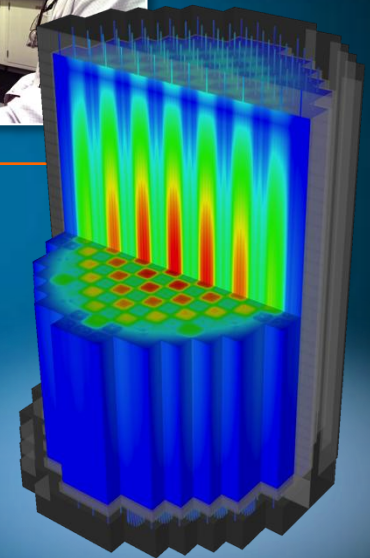
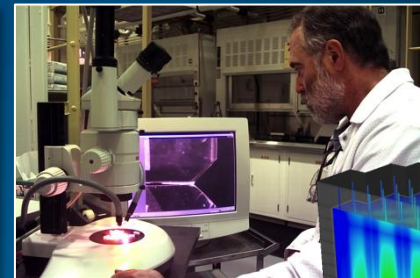


# Status of the MOA for Research Quantities of Commercial Used Nuclear Fuel



Shannon Bragg-Sitton

Nuclear Science and Technology

www.inl.gov



LINE Commission 2.0 Meeting  
Boise, ID – September 26, 2013

## *Purpose*

- **Provide background information and an update**

# *Relevant Terms of 1995 Settlement Agreement*

- **≤ 55 MTHM of DOE Spent Nuclear Fuel (SNF) allowed to be shipped into and stored at the INL between 2001 and 2035**
  - 261 tons was already in storage before 1995 and the additional ≤ 55 tons was agreed upon
  - Between 1995 and 2013: 27.87 tons have been shipped to and stored at INL, 0.08 tons have been shipped off-site (net: 27.79 tons into INL).
  - $55 - 27.79 = \mathbf{27.21}$  (tons of the agreed upon allowance remain)
  - Exception is permitted for quantities of any spent fuel in excess of agreement, but these additional quantities shall leave Idaho within 5 years of receipt
- **Other Requirements**
  - 20 truck shipments per calendar year – 1 rail shipment = 10 truck shipments
  - All DOE (including Three Mile Island) and Navy used nuclear fuel must be removed from the INL by January 1, 2035
- **Reporting**
  - Prior to Jan 1, each year, an estimate of the number of projected shipments and number of metric tons of DOE SNF to be shipped during the following calendar year
  - Prior to Jan 31, provide the actual number of shipments and metric tons of DOE SNF shipped during the preceding year
- **The 1995 agreement addressed the future of the INL as the DOE Spent Fuel Lead Laboratory. The importation of commercial used nuclear fuel was prohibited although some exceptions involving small quantities of commercial fuel have been made to support important research**

## ***2011 Memorandum of Agreement (MOA)***

- **MOA between the State of Idaho and the DOE signed Jan. 6, 2011**
  - Recognizes INL's role as the National Nuclear Laboratory
  - Grants a waiver to section D.2.e of the Settlement Agreement, prohibition on the shipment of commercial used nuclear fuel to the INL
- **MOA allows INL to bring “research quantities” of commercial used nuclear fuel into the State for use in specific research projects and requires specific controls and reporting**
- **Controls:**
  - Total cannot exceed 55 MTHM limit of used nuclear fuel allowed by the Settlement Agreement
  - Allows  $\leq 400$  kg HM per year, which counts toward the 55 MTHM
  - Any material shipped in that is dispositioned as waste can be subtracted from total
- **Library Storage for Future Research**
  - $\leq 10$  kg HM to retain existing samples for future research
  - Library limit counts towards the 55 MTHM limit of used nuclear fuel

# Reporting Requirements

## Annually by December 31:

- Source of used nuclear fuel
- Amount in each shipment
- Research purpose & authorization \*
- Schedule for completion \*
- Anticipated waste volume \*
- Potential disposition path for remaining SNF \*

## Annually by January 31:

- Total receipts of prior calendar year
- Total amount in library storage \*
- Source of material in library \*
- Amount per source or fuel type \*
- Anticipated future research for each source or fuel type \*
- Anticipated date of research for type and amount of material in library storage \*

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\* Specific to research quantities of Commercial used nuclear fuel

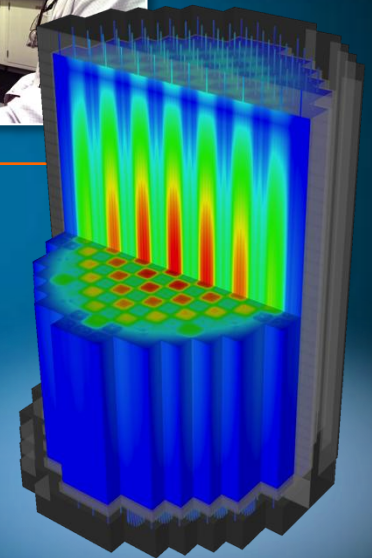
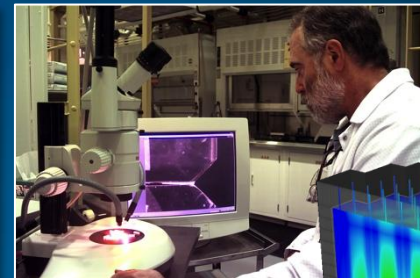
## Status Update

- **Since the MOA was signed, no commercial used nuclear fuel has been brought into the State**
- **Two shipments under this authority are being considered**
  - 4th Quarter CY-2014
    - **Amount:** 1 shipping cask containing up to 25 rods\* (~40-50 kgHM)
    - **From:** Commercial reactor to be determined
    - **Purpose:**
      - Support Cooperative Research & Development Agreement (CRADA) with Korea Atomic Energy Institute (KAERI) on fuel recycling studies (~20 rods)
      - Support industry fuel examinations (~5 rods)
  - 4th Quarter CY-2014 (earliest). More likely late CY-2015 or CY-2016
    - **Amount:** 1 shipping cask containing up to 25 rods (~40-50 kgHM)
    - **From:** Planned for North Anna (VA) nuclear reactor
    - **Purpose:**
      - Perform tests and post-irradiation examinations on ‘sister’ rods associated with cask and fuel storage research to support DOE’s Used Fuel Disposition efforts

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\* 1 PWR fuel assembly contains 200-300 rods. 1 PWR reactor core typically contains 150-200 assemblies (up to ~60,000 rods)  
1 BWR fuel assembly contains 74-100 rods. 1 BWR reactor core typically contains 800 assemblies (up to ~80,000 rods)

# High-Burnup Commercial Used Nuclear Fuel Storage Research Project



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[www.inl.gov](http://www.inl.gov)



LINE Commission 2.0 Meeting  
Boise, ID – September 26, 2013

## *Purpose*

- **Provide background on a near-term research opportunity for INL**
- **Initiate discussion among applicable leaders in State government to consider authorizing INL to receive the materials to conduct this research**



# ***Research is Needed to Advance Our Understanding of the Performance of Modern, Commercial Used Nuclear Fuel in Dry Storage***

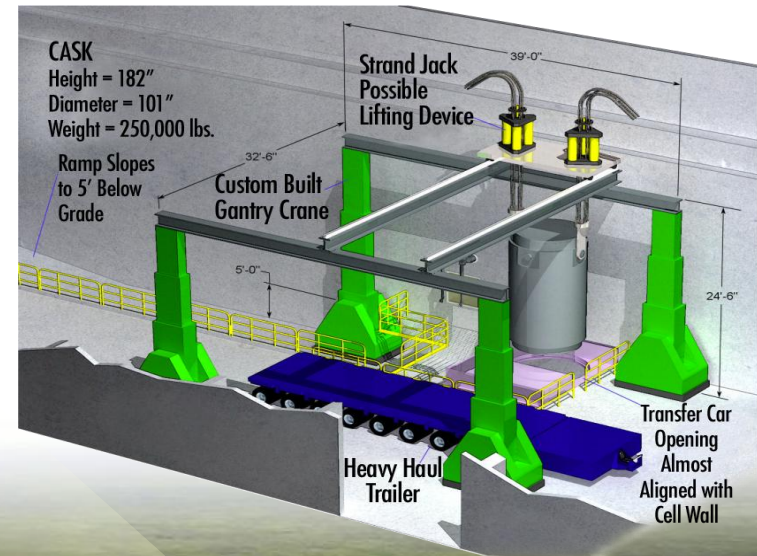
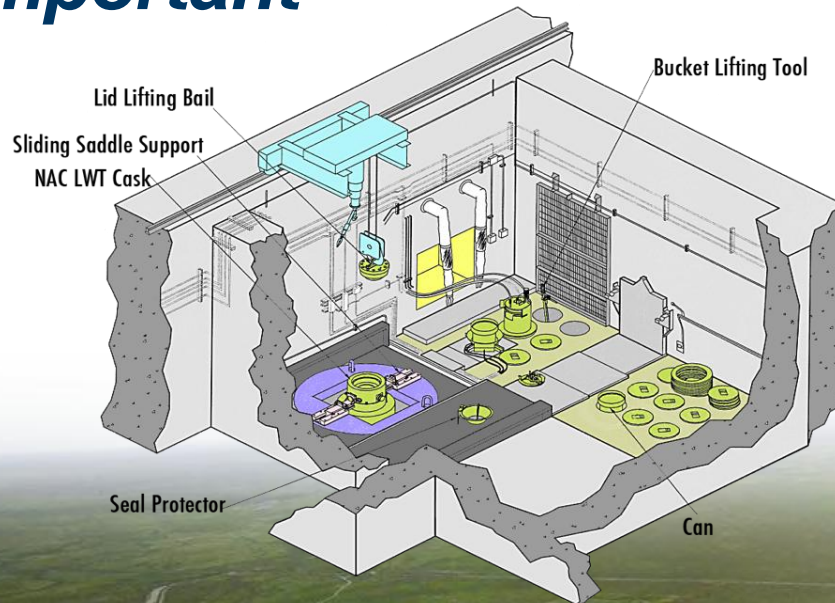
- **Due to uncertainty in the National used fuel disposition program, used commercial nuclear fuel will be in dry storage longer than anticipated**
- **There is limited knowledge about the performance of modern high-burnup\* commercial used nuclear fuel**
- **INL has the capabilities (people, facilities) to perform this important work. If not done here this work could be done somewhere else with significant expenditure of taxpayer dollars to build new facilities**

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\* Leaving fuel in a reactor longer so that more of the uranium is fissioned gets more energy out of the fuel. U.S. utilities have pursued this increased utilization in the last decades. Such fuels are called “high-burnup” and differ from used fuels that preceded.



# INL Has Unique Capabilities – Removing the Fuel from its Casks and Inspecting it Dry is Very Important



Idaho Nuclear Technology and Engineering Center (INTEC)

CPP-603  
Used Fuel Dry Storage

## ***INL has Done this Type of Work in the Past***

- ***Video of cask handling operations***

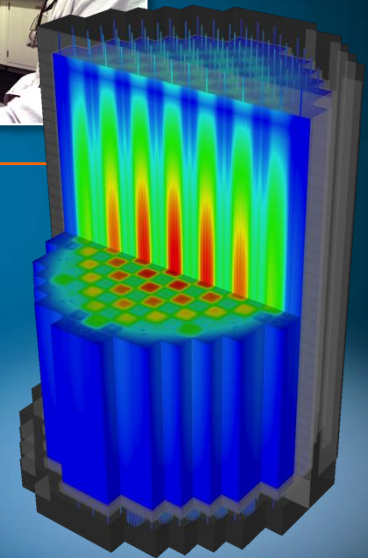
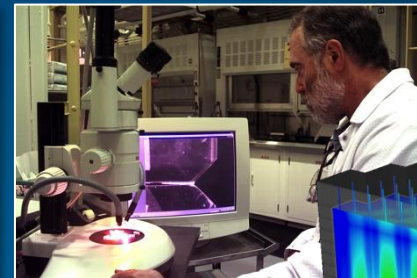
## ***Research Program Opportunities***

- **Potentially up to \$20M in 2014 with potential for growth in 2015 and beyond**
  - Small-scale testing using high-burnup commercial fuel rods and samples
  - Development of instrumentation to monitor dry storage casks
  - Development of intrusive inspection techniques for dry storage casks
  - Appropriate modeling and simulation
- **\$20M program has been awarded to EPRI (includes 20% cost-share)**
  - Load modern high-burnup fuel assemblies into a dry storage cask (~20 MTHM)
  - Remove the fuel for inspection every 5-10 years
  - Location where this research will be conducted is to be determined

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**INL has the capability to perform this research  
with minimal additional facility investment**

# *Transshipment of Commercial Used Nuclear Fuel*



**Shannon Bragg-Sitton**

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## *Purpose*

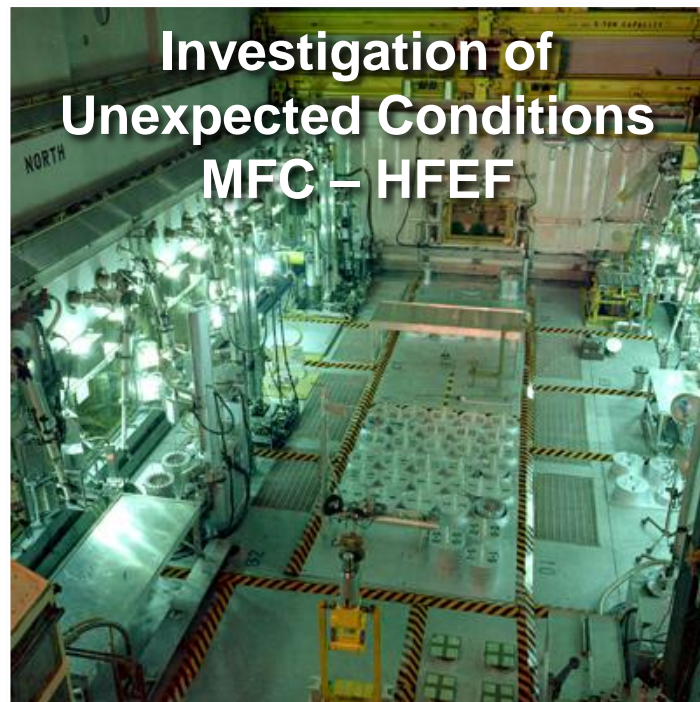
- **Introduce the concept of “Transshipment” of commercial used nuclear fuel to the LINE Commission**
- **Outline the research need and potential opportunity for Idaho and INL**

## ***U.S. Used Fuel Disposition Program***

- **Disposal in Yucca Mountain as a “workable” approach has been called into question**
- **What is certain is that:**
  - Commercial used nuclear fuel is going to be in dry storage longer than anticipated
  - Alternative disposal methods (deep bore holes) or even reprocessing may be considered in the future
  - It is important to define what is known, not known, and what information is needed about the condition and characteristics of commercial used nuclear fuel before it is packaged for final disposition
- **Examining commercial used nuclear fuel before its final packaging to provide that knowledge is “transshipment”**

## ***Why Consider Transshipment at INL?***

- **Work will be done somewhere and it is appropriate for the National Nuclear Laboratory**
- **INL has the capability today to begin this mission without significant expenditure of additional tax dollars elsewhere to duplicate facilities**





## ***Why Consider Transshipment at INL?***

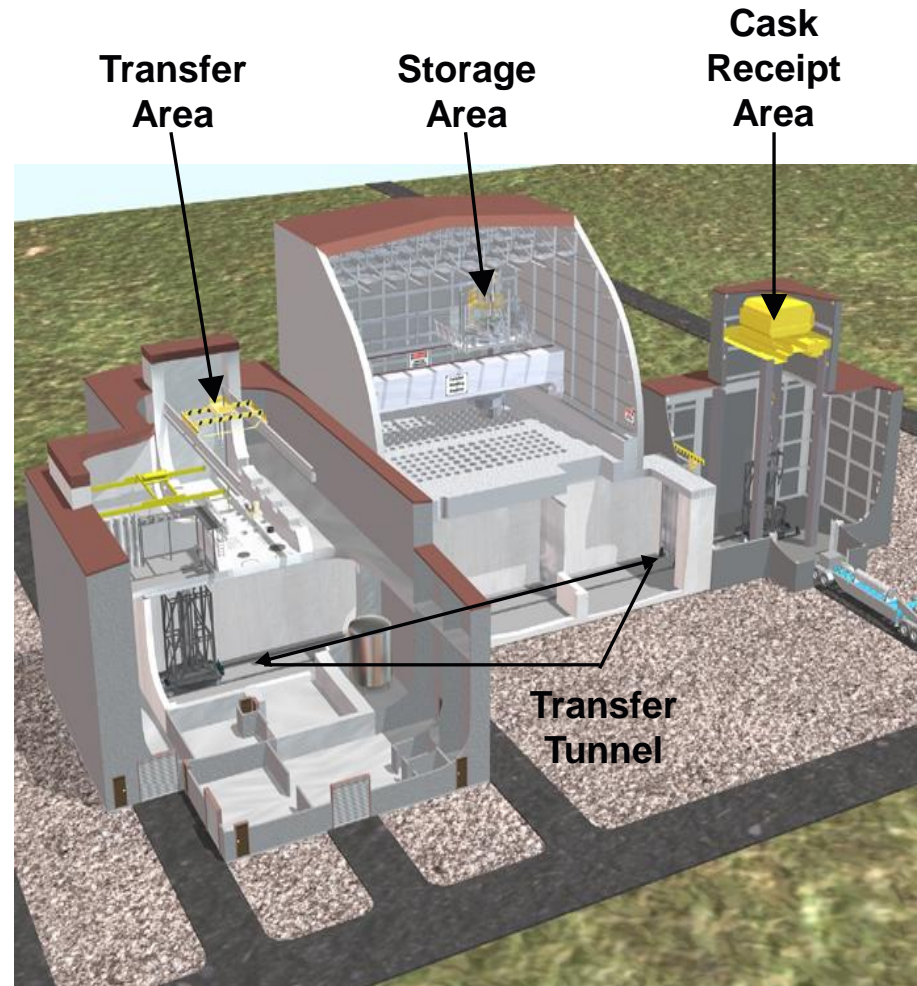
- **INL has an inventory of used fuel today that we could use to:**
  - Develop new instruments and inspection technologies
  - Prototype processes and procedures

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**INL could start today** with fuel that is in the State and needs to go through a “transshipment” process before final disposition outside of Idaho.

# Why Consider Transshipment at INL?

- **INL has an NRC licensed\* design for the next generation of transshipment facility**



\* Designed in 2001. Site-specific NRC license for construction and operation granted in 2004; transferred to DOE in 2009. We would likely modify/redesign today to better accommodate the commercial mission and associated research.

## ***Final Comments***

- **For commission information and discussion**
- **Transshipment of fuel currently stored at INL poses no new burdens and requires no new authorities**
- **Transshipment of fuel currently stored at INL neither commits the State nor assures INL of the mission to transship commercial used nuclear fuel**



Idaho National Laboratory

*The National Nuclear Laboratory*