Regulatory Framework for Managing Uranium Legacy Sites in Russian Federation

V. Neretin

Federal Environmental, Industrial and Nuclear Supervision Service of Russia (Roctechnadzor)
Content

- General Information
- Regulatory Infrastructure
- Licensing Procedure
- Supervision and Enforcement
- Review and Assessment
- Regulatory Challenges
General Information

There are several uranium production sites required remediation actions in the Russia:

- **Decommissioned:**
  - PO “Almaz” (Lermontov, KMV),
  - RU Novotroitskoe (Baley, Chita Reg.),
  - RU Stepnoe (Kalmykia Rep.),
  - pilot industrial test sites (Aldan, Yakutia).

- **Operating:** PPGHO, MSZ, CMZ, RU Malyshevs, SevRAO, DalRAO etc.
General Information

PO “Almaz”  
(Lermontov, KMV)
The following objects of PO “Almaz” uranium mining site are required remediation actions:

- Mines 1 (Beshtau - 29 dumps, 2115 thous. m\(^3\)) and 2 (Byk – 13 dumps, 1800 thous. m\(^3\));
- Tailing ponds (6 ponds - 1258 thous. m\(^2\), 1 – decommissioned, 2 – under decommissioning);
- Buildings of hydrometallurgical plant and mines;
- Discharges of contaminated mine water.
General Information

The objects of PO “Almaz” that requires remediation actions:

- discharge -
- denudation
- sediments
General Information

The objects of PO “Almaz” that require remediation actions:

- ore storage
- buildings
- tailing pond
Joint Convention


Federal Law “On the Radiation Safety of the Public” (№ 3-FZ of 09.01.1996) and others.
Regulatory Infrastructure

The Federal Law “On the Use of Nuclear Energy” established that:

- State regulatory authorities are responsible for regulation of nuclear, radiation, industrial and fire safety, independent from others (art. 24)

- State safety regulation includes: regulations development, licensing, supervision, review (art. 23)

- Defines the power of state regulatory authorities (enforcement, art. 25)

- Defines the State supervision including the regime of permanent supervision (art. 24.1)
The Federal Law “On Radioactive Waste Management” established that:

- Producers are responsible for paying of all stages of waste management, including disposal (art. 10)

- Defines the specific classes of radioactive waste - waste from mining and milling of uranium ores and NORM (art. 4)

- Criteria for radioactive waste classification will be defined by the RF Government (art. 4)
Regulatory Infrastructure

The Federal Law “On Radioactive Waste Management” established that:

- Radioactive waste from mining and milling of uranium ores and VLLW can be disposed without conditioning in near surface disp. facility (art. 12)

- Defines the power of state regulatory authorities (regulations, licensing, oversight - art. 19)

- National operator is responsible for receiving a waste and its final disposal, operating and closure of disposal facilities (art. 20)
Regulatory Infrastructure

The Regulatory Authorities in the field of nuclear energy use are established by the Governmental Decree No 412 from 03.07.2006:

- **Rostechnadzor** (licensing, supervision, regulations development – technical aspects)
- **Federal Medical-Biological Agency** (supervision, regulations development – san.-hygienic aspects)
- **Rospotrebnadzor**
- **Ministry of Emergency Situations**
- **Ministry of Natural Resources**
- **Rosprirodnadzor**
According to the Decree of the RF President No780 dated 23.06.2010:

- Rostechnadzor is reported to the RF Government (prior - Ministry of Natural Resources)

- Rostechnadzor is responsible for development and implementation of the state policy and regulations in the field of nuclear energy use
The Governmental Order No 717 dated 13.09.2010 introduce the changes in to power of Rostechnadzor:

- Develop and implement of the state policy and regulations in the field of nuclear energy use
- Develop and approve the federal level regulations
- Establish the permissible limits for release and discharge of radionuclides to the environment
  - Administrative regulation, technics under development
Regulatory Infrastructure

Some federal level regulations related to the site remediation issues:

- Radiation Safety Rules (NRB-99/2009)
- Sanitary Rules for Liquidation, Mothballing and Re-orientation of Radioactive Ores Mining and Milling Facilities (SP LKP-91) – under revision
- Transportation of Radioactive Materials. Safety Requirements (NP-053-04)
- several regulations under revision/development
ФЕДЕРАЛЬНЫЕ НОРМЫ И ПРАВИЛА

Федеральный закон № 92-ФЗ "О радиационной безопасности населения"

Руководства по безопасности

ОЦЕНКА БЕЗОПАСНОСТИ ПРИПОВЕРХНОСТНЫХ ХРАНИЛИЩ РАДИОАКТИВНЫХ ОТХОДОВ

РБ – 011 – 2000

БЕЗОПАСНОСТЬ ПРИ ОБРАЩЕНИИ С РАДИАЦИОННЫМИ ОТХОДАМИ.
ОБЩИЕ ПОЛОЖЕНИЯ

НП – 058 – 04

Regulatory Infrastructure
The safety guides under development are following (final drafts):

- “Safety Assurance during Remediation of Uranium Mining and Milling Sites” (1)
- “Decommissioning (Closure) of Tailing Ponds” (2)
Regulatory Infrastructure

“Safety Assurance during Remediation of Uranium Mining and Milling Sites” is developing taking into consideration:

- **WS-G-3.1 Remediation Process for Areas Affected by Past Activities and Accidents, 2007**
- **WS-G-5.1 Release of Sites from Regulatory Control on Termination of Practices, 2006**
- **WS-G-1.2 Management of Radioactive Waste from the Mining and Milling of Ores, 2005**
- **IAEA regional project RER 3/010**
Regulatory Infrastructure

It is proposed the following contents of the Safety Guide (SG1):

- **Objective and Scope**
- **Planning and Execution of Remediation**
- **Radiation Protection during Remediation**
- **Waste Management**
- **Radiation Monitoring of Environment**
- **Post-Remediation Management**
- **Annexes – Content of annual report, Content of license application**
The Safety Guide “Decommissioning (Closure) of Tailing Ponds” has the following contents (SG2):

- General Provisions
- Preparedness to Decommissioning of Tailings
- Decommissioning of Tailings
- Monitoring and Surveillance of Tailings
- Annex - Contents of the Safety Justification Report
**Licensing Procedure**


- **Stipulates** that licensing of activities in the field of nuclear energy use shall be carried out by the Rostechnadzor.

- **Defines the steps of licensing procedure.**

- **Defines the list of activities in the field of nuclear energy use that require a license.**
Licensing Procedure

The activities in the field of nuclear energy use includes:

- **Siting, construction, operation and decommissioning of nuclear installations, radiation sources and storage facilities.**

- **Handling of radioactive substances and nuclear materials** (mining, fabrication, use, processing, transportation, and storage).

- **Radioactive waste management** (storage, treatment, transportation, and disposal).
Licensing Procedure

- **Use of nuclear material and/or radioactive substances in R & D.**

- **Design of nuclear installations, radioactive sources, and storage facilities.**

- **Design and manufacture of equipment for nuclear installations, radioactive sources, and storage facilities.**

- **Review of design, technical and safety related documentation.**
Licensing Procedure

Executive Order № 865 stipulates that licensing procedure shall incorporate the following steps:

- **Preliminary review and check of the documents submitted by the applicant.**

- **Review of the safety related documentations submitted to the Rostechnadzor.**

- **Carry out an on-site inspection to verify the data contained in the submitted documents and possibility of applicant to perform the activity.**
Licensing Procedure

- **Making the decision regarding whether or not to issue a license.**

- **Issue a license with obligatory conditions enclosed.**

- **Change of the license conditions in case of reconstruction (modification) of the nuclear installation or significant change the conditions of nuclear activity performed.**

- **Suspend or terminate the license in case of serious violations of the legislation, nuclear regulations or license conditions.**
Licensing Procedure

- **Issue a license can be denied in the following cases:**
  - when false or distorted information are found in the submitted documents;
  - negative expert review conclusions;
  - when declared activity are not in compliance with safety requirements.

- **Abandonment of licensee or its reorganization leads to termination of the licenses issued.**
The Administrative Regulation of Rostechnadzor was approved in October 2008 that established the order of performance the state function on licensing the activities in nuclear energy use.

Delineation of authorities among the Rostechnadzor Headquarters and its regional offices in issuing licenses for various types of activities in the field of nuclear energy use are defined in the Administrative Regulation.
# Licensing Procedure

<table>
<thead>
<tr>
<th>Facility type</th>
<th>Activity type</th>
<th>HQ</th>
<th>Reg.</th>
<th>Max. review time</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI</td>
<td>Siting, construction, operation, decommission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NI</td>
<td>Unit of NPP</td>
<td>Yes</td>
<td>No</td>
<td>12 Months</td>
</tr>
<tr>
<td>NI</td>
<td>Production reactor</td>
<td>Yes</td>
<td>No</td>
<td>12 Months</td>
</tr>
<tr>
<td>NI</td>
<td>Research reactor, critical facility</td>
<td>Yes</td>
<td>No</td>
<td>10 Months</td>
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<tr>
<td>NI</td>
<td>Subcritical facility</td>
<td>No</td>
<td>Yes</td>
<td>6 Months</td>
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<tr>
<td>NI</td>
<td>Nuclear facilities for mining, use, processing, fabrication of</td>
<td>Yes</td>
<td>No</td>
<td>12 Months</td>
</tr>
<tr>
<td></td>
<td>nucl. mat.</td>
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## Licensing Procedure

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<th>HQ</th>
<th>Reg.</th>
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</thead>
<tbody>
<tr>
<td>Storage facility</td>
<td>Siting, construction, operation, decommission</td>
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<td></td>
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<tr>
<td>Storage facility</td>
<td>Radioactive waste containing nuclear materials, interregional meaning</td>
<td>Yes</td>
<td>No</td>
<td>12 Months</td>
</tr>
<tr>
<td>Storage facility</td>
<td>Radioactive waste without nuclear materials, regional meaning</td>
<td>No</td>
<td>Yes</td>
<td>10 Months</td>
</tr>
<tr>
<td>Storage facility</td>
<td>Disposal of radioactive waste</td>
<td>Yes</td>
<td>No</td>
<td>12 Months</td>
</tr>
<tr>
<td>Waste manag.</td>
<td>Containing nuclear materials</td>
<td>Yes</td>
<td>No</td>
<td>6 Months</td>
</tr>
<tr>
<td>Waste manag.</td>
<td>Without nuclear materials</td>
<td>No</td>
<td>Yes</td>
<td>4 Months</td>
</tr>
</tbody>
</table>
The guiding document of Rostechnadzor was approved and put into force since August 1, 2008 – “Methodical instructions on developing the license conditions for activities in the field of nuclear energy use” (RD-03-31-2008).

RD-03-31-2008 defines the general approach to developing the license conditions for activities in the field of nuclear energy use.

Provisions of RD-03-31-2008 are obligatory for Rostechnadzor’s staff (HQ, regional) involving in licensing.
License conditions have the following three sections:

- "Scope of license" – type of activity/facility, specific nuclear or radioactive materials involved, etc.;
- "General requirements and conditions" – personnel, documentation, general safety requirements, etc.;
- "Specific requirements and conditions" – transition from one stage of work to another, specific safety requirements, etc.

If necessary, Rostechnadzor can define the justified time of fulfilment the requirements or conditions.
Executive Order № 865 stipulates that:

- **Rostechnadzor** shall carry out an on-site inspection to verify the data contained in the submitted documents and possibility of applicant to perform the activity.

- **Supervision of the licensee** by carrying out the periodical inspections in order to ascertain compliance with the license conditions.
Supervision and Enforcement

State supervision for safety in the field of nuclear energy use is carried out by the Rostechnadzor HQ and its regional offices and includes:

- receiving and analysis of information related to the safety provision by operators and organizations that perform work and provide services;

- carrying out of inspections and analysis of its results;

- enforcement by imposing a penalties established by the legislation of the Russian Federation in case of violation the safety requirements.
Supervision and Enforcement

Lermontov, 2007 -

- JSC Dalur, 2010
Supervision and Enforcement

Supervision and inspection activities of the Rostechnadzor are defined by the following main guiding documents:

- “Provision regarding the procedure for state safety supervision in the field of nuclear energy use” (RD-03-43-98);
- “Procedure for nuclear and radiation safety supervision of a nuclear fuel cycle facilities” (RD-05-19-99);

Two executive order on state supervision are under development.
Supervision and Enforcement

- **RD-03-43-98** defines the main principles of state supervision for nuclear activities:
  - Rostecznadzor independence;
  - delineation of responsibilities;
  - openness of state supervision;
  - exclusion of undue restrictions;
  - coordination with other regulatory bodies;
  - differential approach to the scope and type depending on potential hazard, safety achieved.
Supervision and Enforcement

- All inspections shall include the following stages:
  - preparation to the inspection;
  - arrangement and carry out of inspection;
  - recording/reporting the results;
  - control of prescriptions issued.

- Duration of all type inspection should not exceed 20 calendar days.
Supervision and Enforcement

- Working program of inspection shall includes:
  - goals, list of questions concerned, information to be prepared by licensee.

- Plan of inspection shall includes:
  - dates of inspection, meetings, discussions;
  - names of inspectors and questions for them.
Supervision and Enforcement

While inspecting the inspectors shall arrange and carry out the following actions:

- meeting with the organization management;
- review of documentation (technical, administrative);
- visit a working premises, review a practice and safety measures;
- discussion with personnel on operational and safety issues;
- preparation of inspection report;
- discussion of the results with organization management.
The control shall be established for fulfilment of prescriptions issued:

- receipt and review the information on prescriptions fulfilment (in due time);
- check of prescriptions fulfilment during future or specially arranged inspections.

All acts/prescriptions shall be recorded and stored at HQ or Regional offices.

An appropriate sanctions can be applied if the prescriptions are not fulfilled in due time.
Rostechnadzor can apply different type of enforcement to the licensee and its officials:

- oral/written notification;
- written prescription;
- disqualification;
- administrative penalty/fine;
- temporary stop the operation/activity;
- temporary stop of the license;
- revoke of the license (permission).
Supervision and Enforcement

- The main principles of applying sanctions to the licensee and its officials:
  - applying to the entities and officials responsible for safety provision;
  - applying a sanction shall correspond to the significance of violation with respect to its influence to the safety;
  - openness of sanction applying;
  - not applying sanctions to the personnel, but to the management in charge;
  - applying sanction to the operator does not exclude the penalty for service organizations.
According to Executive Order 865 the expert review of safety related documentation shall be performed every time when license is issuing or changes of license conditions are introducing.

The order of expert review performance is established by the Administrative Regulation:

- preparation of a Statement of Work;
- review of the safety related documentation;
- meetings with the applicant;
- development of the expert review report;
- acceptance of the review report by Rostechnadzor.
Review and Assessment
According to NP-058-04 requirements the safety assessment shall be performed for radioactive waste storage/disposal facilities.

- **This Guide has been developed on the results of the ISAM Project (IAEA) – Improvement Safety Assessment Methodology.**
- **Example of safety assessment was performed using AMBER computer code for the case of peaceful nuclear explosion.**
Review and Assessment

Scientific and Engineering Center for Nuclear and Radiation Safety (Rostechnadzor) is responsible to carry out the safety assessments during expert review of applicant’s safety related documentation:

- Safety assessment for objects of former PO “Almaz” (Lermontov) was performed in 2011 including:
  - current level of radiation hazards to population;
  - radionuclides migration from dumps;
  - long-term radiation impact assessment.
Current level of radiation impact to population by the objects of former PO “Almaz” (Lermontov):

- **time duration** – several hundred years;
- **exposure scenario** – farmer activity using water from outlet No16 (all pathways of exposure);
- **use the computer code Ecolego 4.4.**
Exposure scenario to population by the objects of former PO “Almaz” (Lermontov):
Review and Assessment

Current level of radiation impact to population by the objects of former PO “Almaz” (Lermontov):

- **Summarized effective dose**
  - Сценарий нормальной эволюции
  - Консервативный сценарий

- **Effective radiation dose**
  - Сценарий нормальной эволюции
  - Консервативный сценарий

**Internal exposure**

**External exposure**
Results of radionuclides migration from dumps with rain water:

- chambers model using the computer code Ecolego 4.4;
- maximum concentration of alpha-emitters will be less than 2000 Bq/kg of surface layer of soil;
- maximum concentration will be arisen after 1000 years;
- sensitivity analysis was performed for the observation data and other input parameters.
Review and Assessment

Chambers model of the dumps:
Review and Assessment

Sensitivity analysis:

Concentration of U-238

Concentration of Th-232
Long-term radiation impact assessment:

- radiation impact of dump around shaft 32 (mine 1 – most conservative);
- scenario of exposure - use of contaminated land;
- modeling calculation was performed using the computer code RESRAD v.6.5;
- conservative assessment resulted in potential exposure up to 20 mSv/y without administrative control.
Irradiation model for RESRAD calculations:

- Radioactive contamination of the soil
- Source
- Paths of migration in the surrounding environment
- Radiation pathways
- Doses

<table>
<thead>
<tr>
<th>Источник</th>
<th>Пути миграции в окружающей среде</th>
<th>Пути облучения</th>
<th>Дозы</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radioactive contamination of the soil</td>
<td>Radiation pathways</td>
<td>Doses</td>
<td></td>
</tr>
</tbody>
</table>

- Direct exposure
- Ground
- Dust
- Radon

- Inhalational pathway
- External
- Dust
- Radon

- Peroral pathway
- Ground
- Dust
- Meat
- Milk
- Fish
- Water
- Soil
- Vegetation
- Animals
- Plant food

- Cumulative individual effective equivalent dose
Review and Assessment

Conservative assessment of exposure:

pathways dependence -

- sum on nuclides
Regulatory Challenges

- **Improvement of the regulatory basis:**
  - safety criteria/requirements;
  - requirements to the content of safety justification documentation;
  - requirements to QA program/safety culture;
  - oversight procedures.

- **Improvement of the safety assessment:**
  - use of verified computer codes (Ecolego/RESRAD);
  - personnel training (TSO/RA).
Regulatory Challenges

- **Training the staff of Regulatory Body:**
  - *exchange of the oversight experience;*
  - *training programs for regional inspectors;*
  - *training of the regional inspectors.*
Thank you for your attention!