

SPENT FUEL TRANSPORT EXPERIENCES IN JAPAN

Masateru Mori

Nuclear Fuel Transport Co., Ltd.

1-1-3 Shiba Daimon, Minato-ku, Tokyo, 105-0012 Japan

SUMMARY

It is a basic national policy to reprocess spent fuel generated at nuclear power stations. Following this policy, the Power Reactor and Nuclear Fuel Development Corporation (currently, Japan Nuclear Cycle Development Institute (JNC)) has been operating a reprocessing plant in Tokai-mura, Ibaraki Prefecture since 1977. However, since the capacity of the plant is insufficient, electric power companies had consigned reprocessing operations to overseas companies. Shipments to the overseas plants completed in 1998. Full scale reprocessing plant is under construction by Japan Nuclear Fuel Limited (JNFL) in Rokkasho-mura, and its spent fuel storage facility started operation in December 1999. Since then almost all spent fuel is to be sent to Rokkasho-mura. This paper expresses the summary of our experience and future plans of spent fuel transports to the reprocessing plants in Japan.

Almost every nuclear power station in Japan has a private wharf. Both reprocessing plants in Tokai and Rokkasho are located on the coast and within 10 miles from the wharf, and none of the nuclear power stations in Japan has railroad access. Consequently, transport of spent fuel is carried out by a vessel. Heavy-duty trailers are used in Tokai-mura and carriers specially designed for spent fuel casks are used in Rokkasho-mura.

Approximately 870 MTU of spent fuel have been safely transported by about 200 voyages to the plant in Tokai-mura since 1978.

To the plant in Rokkasho-mura, 32 MTU of spent fuel were transported in 1998 and 1999 for the purpose of calibration of burn-up monitors. The pool was completed and the license obtained from the central government in 1999. However, it took almost one year to obtain local governments agreement to pool spent fuel, and the agreement was made in November 2000. From December, spent fuel transport started, and some hundreds tons of spent fuel will be transported by the time of the conference to be held in September this year.

Every year, 400 MTU of spent fuel are planned to be transported until the completion of the plant. After then, 800 MTU are scheduled to be transported and reprocessed every year. Nuclear Fuel Transport Company, NFT, owns a ship and casks enough to transport 400 MTU of spent fuel. We need another ship and more casks to meet the future demand. To finalize the specifications of the ship and the casks is our urgent task.

INTRODUCTION

In Japan, it is a basic national policy to reprocess spent fuel generated at nuclear power stations. Following this policy, the Power Reactor and Nuclear Fuel Development Corporation (currently, Japan Nuclear Cycle Development Institute (JNC)) has been operating a reprocessing plant in Tokai-mura, Ibaraki Prefecture since 1977. However, since the capacity of the plant is insufficient, electric power companies had consigned reprocessing operations to overseas companies such as BNFL and COGEMA. Shipments to the overseas plants completed in 1998.

After the termination of reprocessing consignment in Europe, newly generated spent fuel has

been to be reprocessed at a private reprocessing plant in Japan. Japan Nuclear Fuel Limited (JNFL) started construction of a reprocessing plant with a capacity of 800 MTU per year in Rokkasho-mura, Aomori Prefecture in April 1993, with the aim of commercial operation in 2005. The spent fuel storage facility (hereafter referred to as the “F Facility”) of the plant has been in operation since December 1999.

In Japan, all nuclear power stations are located at seaboard area. Every one of them, except for Chubu EPCO’s Hamaoka Nuclear Power Station, has a private wharf within the site. Transport containers (hereafter referred to as “casks”) filled up with spent fuels are transported by sea from these wharfs by dedicated irradiated nuclear fuel transport vessels. Hamaoka Nuclear Power Station uses a public wharf eleven kilometers away from the station. Fig.1 shows Locations of Nuclear Power Stations and Nuclear Fuel Cycle Facilities in Japan.

Here, I will introduce facts about spent fuel transports to JNC and JNFL facilities in Japan.

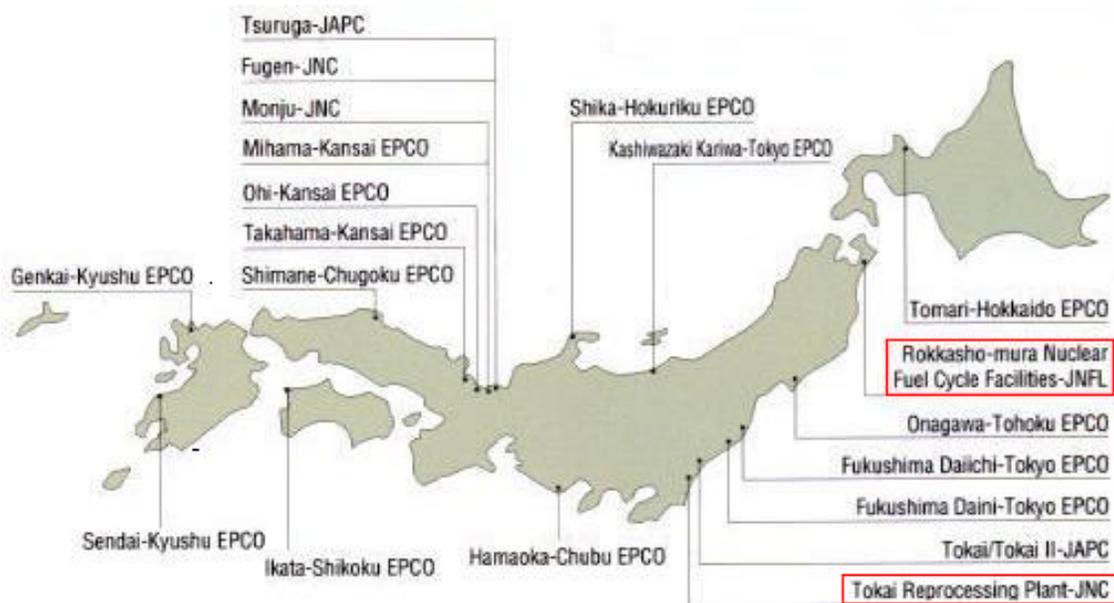
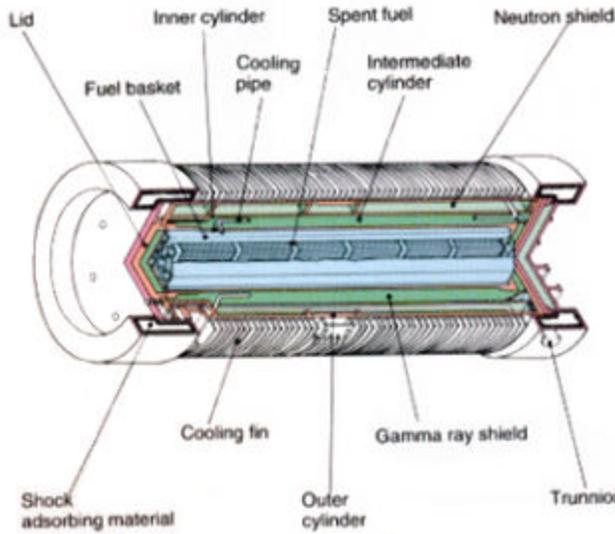


Fig.1 Locations of Nuclear Power Stations and Nuclear Fuel Cycle Facilities in Japan

TRANSPORT TO TOKAI REPROCESSING PLANT

For transporting spent fuel to JNC Tokai Reprocessing Plant in Tokai-mura, Ibaraki Prefecture, HZ-type casks and a transport vessel “HINOURA MARU” (dead weight tonnage: 1,242 tons), which complies with the INF Code, have been used. An HZ-type cask accommodates 3 tons U of spent fuel and weighs 74 tons without skid. Fig.2 shows HZ- type cask and transport vessel “HINOURA MARU”. To avoid opposition groups’ interference at Tokai-mura, spent fuel cask is unloaded at the wharf of Tokai Power Station and transported to the reprocessing plant via the path in the Japan Atomic Energy Research Institute. Being able to use this route is very effective to avoid interruption from opposition groups. For this phase of land transport, all-purpose trailers are chartered every time as the need arises.



HZ-type Cask



HINOURA MARU

Fig.2 HZ-type Cask and Transport Vessel “HINOURA MARU”

Since the start of transport in 1978, approximately 870 MTU of spent fuel (total 351 casks) have been transported in approximately 200 voyages, although some transports were interrupted due to failures and accidents at the reprocessing plant as well as accidents at other facilities. We are proud of having carried out 200 voyages for over a quarter of a century without causing any accidents or contamination. Fig.3 shows Amount of Spent Fuel Transport to Tokai Reprocessing Plant.

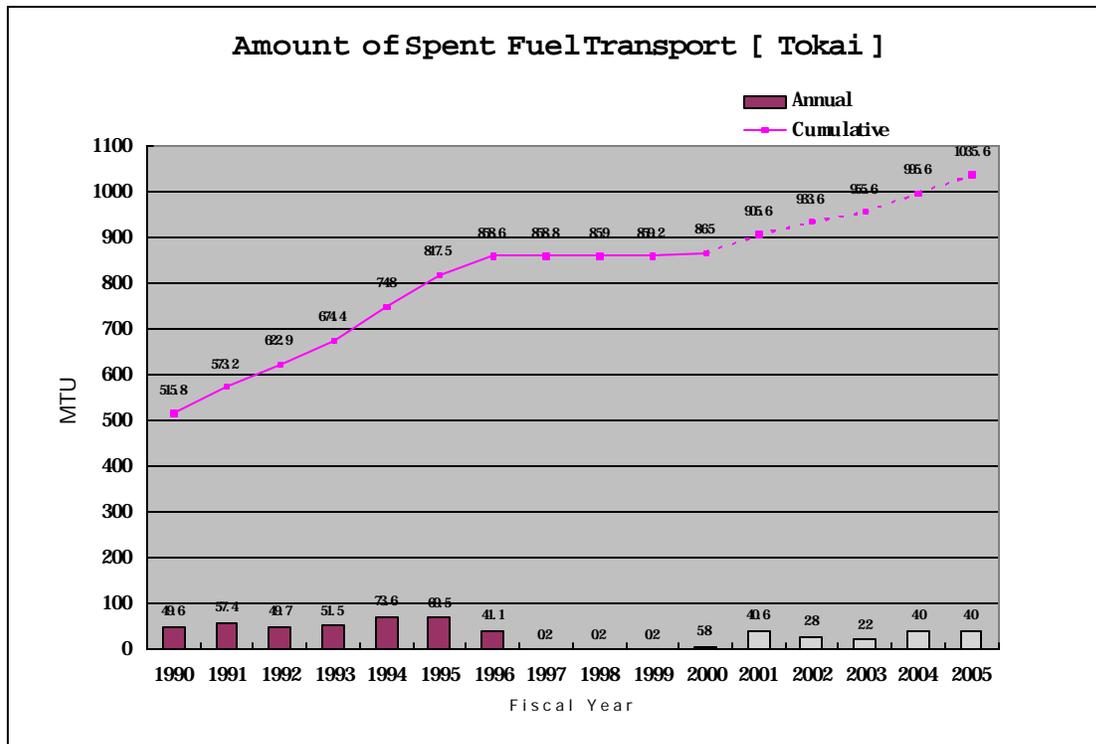


Fig.3 Amount of Spent Fuel Transport [Tokai]

In addition, it deserves a special mention that cask internal surfaces did not have to be decontaminated during that time. We think that this is because the casks are a wet type, the basket structure was simple, and the radiation level of the loose crud on the fuel surface and pool water was low.

Over the next few years, it is planned to transport approximately 40 MTU per year (in FY 2001, approximately 23 MTU and 15 MTU from power companies and JNC, respectively), which is appropriate for the reprocessing capacity of Tokai Reprocessing Plant. After the plan completed, Tokai Reprocessing Plant will be used for R&D activities and therefore it can be expected that the transported spent fuel will greatly decrease. Fig.4 shows example of land transport to Tokai at JNC's Fugen NPS.



Land Transport to Tokai at JNC's Fugen NPS

Fig.4 Example of Land Transport to Tokai at JNC's Fugen NPS

TRANSPORT TO ROKKASHO REPROCESSING PLANT

Spent fuel was transported to the reprocessing plant (Fig.5) in Rokkasho-mura, Aomori Prefecture for the first time in October 1998 to calibrate the burn-up monitors of the F Facility. The F Facility was completed in December 1999 after undergoing various inspections. Almost a year later, in the fall of 2000, a safety agreement was concluded among JNFL, Aomori Prefecture, Rokkasho-mura, and neighboring municipalities. Full-scale transport started in December 2000.

In use for transporting spent fuel to Rokkasho-mura are an irradiated nuclear fuel transport vessel "ROKUEI MARU" (dead weight tonnage: 2,810 tons), NFT-type casks (wet type, approximately 68 to 103 tons without skid) and dedicated cask transport vehicles (hereafter referred to as "Carriers"). There are six types of casks depending on the equipment of the power station. The smallest and largest casks can contain approximately 2.1 MTU and 7.6 MTU of spent fuel, respectively. Fig.6 shows NFT-type cask and transport vessel "ROKUEI MARU". At Rokkasho-mura, spent fuel cask is unloaded at a public wharf and transported to the reprocessing plant on the dedicated route stretching seven kilometers after crossing the national road. Although opposition groups interfere when carriers are crossing the national road, a second dedicated road overpassing the national road is scheduled to be completed this fall. Fig.7 shows example of land transport to Rokkasho Reprocessing Plant.

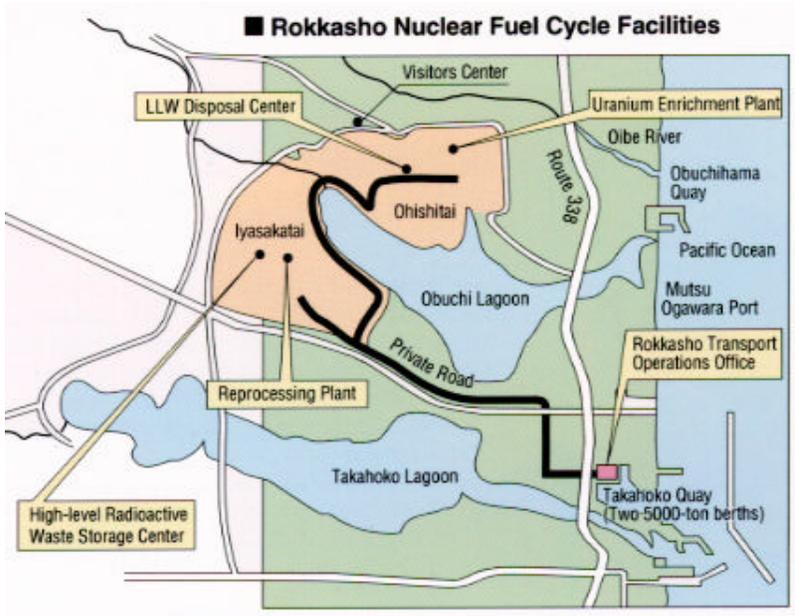
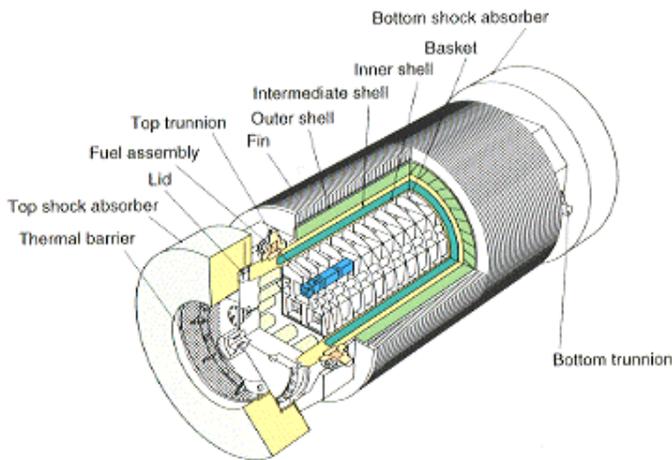


Fig.5 Overview of Rokkasho Nuclear Fuel Cycle Facilities



NFT-type Cask



ROKUEI MARU

Fig.6 NFT-type Cask and Transport Vessel “ROKUEI MARU ”



Public Wharf in Rokkasho-mura



Carrier

Fig.7 Example of Land Transport to Rokkasho Reprocessing Plant

In FY 2000, a total of 97 MTU (17 casks) were transported in four voyages over the four months between December and March. In FY 2001, approximately 350 MTU are planned to be transported in eleven voyages. The security authorities have given suggestions to limit transport to one voyage per month for the time being. The proposed volume will be realized by improving transport efficiency, for example, carrying out mixed transport via some NPSs or increasing the number of casks per voyage. Fig.8 shows Amount of Spent Fuel Transport to Rokkasho Reprocessing Plant.

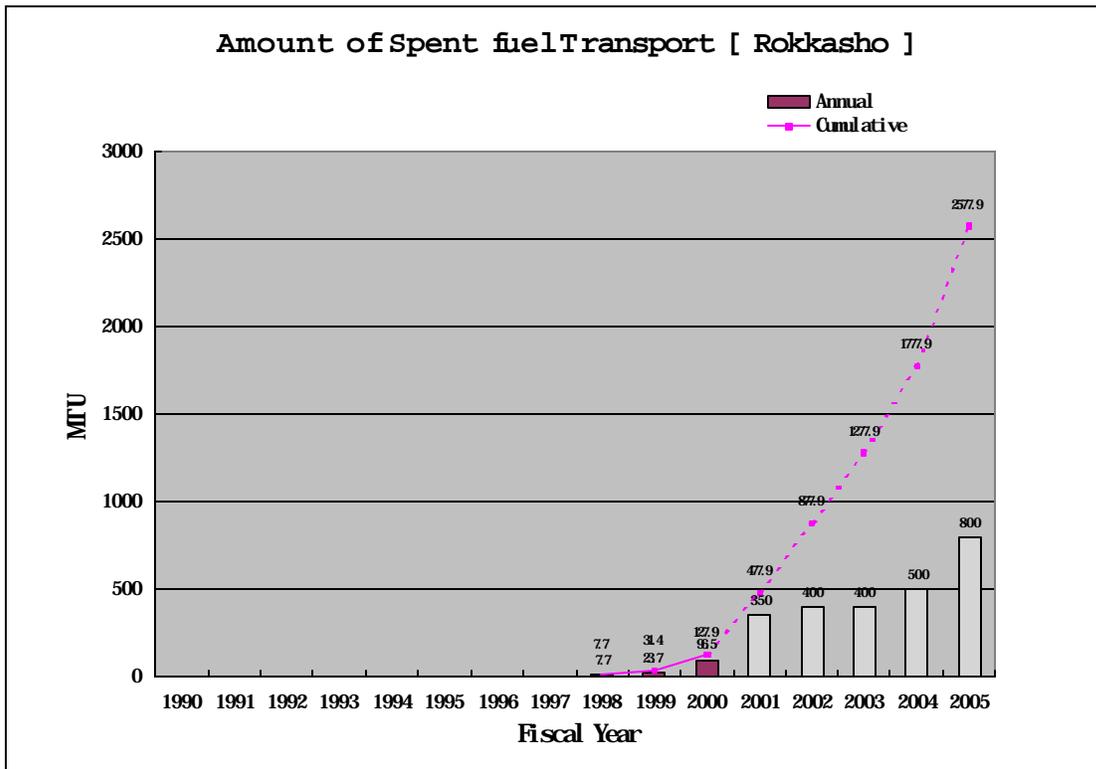


Fig.8 Amount of Spent Fuel Transport [Rokkasho]

IMPROVING TRANSPORT EFFICIENCY AND FLEXIBILITY

From 2005 when the reprocessing plant is completed, the F Facility is planned to accept 800 MTU per year. In order to actually transport 800 MTU per year to the reprocessing plant in Rokkasho-mura, it is necessary to improve and rationalize transport efficiency as well as to establish flexible transport plans. However, there are too many factors that prevent this. It is vital to eliminate or reduce these factors in the future. It is also a significant challenge to establish an efficient cask maintenance system to ensure efficient transport.

Currently, the cask turnover is less than twice a year. It is barely possible to transport 400 MTU per year with the existing forty casks and one transport vessel.

FUTURE PLANS

As mentioned above, in addition to transporting 800 MTU to the reprocessing plant in Rokkasho-mura, spent fuel transport to interim storage facilities is planned to start from 2010. A demand for approximately 600 MTU per year is expected in this regard.

In view of these needs, it is our urgent task to finalize the specifications for casks and transport vessels, quantities, and the timing for placing orders.

ENSURING SAFETY AND ASSURING PEACE OF MIND

Ensuring safety is the number one mission of those engaged in nuclear energy industry. As mentioned above, we have transported spent fuel without causing a single accident nor even an insignificant contamination during over a quarter of a century of operation. To further ensure safety in the future, we obtained ISO9001 certification in September 1999 and are establishing a quality system measuring up to the certificate.

No matter how many safety records we accumulate or how much we reduce the probability of accidents, it can never be enough. This is particularly true in Japan. Japanese people tend to make judgments emotionally rather than thinking rationally. In Japan, therefore, it is extremely important for us that people become free from care, have peace of mind and trust us from the heart. Although there is neither an established method for raising the sense of this nor any particularly effective means, we recognize that it is extremely important to endeavor to raise "anshin".

CONCLUSION

We have been engaging in safe and responsible transport of radioactive materials, considering safety as an administrative matter. In the future, as a company "playing an important role in the nuclear fuel cycle," we will make every possible effort to further improve the technology that we have developed, take all possible measures to ensure safe transport, and become a company that is really trusted and accepted not only by neighboring residents, but also by the general public.