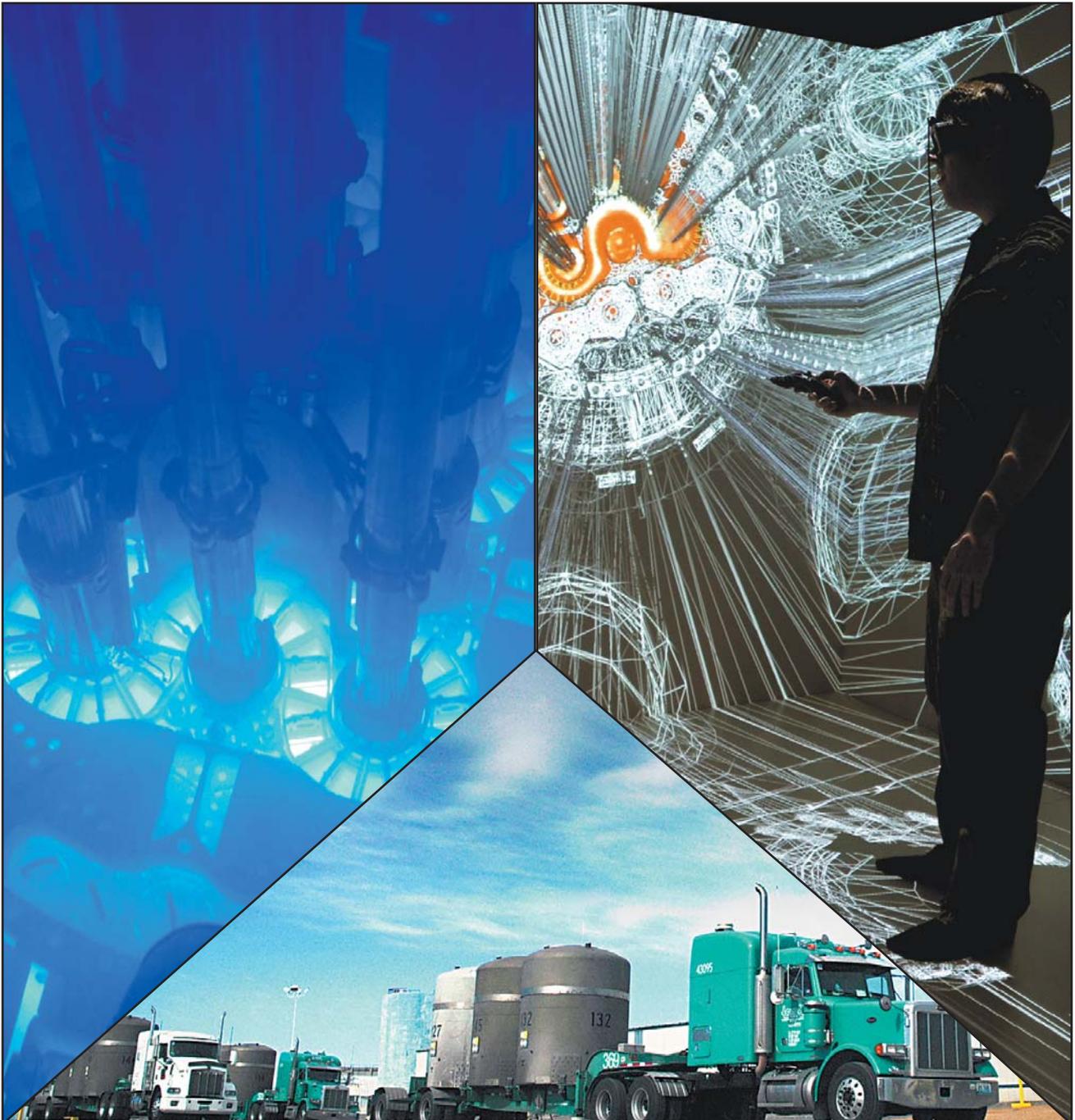
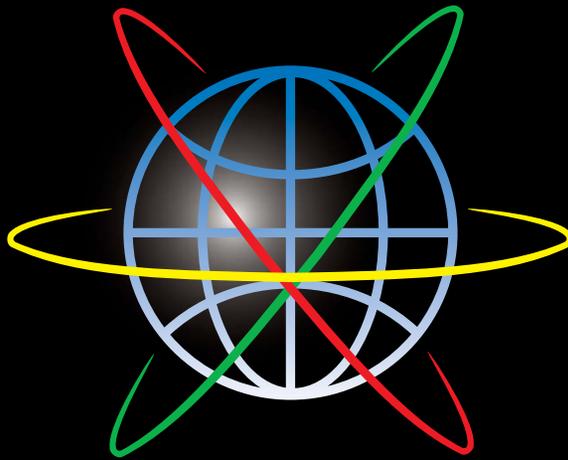


INL and America's Nuclear Energy Future





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INL's world-leading nuclear energy
research missions, PST proudly
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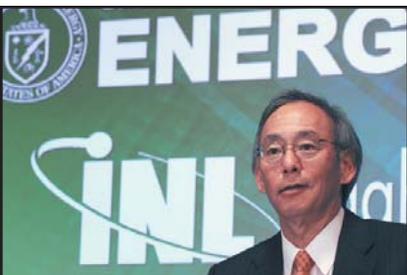
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INL AND AMERICA'S NUCLEAR ENERGY FUTURE

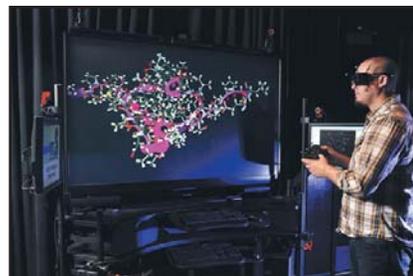


Chu's plan for INL: The fate of INL largely will forecast the fate of the nation's nuclear energy development and deployment.
Story on Page 6

Inside



Waste and trust: An agreement between the state and the DOE makes it easier for INL to import commercial spent nuclear fuel.
Story on Page 10



The future of INL: INL is sure to play a central role in the future of nuclear energy.
Story on Page 18

Features

INL: A nuclear history

12 Only one of the dozens of major reactors that operated on the INL site remains

'Not your father's INL'

14 INL's mission has shifted to include more fundamental scientific research

Watchdogs I: The nonprofits

22 The Snake River Alliance and Keep Yellowstone Nuclear Free are two groups keeping tabs on INL and its cleanup

Watchdogs II: Government oversight

23 Since the government signed an agreement to clean up the INL site, the DOE has improved its trust by taking work seriously

On the cover

courtesy of Idaho National Laboratory

Bottom: The 100th shipment of remote-handled transuranic waste leaves Idaho National Laboratory for permanent disposal in New Mexico.

Right: A model of the reactor vessel and core of Idaho National Laboratory's Advanced Test Reactor is visualized in the Computer-Assisted Virtual Environment (CAVE) at the Center for Advanced Energy Studies.

Left: Idaho National Laboratory's Advanced Test Reactor has a unique serpentine fuel arrangement, which allows researchers to simultaneously test materials under different experimental conditions. The characteristic blue glow is because of the Cherenkov radiation, which is emitted when a charged particle such as an electron passes through the cooling water at a speed faster than the speed of light in the water.



A PUBLICATION OF THE

POST REGISTER

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Planning for a future that builds on investments of the past

When many Idahoans think about Idaho National Laboratory, they tend to focus on the past. While the facility has been operating for more than 60 years, much has changed, and the significance and impact of change at INL is increasing.

The lab's history is influencing the work being done today and will continue to shape its future. The investments taxpayers have made in INL position us to play a key role in meeting the nation's current and future energy challenges. That presents the state of Idaho and Idahoans with an opportunity.

When the federal government established the National Reactor Testing Station in Idaho 62 years ago, residents saw it as a stabilizing counterweight to the state's boom-bust, natural resource-based economy.

Within a few years, the site became home to Experimental Breeder Reactor-I — the world's first electricity-generating nuclear

power plant. The plant inspired the first and only U.S. presidential visit to the site when Lyndon B. Johnson declared EBR-I a National



JOHN J. GROSSENBACHER

Laboratory director

Historic Landmark in 1966.

Numerous other nuclear engineering achievements followed. In fact, the U.S.

Department of Energy's Idaho site is where America discovered much of what the world knows today about how nuclear reactors work and how to make them better.

But Idaho's relationship with the federal facility has not been without challenges. Tensions

peaked with a 1991 lawsuit demanding a plan to remove radioactive waste and used fuel stored at the Idaho site. The historic 1995 Settlement

Agreement defined the three most concerning waste streams and outlined enforceable milestones to clean them up.

Today, that cleanup work is ahead of schedule. Contaminated materials are being exhumed, characterized and shipped to a licensed disposal facility in New Mexico faster than from any site in the country.

Meanwhile, INL's nuclear energy research is as important as — if not more important than — ever. The lab's nuclear expertise and its distinctive, one-of-a-kind research facilities make INL extraordinarily relevant today and position the lab for a strong future.

Nuclear energy's future is being shaped by the Fukushima reactor damage, America's long-term energy needs, and the Blue Ribbon Commission that will recommend a plan to manage used nuclear fuel without the Yucca Mountain repository. As the nation's lead nuclear energy research lab, INL is engaged in and demonstrating leadership in all these events and activities.

For example, preliminary information from the Blue Ribbon Commission recommends stable, long-term support for nuclear fuel cycle research, development, demonstration and deployment. Idaho is a natural first and logical choice for such challenging

The U.S. Department of Energy's Idaho site is where America discovered much of what the world knows today about how nuclear reactors work and how to make them better.

Future

From Page 2

and important work. The lab's people have been leading the nation in fuel cycle research and are uniquely capable of continuing to lead this nationally and internationally important work.

This work requires studying fuel that has been used in a commercial power reactor. INL can now perform this research more readily thanks to a January 2011 interpretation of the Settlement Agreement that simplified the process for bringing small quantities of such materials to INL.

In my opinion, for INL to support our national need for nuclear energy and to fulfill its leadership mission in the future, the lab may need the state's support to modernize current provisions of the Settlement Agreement.

Consideration of such updates requires leaders and Idahoans to reflect upon the history and purpose of the agreement, as well as the mission and value of INL. When the Settlement Agreement was written, the state had little trust in the DOE's commit-

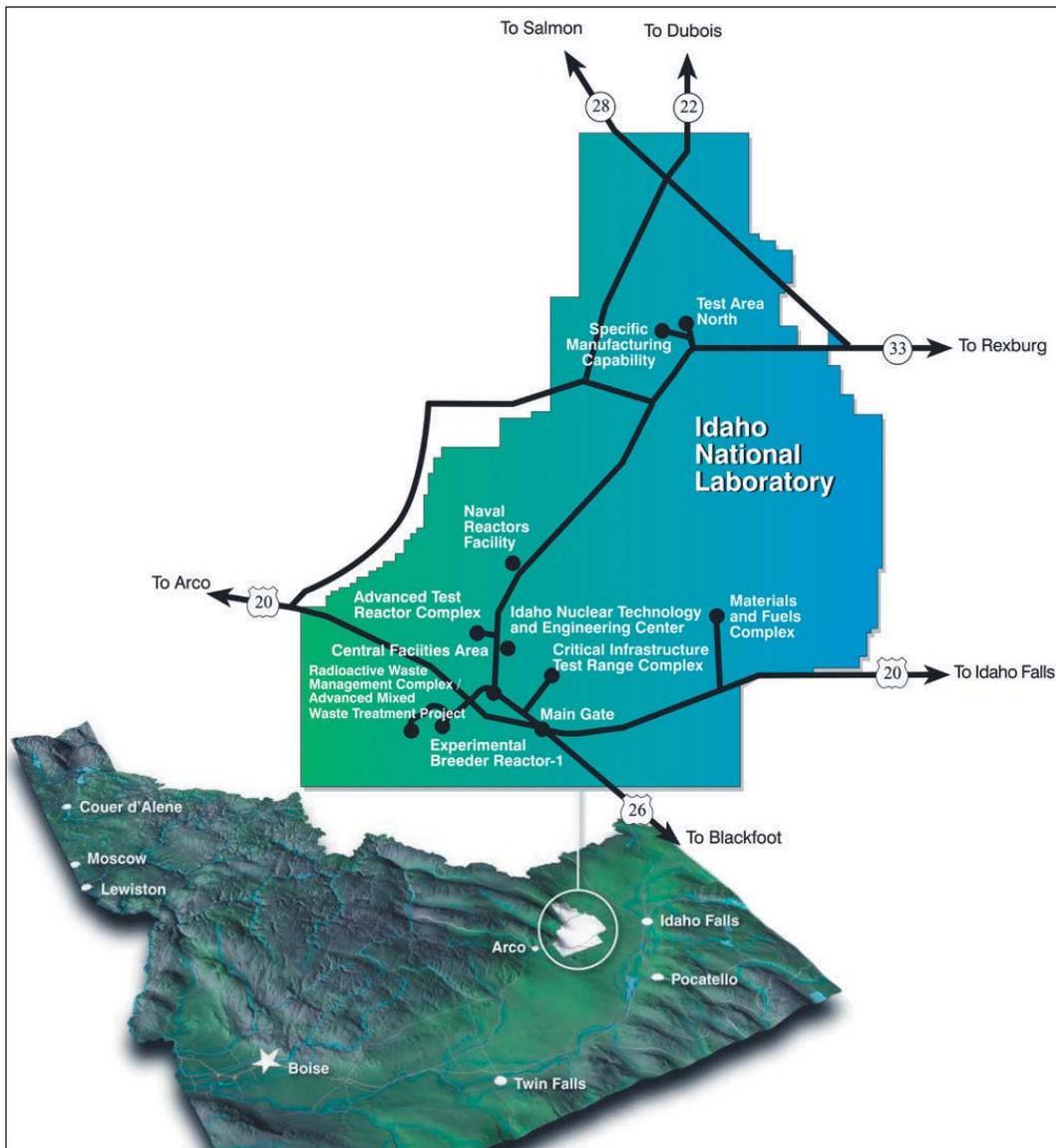
ments, and the lab's mission was unclear. Today, that has changed dramatically.

An indicator of this change has been growth in business volume at the lab. Through partnerships with Idaho universities, communities and industry, INL business volume has grown from \$500 million to \$1 billion in just five years. Today, the site's total economic impact to Idaho is \$3.5 billion per year.

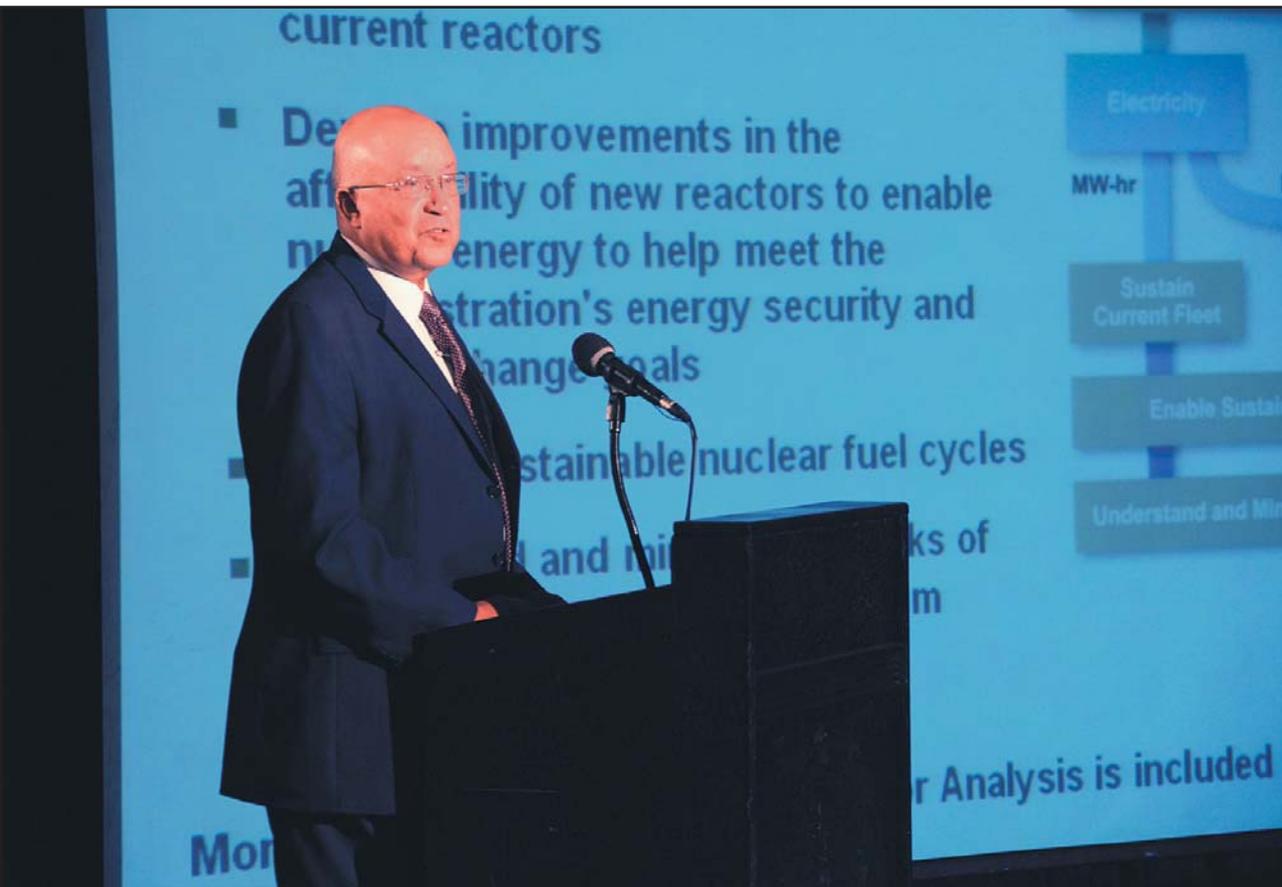
Modernizing the Settlement Agreement to enable INL to

better meet the nation's nuclear research needs could expand that economic impact. By enabling INL to fulfill its nuclear research role, the state and nation will realize a return on the investments that have made INL the globally distinctive nuclear energy science and engineering resource it is today.

John J. Grossenbacher is laboratory director at the U.S. Department of Energy's Idaho National Laboratory in Idaho Falls, Idaho.



INL plans for role in the future of spent fuel



Idaho National Laboratory photo

Warren "Pete" Miller, former head of the Department of Energy's Office of Nuclear Energy, addresses the Blue Ribbon Commission's Reactor and Fuel Cycle Technologies Subcommittee during the subcommittee's Idaho visit in July 2010.

Some recommendations from the Blue Ribbon Commission committee on spent fuel suggest work that would fit well with Idaho National Laboratory's mission

By SVEN BERG

sberg@postregister.com

One of the central concerns about nuclear energy is what to do with fuel once it has been removed from a cycle in a reactor.

With the Nuclear Waste Disposal Act of 1982, the U.S.

government took on the responsibility of managing spent fuel, thereby decreasing some of the capital costs involved in new nuclear projects while charging the industry a tariff for the service.

In early 2010, President Barack Obama appointed a 15-

member panel called the Blue Ribbon Commission on America's Nuclear Future to examine the problem of what to do with spent or used nuclear fuel.

Featuring political, industrial and scientific heavyweights,

Blue Ribbon

From Page 4

the commission was scheduled to release a draft report July 29 that takes into account recommendations submitted by its subcommittees and public comment on those recommendations. (The report was scheduled to be released after this special section went to press.)

One set of recommendations suggests a path that would fit nicely into Idaho National Laboratory's area of expertise. Instead of committing "irreversibly to any particular fuel cycle as a matter of government policy," the commission's Subcommittee on Reactor and Fuel Cycle Technology recommended the country remain open to new technologies.

"(Research, development and demonstration) should continue on a range of reactor and fuel cycle technologies ... that have the potential to deliver societal benefits at different times in the future," the subcommittee's report states.

That falls directly into INL's wheelhouse. While not a policymaker, the lab will research technologies that seek to address politically and scientifically contentious issues, such as handling, storage, processing and waste disposal.

"All of those things are always going to be part of what we do (at INL), because the government owns that problem, not industry," said Dave Hill, INL's deputy director for science and technology. "The government will always have to deal with this issue, and



Idaho National Laboratory photo

Members of the Blue Ribbon Commission's subcommittee for Reactor and Fuel Cycle Technologies toured Idaho National Laboratory's Materials and Fuels Complex with INL leaders during a July 2010 visit.

we will be their main technical arm at dealing with that."

For the moment, the use of Yucca Mountain as a permanent storage facility for spent nuclear fuel appears unlikely. Partly, that's due to resistance by Nevada voters and U.S. Sen. Harry Reid, Nevada's senior

“We ought to view (spent fuel) right now as a future resource. ... We've used maybe 5 percent of it ... We know the path to get that other 95 percent, but it's long term and it's got to follow the discipline of economics.”

JOHN GROSSENBACHER
INL director

senator and Senate majority leader.

"If the citizens of Nevada don't want the repository, then I don't think the government of

the United States is going to force it on them," INL director John Grossenbacher said.

Some experts advocate recycling of spent fuel as a way to increase nuclear energy's efficiency while reducing the longevity of radioactive waste.

Grossenbacher said a process for recycling spent fuel may someday be the best way of dealing with the problem.

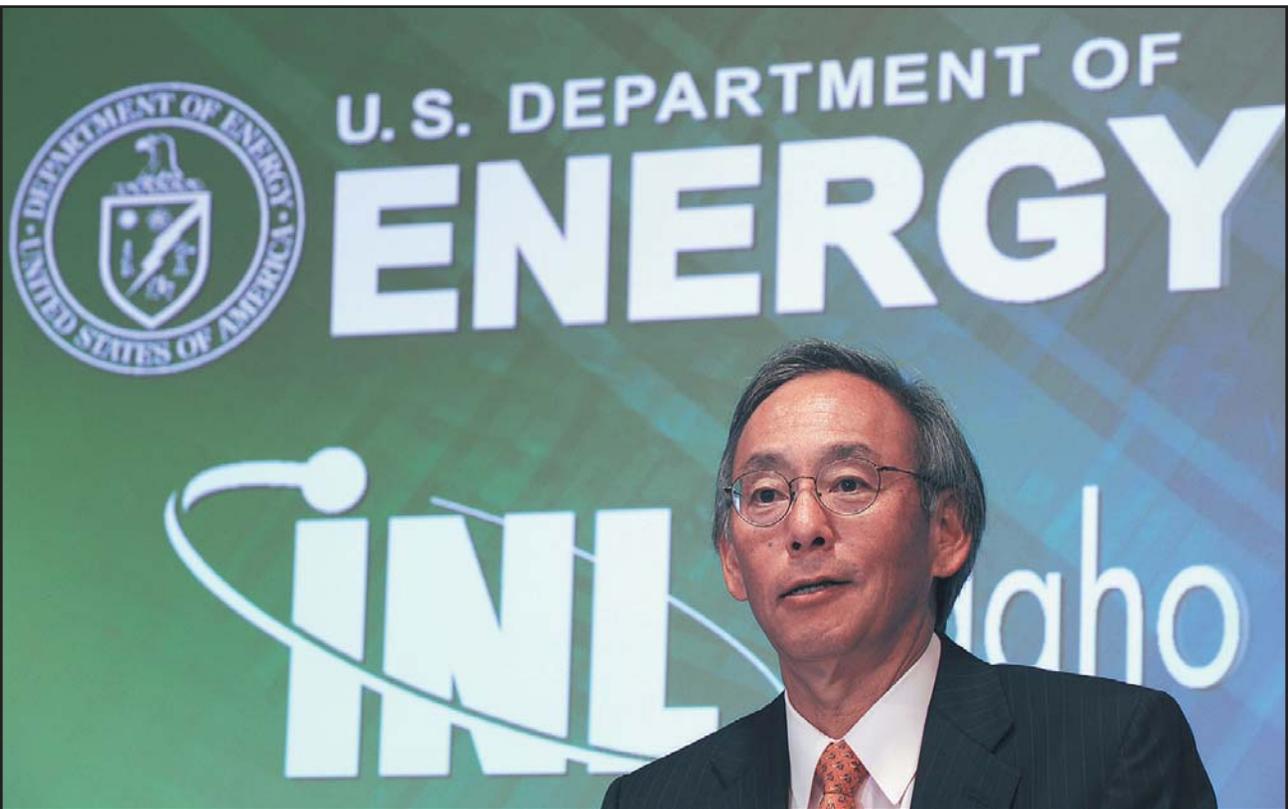
But a perfect process doesn't yet exist.

"In my own opinion, we ought to view (spent fuel) right now as a future resource," Grossenbacher said.

"Because we went through all the trouble of mining that uranium, refining it, processing it, and we've used maybe 5

percent of it ... We know the path to get that other 95 percent, but it's long term and it's got to follow the discipline of economics.”

Chu's plan for INL



Monte LaOrange / Post Register file photo

Energy Secretary Steven Chu visited INL in September 2010 to tour selected facilities and get an overview of INL's mission, programs and activities.

The fate of INL largely will forecast the fate of the nation's nuclear energy development and deployment

By SVEN BERG
sberg@postregister.com

The general thrust of the U.S. Department of Energy's strategic plan, released in May, contained no major surprises.

Energy Secretary Steven Chu restated the Obama administration's concern over evidence suggesting human-caused carbon dioxide emissions are "adversely affecting the climate."

"Any path close to 'business as usual' will imperil future gen-

erations with dangerous and unacceptable economic, social, and environmental risks," Chu wrote in an introduction to the DOE plan. "In particular, our excessive dependence on oil is taking us down an increasingly costly, insecure, and environmentally dangerous path."

Also not surprising was the administration's lukewarm embrace of nuclear energy as a means of meeting soaring energy demand without increasing carbon emissions.

That's where officials at Idaho National Laboratory perk up their ears. Named the country's leading nuclear energy research lab in 2002, the fate of INL largely will forecast the fate of nuclear energy development and deployment in this country.

Though the president belongs to a party famous for its uneasy stance on nuclear power, Obama administration officials have taken the position that nuclear power is necessary, at

Chu

From Page 6

least for the next several decades.

But that doesn't mean they have to like it. The section of Chu's 48-page plan that deals with peaceful nuclear power takes up less than one page and is included in the section titled "Secure our Nation."

The section's introduction starts with a reasonably strong argument for nuclear energy's role in meeting rising energy demands while limiting green-

house gas emissions. But that's followed quickly by a warning about "the impacts of deployment."

"The strategic plan itself, I think for political reasons, didn't define a direction for nuclear energy. It really somewhat avoided that topic and focused on the broader issue of energy security," said Dave Hill,

INL's deputy director for science and technology. "Nuclear is seen as an option."

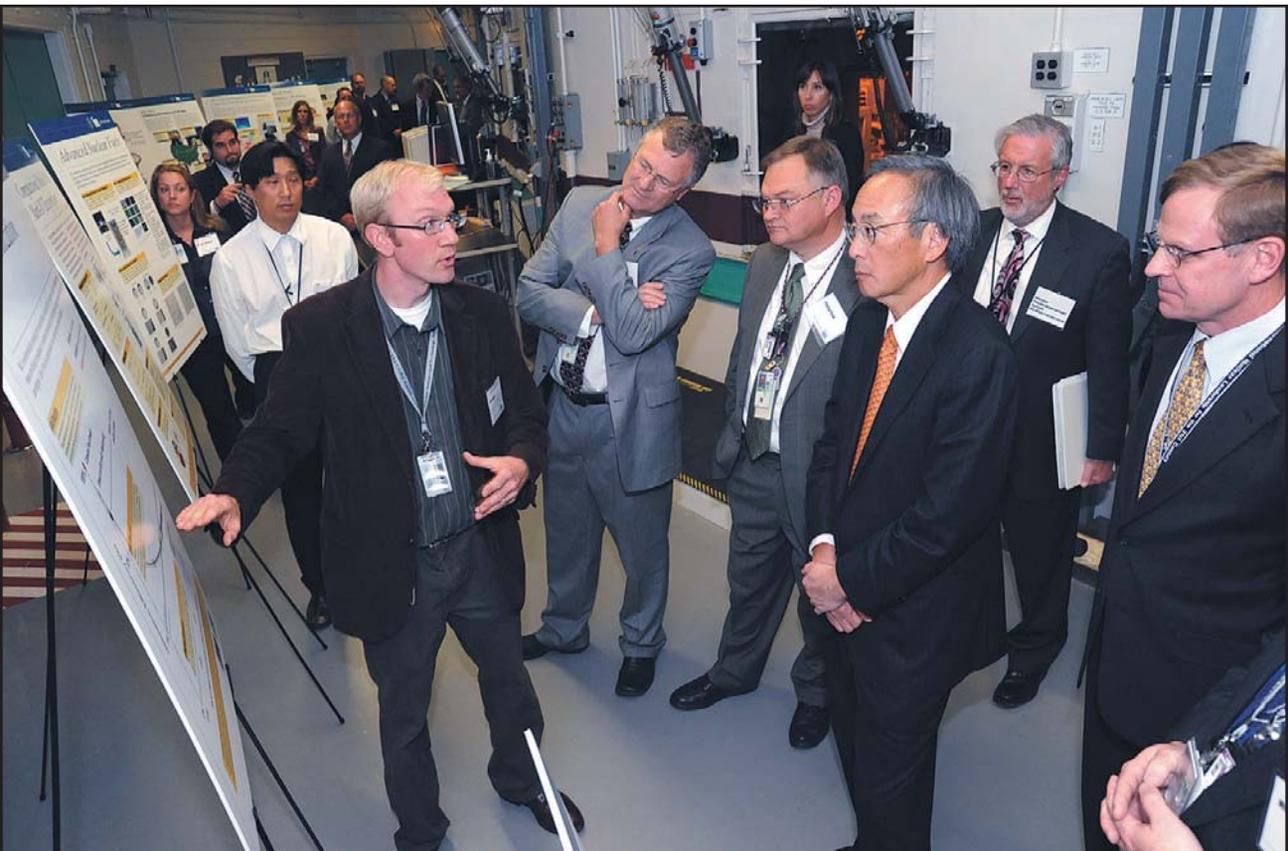
One small part of Chu's plan appears to speak directly to INL capabilities. The Irradiated Materials Characterization Lab-

oratory is scheduled to be built at the Materials and Fuels Complex will be uniquely capable of handling the "research and development in search of fuel-cycle technologies that improve resource utilization while reducing the risk of proliferation" that the plan refers to.

Nonproliferation projects may be easy for the DOE to sell, but ultimately, the way the agency approaches INL's nuclear energy work will speak volumes about how the Obama administration views the threat of greenhouse gas emissions.

Sven Berg is the Idaho National Laboratory reporter for the Post Register in Idaho Falls. He can be reached at 542-6755. Follow on Twitter: @svenerikberg.

One small part of Chu's plan appears to speak directly to INL capabilities.



Idaho National Laboratory photo

Energy Secretary Steven Chu learned more about Idaho National Laboratory's nuclear research capabilities during a visit to INL's Materials and Fuels Complex in September 2010.

Western govts eye nuclear

By SVEN BERG

sberg@postregister.com

Just as the focus at the Idaho National Laboratory site shifted from nuclear cleanup to research nearly 20 years ago, the Western Governors' Association's nuclear focus has begun to shift from cleanup to energy production.

The latest report issued by the association presents what INL state government liaison Brian Whitlock called "kind of a Nuclear 101 primer for all governors in the West."

"Really, (the) Western Governors' (Association) for several decades has mostly been focused on transportation of transuranic waste and waste management and (U.S. Department of Energy) facility cleanup," Whitlock said. "This marks really the first time that Western governors have looked at nuclear energy production."

Formed in 1984, the Western Governors' Association represents the governors of 19 Western states, two territories and a commonwealth. The group's mission is to encourage regional cooperation, coordinate regional policy and serve as a leadership forum for the governors.

In a way, this was the perfect time for the association to tackle the question of nuclear power. Idaho Gov. C.L. "Butch" Otter, who's well-acquainted with INL and its role as the nation's lead nuclear energy research laboratory, chaired the group for the past year.

The association's report,

While a report released in June doesn't wholeheartedly embrace an expansion of nuclear capacity in the West, it does highlight some of nuclear energy's advantages



Idaho National Laboratory photo

Idaho Gov. C.L. "Butch" Otter listens to a discussion at an August 2010 Idaho Falls meeting of the Idaho Strategic Energy Alliance. Steven Aumeier, right, is the director of Idaho National Laboratory's Energy Systems and Technologies program. He is the executive chairman of the alliance's board of directors.

See for yourself

The Western Governors' Association report on nuclear energy is available by accessing this website: www.westgov.org/reports. Click on the link titled "Nuclear Energy 2011" to download the report.

released in June, stops short of a wholehearted endorsement of expanding nuclear capacity in the West. But it does point out some of nuclear energy's attractive features, including the ability to deliver consistent power whose generation process does-

n't produce greenhouse gas emissions.

Other factors that point to nuclear energy include "uncertain fossil fuel prices, a desire to achieve long-term energy security, speculation about the potential reduction of carbon emissions, and the desire to foment an expanding economy that relies on a clean, safe, reliable and affordable electrical energy supply," the report states.

The report also touches on some concerns that arise with the use of nuclear power. Storage of spent fuel and the



Idaho National Laboratory photo

Idaho National Laboratory Director John Grossenbacher, left, meets with Idaho Gov. C.L. "Butch" Otter in April 2007.

Govs

From Page 8

massive amount of capital needed to build nuclear power plants are well-known and talked-about issues in the larger discussion on nuclear power's viability.

But the association's June report brings up another issue that's likely to hit home with many Western governors. Nuclear plants' use of water to cool reactors could be a major concern for states that have struggled through a decade-long drought.

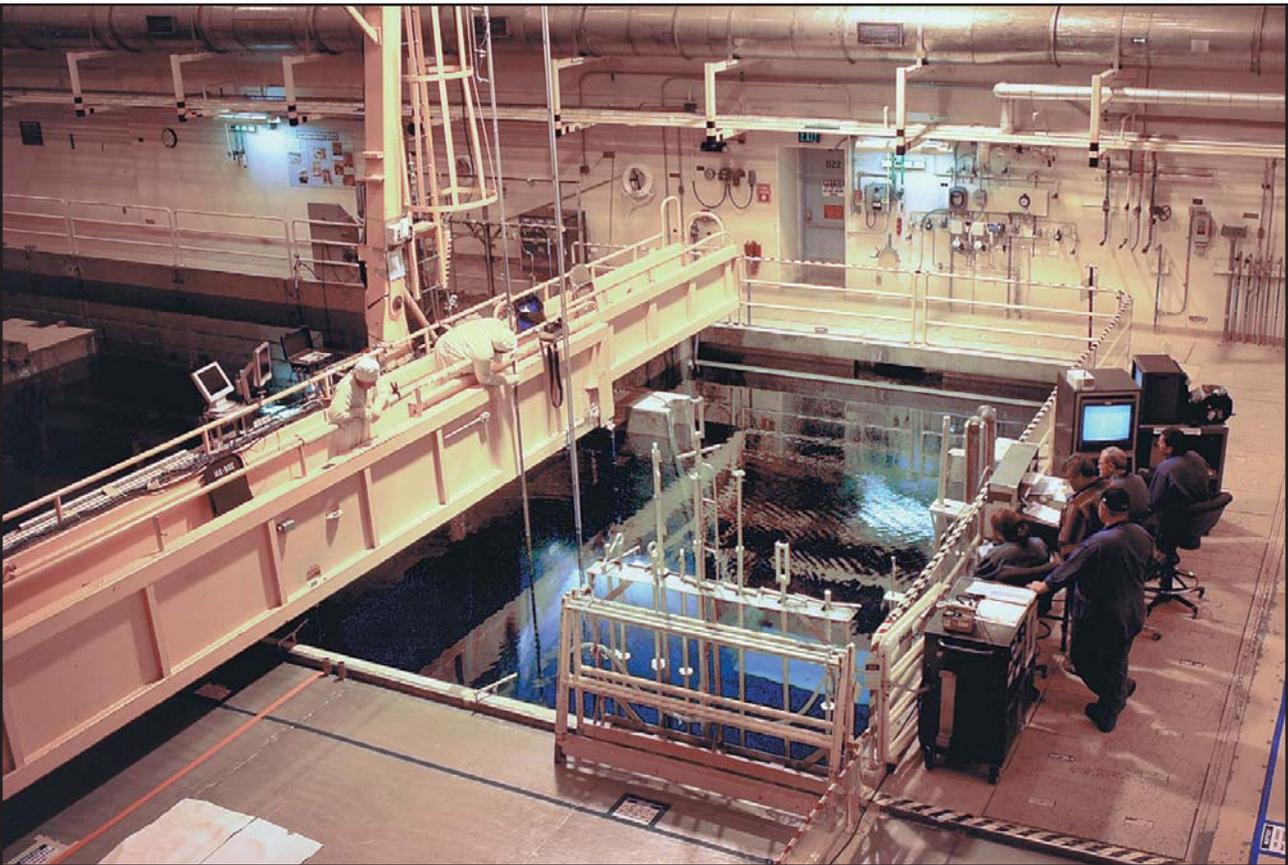
"One issue that can be especially critical in the interior West is the return of warmed water from a thermal electric power plant to the source of the water," the report states.

The bald fact that the Western Governors' Association chose this time to broach the topic of

nuclear power could be seen as an indication that an increased role in nuclear power is a growing possibility in the West. In the end, however, the group's report doesn't take a stand one way or the other on whether expanding nuclear power generation in the West is something governors should back.

"The governors realize there is no set formula for establishing an appropriate mix among electricity production methods," the report states. "Nuclear energy is one potential source of reliable, clean power. By understanding the issues associated with nuclear facility development, the governors will be better positioned to determine the best course of action for the West."

Sven Berg is the Idaho National Laboratory reporter for the Post Register in Idaho Falls. He can be reached at 542-6755. Follow on Twitter: @svenerikberg.



Idaho National Laboratory photo

Spent or used fuel from nuclear reactors is stored in basins of water at the Idaho Nuclear Technology and Engineering Center. All spent fuel currently stored at INL will be transferred to dry storage and ultimately shipped out of Idaho per the 1995 Settlement Agreement.

Waste and trust

A January agreement between the state and the DOE makes it easier for INL to import commercial spent nuclear fuel for research purposes

By SVEN BERG
sberg@postregister.com

Before 1995, there wasn't much reason to believe the federal government was serious about cleaning up toxic and radioactive waste on the Idaho National Laboratory site.

Idaho's desire to see the site cleaned up dates back to the days of former U.S. Sen. Frank Church and Cecil Andrus' first

stint as governor. But federal officials never followed through on promises to make sure the government's waste was removed from Idaho once and for all, said Kathleen Trever, who oversaw cleanup of the INL site between 1997 and 2007.

"There were these promises that dated back to the 1970s," Trever said. "There was sort of

this track record where they hadn't made much progress on cleanup."

Then came the 1995 Settlement Agreement, which set deadlines for the government to clean up the waste or face hefty fines for its tardiness. The settlement agreement includes requirements that the U.S. Department of Energy:



Idaho National Laboratory photo

Transuranic waste exhumed from the Subsurface Disposal Area is physically sorted in a type of “glove box” to protect workers. Following sorting, the waste is repackaged and assayed prior to being sent to New Mexico for permanent disposal.

Waste

From Page 10

- Remove all spent nuclear fuel from Idaho no later than 2035.

- Treat all high-level waste at INL by a target date of 2035.

- Remove all transuranic waste from the state no later than Dec. 31, 2018.

- Place spent nuclear fuel in dry storage by Dec. 31, 2023.

Since the signing of that document, Trever said, federal failures to meet deadlines for treating and removing waste have been the exception instead of the rule.

“It improved the feeling of both people outside of the site and those at the site in terms of making progress,” Trever said. “When you do what you say you’re going to and people see results, then that improves confidence.”

In January, Idaho Gov. C.L. “Butch” Otter signed an agreement with the DOE streamlining the process for INL to import as much as 400 kilograms of spent nuclear fuel per year from commercial nuclear reactors. Otter, Idaho Attorney

“As we look to the future, we need to ensure that our mission and the agreements that govern our activities reflect the very best nuclear science technology and knowledge.”

AMY LIENTZ

INL director of communications and governmental affairs



Idaho National Laboratory photo

This is an aerial view of the Transuranic Storage Area (foreground) and Subsurface Disposal Area (background) at the Radioactive Waste Management Complex. Transuranic waste at the Transuranic Storage Area was disposed of above-ground beginning in 1970 on asphalt pads and was covered with clean soil. Waste disposed in the disposal area prior to the 1970s was buried in unlined pits, trenches and soil vault rows.

General Lawrence Wasden and DOE officials said the new agreement allows the lab to carry out important research work on spent fuel without violating the terms of the 1995 Settlement Agreement.

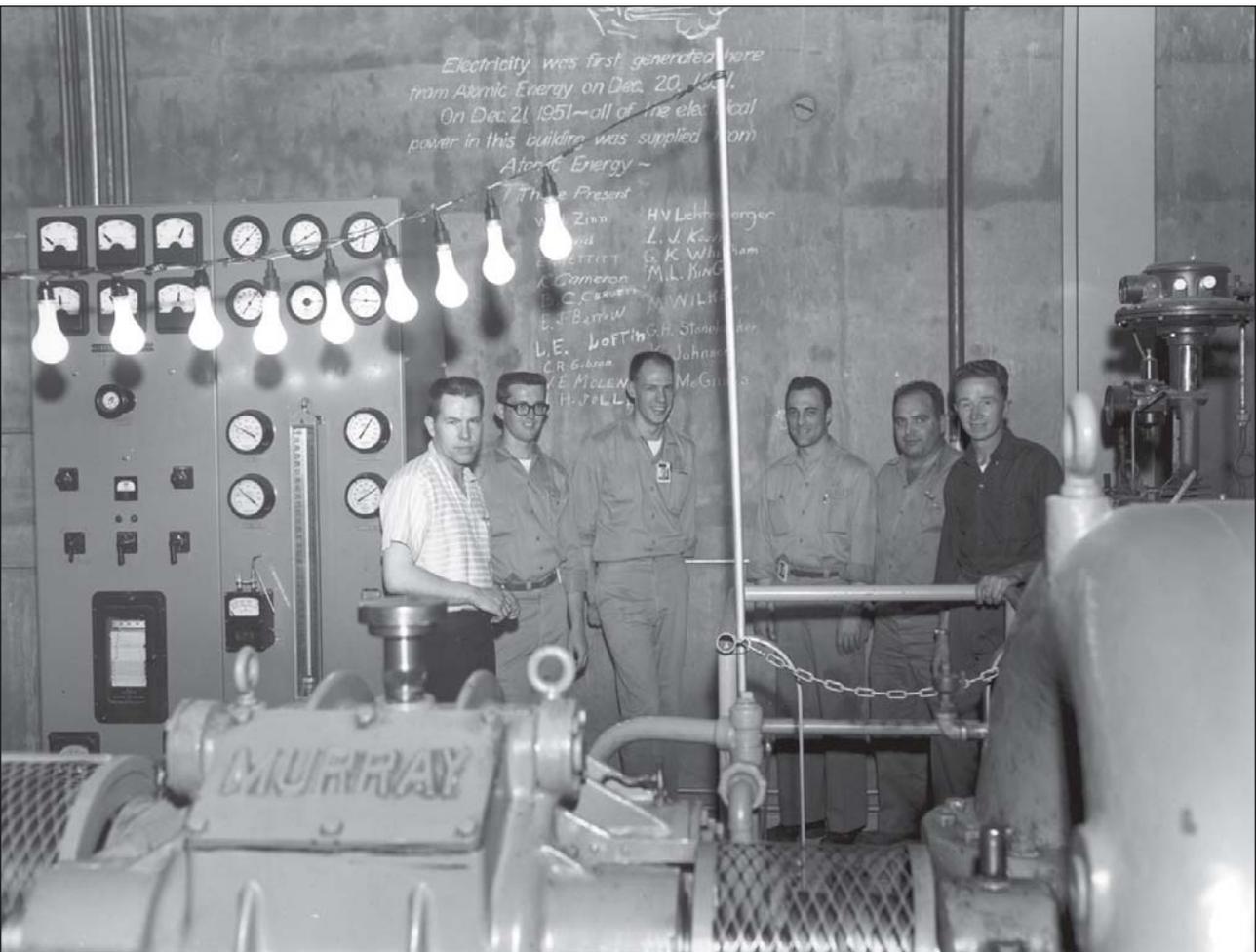
But the fact that state approval was needed for the 2011 agreement raises the question of whether INL will need further amendments to the 1995 agreement to continue its mission as the DOE’s lead nuclear energy research laboratory.

“As we look to the future, we need to ensure that our mission and the agreements that govern our activities reflect the very best nuclear science technology and knowledge,” INL Director of

Communications and Governmental Affairs Amy Lientz said via email. “We hope Idaho will work with DOE to keep options open so INL can help solve some of the nation’s most pressing energy challenges.”

So far, Lientz said, the terms of the 1995 Settlement Agreement aren’t restricting INL’s work. Any changes to those terms would be undertaken in the spirit of the agreement, she said.

“If such a change is warranted, then an open public dialogue with Idaho leaders and the citizens of Idaho is important,” Lientz said.



Idaho National Laboratory photo

On Dec. 21, 1951, after the second EBR-I experiment, Argonne National Laboratory Director Walter Zinn wrote his name in chalk on the concrete wall of the reactor building and invited the crew present to follow. The inscription reads, "Electricity was first generated here from Atomic Energy on Dec. 20, 1951. On Dec. 21, 1951 — all of the electrical power in this building was supplied from Atomic Energy."

INL: A nuclear history

Only one of the dozens of major reactors that operated on the INL site remains

By SVEN BERG
sberg@postregister.com

It is no exaggeration to say the peaceful use of nuclear energy owes much of its existence to the Idaho National

Laboratory site.

Whether it was the first reactor to produce a usable amount of electricity, a process to convert radioactive waste into dry grains or an inherently safe

reactor design, scientists and engineers based in Idaho were at the forefront of nuclear research and design.

History

From Page 12

Today, only one major reactor remains on the INL site. Decades ago, as many as 49 models dotted the desert between Idaho Falls and Arco. While some reactors were operated for military purposes, their influence on civilian life through the years was perhaps the most important result of research at the site.

What follows is a brief rundown of notable moments from INL's early years. As is the nature of research, not all of them were successes.

The birth of nuclear power

Perhaps the most famous reactor throughout the world of nuclear power was the site's Experimental Breeder Reactor-I. The importance of this reactor's achievement needs no embellishment: In 1951, it became the first facility to produce a usable amount of electricity through nuclear fission. President Lyndon Johnson, the only president to visit the INL site, declared EBR-I a historic landmark in 1966.

The godfather

The most influential of all reactors built and operated on the site may have been the Materials Test Reactor, which became operational in 1952.

➤ See **HISTORY**, Page 14



Idaho National Laboratory photo

Aerial view of EBR-I, right, and an associated office building that has since been demolished.



Idaho National Laboratory photo

Starting in 1964, the Experimental Breeder Reactor-II, EBR-II's successor, proved the concept of fuel recycling and passive plant safety characteristics. It later produced almost half of the electricity needed for site operations.

History

From Page 13

Tests conducted at the MTR were responsible for some of the most important design elements in nearly every nuclear reactor in the country today.

"Every reactor in the U.S. owes a debt of gratitude to the MTR," said Don Miley, INL tours director and lab history buff.

And there was light

In 1955, Arco took its place in nuclear history by becoming the first community in the world to be powered by nuclear-generated electricity. Borax III, which temporarily supplied the electricity, was one of a class of reactors used in experiments that opened the door for commercialization of boiling water reactors.

The loss of innocence

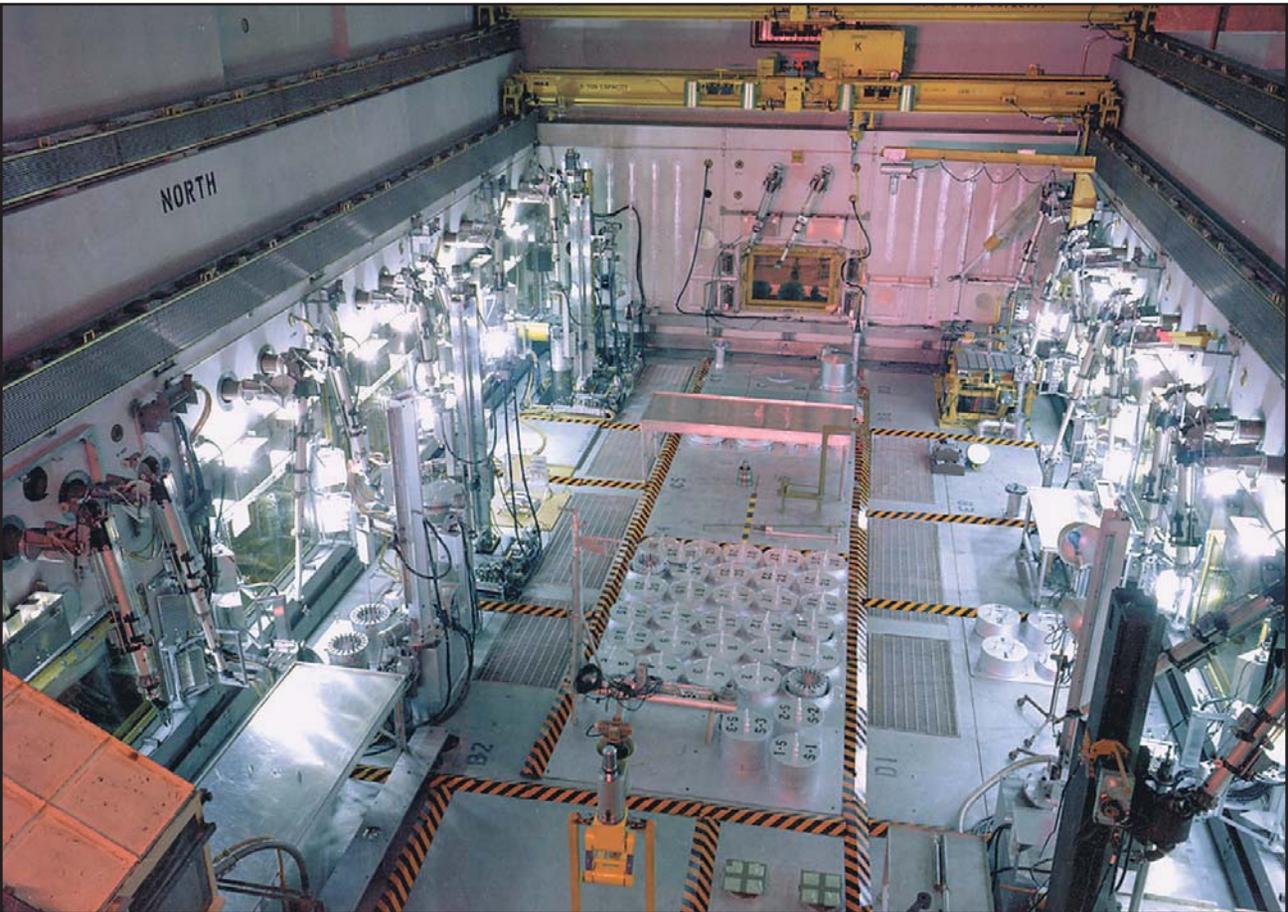
The most notorious reactor on the site is, with-

out doubt, Stationary Low Power Reactor No. 1. On Jan. 3, 1961, the SL-1 reactor melted down in spectacular fashion, killing three workers. A metal rod, driven by the force of flash-heated steam, pinned one worker's body to the facility's ceiling. The SL-1 accident remains the only fatal nuclear accident in this country.

The silver dome

The iconic dome that marks EBR-II's successor, appropriately named EBR-II, is perhaps the site's most recognizable symbol. The most important achievements at EBR-II were the demonstration of fuel recycling and a test that showed nuclear plants could be designed to be inherently safe from severe accidents. Between 1969 and 1994, EBR-II produced almost half of the electricity for the site's operations.

'Not your father's INL'



Idaho National Laboratory photo

A bird's-eye view inside the Hot Fuel Examination Facility at INL's Materials and Fuels Complex. This hot cell provides unique capabilities for examining irradiated materials to see how they held up under the intense irradiation inside a nuclear reactor.

INL's mission has shifted to include more fundamental scientific research

By SVEN BERG
sberg@postregister.com

Some of the top officials at Idaho National Laboratory wear lanyards that proclaim their place of work as "The new Idaho National Laboratory."

That message likely is meant

to promote the lab or perhaps even motivate its employees, but the fact it conveys is undeniable: Things have changed at the lab, probably forever.

In the early years of what today is INL, the federal government built dozens of reac-

tors on the 890-square-mile site east of Idaho Falls, then prodded and probed everything about them. These days, that engineering-focused "demonstrate and deploy" mindset still is on display at the lab, but a

➤ See **MISSION**, Page 16

INL employees use a manipulator to handle materials inside a hot cell at INL's Hot Fuels Examination Facility, which allows researchers to examine radioactive materials and see how they were affected by intense irradiation inside INL's Advanced Test Reactor.

Idaho National Laboratory photo



Mission

From Page 15

shift toward scientific research and development has taken place.

“It’s not your father’s INL,” laboratory director John Grossenbacher said.

Grossenbacher is right — literally. The people who used to prowl the INL site are retiring, in many instances replaced by men and women young enough to be their children.

“We’re younger than we used to be, much younger than we used to be,” said Dave Hill, INL’s deputy director for science and technology. “We’ve got a lot of smart young people in and we’re, frankly, amassing brains.”

The key decisions for today’s INL came in the first half of this decade. In 2002, then-Energy



Idaho National Laboratory photo

INL employees work on top of INL’s one-of-a-kind Advanced Test Reactor during an outage.

Secretary Spencer Abraham declared the lab the country’s leading center for nuclear energy research and development. Abraham’s move made

sense, given the amount of nuclear-research equipment and number of nuclear-savvy



The Advanced Test Reactor simulator, a replica of the ATR control room, supports the ongoing training of ATR operators.

Idaho National Laboratory photo

Mission

From Page 16

personnel already in place at INL. It also gave the lab direction at a time when some suspected it would fade into irrelevance as soon as site cleanup was done.

“The lab has done a very good job of being leaders in fact, not just in name. You know, it’s one thing to say, ‘OK, yeah, you’re the lead lab,’” Grossenbacher said. “We’ve shown that we can do it.”

Then, in 2005, another watershed moment: The U.S. Department of Energy awarded Battelle Energy Alliance a 10-year contract to operate the lab and divided site missions. Cleanup of waste stored around the site during the Cold War became one mission. The other, awarded to Battelle, was the laboratory research and development side.

INL’s inventory of nuclear

research equipment has expanded since 2005, giving eastern Idaho a little security that the mission of lead nuclear energy lab won’t soon end up in another place.

“We have the vast majority of the facilities you need to support nuclear energy research, whichever direction it may take: fuels, materials, new reactors,” Hill said. “It’s large. It’s extremely expensive, and in my opinion this country will find it very difficult — as it should — to build new ones of many of the things we’ve got.”

Today, the lab’s research, development, demonstration and deployment mission has two main objectives: sustaining the United States’ existing fleet of commercial nuclear reactors and improving nuclear technologies for use in the reactors of the future.

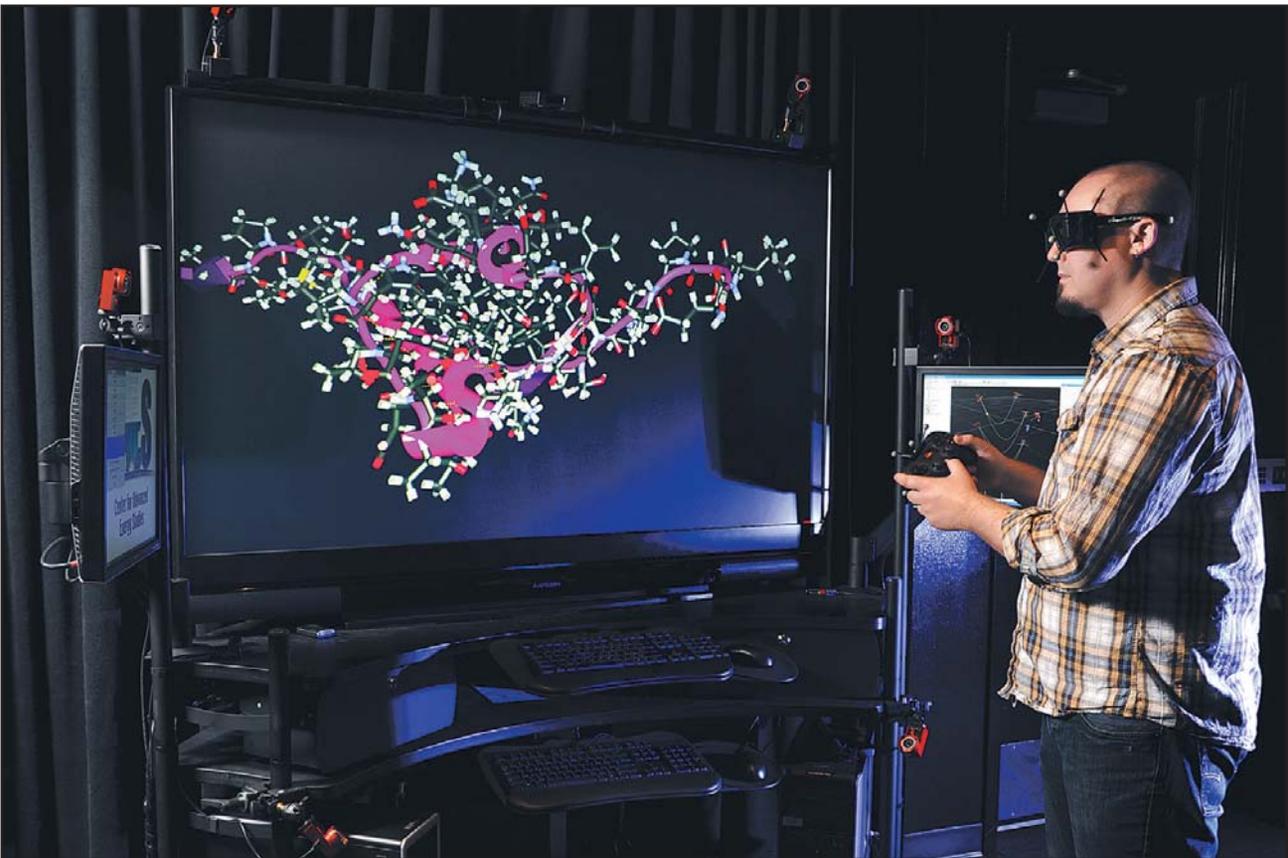
One of the most important areas of research for INL also is one of the most important issues facing the nuclear indus-

try in this country: the fuel cycle.

Commercial reactors in the U.S. use only about 2 percent of useful material, and lawmakers still haven’t settled on where to store fuel once it’s been removed from a reactor. Scientists and engineers at INL work to find solutions for both problems, experimenting on everything from processes that recycle spent fuel to entirely new types of fuel that can yield nearly 20 percent of their usable material on a single trip through a reactor.

“We’re poised like never before to reduce the time, cost and uncertainties associated with new fuel development,” Grossenbacher said. “Our capabilities here allow us to develop fuels (and) test them, because we take a scientific approach to fuel and material development that allows us to use powerful tools of modeling and simulation.”

The future of INL



Idaho National Laboratory photo

INL has provided IQ-Stations — portable versions of the Computer-Assisted Virtual Environment (CAVE) — to Center for Advanced Energy Studies partner institutions Boise State University, University of Idaho and Idaho State University.

INL is sure to play a central role in the future of nuclear energy

By SVEN BERG
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If the world is to continue its escalation of energy use and cut carbon emissions at the same time, many experts believe it will need a massive expansion of nuclear capacity.

As the country's leader in nuclear energy research, Idaho National Laboratory will closely

shepherd nuclear expansion or advances in the United States. Over the past 60 years, some of the most important nuclear advances have originated at INL — or whatever acronym it went by at the time.

Whether it's developing new fuels and materials for the next generation of nuclear reactors or working to upgrade safety features and longevity of existing reactors, INL is sure to play a central role in the future of nuclear energy.

Of course, that future has grown more complicated, thanks to the March tsunami that struck a nuclear power plant in Fukushima, Japan. Though none of the thousands of deaths in Japan has been attributed to nuclear malfunction, the



This computational mesh of a simplified model of INL's Advanced Test Reactor supports INL's advanced reactor modeling activities.

Idaho National Laboratory photo

Future

From Page 18

event nonetheless raised questions about the viability of nuclear power.

There's no doubting the scope of tragedy Japan has suffered, and INL Director John Grossenbacher said he's not surprised the event emboldened critics of nuclear power. Still, he wants to use the event as a diving board into a conversation about nuclear power.

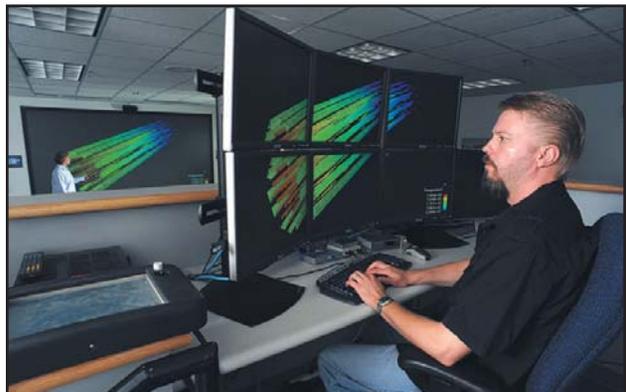
"It's useful, because it raises the question: 'OK, if you believe that, if you believe that the risks associated with nuclear energy are such that we shouldn't use it, then what's Plan B? What's your answer?'" Grossenbacher said. "It's a point where we can get beyond all the hand waving of, 'Well, we'll just do it all with renewables,' because there's no evidence that that can be done."

Not everyone agrees. Members of Idaho's anti-nuclear watchdog group Snake River Alliance go so far as to say INL would better serve the nation by scrapping its nuclear energy research programs and focusing its efforts exclusively on renewable energy and energy efficiency research.

"I think that at this time, nuclear is a thing of the past," said Liz Woodruff, the Snake River Alliance's executive director. "A nuclear future is not a safe, secure or economical future."

Beatrice Brailsford, a Pocatello-based representative for the group, said point-blank that she believes the world will abandon nuclear power in the wake of Fukushima.

Grossenbacher doubts that. Ultimately, he said, Fukushima isn't likely to derail or, perhaps,



Idaho National Laboratory photo

Technician Shane Grover projects a nuclear fuel model in INL's Visualization Lab, which enables analysis and assessment of complex modeling and simulation results. It is part of INL's High-Performance Computing Center, which helps researchers analyze reactor designs and processes.

even delay the progress of nuclear power in the United States.

"The expansion of nuclear energy in the U.S., at this point, is going so slowly anyway, there's no significant impact," he said.

Besides that, the examination of what exactly went wrong at Fukushima could lead to new technologies and policies that eventually make nuclear power safer and more effective, Grossenbacher said.

"The U.S. is going to move forward in nuclear energy," he said. "We're going to learn from Fukushima, but we're going to move forward."



Monte LaOrange / Post Register file photo

A group of volunteers for INL painted the Idaho Falls Animal Shelter.

Economic driver

By SVEN BERG

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Idaho National Laboratory's ranking as the state's second largest employer probably understates its role in the Idaho economy, according to a study released by Boise State University.

While state government is responsible for the largest payroll in Idaho, most of that money starts inside the economy and cycles through it. By contrast, much of INL's payroll is injected into the state's economy from outside sources, particularly the federal government.

"INL is not only the second largest source of

Nearly one of every three dollars in wages earned in Bonneville County goes to an INL or site employee

jobs in the state, but nearly all of its funding comes from outside Idaho," said Geoffrey Black, chairman of Boise State's economics department and co-author of the study.

Overall, INL and related contractors account for 6.5 percent of Idaho's \$50 billion economic output and employ some 8,000 workers, whose average yearly income tops \$80,000, according to the study.

While INL and site jobs account for 3.5 percent of all jobs statewide, the lab's economic influence is far more pronounced locally. Consider this: Nearly one of every three dollars in wages earned

Economic

From Page 20

in Bonneville County goes to an INL or site employee.

And that's just the people who work directly for INL and site contractors. Through indirect hiring, the lab and site contractors are responsible for 24,000 jobs, according to Boise State's study.

Will Jenson, a regional labor economist for the Idaho Department of Labor, said that besides Bonneville County, the lab's presence is felt most strongly in Bingham, Bannock, Jefferson and Butte counties.

"We could essentially say that one in five jobs in these five counties is sustained by the existence of INL," he said. "It's interesting to see the multiplying effect of the 8,000 jobs."

Besides jobs and wages earned at them, INL and site employees are well-known for

“We could essentially say that one in five jobs in these five counties is sustained by the existence of INL. It's interesting to see the multiplying effect of the 8,000 jobs.”

WILL JENSON

Idaho Department of Labor economist

their contributions to charities and community projects throughout eastern Idaho. Whether it's collecting hundreds of Christmas presents for kids, chipping in to spruce up the local animal shelter or holding fundraisers for the zoo, workers in all strata of INL regularly make their presence felt in volunteer pursuits.

The university's economic impact study was the 12th of its kind since the 1980s. It was commissioned by the U.S. Department of Energy, which oversees INL operations, though lab spokeswoman Marilyn Whitney said the majority of money for the study came from private sources, including four contractors that manage the lab and cleanup efforts on the INL site.

Despite the fact that lab contractors helped pay for the study, Jenson said its findings are realistic.

"It's a robust study," he said. "It should give a real reliable result."

Besides the present-tense economic impact, INL contributes to much longer-term economic prosperity by encouraging a high level of education and training, Jenson said.

"They're developing human capital that can propel us into the future," he said.



INL Tour Director Don Miley, who is a part of the Tautphaus Park Zoological Society, hangs lights in preparation for a Zoo Gala fundraiser.

Monte LaOrange Post Register file photo

Keeping an eye on INL

Watchdogs I: The nonprofits

The Snake River Alliance and Keep Yellowstone Nuclear Free are two of the most prominent groups keeping tabs on Idaho National Laboratory and cleanup of its site

By SVEN BERG
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Controversy was inevitable from the first moment the federal government set aside 890 square miles in the Idaho desert as a headquarters for exploring nature's tiniest particles.

Indeed, one of Idaho's most prominent watchdog groups was born out of concern over the government's injection of radioactive materials into the aquifer below what today is the Idaho National Laboratory site.

Make no mistake: The Snake River Alliance's leadership wholly mistrusts nuclear energy and believes the taxpayer money the lab spends on furthering it is wasted.

"We would love to see the Idaho National Lab become the Idaho renewable energy lab," executive director Liz Woodruff said.

Though prominent, the Snake River Alliance isn't alone in keeping its eye on INL and the site. The mission of Wyoming-based watchdog group Keep Yellowstone Nuclear Free largely is consumed with monitoring the Advanced Test Reactor, the

only major reactor remaining on the INL site.

Unlike the Snake River Alliance, Keep Yellowstone Nuclear Free isn't necessarily anti-nuclear, executive director James Powell said.

"In a lot of situations with (the Advanced Test Reactor), we're kind of playing devil's advocate."

JAMES POWELL
Keep Yellowstone Nuclear Free executive director

Powell said major concerns relating to the operation of the test reactor include the lack of structures built to contain radioactive materials in the event of a meltdown or other mishap, the reactor's age, and the fact it's monitored by the U.S. Department of Energy instead of the U.S. Nuclear Regulatory Commission, which regulates America's fleet of commercial nuclear reactors.

"As much as I think it's a great facility, we have been worried in the past about an accident there," Powell said. "There are a lot of external events that could damage the (Advanced Test Reactor)."

Today, the Snake River Alliance has branched out into other environmental issues facing Idaho, but cleanup of the INL site remains one of its top — and highest profile — priorities.

Beatrice Brailsford, the group's program director, called the goal of pushing the government to clean the site as thoroughly as possible "attainable," though a return to the state of the land before the government claimed it is impossible, she said.

"Obviously, INL is never going to be as clean as it was in 1949, and it is never going to be as clean as it would be if it were in the middle of San Francisco," Brailsford said. "Those areas will be contaminated, for all intents and purposes, until the end of time."

Brailsford worried that as the government achieves mandated milestones in its cleanup of the site, the completion of high-profile projects will erode public interest in making sure the job is done right.

That is the similarity between the Snake River Alliance and Keep Yellowstone Nuclear Free. Both nonprofit groups believe it is their mission to keep the public focused on the issues and potential problems facing INL and cleanup of the site.

"When you have this kind of independent oversight, I think it keeps the DOE on its toes," Powell said.

Keeping an eye on INL

Watchdogs II: Gov't oversight

Since the state and federal government signed an agreement in 1995 to clean up the INL site, regulators say the Energy Department has improved its public trust by taking the work seriously

By SVEN BERG

sberg@postregister.com

These days, the people charged with environmental oversight of Idaho National Laboratory don't have too many bad things to say about the lab.

About the closest they'll come to criticizing INL's compliance with environmental regulations is to say that in the old days, violations were more frequent and more severe.

"It's improved over the long term," said Richard Kauffman, environmental resources supervisor for the U.S. Department of Energy's Idaho office. "In the past we had large violations. We don't have very many (today), and what we have is small."

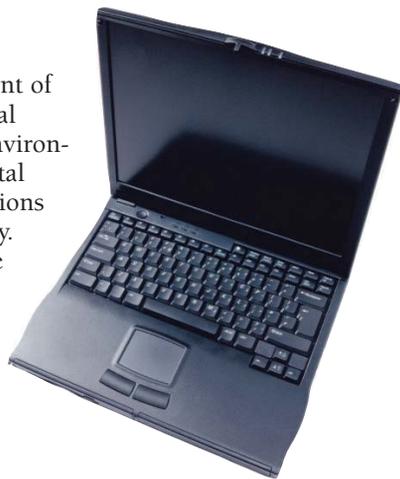
Teresa Perkins, director for DOE-Idaho's environment and sustainability division, said an environmental management system the lab put in place as a means of self-monitoring has "really improved their ability to protect the environment" while still completing work. The system includes two visits a year from an independently certified auditor whose job is to make sure INL operations are carried out as environmentally friendly as possible.

"It isn't just a DOE review, but it's a review by an independent body that has no stake in what they're doing at all,"

See for yourself

Each year, the U.S. Department of Energy reports on Idaho National Laboratory's compliance with environmental regulations, environmental monitoring of the lab and violations of environmental protocol, if any.

That report is available to the public by accessing this website: www.stollerreser.com/Annuals/2009/index2.htm.



Perkins said.

In addition to the DOE and an independent auditor, the Idaho Department of Environmental Quality and the U.S. Environmental Protection Agency keep tabs on INL operations and the 890-square-mile site associated with the lab.

As with operations at the lab itself, trust between the Department of Environmental Quality and the DOE has improved since 1995, when the state and federal government signed an agreement to clean up radioactive and toxic waste stored on the site.

"Since then, the DOE has, for the most part, met all of its deadlines," said Kathleen Trever, who oversaw site cleanup for the state between 1997 and 2007. "By meeting the deadlines, it built public confi-

dence."

Today, both the state and the Environmental Protection Agency have the authority to visit and inspect facilities at INL and on the site at any time. Perkins said visits from the federal agency are rare, but the state Department of Environmental Quality shows up "probably at least quarterly."

For better part of the past decade, Perkins and Kauffman said, INL officials from top to bottom have largely been responsive to concerns that DOE-Idaho's environmental monitoring staff raises.

Sven Berg is the Idaho National Laboratory reporter for the Post Register in Idaho Falls. He can be reached at 542-6755. Follow on Twitter: @svenerikberg.

Scientists work to understand radiation

By SVEN BERG

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Americans' exposure to radiation may be one of the least understood aspects of our lives.

Of course, we all know that anything that has the word "nuclear" in its title is a source of radiation. But how many people know that living near a coal-fired power plant exposes them to vastly more radiation in a year than living near a nuclear power plant? Or that our food, especially potassium-rich foods such as bananas and lentils, accounts for about one-eighth of the average American's yearly radiation?

Other everyday activities, like taking a trip on a plane, having an X-ray taken or wearing a watch with a luminous dial, add to our exposure. Even the person you sleep next to at night leaves you with a trace exposure to radiation.

"We live in a radioactive world," said David Rynders, a radiological control expert for Idaho National Laboratory. "We do not live in a sterile bubble."

Of all the activities humans take part in, smoking tobacco may be the greatest offender for radiation exposure. According to the Idaho Department of Environmental Quality, sucking down 30 cigarettes in a day increases the smoker's yearly radiation dose by 25 times.

That's more than 10 times the dose that INL workers are allowed to receive to their torso areas in a year. If it's any comfort to smokers, however, the radiation from cigarettes is far short of what's needed to kill a human or even cause a skin burn.

Since the dawn of the nuclear age, scientists have worked to understand radiation and set up policies to protect workers and the public from excessive exposure to it. The limits the U.S. government set for its workers reflect the kind of caution that stemmed from nuclear accidents such as Three Mile Island and Chernobyl.

For instance, the Department of Energy's limit for a worker's dosage over the course of a calendar year is 5 rem — the common term for a measure of radiation exposure. To put that number in perspective, Rynders said about 40 times that limit is needed to cause human skin to begin reddening. With no medical intervention, a person exposed to about 430 rem — more than 80 times the DOE's limit for a year — in a short time period has about a 50 percent chance of dying within six weeks.

To make sure workers don't approach their



Monte LaOrange / Post Register file photo

David Rynders displays survey equipment used to measure radiation in a classroom at Eastern Idaho Technical College.

limit of 5 rem, the DOE has put in place a policy that's known as an administrative control, which allows workers to reach only 2 rem per year.

On top of that control, INL, which the DOE oversees, has its own administrative control that allows workers to reach just 700 millirem per year, or a little more than twice the public's natural exposure. Visitors to DOE facilities and commercial nuclear plants are allowed to receive only 100 millirem of radiation in a year.

The point, INL spokeswoman Misty Benjamin said, is to exercise an abundance of caution.

"The public isn't in danger because there's a (nuclear research) facility here. And the workers aren't in danger because there's a facility here, because we really put some tight controls on it," Benjamin said. "And the reason we put tight controls on it is public trust of confidence."

No matter what the source, the intensity of radiation exposure comes down to three factors: time, distance and shielding. The closer people are to a radiation source and the longer they stay there, the greater their accumulated dose will be. Shielding, such as a lead vest, decreases the exposure's intensity.

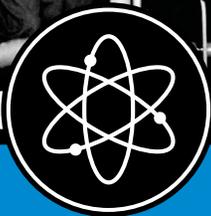
In this way, radiation experts have learned to predict doses, but Rynders said the discipline is constantly moving forward.

"Radiation protection standards, guidance, are always evolving as technology moves," he said. "It's a relatively young science, because the nuclear age has only been around since the '40s, whereas, say, medicine has been around for a lot longer."

TINY ATOMS BIG IDEAS



EST.



1951

In 1951, harnessing the atom for peaceful purposes became fact when a small reactor in Idaho generated the world's first usable electricity from nuclear power. The EBR-I Atomic Museum is a National Historic Landmark open from Memorial Day weekend through Labor Day weekend, seven days a week from 9 a.m. to 5 p.m. For more details and directions, go to www.inl.gov/ebr.

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