



Idaho National Laboratory

# U.S. Domestic Reactor Conversion Programs

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4th WORLD TRIGA USERS CONFERENCE  
September 2008

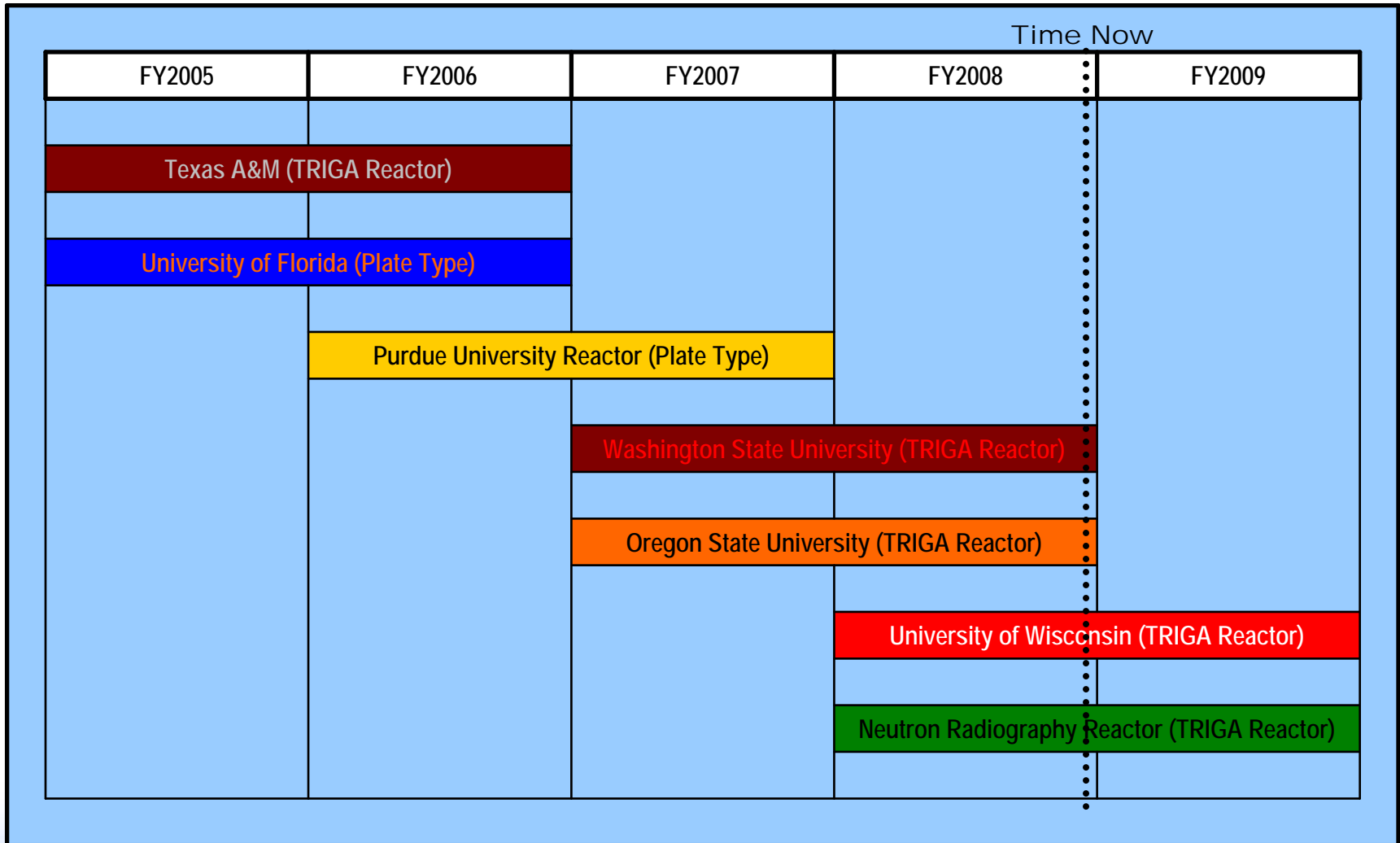
# The major entities involved are:

- **U.S. Nuclear Regulatory Commission**  
Multiple internal offices and departments, Brookhaven National Laboratory
- **University reactor department**  
Reactor operations, radiation protection, shipping, procurement, and others
- **Fuel and hardware fabricators**  
Oak Ridge Y-12, BWXT, CERCA, General Atomics, TRIGA International, other local machine shops
- **Spent fuel receipt facilities**  
Savanna River Site, Idaho National Laboratory
- **Spent fuel shipping services**  
Nuclear Assurance Corporation (NAC), Secured Transport Services (STS), Idaho National Laboratory
- **U.S. Department of Energy and their subcontractors**  
Idaho National Laboratory, Argonne National Laboratory, National Nuclear Safety Administration

# The Conversion Projects Include

- **Revision of the facilities safety basis documents and supporting analysis**
- **Fabrication of new LEU fuel**
- **Change-out of the reactor core**
- **Removal of the used HEU fuel (by INL University Fuels Program or DOE-NE)**

# Domestic University Conversion Projects:



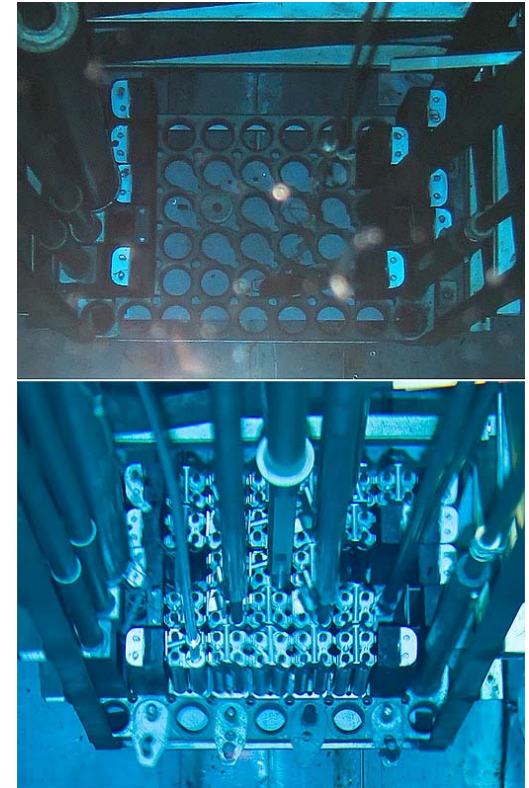
# Three major Reactor Conversion Program milestones have been accomplished since 2006

- The conversion of the TRIGA reactor at Texas A&M University Nuclear Science Center
- The conversion of the University of Florida Training Reactor
- The conversion of the Purdue University Reactor



# Texas A&M University Nuclear Science Center

- TRIGA conversion reactor, 1 megawatt
- Spent LEU core shipped before conversion
- Conversion milestone accomplished on 27 September, 2006
- Final HEU SNF shipment complete
- Unirradiated HEU element removed



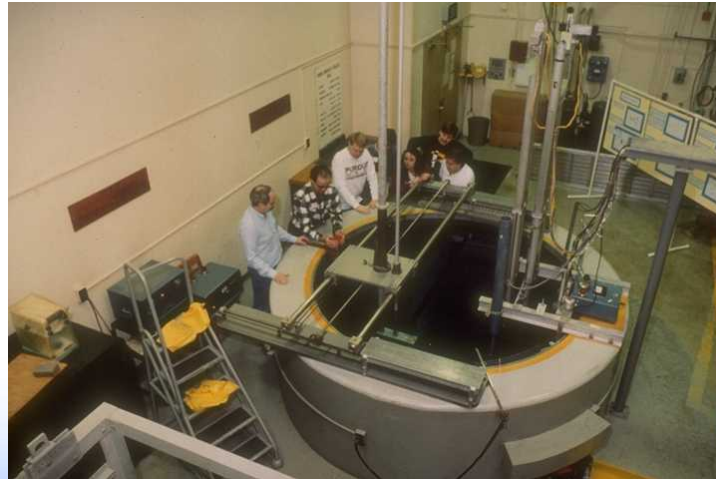
# University of Florida Training Reactor

- Argonaut type reactor, 100 kilowatt
- Spent core shipped before conversion
- Conversion milestone accomplished on Sept. 28, 2006
- Final partial rod assembly completed in August 2007



# Purdue University Reactor

- **LW moderated pool, plate fuel, 1,000 watt**
- **Spent core shipped**
- **Conversion milestone accomplished on 8/8/2007**





# Four Reactor Conversion Program milestones yet to be accomplished

- **Washington State University** Nuclear Radiation Center reactor  
September 30, 2008
- **Oregon State University** TRIGA Reactor  
September 30, 2008
- **University of Wisconsin** Nuclear Reactor  
September 30, 2009
- **Neutron Radiography Reactor Facility**  
September 30, 2009

# Washington State University Nuclear Radiation Center Reactor

- TRIGA conversion reactor, 1 megawatt
- Conversion Proposal under final consideration by NRC
- Fuel has been fabricated and delivered by TI
- Spent core to be shipped after conversion



# Oregon State University TRIGA Reactor

- TRIGA Mark II, 1.1 megawatt
- Conversion Proposal under final consideration by NRC
- Fuel has been fabricated and delivered by TI
- Spent core to be shipped after conversion



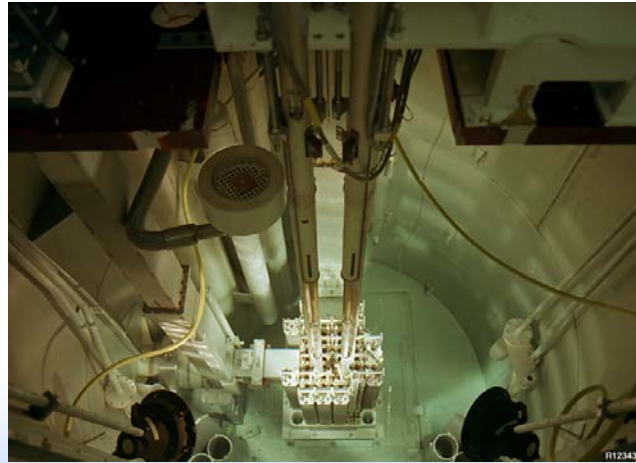
# University of Wisconsin Nuclear Reactor

- TRIGA conversion reactor, 1 megawatt
- Safety Analysis submitted to the NRC on August 29, 2008
- Fuel fabrication by TI began in August
- LEU SNF to be shipped before new fuel receipt
- HEU SNF to be shipped after conversion



# Neutron Radiography Reactor Facility

- TRIGA conversion reactor, 1 megawatt
- DOE regulated
- Safety Analysis work is underway
- Fuel fabrication to begin following UWNR
- Spent core to be shipped after conversion



# Lessons Learned Overview

**NNSA is committed to doing things cheaper, better, smarter, safer through a “Lessons Learned” process.**

- **The conversion team assessed each major activity grouping:**
  - **Project Initiation,**
  - **Conversion Proposal Development,**
  - **Fuel Fabrication and Hardware,**
  - **Core Conversion, and**
  - **Spent Nuclear Fuel Removal.**
- **Issues were identified.**
- **Recommendations were given.**

# Lessons Learned: Project Initiation

## Recommendations:

- Hold early “kick-off” meetings involving all of the Conversion Project Team members.
- Clarify roles and expectations during the kick-off meeting (especially as they relate to quality assurance and design review).
- Determine technical requirements for each of the major conversion activities.
- Establish a list of individuals who are involved with the major activities.

# Lessons Learned: Conversion Proposal

- **Recommendations:**
  - **Advise reactor personnel to begin early search for historical documents, drawings, etc.**
  - **Ensure all assigned parties participate in conversations that will impact them directly/indirectly.**
  - **Involve the NRC in the process as soon as possible**
  - **NRC discussed issues and questions with Licensee during the review. This practice eased the Request for Additional Information process.**



# Lessons Learned: Fuel and Hardware Fabrication

- **Recommendations:**
  - **Verify existing equipment because the drawings don't always match the existing configuration.**
  - **Ensure the university and the shipper communicate with regard to logistics, restrictions, tools needed, truck configurations, etc.**
  - **Inform the university early about the requirements for return shipment**

# Lessons Learned: Core Conversion

## Recommendations:

- **Provide for onsite expertise to resolve startup issues.**
- **Have detailed procedures for restart.**
- **Build slack time in the schedule for the unexpected.**

# **My two best recommendations to ensure success:**

- **Be inquisitive and investigate every detail.**
- **Plan and perform activities as early as resources allow.**