering in 2004. ISU has had an emphasis in nuclear engineering at the BS level since the inception of the engineering program in1965, and approximately 185 graduates have received a BS degree with this emphasis. The ISU engineering programs, since their inception 40 years ago, have had an interdisciplinary characteristic. This is manifested in a sophomore and junior level set of core courses covering the breadth of engineering disciplines. This has particularly served nuclear engineering education quite well. The interdisciplinary emphasis will continue in all the BS programs at ISU, including the new NE degree. That degree by necessity must be interdisciplinary in order to effectively provide the desired educational emphasis aimed primarily at the INL mission of research and development.
- ISU continues to maintain the operating license for its low power training reactor and its subcritical facility. Current efforts involve the conversion of the control console (which operates on vacuum tube technology) to a new console using digital microelectronics control and data logging.
- The Idaho Universities established a 2 + 2 nuclear engineering program whereby students can take their first two years at these schools, then transfer to ISU at the Idaho Falls campus for their final two years toward the nuclear engineering degree. A related 3 +2 program exists with the Lewis and Clark State College in northern Idaho, where the student spends the first three years at LCSC and the last two at ISU's Idaho Falls campus, receiving both a BA from LCSC and a BS in NE from ISU.
- ISU established, in 2004 the first three joint appointments in nuclear engineering between the Institute of Nuclear Science and Engineering and the INL. Numerous such appointments are considered to be appropriate to achieve the goals. Such appointments should not only involve the Idaho universities, but other universities in the nation with the INL.
- ISU created a post-baccalaureate 14- credit certificate program in Nuclear energy, designed specifically for INL professionals not schooled in the physical sciences, but desiring to have a better understanding of nuclear technology and related issues.
- A cooperative research arrangement between the ISU Idaho Accelerator Center (IAC, on the Pocatello campus) and the INL has existed for nearly 15 years. The IAC has a dozen charged particle accelerators, most accelerating electrons, with peak energies in the MeV range, the highest energy unit being 50 MeV. Since the INL has no accelerators, research agreements were established in which INL engineers and scientists set up their research experiments at the IAC, and are provided office space and working space. The INL/ISU teams have worked jointly together on a variety of projects, and publish the results jointly.

Future Considerations

There are many other developments which can be implemented to help achieve the desired goals of making the INL the pre-eminent laboratory for nuclear energy in the nation and of revitalizing nuclear engineering education. The following lists a number of proposed initiatives, many of which are considered essential for the success of the mission of the INL.

- Obtain ABET accreditation for the new BS in nuclear engineering program at ISU (all of the other engineering programs at all three Idaho universities are accredited).
- Establish joint cooperative courses between the Idaho universities and other nuclear

engineering universities in the nation.

- Establish a routine system of operation so that faculty and students from other universities can participate in R&D programs at the INL, and have available to them use of university facilities at the Idaho Falls campus (University Place).
- The Idaho universities should work cooperatively with Battelle Energy Alliance in developing a role, mission, and organization for the Center for Advanced Energy Studies (CAES) which is to be established as a university directed program of the INL.
- Work on plans to permit easy access and interaction between the university students and faculties and the INL, taking advantage of the proximity (adjacency) of the Idaho Falls INL facilities and University Place.
- Market the INL and its university connections with minorities, with particular emphasis on women in engineering, and on the local Native American groups.
- Expand the mission of education to include, to the extent deemed appropriate, local two-year technical colleges in both Idaho Falls and Pocatello.
- Lead in initial implementation of an Energy Policy Institute, with primary leadership from Boise State University.
- The universities should help to promote the INL and its mission throughout the nation, especially developing a close relationship with the Nuclear University Consortium that is part of the BEA team.

In summary, the opportunities for developing a new paradigm for national laboratory and university interaction and cooperation lies ahead. Successful development of the partnership will lead to effective implementation of the INL mission and of a viable future for nuclear energy in the nation and the world.

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Biographical Information

Jay Kunze is the Dean of Engineering and Associate Director of the Idaho Accelerator Center at Idaho State University (ISU). He spent 20 years of his career at the INL predecessor laboratories, then 5 years as president of a geothermal energy company. During that period he was an adjunct (teaching) faculty member for the University of Idaho at Idaho Falls. Then he entered into full-time academia positions, first at the University of Missouri-Columbia as chair of Nuclear Engineering, and then at Idaho State University.

John Bennion is an associate professor of engineering and the reactor supervisor at ISU. He is the coordinator for the nuclear engineering programs Previously he was a student reactor operator on the TRIGA reactor at the University of Utah.

Michael Lineberry has a 33 year career at Argonne National Laboratory, Idaho site, serving as a division director and on a variety of special assignments for Argonne in Illinois and in Washington DC. He is the Director of the Institute for Nuclear Science and Engineering at ISU and Assoc. Director of the new Center for Advanced Energy Studies at the INL. He has served during much of his career as an adjunct (teaching) faculty at both ISU and UI.

Mary Lou Dunzik-Gougar is an Assistant Research Professor in the Institute for Nuclear Science and Engineering. Her career has included teaching high school chemistry, and working at a commercial nuclear power plant in public relations ind public information positions.