

Idaho National Laboratory



INL Nuclear Research, Development and Demonstration

Leading the quest for a
nuclear renaissance

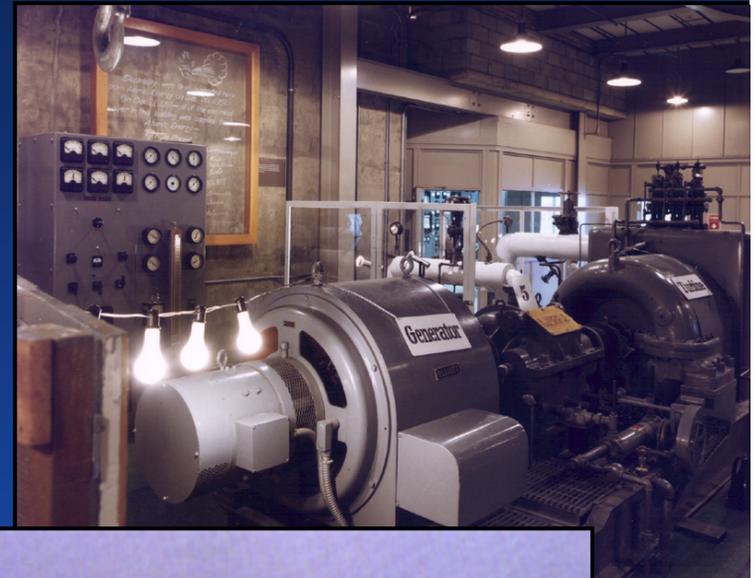
James Lake, Ph.D.
Associate Laboratory Director
Idaho National Laboratory

U.S. Women in Nuclear
6th Annual Meeting
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INL, A Proud Heritage of Nuclear Excellence

- World's First Generation of Electricity from Nuclear Power
- First Materials Test Reactor
- First Breeder Reactor
- First Naval Propulsion Reactor
- 52 Research, Development, Testing, and Demonstration Reactors
- Worldwide Nuclear Safety Basis (LOFT/RELAP5)



DOE's Vision: Our plan for the future

The Idaho National Laboratory will be:

- The preeminent, internationally-recognized nuclear energy research, development and demonstration laboratory within 10 years
- A major center for national security technology development and demonstration
- A multi-program national laboratory contributing to other national goals, and obtaining world-class recognition in the science and engineering fields
- A nexus of academic, industry, government and international collaboration that will produce the needed investment, programs and expertise to assure this vision is realized.

The INL Team



The Six Critical Attributes for the INL

Nuclear Programs

A robust portfolio of relevant and impactful nuclear science and technology programs targeting the most demanding research challenges on the path to a technically, economically, and environmentally compelling nuclear energy option for our nation and the world.

Synergistic Programs

A synergistic portfolio of national security, energy and environmental programs

Science Base

A robust science base to attract the best staff and create a culture of scientific inquiry

Revitalize Education

A central role in revitalizing nuclear science and engineering education

Partner/Collaborate

Extensive national and international collaborations

Modern Infrastructure

Forefront research facilities, support infrastructure and management systems

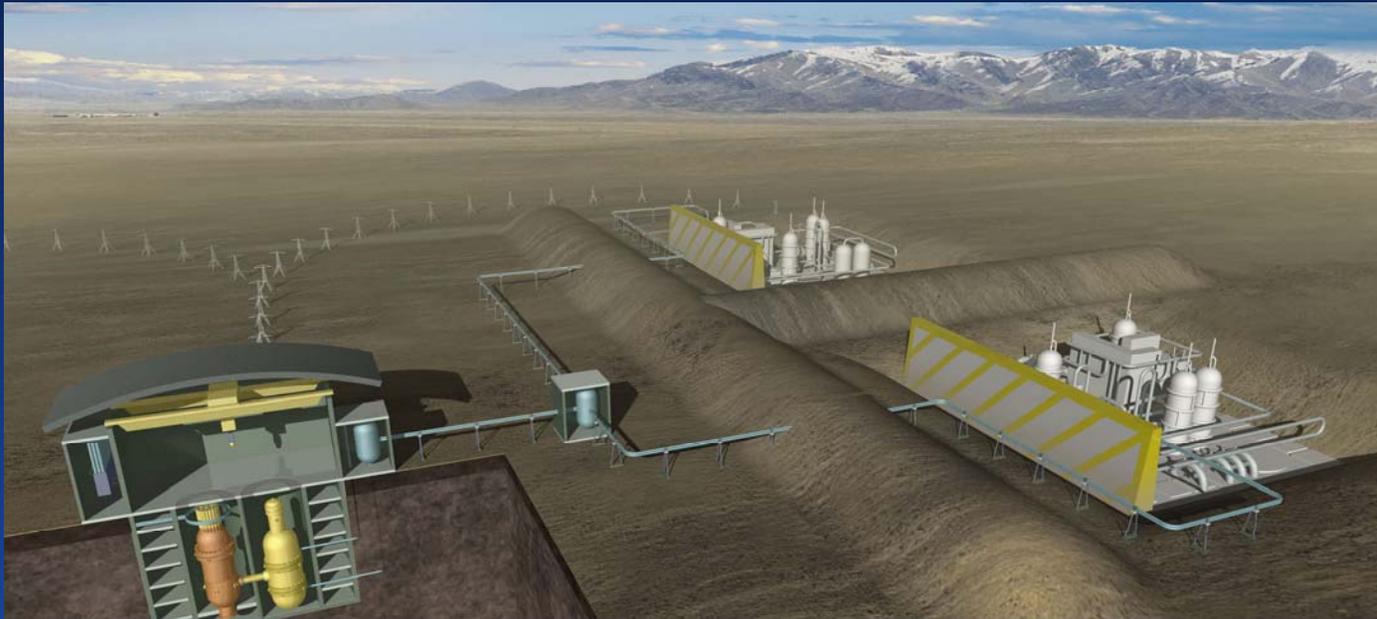
Nuclear Programs

GOAL More than double INL nuclear programs in 10 years and build a portfolio with national priority

Nuclear Programs: A robust portfolio of nuclear science and technology programs.

- Lead the Global Nuclear Energy Agenda
- Lead and deliver the Next Generation Nuclear Plant
- Build the bases for the Fuel Cycle of the Future
- Power Space Exploration for the nation
- Grow Strategic commercial partnerships and support the nuclear industry's technology needs
- Build a new strategic relationship with the NRC

Very High Temperature Reactor



- **INL's DOE-assigned role:**
 - lead development of technology for the reactor and its fuel cycle
 - lead technical coordination with other laboratories and international partners
 - assist the Nuclear Regulatory Commission in developing the regulatory process for the next generation of reactor

Advanced Fuel Cycle

- ***INL's work on AFCI seeks to develop a fuel cycle technology that:***
 - *Enables recovery of the energy value from commercial spent nuclear fuel,*
 - *Reduces cost of geologic disposal of commercial spent nuclear fuel,*
 - *Reduces inventories of U.S. civilian plutonium*
- *Reduces toxicity of high-level nuclear waste bound for geologic disposal, and*
- *Enables more effective use of the currently proposed geologic repository.*



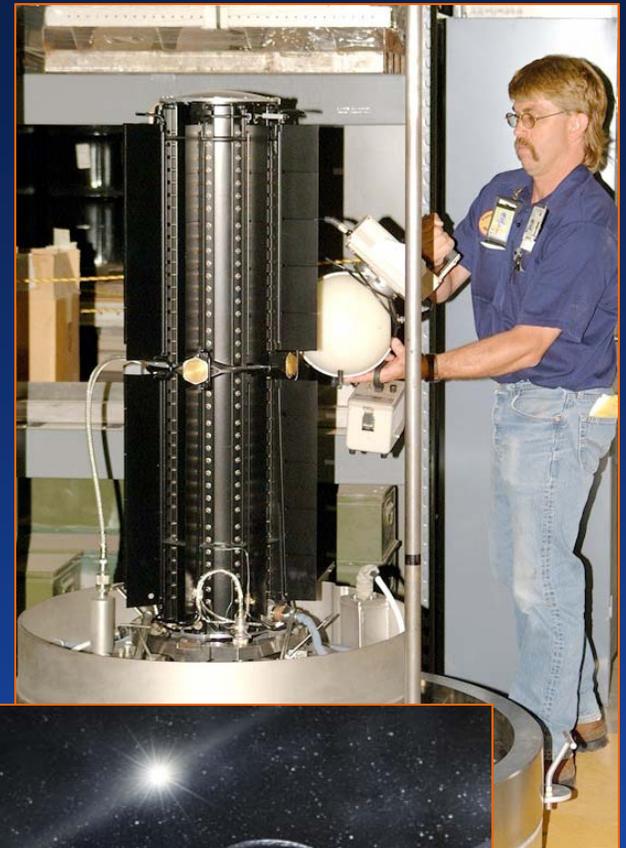
Nuclear Hydrogen

- The goal of the Nuclear Hydrogen Initiative is to demonstrate the commercial-scale, economically-feasible production of hydrogen using nuclear energy.
 - INL's research is highly focused and heavily collaborative
 - High temperature electrolysis
 - Thermochemical cycles



Space Nuclear

- INL currently responsible for assembly & testing of radioisotope power systems
- INL's Advanced Test Reactor is uniquely able to provide volume isotope production
- DOE considering Radioisotope Power Systems consolidation at INL
- Serve future NASA needs for space reactors



Nuclear Science & Applications

- National/Homeland security
- Advanced materials
- Theory, modeling & simulation
- Nuclear medicine
- Fusion safety
- Fuel development, commercial nuclear fuel performance



National Security, Energy and Environmental Programs

GOAL More than double synergistic programs in 10 years and build a portfolio based on unique INL assets

Synergistic Programs: A synergistic portfolio of national security, energy & environmental programs

- Establish the INL Critical Infrastructure Test Bed as a national user facility
- Integrate INL's expertise and establish a distinct role in counter proliferation and safeguards
- Develop intelligent systems to extend performance and protect complex, high consequence systems
- Key programs in fossil energy, bio-energy, energy efficiency, and hydrogen

Robust Science Base

GOAL Within 5 years – win \$50M in competed research grants, double patents and peer-reviewed publications, and add 50 new scientists to build the foundation for nuclear and national security missions

Science Base: Build a robust science base to attract the best staff and support core INL mission responsibilities

- Add 50 new senior scientists in five years
- Develop distinctive Scientific Signatures
 - Fuels and materials
 - Modeling and Simulation
 - Advanced Separations
 - Advanced I&C
 - Bio/Geo Sciences
- Foster a culture of scientific inquiry and exploration

Central Role in Revitalizing Education and Training

GOAL Revitalize Nuclear Science and Technology education and training in the U.S. and increase the number and quality of students

Revitalize: **A central role in revitalizing nuclear science and engineering education**

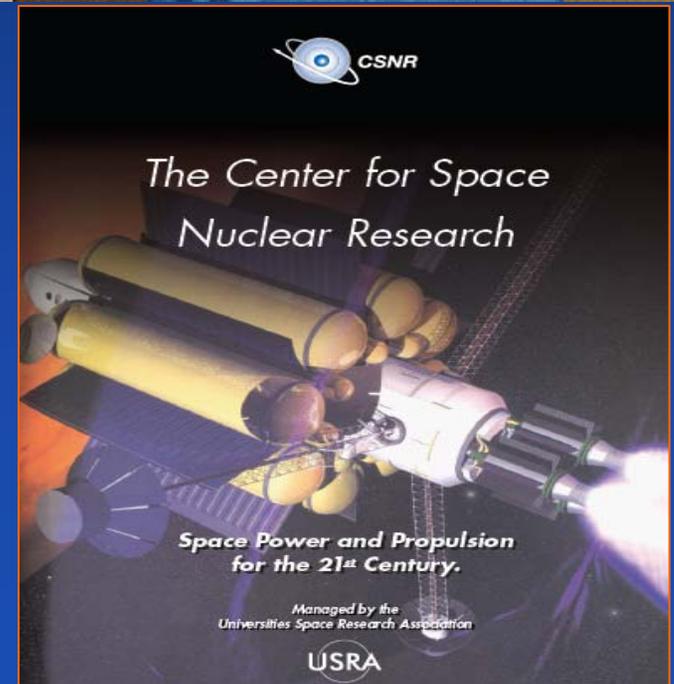
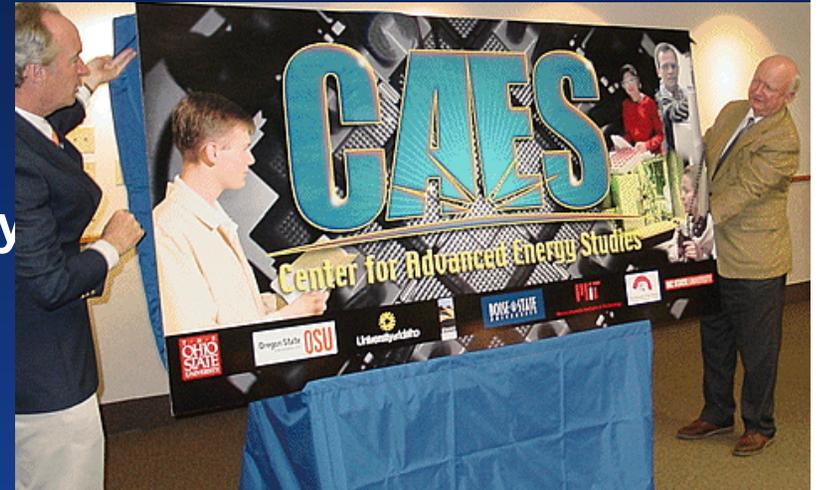
Create a network with five national and three Idaho universities

- Build Center for Advanced Energy Studies (CAES) by 2008 and organize other centers
- Work with industry to improve training



Establish Research Centers to Support Collaboration and Partnerships

- Center for Advanced Energy Studies (CAES)
(Joint Institute for Advanced Energy Studies)
- Center for Advanced Modeling and Simulation (CAMS)
- Center for Nuclear Fuels & Materials Research (CNFMR)
- Center for Nuclear Systems Design and Analysis (CNSDA)
- Center for Space Nuclear Research (CSNR)



Extensive Partnerships and Collaborations

GOAL Become the center of an international nuclear RD&D network, focusing on cutting-edge research with significant industry participation

Partner - Collaborate: Extensive national and international collaborations are essential to Mission Success

- Lead the development of a global research agenda for nuclear energy
- Lead an Industry Network
- Lead a University Network
- Lead a Laboratory Network

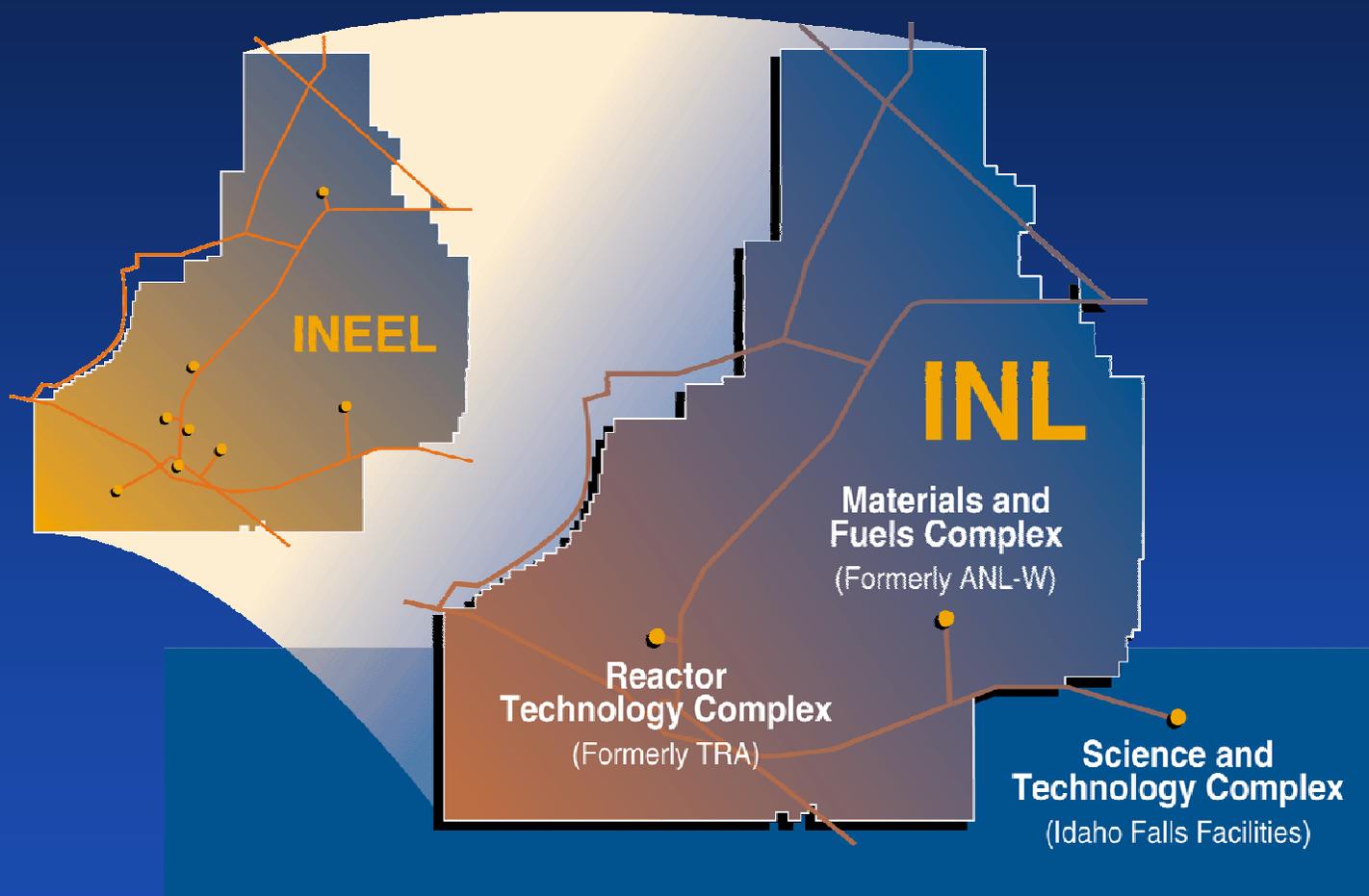
Modern Infrastructure

GOAL Establish Use Permit, remove 1.1M sq ft, add or renovate 0.4M sq ft, and achieve \$200M in cost savings

Modern Infrastructure: Forefront research facilities, support infrastructure and management systems

- Battelle funded Advanced Test Reactor upgrades
- Build CAES by FY08 (60,000 sq ft); new Science and Technology Complex by FY09
- Lead the complex-wide consolidation of DOE nuclear facilities

INL will develop around three main campuses



Reactor Technology Complex



Materials and Fuels Complex



Science and Technology Complex



INL plays a key role in assuring that Nuclear Energy can exploit the opportunity to contribute to a more secure and prosperous tomorrow

