Complex decommissioning of Nuclear Submarines (NSs) and Nuclear Powered Surface Ships (NPSSs) is one of major challenges the Russian Shipbuilding Industry has presently to deal with. Despite important recent achievements thanks, firstly, to the efforts of the teams of “Zvezdochka” Shipyard, Far East Plant “Zvezda” and “Onega” Research and Design Engineering Bureau, many serious problems still persist. Among them, safe management of Spent Nuclear Fuel (SNF) unloaded from retired nuclear vessels represents one of the most intricate problems.

The problem is further aggravated by the following circumstances.

So far only in the Russian Northern Fleet about 110 NSs with 200 nuclear reactors have been withdrawn from service for subsequent dismantlement. In addition, 160 nuclear submarine reactors have been reloaded during running of the Northern Fleet’s NSs. Thus in the Northwest Russia the total number of cores which fuel is to be reprocessed exceeds 360.

In the Pacific region the number of reactor cores to deal with makes up 240.

Taking into account the available capacities for SNF processing and temporary storage at PA “Mayak” and the related shipment resources, today SNF of up to 24 cores can be shipped per year using two special trains (i.e. SNF of 2 ½ cores by every freight once every 2-3 months). Such transportation paces would allow removing SNF from storage facilities in Andreeva Bay and Gremikha (Kola Peninsula) only after 15 years at the earliest.

Acceleration of SNF removal from the Northern Fleet’s former naval bases would be only possible through the establishment of a new long-term SNF storage facility in less-hazardous area, as compared to Kola Peninsula, e.g. on the Novaya Zemlia (the New Land) Archipelago.

To resolve the challenge of defueling the retired NSs of the Northern Fleet followed by SNF transportation from storage facilities in Andreeva Bay and Gremikha to special transshipment pads for SNF reloading into special railcars and to temporary and long-term storage centers, one needs (along with commissioning of new capacities at PA “Mayak”) speed up works on construction of a specialized vessel to ship SNF using special transportation casks.

The necessity of constructing such a vessel results, first and foremost, from an understanding of major actual importance of the issues related to human and environment safety.

The widely known recent sea tragedies – loss of “Kursk” and “K-159” nuclear submarines – are evidence of the huge scale of potential threats to human beings and the World’s ecosystems. However the expenses for salvaging operations, according to “Kursk” NS’s salvaging experience, are quite comparable with those needed to construct a new specialized SNF transportation vessel.

The collected so far foreign experience of SNF carriage by sea (such transportations have been performed since the mid-1960s) shows that, if appropriate vessels are used, the safety problem is resolved rather successfully: to date the integral flow of the relevant sea-traffic operations nears 20 million container-miles, and no container damage during SNF carriage by sea has ever occurred.

The available Russian Maintenance Vessels (MVs) could be used for SNF shipment purposes, but only in theory. Analysis of their specifications and actual condition shows that safe shipment of large flows of extremely hazardous cargos (containers with SNF) on board of actual MVs is rather problematic.

In fact, Russian naval MVs - Floating Service Vessels (FSVs) design #326 or #326М (the latest FSV was constructed in 1966), and FSV, design 2020 (the latest vessel was commissioned in 1989) - are entirely obsolete. The idea of reequipping special vessel “Amur” (design #11510, built in 1986) has not been implemented either because of various technical and economic reasons.

Similar situation characterizes MVs of the Murmansk Shipping Company (MSC). To date the MSC has 5 MVs used in SNF-reloading operations and storage of Solid and Liquid Radioactive Waste (SRW and LRW).

In theory, FSV “Imandra” could be used for shipment of SNF, LRW and spent sorbents. However this vessel (built in 1981) does not comply with the present-day safety requirements, and its use for shipping Metal-Concrete Casks (MCCs) to SNF reloading/long-term storage centers casts doubts.

MVs “Lotta” (built in 1961), “Lepse” (1936) and “Volodarskiy” (1929) actually used for storage of SNF and LRW are even less suitable for purposes of SNF and Radioactive Waste (RW) shipment.

Thus to ensure safe management of SNF and RW unloaded from NSs and NPSSs, construction and commissioning of a new specialized vessel is necessary. Such vessel would allow shipment of different-type containers with SNF and RW to: -the transshipment pads for subsequent reloading into a special train and -the areas of MCC temporary and long-term storage at special pads of shipyards or in the Novaya Zemlia, the most rigid safety requirements being observed.

To ensure safety when running, the specialized vessel should have:

– increased strength of hull;