



Idaho National Laboratory

United States Domestic Research Reactor Infrastructure – TRIGA Reactor Fuel Support

Douglas Morrell

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Program Management

DOE HQ / Idaho Operations Office

Jim Wade

Idaho National Laboratory

Project Manager

Doug Morrell

Project Engineer

Tony Vinnola

Nuclear/Reactor Engineer

Bill Steinke

Quality Engineer - at Idaho

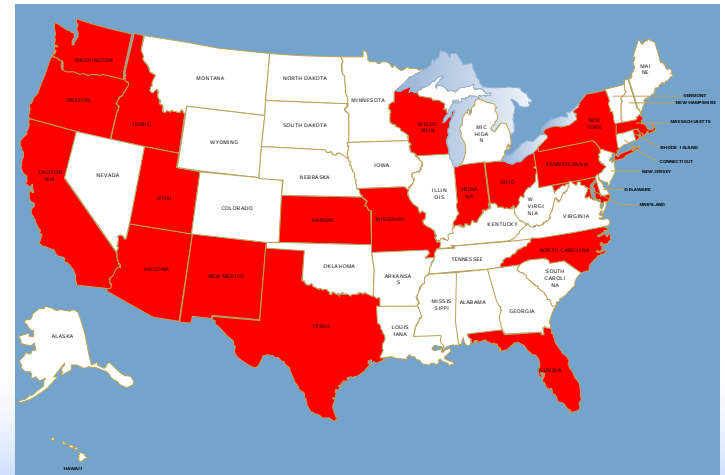
Dana Cooper

Purpose of Program

The purpose of the United State Domestic Research Reactor Infrastructure Program is to provide fresh nuclear reactor fuel to United States universities at no, or low, cost to the university. The title of the fuel remains with the United States government and when universities are finished with the fuel, the fuel is returned to the United States government.

The Research Reactor Infrastructure Program

- **Funded by the United States Department of Energy - Nuclear Energy division**
- **Managed by Department of Energy –Idaho Field Office**
- **Contracted to the Idaho National Laboratory’s Management and Operations Contractor - Battelle Energy Alliance**
- **Program has been at Idaho since 1977**
 - **INL subcontracts with 26 United States domestic reactor facilities**
 - **Thirteen TRIGA facilities**
 - **Nine plate fuel facilities**
 - **Two AGN facilities**
 - **One Pulsar fuel facility**
 - **One Critical facility**





United States Domestic University TRIGA Reactor Facilities



- University of Arizona
- University of California at Irvine
- Kansas State University
- University of Maryland
- Oregon State University
- Penn State University
- Reed College
- University of Texas at Austin
- Texas A&M University
- University of Utah
- Washington State University
- University of Wisconsin
- University of California Davis

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Anticipated Fresh Fuel Needs ***5 Year Outlook***

- ***Kansas State University***
 - ***4 to 6 Standard Elements (12 wt%, Stainless Steel)***
- ***University of California – Davis***
 - ***12 Standard Elements (20 wt%, Stainless Steel)***
- ***University of Texas – Austin***
 - ***10 Standard Elements (8.5 wt%, Stainless Steel)***
- ***Reed College***
 - ***75 Standard Elements (8.5 wt% Stainless Steel)***
- ***Penn State***
 - ***12 Standard Elements (20 wt%, 30 wt% Stainless Steel)***
 - ***2 Instrumented Elements (20 wt%, 30 wt % Stainless Steel)***
 - ***3 FFCR (8.5 wt%, Stainless Steel)***

Anticipated Spent Fuel Shipment Needs 5 Year Outlook

- ***University of Arizona***
 - ***98 fuel elements (Decommissioning scheduled for 2010)***
- ***University of California at Irvine***
 - ***107 fuel elements (If Decommissioned)***
- ***University of Texas – Austin***
 - ***48 fuel elements***
- ***University of California at Davis***
 - ***92 elements***
- ***Reed College***
 - ***58 fuel elements***
- ***Penn State***
 - ***54 fuel elements***

Challenges of Shipping Spent Fuel

- **University has not shipped fuel since 1968 and as such, we have no present procedures for shipping spent fuel.**
- **Floor loading rate unknown.**
- **Many interferences must be removed to allow direct access to the reactor tank.**
- **Floor space in the reactor cell is very limited.**
- **Pavement ends inside our fence; some of the surface is not finished. The whole approach is narrow, curving and downhill. A truck large enough to transport the cask cannot pull into the lot and then back out (nearly impossible / refused by drivers).**
- **A large capacity (100 ton), long boom crane would have to be used due to loading dock obstructions.**

Challenges of Shipping Spent Fuel

- **Access to the entrance door is on a sidewalk. The campus uses it as a road for construction equipment, deliveries and security response. Large trees are on both sides of sidewalk.**
- **Spent fuel shipments have never been done, no procedures approved or in place, no approved casks, no accident or safety analysis for spent fuel loading. Any cask assembly used in this facility will have to be removed from one crane, moved on the floor and then attached to another crane to get from the staging area to the reactor room.**
- **Reactor pool surface area is small (the cask could not be lowered into the pool) and entrance into the facility is limited.**
- **Facility entrance door is 7 feet tall by 5 feet wide.**
- **Crane limit is 1 ton.**

Lessons Learned

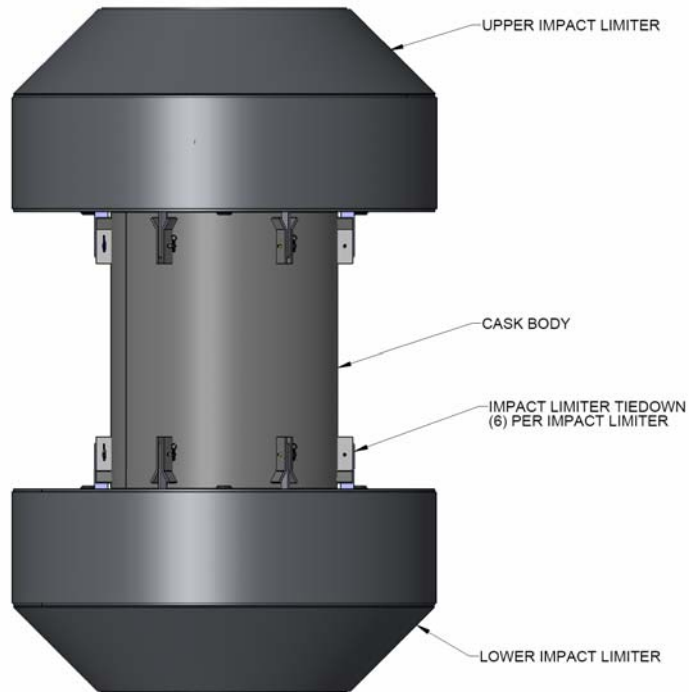
- **Costs associated with shipping spent fuel**
- **Shipper of record – authorized user of the cask**
- **Not a routine activity**
- **Preparation and approval of Required Shippers Data (RSD) forms – fuel history**
- **Appropriately trained personnel available**
- **Support equipment available**
- **Uncertainty of dose rates**
- **Door sizes**
- **Floor loadings**
- **Overhead crane availability / reliability**
- **Last minute surprises**

Spent Fuel Shipping Casks (NAC-LWT)



- Versatile cask for use at research and commercial reactor facilities
- Meets all USNRC, DOT and IAEA requirements (-96)
- Lease costs include experienced and certified support personnel
- Dry transfer system available for loading of fuel at reactor facilities that are not capable of direct loading into the NAC-LWT cask
- Provisions for damaged fuel elements – screened and sealed canisters

Spent Fuel Shipping Casks – (DOE Owned)



- Design and Fabrication performed by AREVA Federal Services
- Design derived from AFS' Sterigenics Eagle Cask, NRC Docket 71-9287
- Designed for both wet and dry loading/unloading operations
- Cask consists of body, closure lid, shield plug, impact limiters, and spent fuel baskets

SNF Cask Comparisons

	<i>NAC-LWT</i>	<i>DOE owned Cask</i>
<i>TRIGA element capacity</i>	<i>140 elements</i>	<i>19 elements</i>
<i>Overall length</i>	<i>199.80 inches</i>	<i>74 inches</i>
<i>Overall diameter</i>	<i>44.20 inches</i>	<i>38 inches</i>
<i>Cavity length</i>	<i>180.90 inches</i>	<i>54 inches</i>
<i>Cavity diameter</i>	<i>13.37 inches</i>	<i>16 inches</i>
<i>Weight – loaded cask with impact limiters</i>	<i>51,200 pounds</i>	<i>~31,000 pounds</i>

Requests for Assistance

- ***Future requests for fresh fuel or spent fuel shipments need to be communicated to program office – Provide documentation to justify request (E-mail notification preferred)***
- ***Other university concerns or assistance to be communicated to program for consideration into future plans for DOE funding***

Future Challenges

Sufficient Funding For:

- New fresh fuel for recurring fuel needs***
- Spent fuel shipments***

Questions?