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ABSTRACT

The TN-7/2 cask was historically received into the Savannah River Site (SRS) Receiving Basin for Offsite Fuels (RBOF) and the spent nuclear fuel (SNF) it transported was unloaded and bundled for storage. Due to L-basin's physical limitations, RBOF continued receiving the TN-7/2 even after L-basin was designated as the primary SRS SNF wet storage basin.[1] Re-bundling the SNF received in RBOF and transferring it to L-basin was counterproductive to the RBOF deinventory effort.[2] Since the TN-7/2 casks are an important part of the ongoing foreign research reactor (FRR) SNF receipt program, Westinghouse Savannah River Company (WSRC) developed and implemented an approach for unloading the TN-7/2 in the SRS L-Area basin.[3] Several benefits were achieved with the completion of this effort. Foreign research reactors and shippers benefit from continued receipt of the TN-7/2 cask at SRS and risk for contamination on the cask exterior is reduced since L-basin water has lower contamination levels than RBOF. Benefits to SRS included the reduction in personnel exposure by eliminating double handling of SNF and support of RBOF deinventory efforts. The first TN-7/2 cask was unloaded in L-basin in November of 2000. In January of 2001, the empty casks were received at ANSTO, in Australia, and radiological surveys confirmed non-fixed surface contamination levels were well within IAEA and DOT transportation limits.

INTRODUCTION

From 1997 through 1999, several instances occurred where the next facility receiving the empty TN-7/2 cask directly from RBOF found, at receipt, non-fixed contamination levels on the surface of the cask exceeding DOT/IAEA limits for transportation. After each instance, WSRC-SFSD reconfirmed that pre-shipment survey results were below non-fixed surface contamination limits at the time the casks were offered for transportation. SFSD critiqued each occurrence with all involved parties and applied increasingly more stringent decontamination measures and enhanced cask handling procedures in an attempt to correct the problem.

RESOLUTION OF TN-7/2 CONTAMINATION ISSUES

In January of 1999, after notification of higher than allowable contamination levels upon receipt of the empty TN-7/2 casks at ANSTO, a multi-functional team including RBOF operations, Health Physics, Engineering, and Fuel Integration met to discuss possible actions to resolve the problem. The team developed a list of all feasible options for correcting the problem and rated the following actions as the most cost effective while having the highest probability of success:

- Polish/paint the unpainted cask surfaces and electro-polish the trunnions
- Return ship the empty cask as a limited quantity of radioactive material inside a new IP-2 container
- Unload the cask in L-Basin
- Fabricate a new lifting yoke with soft metal inserts to minimize scratching the trunnions
- Enhance RBOF cask handling and decontamination practices

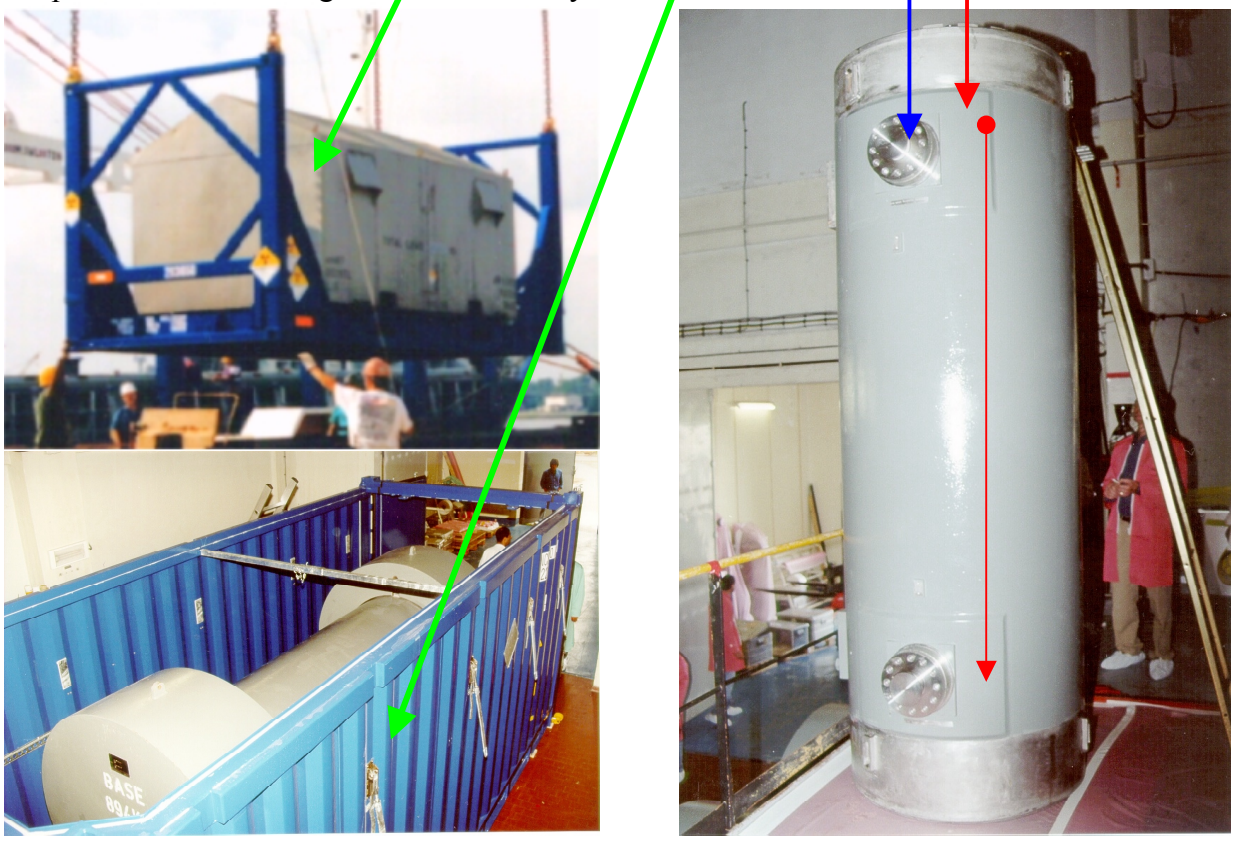
In February 2000, SFSD met with the cask owners, Nuclear Cargo and Service (NCS), to discuss the actions identified by SFSD and to develop a mutually agreed upon plan for resolving the contamination issue. The two-day meeting attended by DOE-SR, NCS, RBOF Operations, Health Physics, Engineering, Fuel Integration, Hazardous Material Transportation, and Transport Logistics International successfully identified fifteen actions for SFSD and NCS to evaluate. After evaluation, SFSD and NCS agreed to implement the following corrective actions:

WSRC-SFSD

- Ship the empty TN-7/2 using the new ISO container as the package with the cask as the contents.
- Continue to decontaminate the exterior of the cask to <20 dpm/100cm2 alpha and <200 dpm/100cm2 beta/gamma (ten times lower than the DOT non-fixed contamination wipe limit)
- Implement several cask handling enhancements to limit the exposure of the cask to the RBOF basin waster.
- Run the RBOF Filter Deionizer (FD) system on a best effort basis to keep basin water activity as low as possible (100 to 300 dpm/ml).
- Fabricate a new lifting yoke with soft metal inserts to minimize scratching the trunnions

NCS

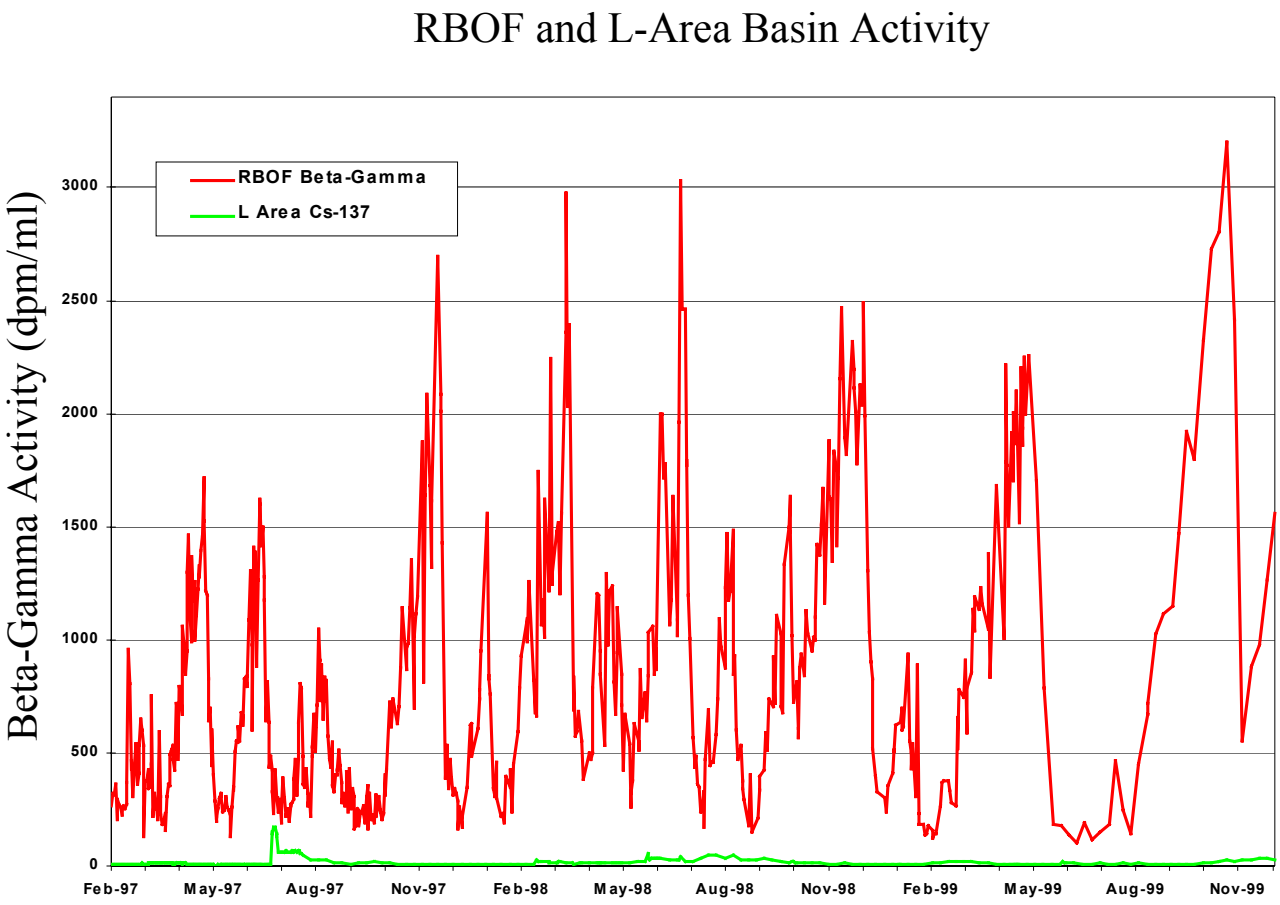
- Install new top trunnions on the cask
- Paint all four trunnion mounting plates
- Replace the TN-7/2 'dog-house' with a fully enclosed ISO container



SRS L-BASIN MODIFIED TO RECEIVE THE TN-7/2

Up to this time, L-basin was capable of receiving all of the cask types (See Attachment A) used in the FRR and DRR SNF return program except for the TN-7/2. Due to the height of the TN-7/2, it could not be unloaded in the –17' elevation of the L-area Transfer Basin. Also, structural steel in the Transfer Basin, used to handle the SRS 70-ton cask lid, was physically blocking the way for unloading the TN-7/2 in the deeper –20' elevation. Due to these L-basin physical limitations, RBOF continued receiving the TN-7/2 even after L-basin was designated as the primary SRS SNF wet storage basin. SNF received in RBOF had to be transferred to L-basin using the SRS 70-ton cask, which was counterproductive to the on going deinventory of RBOF.

In parallel with the SFSD and NCS actions to resolve the TN-7/2 contamination issues identified above, SFSD also investigated the possible methods and impacts of receiving the TN-7/2 cask in L-Basin. Receipt of the TN-7/2 directly into L-Basin was attractive because L-Basin water activity can be maintained factor of 100 to 1000 times lower than RBOF basin water (depending



on RBOF FD system operation). Also, direct receipt in L-Basin would eliminate transfers (double handling) of SNF from RBOF to L-Basin accelerating RBOF deinventory. Past

assessments of receipt of the TN-7/2 cask in L-Area had determined capital modifications to be too costly and presented significant impacts to the SRS FRR and DRR SNF receipt schedule. However, a new reduced scope proposal was assessed by SFSD and yielded a cost-effective proposal that allowed unloading of the TN-7/2 in L-Area with limited facility modifications. SFSD's resulting proposal to receive the TN-7/2 cask in L-Basin was submitted to DOE-SR and approved. The equipment and facility modifications needed to receive the TN-7/2 included:

- Design and install new cask rigging utilizing the 30 ton disassembly crane
- Changing the 85/30 ton crane PLC to allow a new flight path for the TN-7/2
- A new fuel chute to move fuel assemblies from the TN-7/2 through obstacles in the basin
- A new work platform for operators to unload the TN-7/2 cask

New Rigging

The new rigging will allow the following TN-7/2 cask handling operations:

- Engage the horizontally oriented cask
- Pivot the cask on the lower cask trunnions and raise the cask to the vertical position
- Rotate the cask to orient the lifting trunnions into an east-west position
- Place the cask on the –20' Disassembly Transfer Basin elevation
- Remotely disengage and reengage the lifting trunnions from the cask once lowered to the –20' elevation

85/30 Ton Crane Flight Path

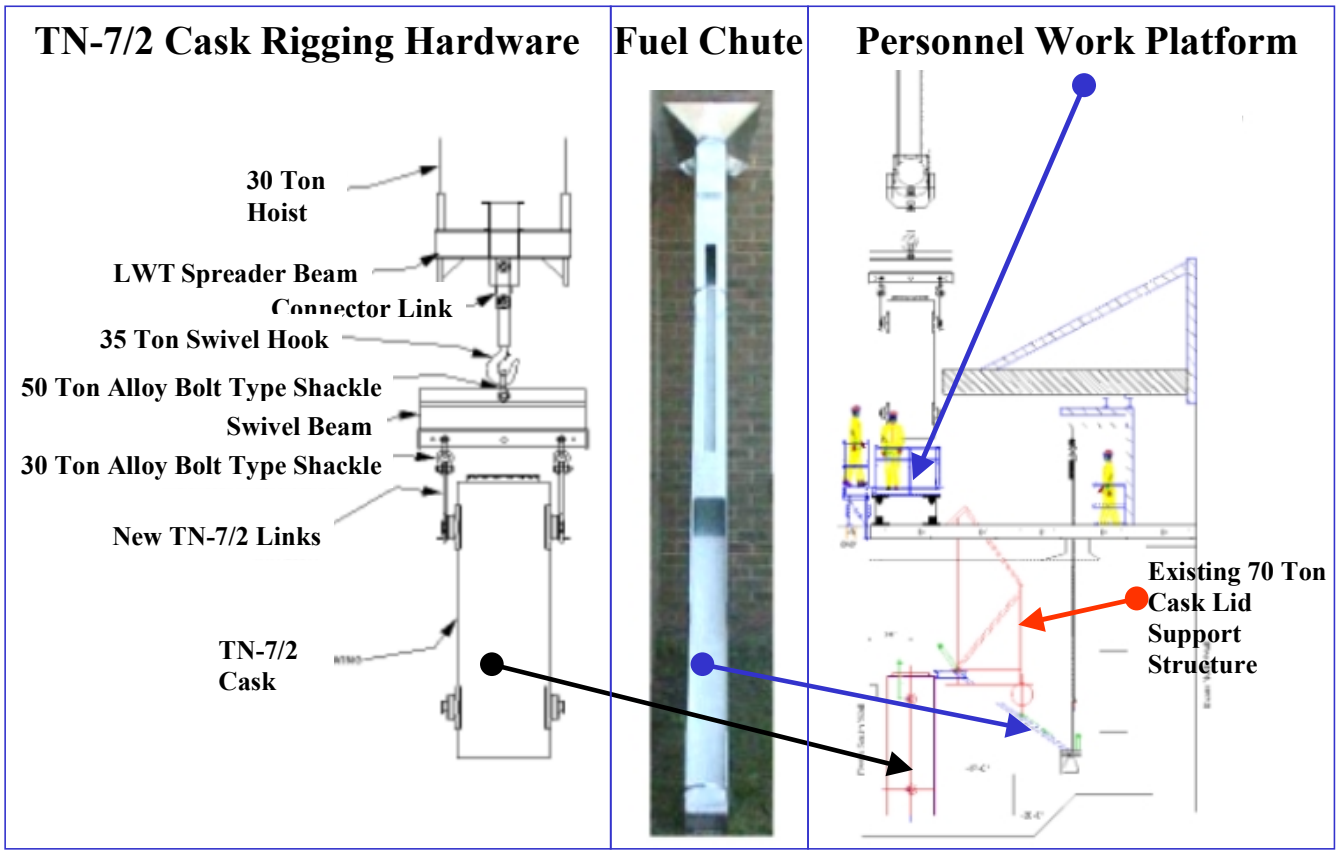
- Revise the Programmable Logic Controller (PLC) to permit the existing 30 ton crane to travel in the needed 'flight path' to place the TN-7/2 on the south side of the 70-ton cask lid support structure.

New Fuel Transfer Chute

- Allow an individual fuel element to be moved from the south side of the 70-ton cask lid handling structure at the –9' elevation to the north side of the structure and –17' elevation.
- Capable of being removed and installed from the operator work platform and not interfere with any other type cask unloading operations.

Removable Platform

- Capable of being lifted into and removed from the area spanning the Disassembly Transfer Basin using the existing 85/30 ton crane and 70-ton cask rigging system.
- Utilize a removable handrail system to allow operations personnel various access points as required to support fuel unloading operations.
- Permanently installed platform supports shall not interfere with any other type cask unloading operations.

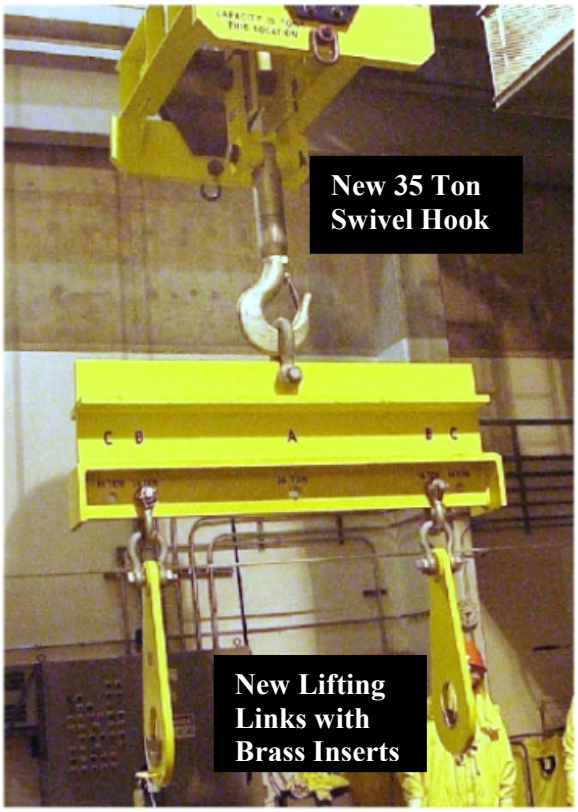


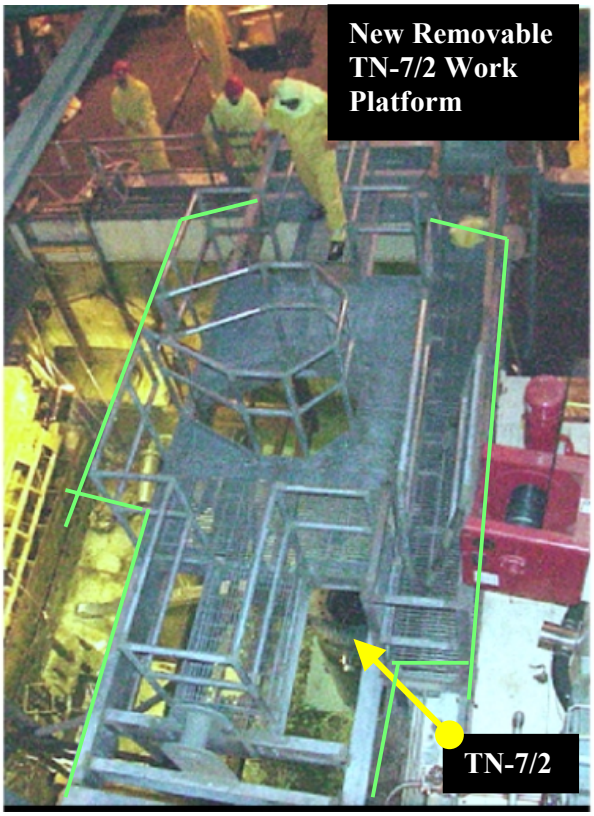
It was then determined that an accelerated installation schedule was needed to implement the proposal in time to benefit from receiving the TN-7/2 cask in L-Basin. The modifications were completed in October of 2000 and the first TN-7/2 was successfully unloaded ahead of schedule.

Description of the New TN-7/2 Handling Process in L-Basin

The cask arrives at the L-Area Transfer Bay where removal of the ISO cover and cask impact limiters takes place while the cask remains in the horizontal position,. The cask is then lifted to the vertical position and set on the transfer bay floor using the 30-ton crane. The cask is vented, sampled, and lid bolts are loosened in preparation for entry into the basin. The 30-ton crane, using the TN-7/2 flight path, is used to place the cask on the –20' basin floor to the south and center of the 70-ton cask lid support structure. The new fuel chute is maneuvered into position through the 70-ton cask lid support structure. The new removable work platform is lowered into place for the operators to perform fuel unloading activities. A chainfall, attached to an existing spreader beam, is used to remove the cask lid and raise the fuel baskets to the top of the cask. The operator removes a piece of fuel and places it on the fuel transfer chute. The fuel is moved

through the chute to the –17' elevation where it is identified and placed into a fuel transfer bucket. The process is then repeated until all the fuel is unloaded and stored.





The modifications to L-Basin and to the casks were successfully demonstrated with the unloading of the TN-7/2 in November 2000. The empty casks were then shipped to Australia with the Australians finding no transferable surface contamination levels above allowable transportation limits. Benefits achieved with the completion of this effort include:

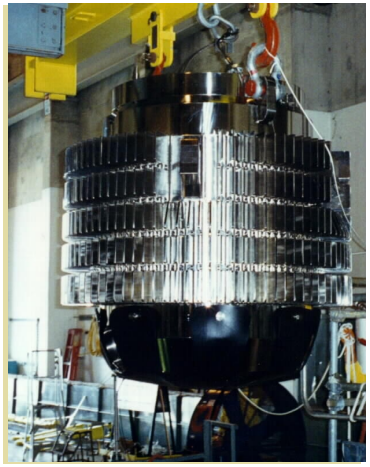
- SFSD Operations reduced the time needed to decontaminate the cask since L-Basin water has significantly lower contamination levels as compared to RBOF.
- SFSD reduced operator radiological exposure by elimination of double handling of SNF
- NCS and FRR operators can continue to use this cost-effective cask for return of SNF to SRS
- NCS and DOE reduced the risk for cask surface contamination levels increasing above transportation limits during shipment
- DOE will save millions of dollars over the life of the FRR SNF return program due to SFSD's accelerated deinventory of RBOF.

REFERENCES

1. WSRC, Savannah River Site FY2001 Spent Nuclear Fuel Integrated Management Plan, WSRC-RP-2000-00883, October 2000
2. WSRC, RBOF De-Inventory Planning Analysis, WSRC-RP-99-00585, July 1999
3. WSRC, TN-7/2 Cask Handling Upgrade, Building 105-L, C-CDP-L-00002, May 2000

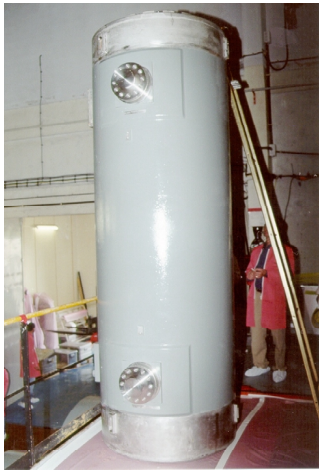
Attachment A: Typical FRR Program Casks Received in L-basin

Cask: BMI-1
Owner: DOE
Max. Capacity: 12 MTR
Fleet size: 1



Cask: 18.5T
Owner: JAERI,KUR
Max. Capacity: 30 MTR
Fleet size: 4,2

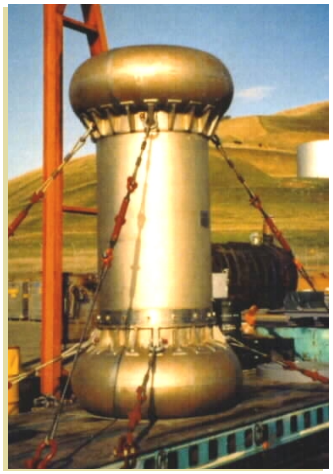
Cask: 20T
Owner: JAERI
Max. Capacity: 30 MTR
Fleet size: 2



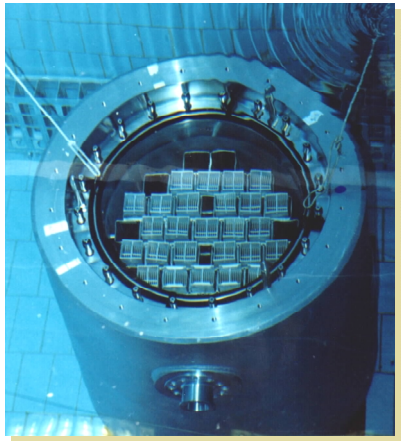
Cask: TN-7/2
Owner: NCS
Max. Capacity: 64 MTR, 60 DIDO
Fleet size: 2

Cask: LWT
Owner: NAC
Max. Capacity: 42 MTR
Fleet size: 5

Cask: GNS-16
Owner: NCS
Max. Capacity: 33 MTR, 28 DIDO
Fleet size: 2

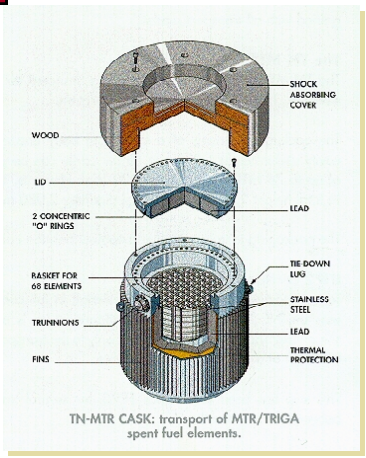


Cask: GE-2000
Owner: GE/DOE
Max. Capacity: 42 MTR, 1 HFIR Core
Fleet size: 3: 2 (GE), 1 (DOE)



Cask: GNS-11
Owner: NCS
Max. Capacity: 33 MTR ,28 DIDO
Fleet size: 2

Cask: LHRL-120
Owner: ANSTO
Max. Capacity: 120 ANSTO (DIDO)
Fleet size: 1



Cask: TN-MTR
Owner: Transnucleaire
Max. Capacity: 68 MTR, 52 DIDO
Fleet size: 3