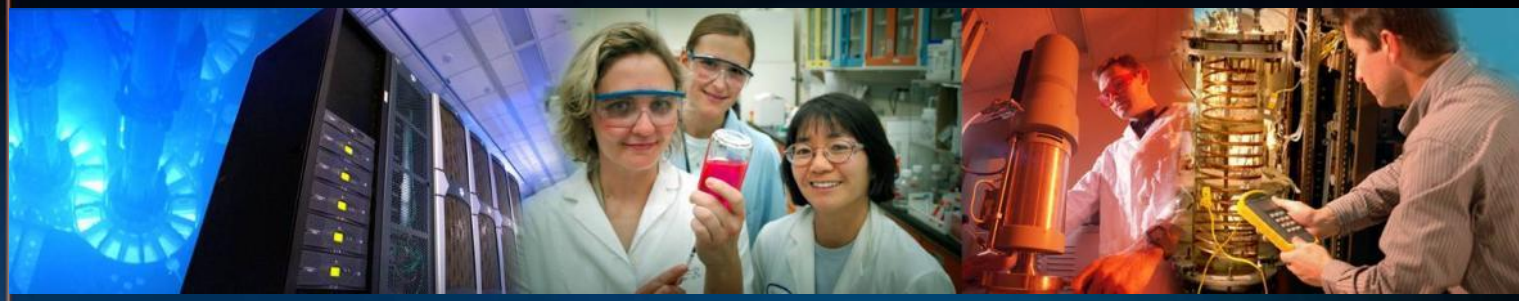


Idaho National Laboratory Overview

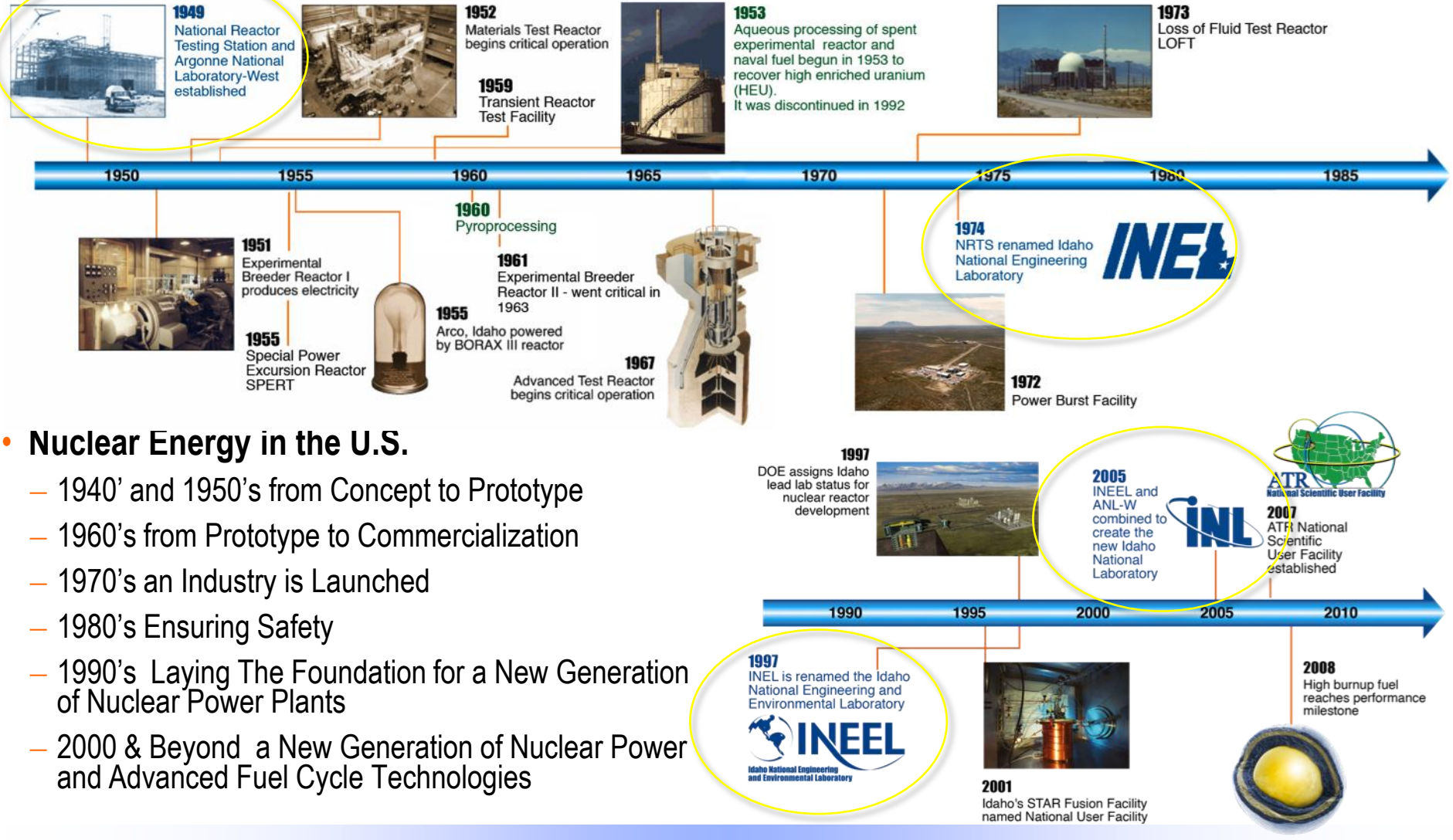
John Grossenbacher
Laboratory Director, Idaho National Laboratory

April 7, 2012

www.inl.gov

Idaho National Laboratory

Providing Solutions to the Nation's Energy Challenges for Over 60 Years



- **Nuclear Energy in the U.S.**
  - 1940' and 1950's from Concept to Prototype
  - 1960's from Prototype to Commercialization
  - 1970's an Industry is Launched
  - 1980's Ensuring Safety
  - 1990's Laying The Foundation for a New Generation of Nuclear Power Plants
  - 2000 & Beyond a New Generation of Nuclear Power and Advanced Fuel Cycle Technologies

The history of nuclear energy has been written in Idaho

Idaho National Laboratory is a Government-Owned, Contractor Operated (GOCO) Institution

DOE is the Owner, Often the Regulator, Sometimes the Sponsor of Work

INL's Position — Nationally

- **One of 10 DOE multi-program labs**
- **DOE's lead lab for nuclear energy technology research, development, demonstration and deployment**
- **Major contributor in national and homeland security**
- **Important regional role**

Single Program National Laboratories

- Ames Laboratory
- Bettis Atomic Power Laboratory
- Fermi National Accelerator Laboratory
- Knolls atomic Power Laboratory
- National Energy Technology Laboratory
- National Renewable Energy Laboratory
- Princeton Plasma Physics Laboratory
- Thomas Jefferson National Accelerator Facility
- SLAC National Accelerator Laboratory

National Labs do what industry and universities, Can't Won't or Shouldn't Do. They Partner with universities and industry to RDD&D Technology in the National interest

National Laboratories are Collaborators and Competitors

Laboratory Funding

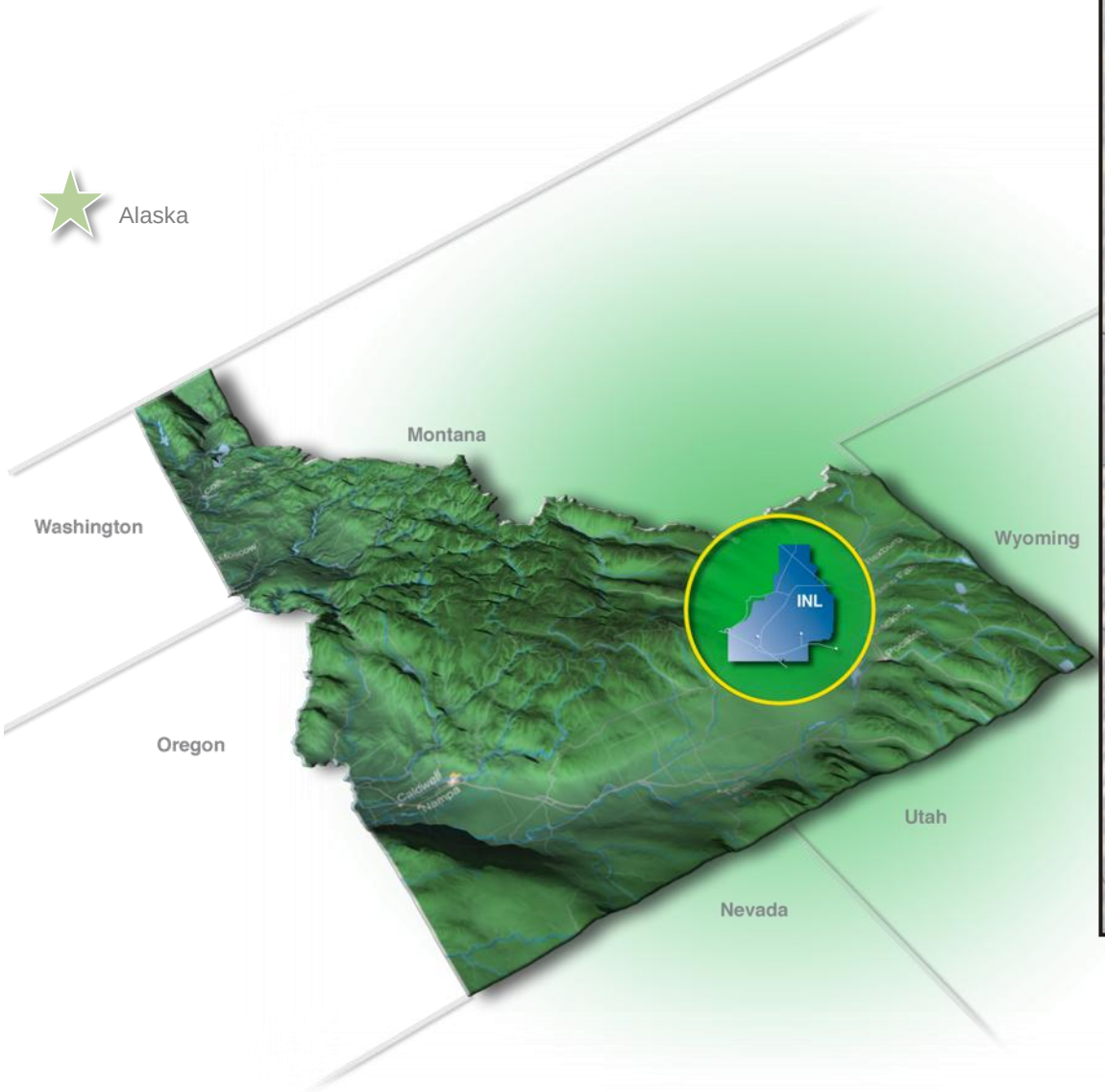
1.	Los Alamos	$1.95B
2.	Sandia	$1.45B
3.	Lawrence Livermore	$1.25B
4.	Oak Ridge	$1.10B
5.	INL	$1.01B
6.	Argonne	$596M
7.	Brookhaven	$593M
8.	Lawrence Berkeley	$557M
9.	NETL	$551M
10.	PNNL	$537M

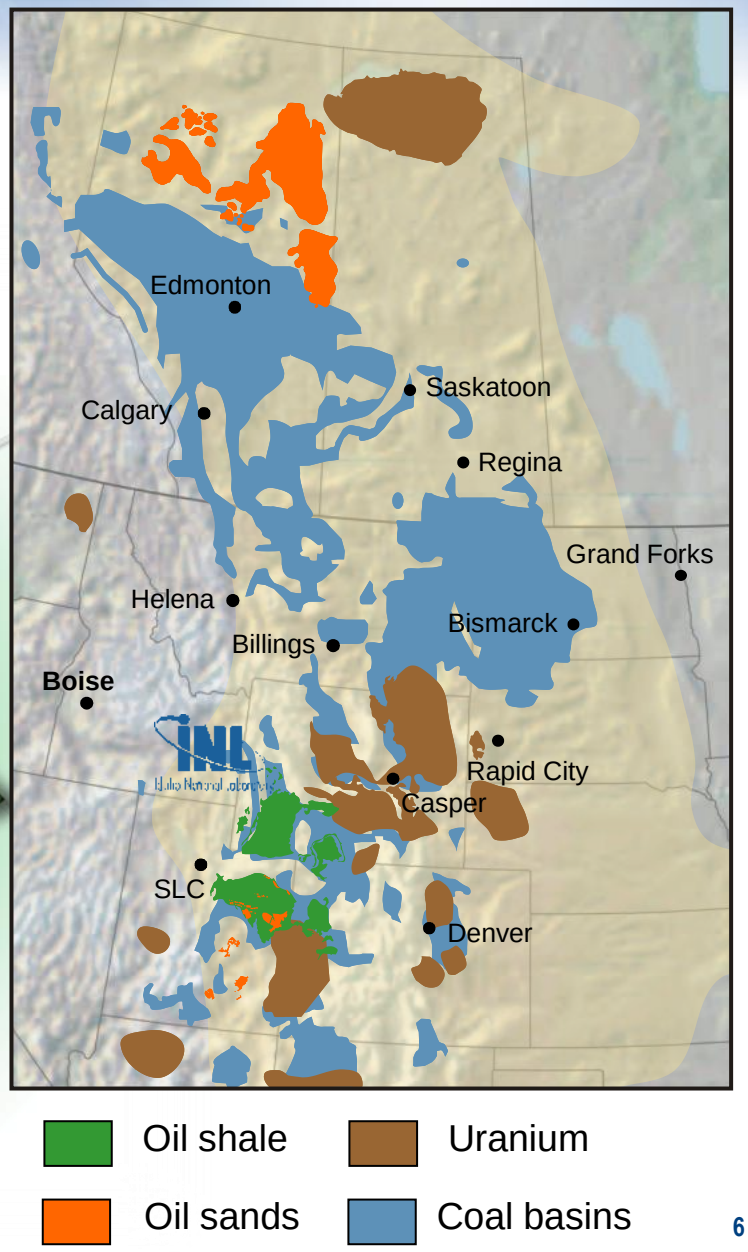
Nuclear Energy Funding

1.	INL	$268.8M
2.	Oak Ridge	$76.4M
3.	Los Alamos	$45.3M
4.	Argonne	$21.5M
5.	Sandia	$18.4M
6.	PNNL	$12.7M
7.	Lawrence Livermore	$4.3M
8.	Savannah River	$4.1M
9.	Lawrence Berkeley	$3.4M
10.	Brookhaven	$2.6M

National Labs do what industry and universities, Can't Won't or Shouldn't Do. They Partner with universities and industry to RDD&D technology in the National interest

INL's Regional Role





Idaho National Laboratory…

We Maintain

- 890 square miles
- 111 miles of electrical transmission and distribution lines
- 579 buildings
- 177 miles of paved roads
- 14 miles of railroad lines

- 3 Reactors
- 2 Spent Fuel Pools
- Mass Transit system
- Security
- Museum
- “Landfills”
- 300 Metric Tons of Used Fuel
- Educational and Research Partnerships – CAES

…the National Nuclear Laboratory

Idaho National Laboratory Site

Idaho National Laboratory

4,108 Employees

FY-2011 Business Volume

$974M

CH2M•WG IDAHO, LLC

Idaho Cleanup Project

*

Idaho Treatment Group

AMWTP

*

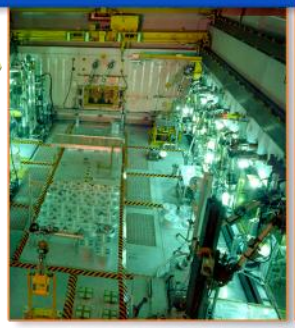
Naval Reactors Facility

*

* *Approximately 3500 employees combined*

Our Identity — The National Nuclear Laboratory

Developing world-class Nuclear Energy capabilities



Fostering education, research, industry, government and international collaborations to produce the needed investment, programs and expertise

Preeminent Internationally-Recognized Nuclear Energy RDD&D Laboratory

Major center for National and Homeland Security technology RDD&D

Lead clean energy systems RDD&D laboratory and a regional resource

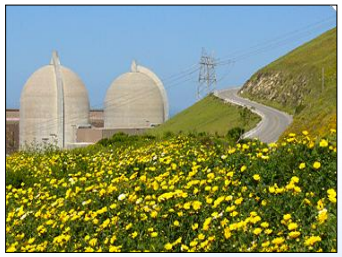
Research – Development – Demonstration — Deployment

Our Business — Research Programs of National Importance and Regional Relevance

Delivering technologies that benefit our communities, state, region, country and the world

Nuclear Capabilities

ALWR Deployment



LWR Sustainability

Next Generation Nuclear Plant & Small Modular Reactors

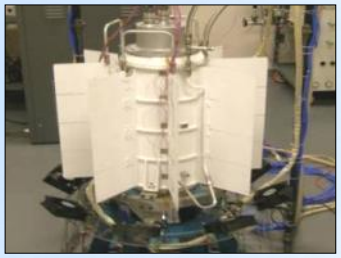
Aqueous & Pyro Fuel Recycling

Instrumentation and Control

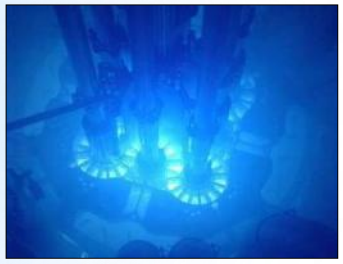
Hydrogen Production

Advanced Fuel Development

Modeling and Simulation and **Validation!**



Space Batteries



National Scientific User Facility

National Laboratories are Capability Machines

National & Homeland Security Capabilities

Industrial Control Systems Cyber Security *

Wireless Communications *

Explosives Detection & Testing *

Armor Development

Nonproliferation / Safeguards & Security *

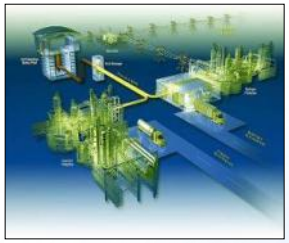
Unmanned Systems

INL Wireless TEST BED

** Our nuclear laboratory infrastructure provides N&HS capabilities*

National Laboratories are Capability Machines

Energy & Environment Capabilities

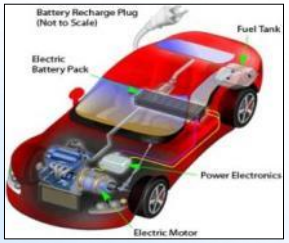


Process Engineering / Modeling/Validation Hybrid Energy Systems *

Catalysis & Chemical Conversion, Hybrid Energy Systems *

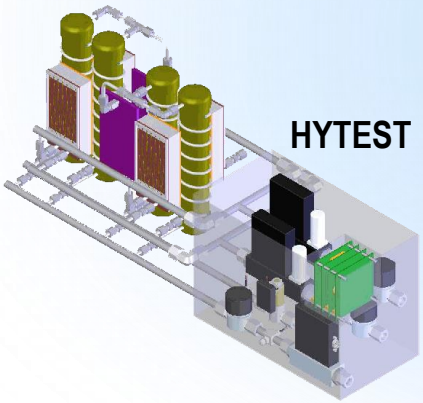
Geoscience *

Nuclear Materials Engineering, Processing & Disposition *



Process / Materials Characterization & Monitoring *

Interfacial Chemistry & Microbial Systems Control



HYTEST

Energy Systems Laboratory

Biomass Processing, Batteries, Hybrid Systems

Advanced Vehicle Testing Lab

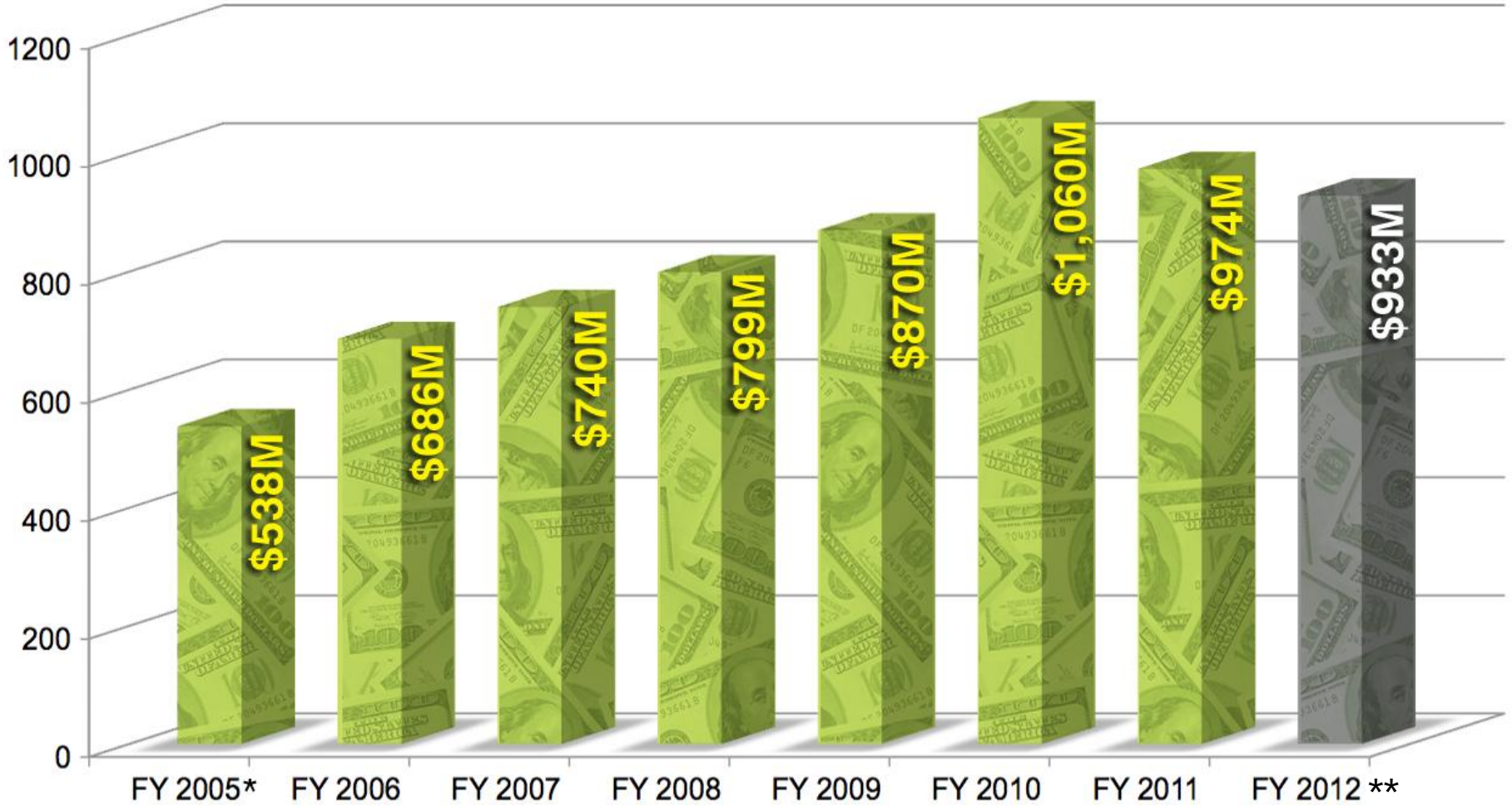
* *Synergistic with our nuclear mission*

National Laboratories are Capability Machines

INL Capabilities

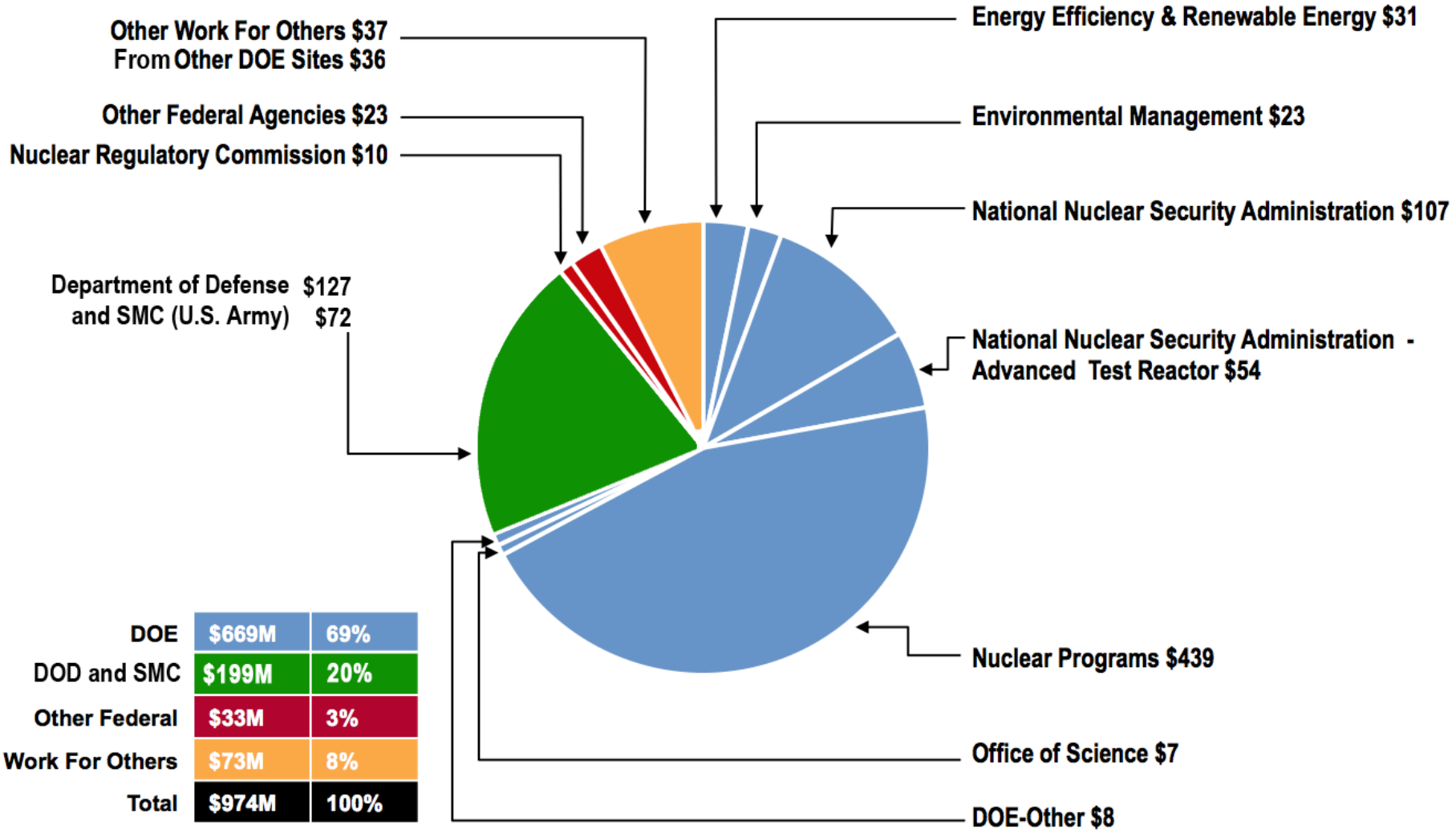
High Performance Computing

INL Business Growth ($M)



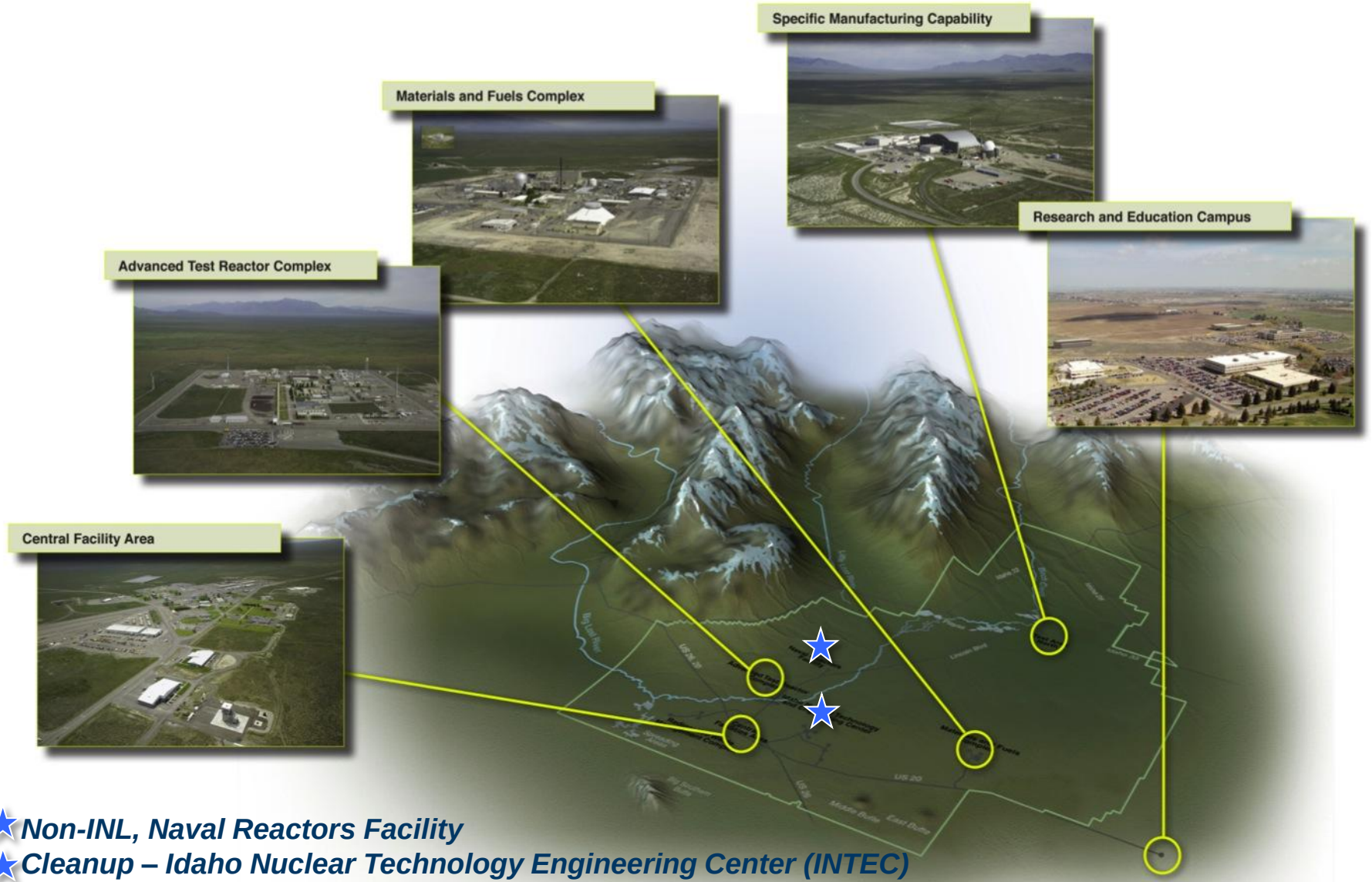
* 8 Months
** Projected

INL Customer Base - 2011



DOE	$669M	69%
DOD and SMC	$199M	20%
Other Federal	$33M	3%
Work For Others	$73M	8%
Total	$974M	100%

INL's Facility Areas

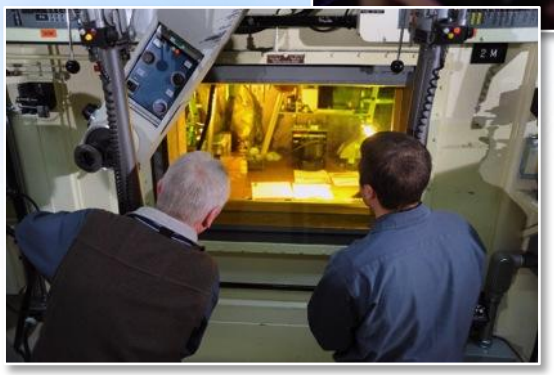


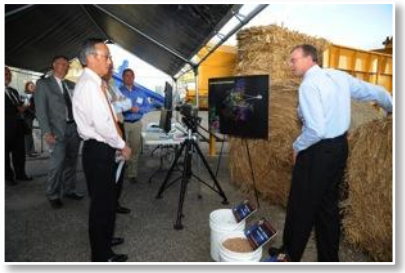
★ *Non-INL, Naval Reactors Facility*
★ *Cleanup – Idaho Nuclear Technology Engineering Center (INTEC)*

INL Future Capabilities

Short Term

- **Great People!**
- **High Performance Computing**
- **Nuclear**
  - ATR conversion and modernization
  - Irradiated Material Characterization Laboratory
  - Experimental Fuels Facility
  - Advanced Post-irradiation Examination Facility
  - Reactor for Transient Testing of Reactor Fuels
  - Fuel Storage and Reprocessing facilities at INTEC
- **National and Homeland Security**
  - Wireless communications National User Facility
  - Electric Grid National User Facility
- **Energy and Environment**
  - Energy Systems Laboratory (Batteries, Biomass processing, Hybrid Energy Systems)
  - Research and Education Laboratory

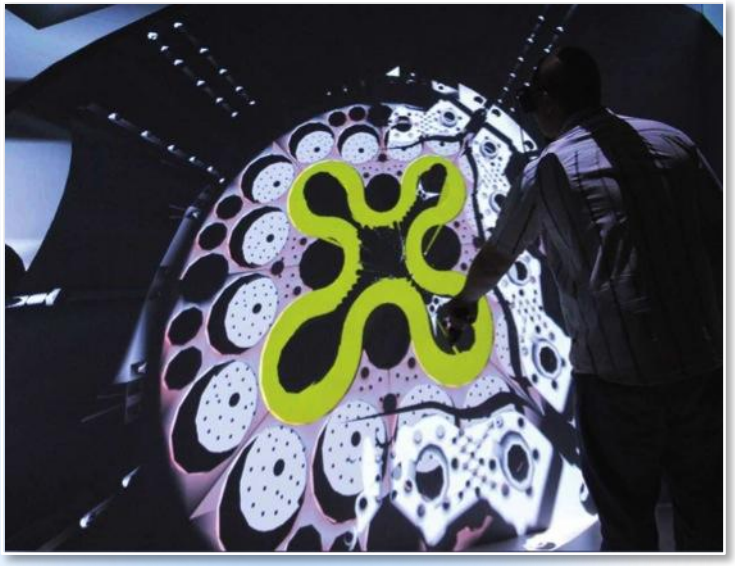




INL Future Capabilities

Long Term

- **Great People!**
- **High Performance Computing**
- **Nuclear**
  - Fast Reactor
  - Demonstration Reactors and recycling facilities



- **National and Homeland Security & Energy and Environment**
  - Essential RD**D&D** Facilities and Equipment

INL Strategic Issues

- **Federal budget — 2013 and beyond**
- **National Commitment to Nuclear Energy**
  - Portfolio approach
  - Long term view (strategy)
  - Government's role and ability to partner with industry
- **Implementation of Blue Ribbon Commission recommendations**
- **Concentration of infrastructure resources and technical integration responsibilities at INL (National Nuclear Laboratory)**
- **1995 Settlement Agreement and the relationship between Idaho and the Federal government, relative to INL**

Idaho's Leadership Role in Nuclear Energy

www.inl.gov

Idaho National Laboratory

April 7, 2012

Overview

- Background
- Burdens and Benefits of Nuclear Technology for Energy and Defense
- The Idaho Settlement Agreement
- Yucca Mountain History
- Blue Ribbon Commission Charter and Schedule
- The Opportunity for Idaho

Background

Cleanup commitments at the INL are being met, the federal government is in compliance with the Settlement Agreement. In some cases, cleanup is being accelerated, waste is leaving the state, and the aquifer is being protected.

Yucca Mountain is not acceptable to the citizens of Nevada as a repository.

A Blue Ribbon Commission made recommendations for a comprehensive used fuel and high-level waste disposition strategy.

Governor Otter has created the LINE Commission

Opportunities for Idaho

National Leadership

Strengthen Idaho's Economic Foundation

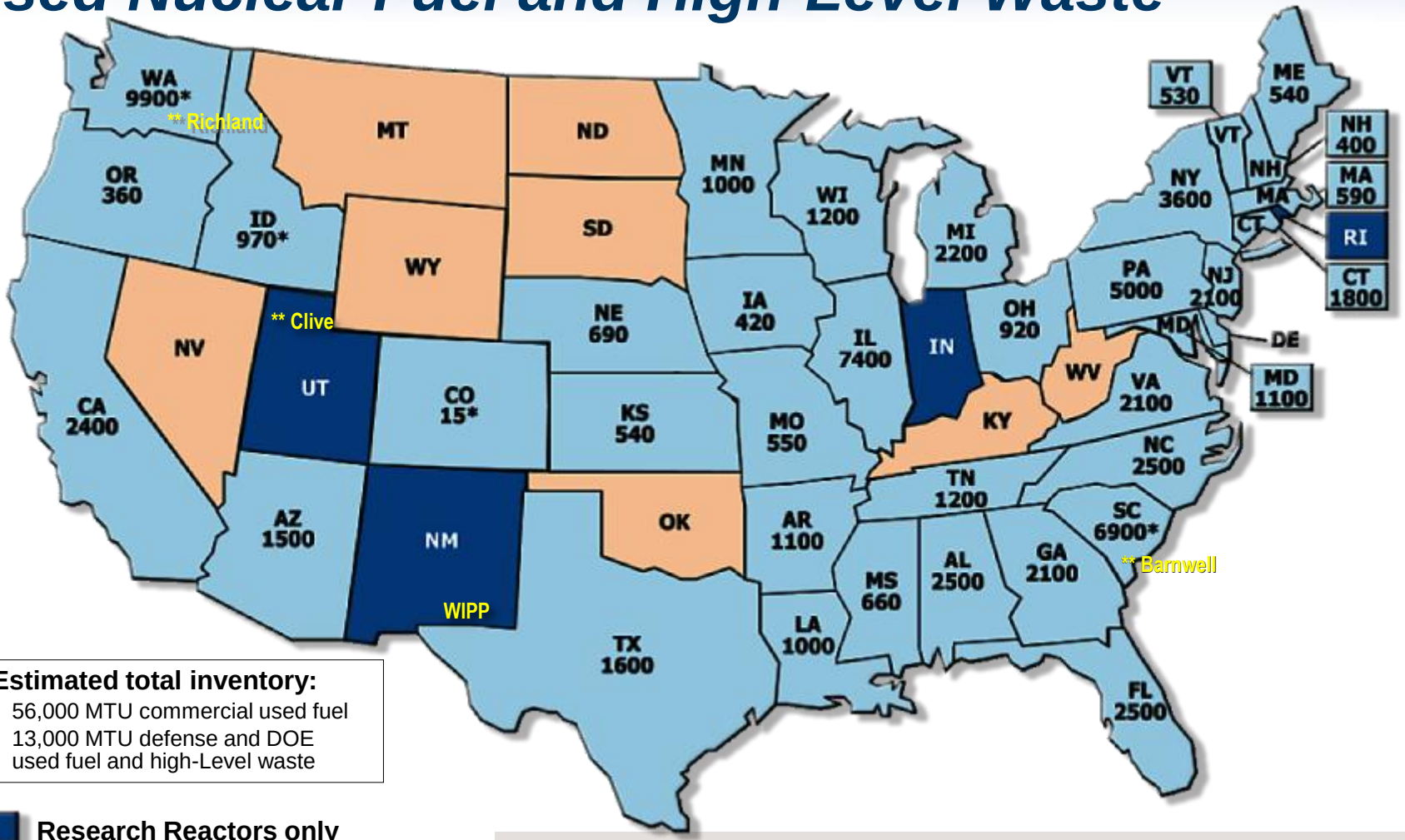
Enhancing the Future of the INL

Burdens and Benefits of Nuclear Technology for Energy and Defense

- **Burdens**
  - Used fuel from DOE Reactors
    - Plutonium production
    - Test and demonstration reactors
  - Used fuel from commercial power reactors
  - High-level Waste — liquid or solid waste resulting from reprocessing of fuel for plutonium recovery, uranium recovery or research and development

- **Benefits**
  - Electricity generation
  - Industrial Process Heat
  - National Security
  - Economic
  - Environmental

Burdens — Used Nuclear Fuel and High-Level Waste



Estimated total inventory:

- 56,000 MTU commercial used fuel
- 13,000 MTU defense and DOE used fuel and high-Level waste

Research Reactors only

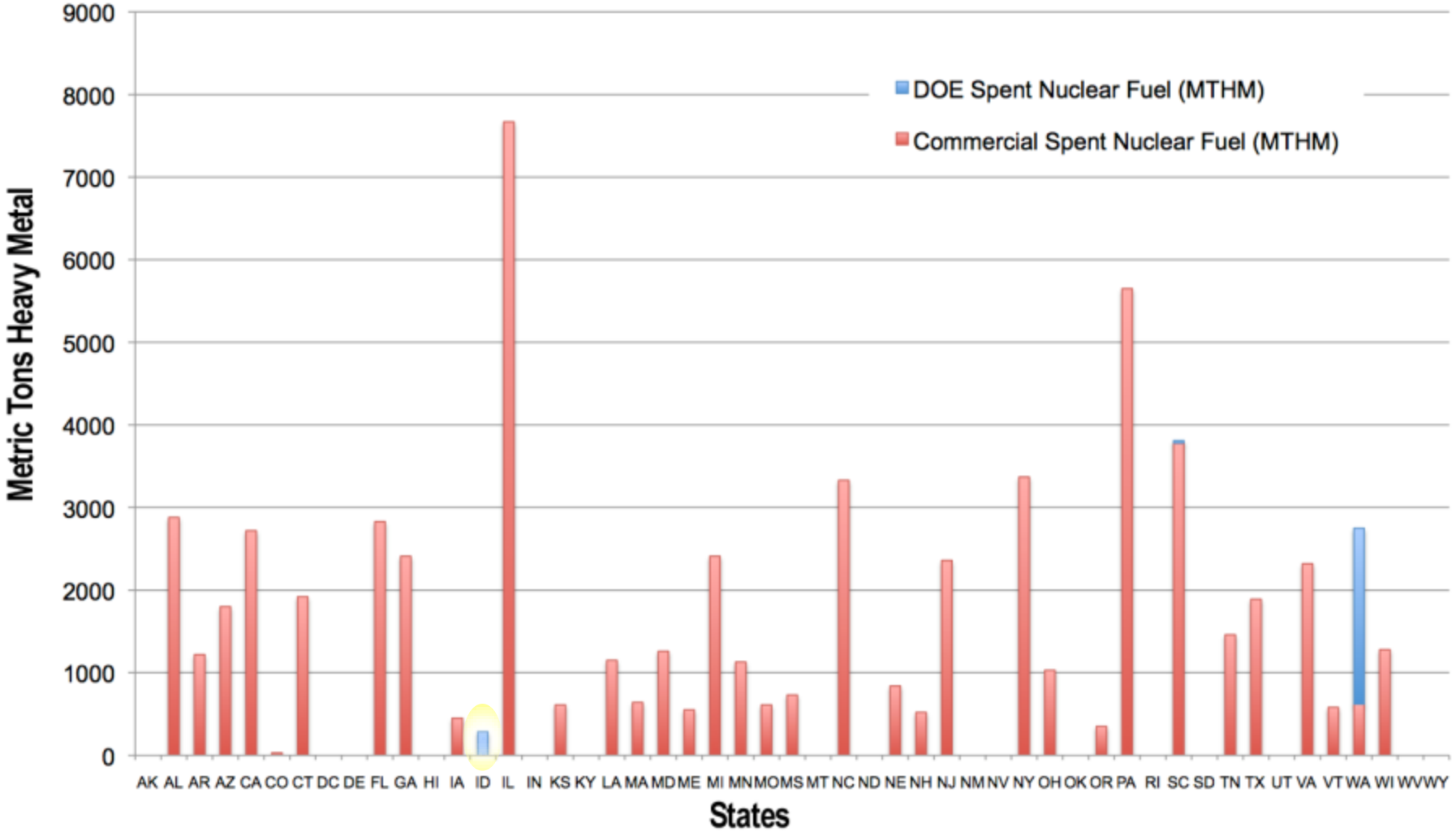
No High-Level Waste

** = Defense high-level waste included in totals*

*** = Low-level Waste Disposal Facilities*

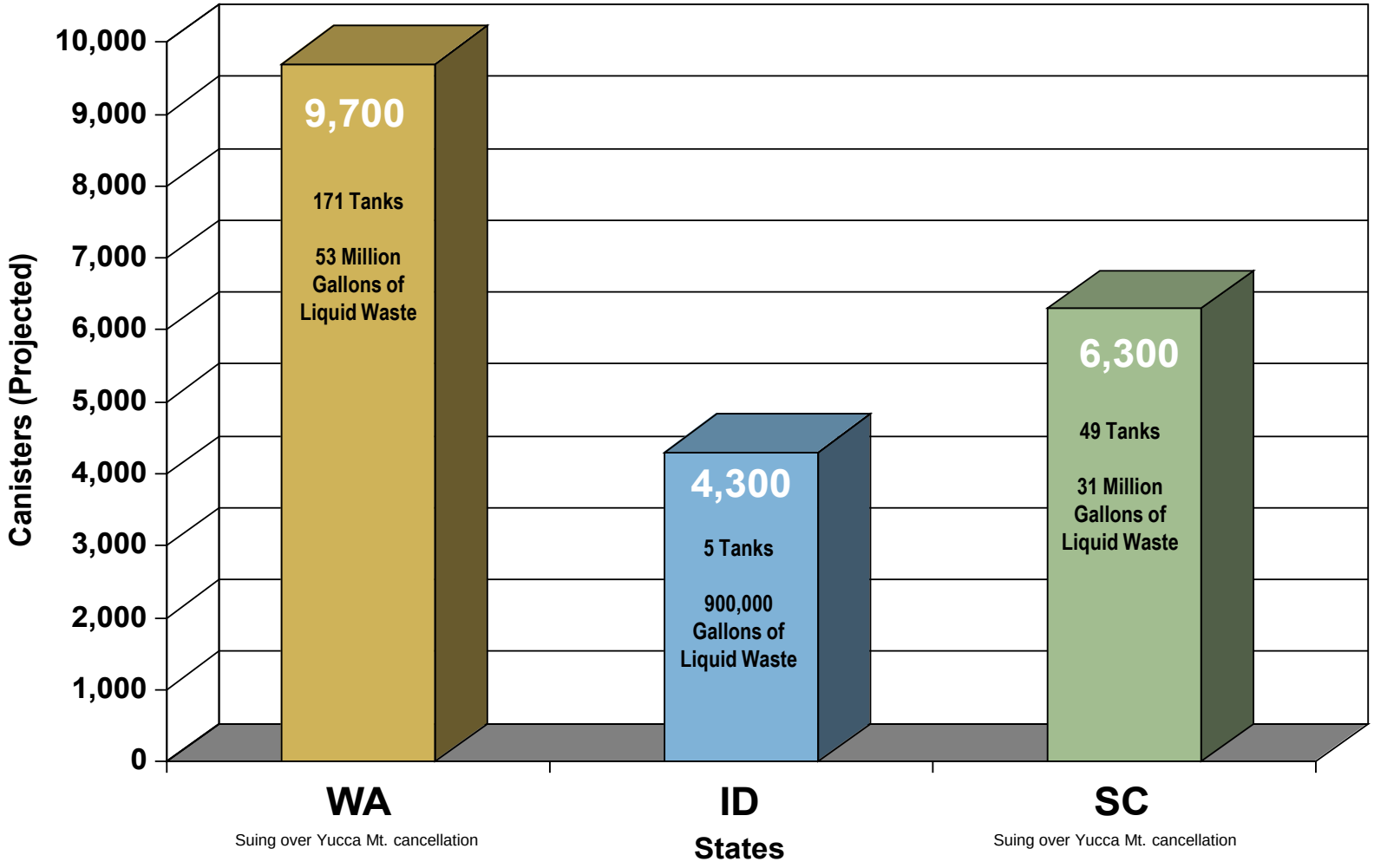
High-level waste and used nuclear fuel are currently stored at 121 sites in 39 states. Approximate amounts shown in metric tons uranium (MTU)

Burdens — Used Nuclear Fuel

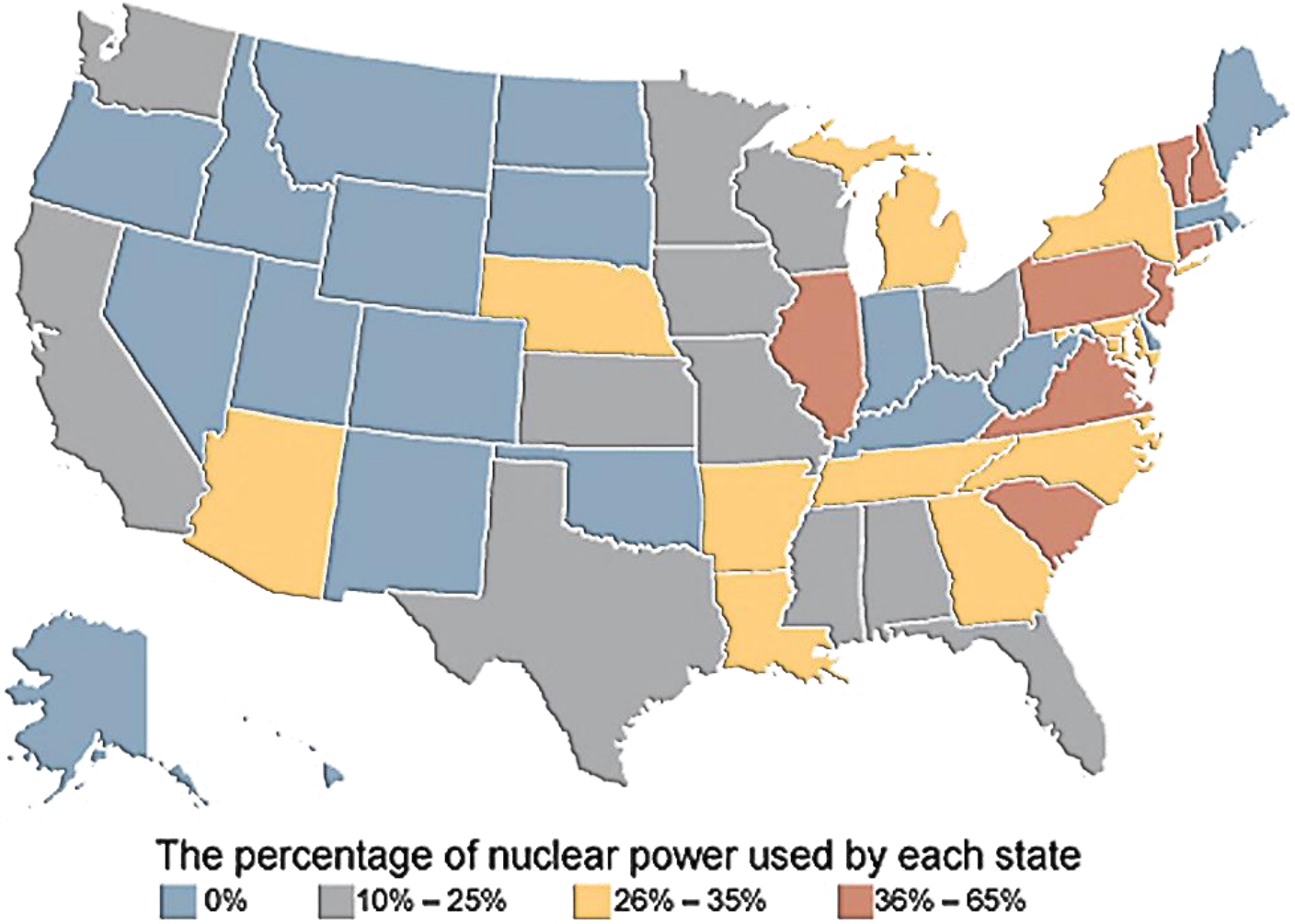


- *Commercial fuel in Idaho is held/owned by DOE*
- *Source NEI 2010*

Burdens — High-Level Waste

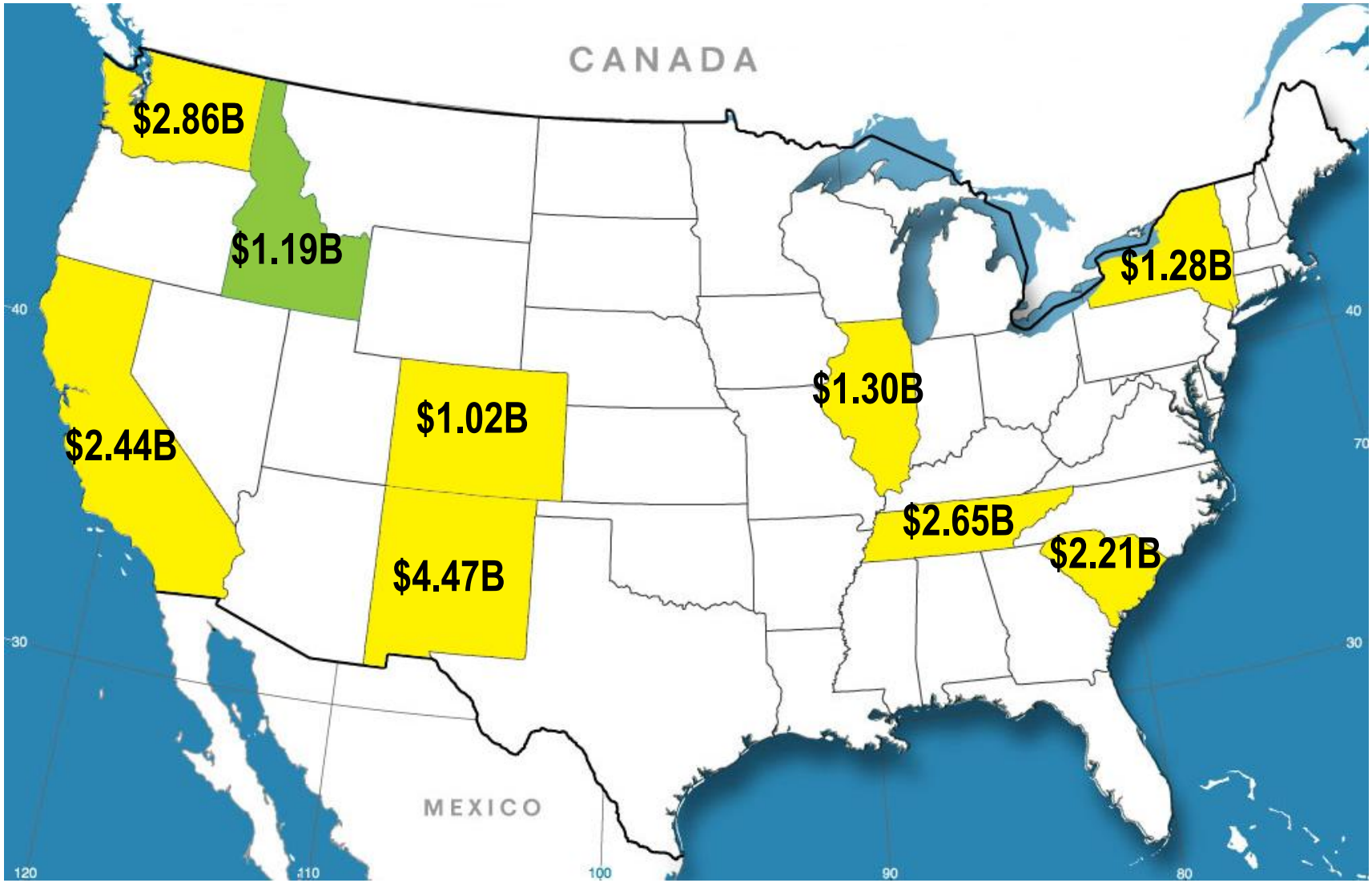


Benefits — Electricity Generation



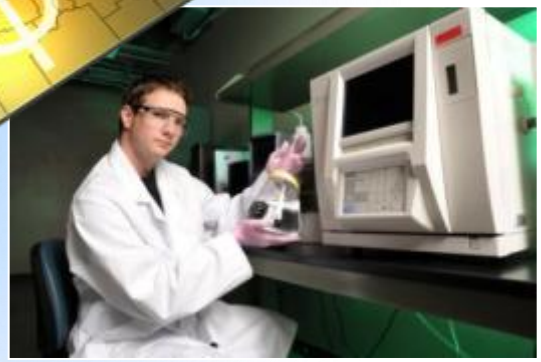
Source: Energy Information Administration report
Research by Wendell Cochran, Investigative Reporting Workshop

States Getting the Most DOE Funding



Benefits to Idaho — Economic

- **A major employer**
  - INL is responsible for a total of 24,000 jobs (direct & indirect) in Idaho
- **An engine of economic growth**
  - Total economic impact on the state of Idaho of $3.5B
  - Responsible for increasing personal income in Idaho by $2B
- **An economic stabilizer and major contributor to civic and charitable causes**
  - Directly and indirectly paid more than $135M in taxes
  - Purchased more than $296M in goods and services from Idaho companies
  - Employees donated more than 240,000 hours of their time to community groups and associations



"The stabilizing effects of INL … allow for more effective functioning of state and local governmental services." BSU Impacts Report, Fall 2010

Idaho Settlement Agreement

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035

2008
Issue addendum extending Navy Operations and fuel storage at INL beyond 2035

2009
Issue record of decision for schedule to complete treatment of calcine waste at INL

2012
Complete calcination of liquid high-level waste

2015
Target: All TRU waste will be removed from the State

2018
Deadline: Remove all TRU waste from State

2023
All spent fuel will be placed in dry storage by 12-31-23

2035

- **Treat all high-level waste (calcine) at INL in preparation for final disposal elsewhere.**
- **All spent nuclear fuel to be removed from the State (or a $60K/day fine, 21.9M annually). This includes TMI fuel. Spent fuel being maintained for testing is exempt**

Note: TRU received from another state for treatment at the INL shall be shipped outside of Idaho for storage or disposal within six months following treatment

Status of Cleanup at the INL Site

AMWTP Advanced Mixed Waste Treatment Project
Idaho Treatment Group, LLC

- Two-thirds of the original 65,000 cubic meters of stored transuranic waste have been shipped out of Idaho.
- Anticipate meeting the Idaho Settlement Agreement milestone of shipping all transuranic waste out of Idaho by September 30, 2015

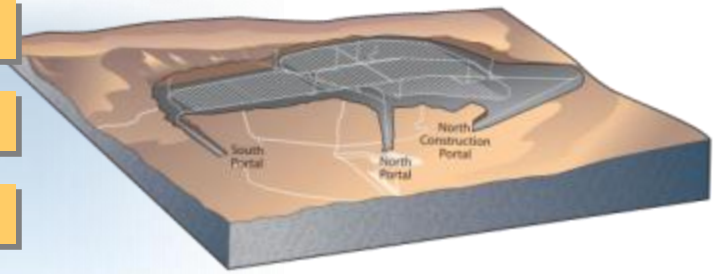
Idaho Cleanup Project

CH2M•WG IDAHO, LLC

- Much of the remediation of the Idaho site is complete.
- 73.8% of the of targeted transuranic waste has been removed from the Subsurface Disposal Area. DOE will meet its commitment under the settlement agreement of having the waste shipped out of state by 2018.
- Hot operations of the Integrated Waste Treatment Unit will begin this spring. This will remove and treat the final 900,000 gallons of liquid, sodium bearing waste by the Settlement Agreement milestone of Dec. 31 of this year. That will also allow DOE to complete closure of the high-level waste tank farm, as required by our agreements with the state.
- DOE must ensure the cleanup remedies are maintained and the groundwater is monitored to ensure cleanup effectiveness.

Yucca Mountain History

- Nuclear Waste Policy Act 1982
- Yucca Mountain only site characterized 1987
- Congress Approved Yucca Mountain 2002
- Design for License Application 2007
- License Application Submittal 2008
- Repository Supplemental Environmental Impact Statement 2008
- Nuclear Regulatory Commission Application Review, Docketed 2008
- NRC Construction Authorization 2011
- Start Repository Construction 2012
- NRC Issues License to Receive & Possess 2019
- 1st Phase Construction Complete 2019
- Begin Receipt and Emplacement 2020



- Yucca Mountain Nuclear Waste Repository Termination announced: **June 2009**
- U.S. DOE requests withdrawal of license application: **March 2010**
- Blue Ribbon Commission (BRC) Formally Chartered: **March 2010**
- BRC recommendations: **September 2011**
- Final BRC Report and recommendations: **January 2012**

The Yucca Mountain Decision:

Impacts to Idaho

- 300 MTHM used fuel currently in interim storage
- 4,400 cubic meters of high level waste in calcine-form (resembling laundry detergent)
- 900,000 gallons high-level waste in liquid form

…No path to disposition

Blue Ribbon Commission Recommendations on Used Fuel and High-Level Waste

Commission Charter

"Conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle, including all alternatives for the storage, processing, and disposal of civilian and defense used nuclear fuel, high-level waste, and materials derived from nuclear activities."

BRC Recommendations

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.

Schedule

Commission Formed:
March 2010

Visit to INL:
July 2010

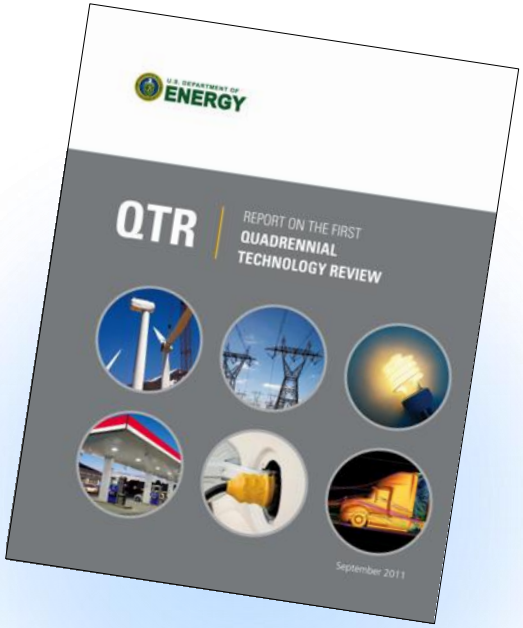
Draft Report:
September 2011

Final Report:
January 2012

Idaho should be a prominent participant — proposing practical solutions

Quadrennial Energy Review (QER)

- **In 2010 — President's Advisory Committee on Science and Technology recommended DOE lead a QER modeled after the Defense Department's Quadrennial Defense Review (QDR).**
- **In 2011— DOE developed a Quadrennial Technology Review (QTR), which is an important first step. It lacks details of policy, regulation, economics and the interagency coordination essential to a QER.**
- **QER is a step toward developing a national energy strategy. This is essential to providing a long-term perspective to our energy choices and the stability that comes with it.**



Governor Otter's Leadership in Nuclear Energy (LINE) Commission

Schedule

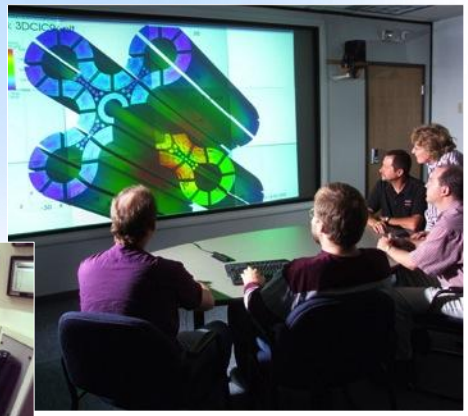
Commission Formed:
January 2012

Final Report:
January 1, 2013

- **Make recommendations to the Governor on Policies and actions of the State of Idaho to support and enhance long-term viability and mission relevance of INL.**
  - Identify opportunities to ensure research capabilities of INL continue to be important in Idaho's economic growth and our National Energy Security.
  - Review Idaho's efforts to provide a nuclear workforce development program and make recommendations for improvement.
  - Identify long-term issues relating to operations at INL.
  - Identify opportunities and investments in the Center for Advanced Energy Studies (CAES) that further INL's mission.
  - Identify infrastructure needs (roads, rail, electrical transmission, information technology) at INL.
  - Review the BRC report and identify appropriate roles and opportunities for the advancement of R&D at INL. Adhere to the long-standing position of the State, under the 1995 Settlement Agreement, that the State will not be a repository for spent nuclear fuel or high-level waste.
  - Evaluate policy options for strengthening the nuclear industries sector in Idaho.

Opportunities

- **Demonstrate National leadership at an important time:**
  - Yucca Mountain decision
  - BRC Recommendations
  - Forthcoming QER
- **Provide a key element of the National and International capability essential to mankind's future uses of nuclear energy.**
- **Take a long-term view of the burdens and benefits of Idaho's role as the home of the National Nuclear Laboratory.**



Idaho National Laboratory

The National Nuclear Laboratory