Regulatory Challenges at Legacy Sites in Russian Federation

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1. Russian nuclear legacy and its regulation for today

2. Experience and Regulatory Challenges in Nuclear Legacy Sites

3. Experience and Regulatory Challenges in Uranium Legacy Sites

4. Conclusions and Recommendations
The Russian nuclear legacy consists of:

- Areas of legacy works with radionuclides
- Radiological accident areas
- Former Naval support technical bases
- Landfills for nuclear weapons and areas for peaceful nuclear explosions
- Uranium tailing dumps
Normative Basis of Regulation

Current Regulatory Nuclear Legacy Problems:

- There is no term “nuclear & uranium legacy sites and facilities”
- The documental basis insufficient
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Radiation protection at STS
Work methodology
Contents of $^{90}$Sr and $^{137}$Cs in soil

Andreeva Bay

Gremikha
## SNF removal

<table>
<thead>
<tr>
<th>Working place, occupation</th>
<th>Doses, μSv/h</th>
<th>Surface contamination level, part/cm²·min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reference dose rate</td>
<td>Real level</td>
</tr>
<tr>
<td><strong>Dry storage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>worker, engineer, dosimetrist</td>
<td>500</td>
<td>171 – 510</td>
</tr>
<tr>
<td><strong>Site under the crane</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strap per, dosimetrist</td>
<td>15</td>
<td>8 – 27</td>
</tr>
<tr>
<td><strong>Crane cabin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td>28</td>
<td>62</td>
</tr>
<tr>
<td><strong>Container vessel</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td><strong>Serebryanka ship</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master</td>
<td>2500</td>
<td>250</td>
</tr>
</tbody>
</table>
Specific activity in ground water
International Exercise & Training in case of emergency
New Regulatory Documents

- Requirements to provide radiological protection of the personnel and the public
- Criteria and norms on remediation of sites and facilities
- Arrangement of the environmental radiation monitoring
- Requirements for industrial waste management
- The Operational Radiological and Medical Criteria for the Initiation of Emergency Protective Actions
- Requirements to support safe management of products containing nuclear materials
Three remediation options

1. Conservation
   - Controlled territories
     - Disposal
2. Conversion
   - Limited use
     - Remediation
3. Liquidation
   - Unlimited use
     - Release from control
## Remediation criteria

<table>
<thead>
<tr>
<th>Conservation</th>
<th>Category of persons</th>
<th>Dose constraint, mSv·y⁻¹</th>
<th>Due to residual contamination</th>
<th>Due to new operation involved radiation sources</th>
<th>Total</th>
<th>Dose limit from (NRB-99)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers</td>
<td></td>
<td></td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Public</td>
<td></td>
<td></td>
<td>0,1</td>
<td>-</td>
<td>0,1</td>
<td>1</td>
</tr>
<tr>
<td>(SA territory)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel group A</td>
<td></td>
<td></td>
<td>3</td>
<td>7</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Personnel group B</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Public</td>
<td></td>
<td></td>
<td>0,1</td>
<td>0,15</td>
<td>0,25</td>
<td>1</td>
</tr>
<tr>
<td>(SA territory)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquidation</td>
<td></td>
<td></td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>Lack of norms in NRB-99</td>
</tr>
<tr>
<td>(“green field”)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td></td>
<td></td>
<td>0,1</td>
<td>-</td>
<td>0,1</td>
<td></td>
</tr>
<tr>
<td>(the rest territory)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Nuclear legacy - Southern Urals - originated from “Mayak” activities

FMBA Registry of «Mayak’s personnel & population»

Techa river
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Uranium Legacy Areas

Octyabrsky village Zabaikalsky Territory

Lermontov Stavropolsky Territory

39.1% > 200 Bq/m³
31.3% 100-200 Bq/m³
29.6% < 100 Bq/m³
Nearby uranium mining facility (1)

Ground water contamination, Bq/l

<table>
<thead>
<tr>
<th>No borehole</th>
<th>$^{226}$Ra</th>
<th>$^{210}$Pb</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.05</td>
<td>0.6</td>
</tr>
<tr>
<td>7</td>
<td>0.02</td>
<td>0.3</td>
</tr>
<tr>
<td>22</td>
<td>0.03</td>
<td>0.5</td>
</tr>
<tr>
<td>201</td>
<td>0.18</td>
<td>0.8</td>
</tr>
<tr>
<td>IL</td>
<td>0.5</td>
<td>0.2</td>
</tr>
</tbody>
</table>
Nearby uranium mining facility (2)

Total alpha activity in drinking water, Bq/l.

\[ \text{IL} = 0.2 \]

\[ \text{IL} = 60 \]

$^{222}\text{Ra}$ in drinking water, Bq/l
Specific activities of $^{226}$Ra and $^{210}$Pb in foodstuffs

- Nearby uranium mining facility (3)
Uranium Mines

Lung cancer among the uranium miners
Regulatory decisions and practice

Resettlement of Octyabrsky

2007

2010

2012
Harmonization of dose and environmental protection criteria

- Participation of FMBA of Russia in the Interstate target programme EurAsES “Reclamation of areas of EurAsES member states affected by uranium mining industry”

- Development of Regulatory Guide document “Radiation safety regulation during remediation of uranium legacy sites and facilities” under NRPA-FMBA cooperation with Central Asia
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Challenges

1. In order to properly maintain contaminated sites additional regulation should be developed

2. Actions to remediate the legacy sites might affect the public living at the neighboring territories

3. Credibility of authorities responsible for protective strategies needs to be increased

4. Public concern might be related not only to radiation protection as well as to the complex aspects (public health, environment, economics, social & psychological, etc.)
What Else is Needed to Regulate the Nuclear Legacy?

1. To introduce the existing exposure situation
2. To develop criteria for site remediation and return to uncontrolled uses
3. To consider methods of optimization for the remediation strategies
4. To introduce legal limit relating to stop generation of new nuclear legacy
5. International development documentation
Key issues (1)

- Fundamental protection principles: justification and optimization of implementing protection strategies
- Reference levels are used (typically: 1 - 20 mSv/y effective dose)
- Protection strategies encompass a series of protective actions directed at the relevant exposure pathways
- Several areas may be defined with relevant conditions according to a graded approach
- Governments or national authorities should take responsibility of ensuring an overall benefit to society as well as to individuals
Key issues (2)

- Strong recommendation to involve local stakeholders to participate at all stages of planning and implementation of protection strategies
- An inclusive radiation monitoring system
- A health surveillance strategy
- Dissemination of radiation protection culture
- Education of local population and transmission of practical knowledge
Thank you for your attention

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