

Legal and practical approaches to address nuclear legacy issues (by the example of the «Mayak» facility)

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The issues of developing legal and practical approaches to managing operation and remediation of technologically complicated sites in Russia could be discussed by the example of the «Mayak» facility – the first enterprise for plutonium and nuclear weapons production in the USSR.

With imperfection of the technologies used and lack of practical knowledge, the operation of the facility produced a whole complex of environmental problems, mainly associated with liquid radioactive waste (LRW) management. During the first years LRW were discharged directly into the open drainage network (the Techa River) and lately – into the natural and man-made water reservoirs (the Techa cascade, Karachai Lake, etc). The most radiological consequences occurred during the first years of the operation. They were determined by LRW discharges into the Techa River and the accident on the radioactive waste storage tank in 1957.

At present, the environmental protection problems of the «Mayak» facility and surrounding area are linked to the operation of industrial reservoirs which are liquid radioactive waste storage facilities.

Concerning two of them (Karachai Lake and Staroe Boloto Lake), there are clear concepts of bringing these reservoirs into the safety state. It should be mentioned that:

- Potential danger of Karachai and Staroe Boloto deals with 1) wind-induced carry-over of radionuclides deposited at the shore line and 2) groundwater contamination.
- There are specified plans for Karachai and Staroe Boloto phase out.
- Karachay and Staroe Boloto phase out activities and reduction of relevant risks depend on the improvement of the «Mayak» radioactive waste management system and cessation of the middle-level radioactive waste discharges into these reservoirs.

At the same time, there are no obvious solutions with regard to the Techa cascade of reservoirs (TCR). During the last twenty years the issue of the water level reduction has become the most critical element of TCR safety management. The problems of safety aggravated sharply due to climate changes in the region – since the 1980s the rise of the water content level has been observed (precipitation exceeds evaporation). Ready-made scientific and engineering solutions to ensure quick reduction of the water level in the end water reservoir of the Techa cascade and to manage water regime of the Techa cascade are lacking:

- TCR is a large-scale hydro-engineering facility, including reservoirs, bypass channels and dams with discharge valves and emergency spillways.
- Possibilities to lower the water level are extremely limited.
- TCR contains a great volume of radionuclides which can pose a threat of contamination of adjacent territories, the Techa River and groundwater.
- The other problem is that TCR, which is the unique facility from a technical point of view, does not conform to relevant environmental and radiation safety regulations.

Consequently, there is an obvious need to develop basic principles of the acceptable level of TCR safety and justify effective spending of financial resources:

- federal regulations should be followed while the deviation from the safety and health requirements is also possible if justified;
- safety requirements which limit the TCR influence on the public, property and environment, do not need to include safety requirements for TCR biota;
- improvement of the safety level of TCR operation should be provided.

In the near-term outlook, managing environmental problems of the «Mayak» facility aims at limitation of negative influence of industrial reservoirs on adjacent territories. As to Karachai Lake and Staroe Boloto Lake, activities are formalized and included in the Federal Target Program «Nuclear and Radiation Safety Assurance for 2008 and the Period Until 2015». As to TCR, priority task is to stabilize water level in the Cascade to prevent hydrodynamic accident which may lead to major environmental and economic consequences.

In the medium-term outlook, it is necessary to reduce water level in TCR to the level that guarantees the minimum of filtration from the Cascade (215.5 m). This means solving the wide range of engineering problems in and carrying out major improvements in radioactive waste management at the «Mayak» facility. It should be mentioned that normal or low water content in the region is one of the important features of TCR safety.

In the long-term perspective, it is necessary to suggest and carry out more drastic decisions on TCR water balance management to guarantee environmental safety. Safety criteria for TCR operation are summarized in the Figure 1.

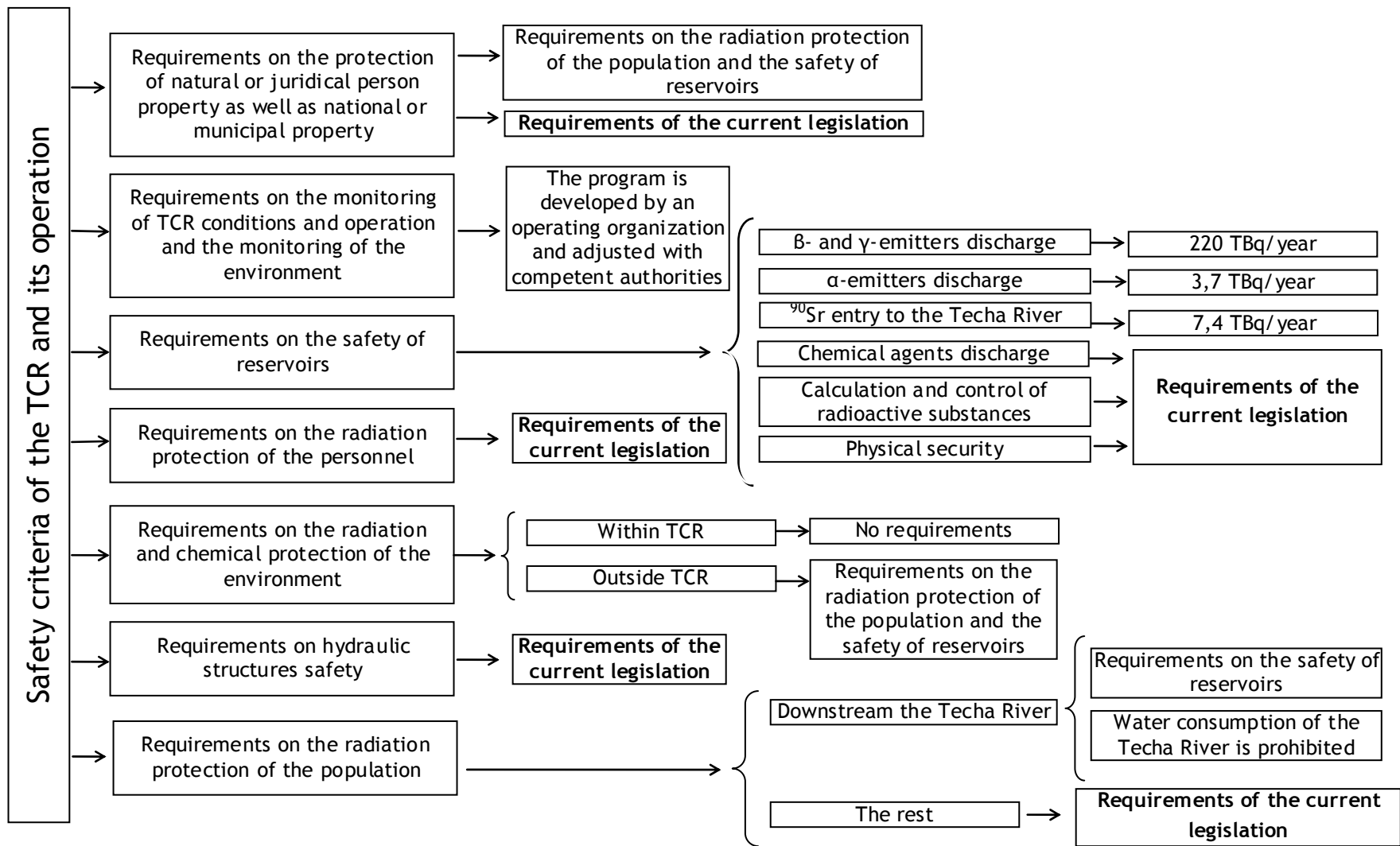


Figure 1. Safety criteria of the TCR and its operation