VALIDATION OF THE PRIORITIES FOR COMPLETE SALVAGING AND ECOLOGICAL REHABILITATION OF OBJECTS OF THE NUCLEAR-POWERED FLEET

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An approach to validation of the priority problems and measures which must be taken first for complete salvaging of the nuclear-powered ice breakers in the northwest region of Russia is proposed and implemented. A list of the priority measures which must become the foundation for formulating projects financed by Russia or donor countries is presented.

One of the main problems in future planning of works in the comprehensive salvaging of nuclear powered submarines is determining the priority projects on which substantial monetary resources must first be spent. This formulation of the question is important not only for our country but also for foreign investors who finance many projects on bilateral and multilateral bases. Specifically, many tens of millions of dollars are concentrated on these purposes only in the European Bank for Reconstruction and Development.

The validation and determination of priorities is a complicated question because of the following circumstances:

• the large number and diversity of objects of analysis: nuclear powered submarines, nuclear powered surface ships, shore servicing bases, reactor blocks, nuclear tenders, commercial enterprises participating in the salvaging of ships and vessels, transport connections, and others;

• a large number of determining factors of different nature which must be taken into account to develop recommendations; the significance of these factors and their influence on the validation of priorities is constantly changing in time; the most important such factors are presented in Fig. 1.

The program, currently under development, for comprehensive salvaging of the decommissioned Russian nuclear-powered fleet in the northwestern region of the Russian Federation is understood as a system of mutually matched projects for each of which the final goal, volume and content of work, location and sequence of the projects carried out in the system, duration, possible performers of the work, cost, safety parameters and other characteristics needed for formulation of the appropriate technical tasks must be defined.

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Only the first (initial) phase of this plan, in which the priority and high-priority first measures for handling decommissioned radiation hazardous objects of the fleet has now been completed. It should be noted that at the first stage of the work the problems and measures were not graded among priorities. This complicated and laborious problem cannot be solved strictly, especially since several problems can have approximately the same urgency and priority at the same time. The identification of such projects is the main goal of ranking the projects.

The approaches and methodology for identifying objects, the problems and measures which are most urgent and priorities taking account of various influencing factors, were determined at the first stage of the development of a strategic plan. Among these factors safety is acknowledged to be the most important one.

The order of assigning any particular project to the priority projects is based on the following assumptions:

• identification of priorities is examined according to a four-level scheme: direction of work–objects–problems–measures (projects);
• priorities are not identified among the directions of work; several works can be performed in each direction simultaneously and in parallel, taking account of their technological compatibility and economic possibility; the main priorities must be determined and matched at the levels of the objects, problems, and measures to be taken;
• at the first stage, the objects of salvaging are examined and compared, on the basis, first and foremost, of their possible effect on ecological safety but also taking account their multifactorial nature;
• the priority problems are identified in accordance with the priority of the objects, the real and potential risk, the technological chains for handling the objects of salvaging and bottlenecks, determined when studying the technological chains for handling each object;
• high-priority and priority measures (projects) are identified on the basis of expert analysis.

Nuclear-powered submarines, surface ships of nuclear powered systems, nuclear-technological servicing ships, shore servicing bases, and reactor blocks are classified as objects of salvaging and ecological rehabilitation; problems are formulated for each of the objects listed; a problem is determined as a collection of different intercoupled measures, which must be taken to reach the final goal; as an example, Fig. 2 shows a list of problems with respect to nuclear tenders.

A measure is an individually important part of the problem which can become the basis of one or several concrete projects after the required economic and organizational questions are matched with the investor, coordinator, and performer of the work. The priorities were examined at each of the indicated hierarchical levels, i.e., among obvious, problems, and measures. At the first stage, the objects to be salvaged were ordered using various methods. Objects are most easily ordered according to the safety factor, taking account of the radiation potential, for which data on the total activity of radionuclides are used. Spent nuclear fuel makes the main contribution to the radiation potential of objects to be salvaged and ecological

Fig. 1. Main factors influencing decision making when choosing priorities for comprehensive salvaging of nuclear-powered submarines.