SAFE SHIPMENT OF NAVAL SPENT NUCLEAR FUEL

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Removal of Spent Nuclear Fuel (SNF) of retired Nuclear Submarines (NSs) from the Russian Northwest and Pacific Regions to “Mayak” Production Association (PA “Mayak”) began in the 1970s after commissioning of a buffer storage facility at PA “Mayak”. Over more than 30-year period about 200 runs of special SNF-shipping train were performed, the length of route from the Northwest region’s naval bases equaling 3000 km, from the Pacific’s naval bases 7500 km.

At present, the fleet of transport facilities involved into shipment of naval SNF comprises:

1. 52 transportation casks ‘TUK-18’ certified for all types of SNF reprocessed at PA “Mayak”;

2. Two special trains of 4 railcars of ‘TK-VG-18’ and ‘TK-VG-18A’ types. One more special train of 6 railcars ‘TK-VG-18-2’ is to be commissioned in the near future. However for lack of an extra escort-railcar, the new train can be either put into operation instead of one of the two actually-operating special trains or broken-up, its railcars being hooked to each of the two trains. It should be emphasized that ‘TK-VG-18A’ and ‘TK-VG-18-2’ railcars were made thanks to the assistance of Norway and the USA;

3. Metal-concrete casks ‘TUK-108/1’ certified for storage of SNF of NSs of the first and the second generations have been already tested and are to be put into operation in the immediate future. Because this-type containers have been mainly designed for long-term storage of naval SNF, their use under the “run-around-track” conditions necessitates some design adaptations.

Technical condition of ‘TUK-18’ after 10 years of running may be considered as quite satisfactory. By contrast, that of railcars ‘TK-VG-18’ and ‘TK-VG-18A’ calls for special attention. After virtually every run various railcar defects are revealed and eliminated (sometimes with the developer’s participation). In most cases the defects are due to excess of limit load for such-type railcars. The new railcar ‘TK-VG-18-2’, designed with consideration for previous special-train-running experience, will be loaded with 2 ‘TUK-18’. It is deemed that the new-design railcar will not have so many defects as those of previous designs.

As known, SNF is the source of the following major types of hazard:
- Nuclear hazard due to fissile materials contained therein;
- Radiation hazard resulting from the presence of a wide range of radionuclides; and
- Decay heat.

Safe shipment of SNF is reached thanks to the following technical and organizational measures:

- observance of the requirements of national standard and regulatory base which development complies (in most cases) with the world tendencies;
- licensing of activities of the involved entities;
- supervision of SNF-shipment-related works by the Department of State Supervision over Nuclear and Radiation Safety of Ministry of Defense of the Russian Federation (RF);
- certification of transportation casks and transport facilities for compliance with the requirements of the national and international standards;
- implementation of quality assurance system during transport facility preparative operations;
- functioning of Emergency-Technical Centers (ETCs) of the RF Agency for Atomic Energy (RF Rosatom) and of special Emergency-Rescue Unit (ERU) of PA “Mayak”.

PA “Mayak” has a license for activities related to the use of atomic energy for defense purposes. Such a license is granted by Rosatom only in a case that the relevant license applicant has certified transport facilities, developed infrastructure and trained personnel to perform servicing and repair of the transport facilities in question in compliance with the environment-protection requirements in force.

Obviously, it is the construction of transportation casks that ensures nuclear and radiation safety during SNF shipment. Since 1994 shipment of naval SNF has been performed in transportation casks ‘TUK-18’ complying with national and international safety requirements to B(U)-type packages under normal running conditions and in a case of emergency.

To ensure safe SNF rail shipment, the following technical and organizational measures are taken by PA “Mayak” and the Federal Agency for Rail Transport:

- only certified packages and special railcars are used;
- SNF transportation is performed in compliance with the requirements of the guiding documents in force on shipment of special cargos by special trains (category of shipment: “Special-Importance Train” - SIT);
- the cargo is escorted by a team of trained specialists of PA “Mayak”;
- special trains have adequate physical protection systems and are guarded;
- throughout the route monitoring of SNF shipment is performed;
- prior to SIT departure PA “Mayak” informs the relevant supervisory body on the planned shipment;