NCS experience in the Shipment of Spent Nuclear Fuel to US-DOE

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Abstract

On May 13, 1996 the US-Department of Energy issued a Record of Decision on a "Nuclear-Weapons Non-proliferation Policy concerning Foreign Research Reactor Spent Nuclear Fuel (FRR SNF)". The goal of the long-term policy is to recover enriched uranium exported from the United States by May 12, 2009.

Within this program NCS is one of the companies who arranges the complete service which includes cask rental, cask loading, shipment by road, rail, sea or air to make the program successful.

NCS was involved in the management of the shipments from Europe, South America, Australia and Japan. Each shipment has proven to be unique in some aspect and the lessons learned from each of these shipments have been incorporated to make future shipment go more smoothly.

The purpose of this presentation is to show you the possibilities NCS has to offer in order to ensure that these transport operations can then be carried out with successful results.

NCS-overview

NCS was founded in 1985, the common stock amounts to 10 million DM. The head office of the company is Hanau/Germany.

The objects of the company are: To carry on the business of forwarding, shipping, commission agency, packaging services, insurance brokers and other operations, particularly services in the nuclear sector.

The NCS business site with offices, secured truck parking lot and warehouse for the interim storage of contaminated containers and equipment as well as maintenance facilities are situated at Hanau, which provides the necessary infrastructure with security and medical services, as well as protection against radiation.

NCS has a staff of 84 persons with long-standing experience in the field of packaging and transport of dangerous goods, and particularly radioactive goods.

NCS international

To ensure a continuous supply of electric energy is a global challenge. Today and in the future close international co-operation is the key to achieve this task.
The international fuel cycle is highlighted by special standards and extremely high requirements, calling for reliable as well as qualified enterprises to solve the logistic problems of this "hard to please" industry.

⇒ NCS has the necessary know-how and up-to-date information in front-end as well as back-end areas, to find practical solutions for all transport problems.

⇒ In all major countries with a nuclear industry, NCS is represented by experienced and well known partners qualified to arrange nuclear transports in a smooth and reliable way in accordance with the law and the regulations of the respective country. In addition to that, NCS has offices in Almaty/Kazakhstan, Amsterdam/Netherlands, Beijing/China, Burtonsville/USA, Cairo/Egypt, Montélimar/France and in St. Petersburg/Russia.

⇒ NCS offers comprehensive transport solutions optimised safety- and costwise.

When it was known that the US Department of Energy (DOE) was again taking back fuel assemblies from research reactors containing fuel of American origin, it became clear for us that here was a challenge to the transport providers and the owners of transport packages, in order to assure the success of the 10 to 13 years programme. In this respect, NCS reached an agreement with the GNS company - Gesellschaft für Nuklear-Service mbH (Company for Nuclear Services Ltd.), which is specialised in the disposal and removal of waste and spent fuel, and especially in providing, obtaining the approvals and in handling transport packages, to work together within the scope of a consortium in the field of nuclear transports for research centres and research reactors (NCS/GNS Consortium). The objective is to provide all services from one hand and to manage projects without interface problems, to the advantage of the customers. For this purpose, the members of the consortium will pool their specific knowledge and use their respective packages and equipment in common.

Transport casks

The following transport casks, which are approved according to 85 - IAEA Regulations, are available:

1.) TN 7-2

This cask, of which 2 exist, has a maximum transport capacity of either 64 cut square section MTR fuel assemblies or 60 cut round section MTR fuel assemblies, the weight of the cask being 21 t. The U-235 enrichment varies from 20 to 93 % according to the type of fuel. The fuel assemblies are loaded under water into the transport baskets. These are then placed one above the other in the cask. Due to the weight of the cask, the latter can only be used in ponds which have sufficiently powerful cranes. A 20' Open Hard Top Container is used to transport the TN 7/2 so that transfer from road to rail or ship causes no problems.

2.) GNS-11

The GNS-11 has a maximum transport capacity of 33 square section or 28 round section MTR fuel assemblies, the maximum cask weight being 11.5 t. The U-235 enrichment again varies from 20 to 93 %, according to the type of fuel assemblies.
Due to its relatively small weight of 11.5 t, this cask can be used in very many facilities. There are 2 of these casks.
The GNS-11 is transported in 20' Open Hard-Top Container.

3.) GNS-16

The GNS-16 cask which is in operation since May 1998 has the same capacity for MTR fuel assemblies as the GNS-11. The total weight of the cask including the shock absorber is about 15,3 t.
The cask is also approved for up to 90 TRIGA fuel assemblies with an enrichment of U-235 of 21 %.
The loading of TRIGA fuel assemblies will be carried out by means of so-called transfer baskets which can take 3 to 6 assemblies each.
These transfer baskets are then loaded into the 15 transport shafts.

Transfer station

We all know that there are research facilities which cannot handle weights of 12 t or more. We offer a transfer station, so as to assure the removal of spent fuel from such centres too.

The transfer station includes:

- the loading lock
- the adapter plate
- the water tank
- the transfer cask.

The fuel assemblies are loaded into the ready “transfer baskets” and transported to the loading lock, using the transfer cask. When MTR fuel assemblies must be loaded, the transfer cask can take 1 MTR fuel assembly at a time. If the transfer cask is in position on the loading lock, the “transfer basket” may be lowered into the basket shaft of the GNS 16 package by opening the slide door of the loading lock and the rotating lock of the transfer cask.

During the transfer procedure, the transfer basket or the MTR fuel assembly is attached to a suitable gripping device.

When all basket positions have been loaded, the water tank is set onto the adapter plate and filled with water, in order to allow for the removal of the loading lock. The shielding lid of the GNS 16 package is then set on, the water is removed by aspiration and the water tank is removed.

The GNS 16 is then emptied and dried, after which a leak check is performed.

The transfer station was used to remove the fuel assemblies from the research facilities of IPEN, Sao Paulo, FRM-Munich and DKFZ-Heidelberg.

Maritime Transport

As far as maritime transport is concerned, the International Maritime Dangerous Goods (IMDG) Code was supplemented in early 1995 by the INF code laying down stringent requirements for ships carrying irradiated nuclear fuel, plutonium or high-level radioactive waste.

For the transport of MTR or TRIGA fuel assemblies, one may assume that the activity limit of the total load for INF2, from 4 PBq to 1000 PBq, will be easily reached if transport combinations are foreseen (up to 16 casks per ship load).

The INF Code is implemented in numerous countries where the IMDG Code is considered as the basic regulation for international maritime transport. This Code covers matters concerning ship's design, construction and equipment. The requirements of the INF code and the decision of the DOE to use military ports in the USA, de facto exclude the use of routine liner services.

Taking these facts into account, NCS has decided to qualify "MV ARNEB" as an INF2 ship together with a German shipping company.

The particularity of MV ARNEB is that the complete unit (vehicle + cask) can be driven into the cargo hold (Ro-Ro), thus keeping transfer times low. In ports which have no Ro-Ro ramps, the casks can of course be lowered with a crane into the cargo hold. In the meantime, NCS has transported fresh MOX fuel assemblies from BNFL/England to a German nuclear power plant, and MOX fuel pins from Hanau to Dounreay with MV ARNEB.

Within the scope of the US-DOE program, the ship MV Arneb has been used 7 times since 1997.

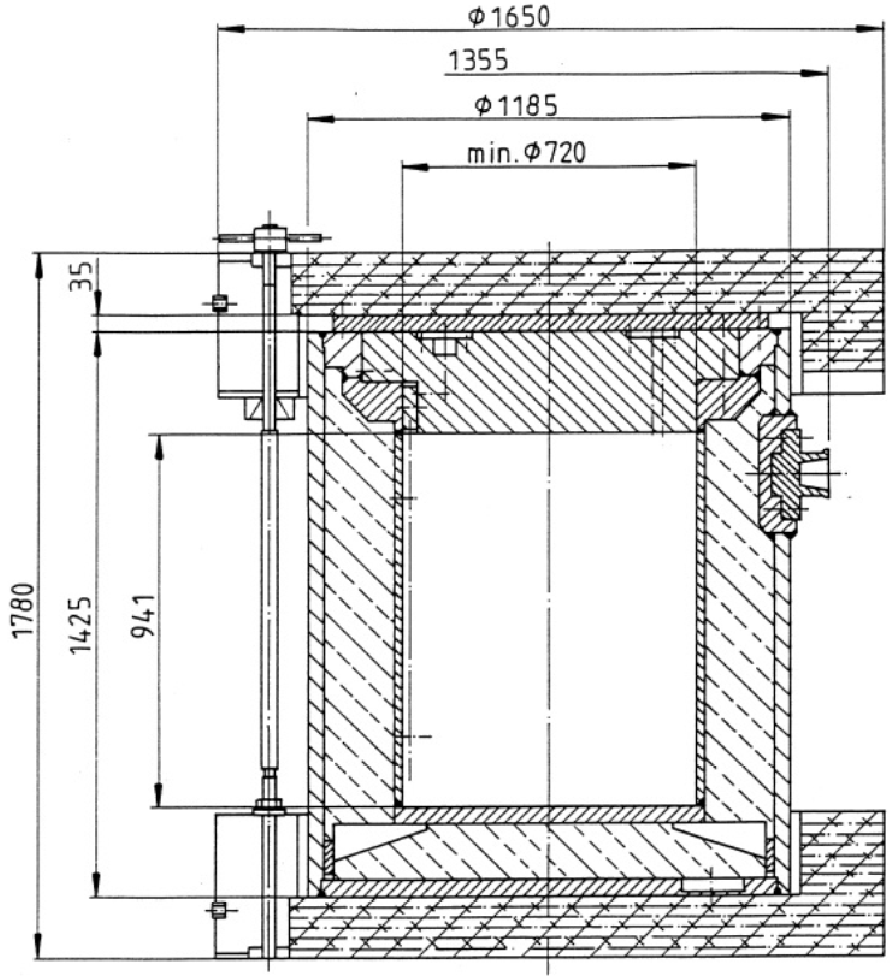
Conclusion

So far, NCS could transport approximately 1400 MTR-fuel assemblies of the total amount of 3400 to Savannah River Site, using the mentioned transport packages and without any trouble.

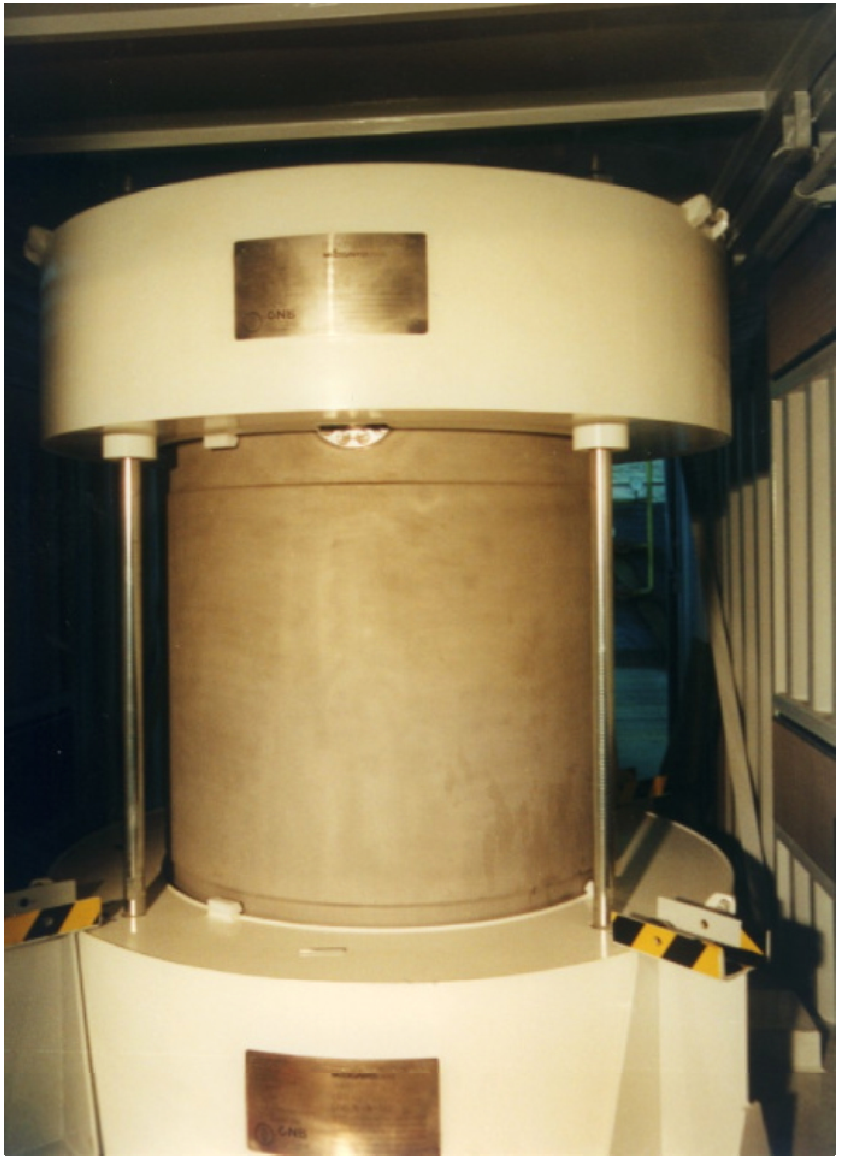
To the Idaho Falls Site we could ship 202 TRIGA fuel assemblies in 2 shipments. NCS not only provides advice for all transport and handling problems, NCS also carries out the transports.

Handling of cask “TN 7-2” at research center

Transport of cask “TN 7-2” on 20ft. flat



Cask “GNS 11”



Cask “GNS 16” in the 20`-Transportcontainer

Transfer of TRIGA fuel into the „GNS 16“ at DKFZ Heidelberg

Preparation of the cask lid

“MS-ARNEB” and Security vehicle

„MV ARNEB“ with loaded Containers