FMBA’s Responsibility on nuclear and uranium legacy regulation in Russian Federation

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Technical Meeting for the International Working Forum on RSLS, Vienna, 11-15 Oct. 2010
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1. Nuclear and uranium legacy regulation in Russian Federation
2. Federal agencies responsible for control and regulation in sphere of nuclear energy
3. Characteristic of FMBA
4. Nuclear legacy:
   • in Southern Ural
   • in North-West of Russia
5. Conclusion

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Nuclear and uranium legacy regulation in Russia

is developed in complains with:

- Constitution of Russian Federation;
- Federal laws;
- Fundamentals of the public policy in the field of nuclear and radiation safety guaranteeing in Russian Federation over the time period up to 2010 and further perspective (approved by the President of Russian Federation on December 4, 2003)
Federal Laws

Federal Law of 09.01.1996 №3 – FZ
«About radiation safety of the public»

Federal Law of 30.03.1999 №52 – FZ
«About sanitary and epidemiological prosperity of the public»

«About atomic energy application»

Federal Law 10.01.2002 №7 – FZ
«About protection of environment»

«About technical regulation»

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Structure of Regulation

MINZDRAVSOCRASVITIYA (FMBA)  ROSTECHNADZOR

Federal Laws:
«About radiation safety»
«About sanitary and epidemiological prosperity»

Sanitary Limits and Regulations, Hygienic Norms

Guidance, Methodical Instructions

Methodical Instructions of Control Methods

Normative documents

Guidance

Laws

Federal Laws:
«About atomic energy application»
«About technical regulation»

Federal Norms Technical Regalements

Recommendations

Standards

RUSSIA  EUROPEAN COUNTRIES, USA  RUSSIA

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Regulation Functions of FMBA

Regulation of radiation safety both for workers at Rosatom facilities those of nuclear shipbuilding and for the public from areas at Rosatom facilities

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Structure of Federal Medical-Biological Agency

42 regional authorities and 60 centers of hygiene and epidemiology (Regulation)

Scientific-Research Institutes (36) (Scientific–technical supports)

Special patient care (Medical care)

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Main problems of Nuclear Legacy

- Storage of non-isolated liquid RW of low and medium-level (Techa cascade, Karachay lake, other) – **Southern Ural**
- Accumulation of high-level RW in storage tanks
- Discontinuance of operation of industrial reactors, radiochemical production and other defense complex
- Accumulation of SNF and RW at NPP sites
- Accumulation of SNF and RW of nuclear submarines – **Nord-west** and East of Russia
- «URANIUM» legacy

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Main problems of Nuclear Legacy in Southern Ural

- Releases of liquid radioactive waste into the open hydrographic system of Techa river from 1949 till 1956;
- Accident with storage tank of liquid HLW (1957), caused generation of «Eastern-Ural radioactive trace - EURT»;
- Usage of ponds 9 and 17 for store of liquid intermediate level waste;
- Construction of artificial ponds of Techenskij cascade for store of liquid low level waste;
- Wind carry-over of radioactive bottom sediments from outcropping coastal stripe of Carachaj lake in 1967

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SOUTHERN URAL

”Mayak” PA industrial area, buffer zone and affected area

Diagram of FSUE “Mayak” PA reservoirs

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EURT-Soil contamination density, Sr-90

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SOUTHERN URAL
EURT-Soil contamination density, Cs-137

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Population centers on the Techa River

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### Characteristics of Radiation Exposure

<table>
<thead>
<tr>
<th>Basic characteristics</th>
<th>Ozersk</th>
<th>Techa river</th>
<th>EURT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total release, Ci</td>
<td>?</td>
<td>$3 \cdot 10^6$</td>
<td>$2 \cdot 10^7$</td>
</tr>
<tr>
<td>Area contamination type</td>
<td>air</td>
<td>water</td>
<td>air</td>
</tr>
<tr>
<td>Basic dose-forming nuclide</td>
<td>$^{131}I$</td>
<td>$^{90}Sr$, $^{89}Sr$, $^{137}Cs$</td>
<td>$^{90}Sr$</td>
</tr>
<tr>
<td>Contamination area</td>
<td>Techa and Iset rivers bottom (width up to 4 km)</td>
<td>23 000 km$^2$ (density by $^{90}Sr$ 0.1 Ci/km$^2$ and over)</td>
<td></td>
</tr>
<tr>
<td>Maximum dose rate</td>
<td>?</td>
<td>3.5–5 R/hour</td>
<td>1–3 R/hour</td>
</tr>
<tr>
<td>Out of land-use management</td>
<td>-</td>
<td>80 km$^2$</td>
<td>1 000 km$^2$</td>
</tr>
<tr>
<td>Resettled</td>
<td>-</td>
<td>About 8 000 people</td>
<td>10 000 people</td>
</tr>
<tr>
<td>Exposed population size</td>
<td>40 000 people</td>
<td>124 000 people (Techa and Iset)</td>
<td>272 000 people</td>
</tr>
</tbody>
</table>

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Radiation protection

• Physical protection of ionizing radiation sources
• Zoning of inside and outside territory of hazardous facilities
• Radiation and chemical monitoring
• Compliance with technical system operating conditions, equipment upgrade, running and scheduled repairs
• Sanitary-epidemiological assessment of operation, products and technologies; licensing of operation
• Procedures on personnel and population radiation protection in standard conditions and in case of radiation accident
• Improvement of personnel and population radiation-hygienic awareness

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### SOUTHERN URAL

**Regulator and TSO of FMBA**

<table>
<thead>
<tr>
<th><strong>Regional office №71</strong></th>
<th><strong>Sanitary-epidemiological surveillance</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hygiene and epidemiology center №71</strong></td>
<td><strong>Sanitary-epidemiological monitoring</strong></td>
</tr>
<tr>
<td><strong>Central medical department №71</strong></td>
<td><strong>Delivery of health care</strong></td>
</tr>
<tr>
<td><strong>Southern Urals Biophysics Institute, Ozersk</strong></td>
<td><strong>Scientific support (in “Mayak” PA area)</strong></td>
</tr>
<tr>
<td><strong>Ural theoretical and practical center of radiation medicine, Chelyabinsk</strong></td>
<td><strong>Scientific support (in the Techa river area, EURT)</strong></td>
</tr>
</tbody>
</table>

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### SOUTHERN URAL

**Regulating documents**

*(subject to compulsory implementation)*

<table>
<thead>
<tr>
<th>Document</th>
<th>Code</th>
<th>Ministry</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Radiation standards (NRB-99)”</td>
<td>SR 2.6.1.758-99 RF Health Ministry</td>
<td></td>
</tr>
<tr>
<td>“Basic sanitary rules of radiation safety (OSPORB-99)”</td>
<td>SR 2.6.1.799-99 RF Health Ministry</td>
<td></td>
</tr>
<tr>
<td>Sanitary Rules and standards &quot;Sanitary rules for radiation safety of personnel and population at radioactive materials (substances) transportation&quot;</td>
<td>SanPiN 2.6.1.1281-03 RF Health Ministry</td>
<td></td>
</tr>
<tr>
<td>Sanitary rules “Requirements for sanitary-epidemiological safety provision at operating special industrial reservoirs of “Mayak” PA” (SP-ESPV-POM-04)</td>
<td>SR 2.6.1.70-04 RF Health Ministry (FMBA of Russia)</td>
<td></td>
</tr>
<tr>
<td>Sanitary Rules and standards “Hygienic safety requirements of articles of food”</td>
<td>SanPiN 2.3.2.1078-01</td>
<td></td>
</tr>
</tbody>
</table>

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Guidelines “Estimation of commitment dose for residents of RF settlements affected by radioactive contamination due to the 1957 accident on “Mayak” PA and radioactive wastes release into the Techa river”

Guidelines 2.6.016-93. Instructional guidelines “Sanitary requirements for collection, storage, transportation, and dumping of solid radioactive waste on “Mayak” PA”

Guidelines “Radiation facility controlled area. Organization and performance of environmental radiation monitoring”


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Environmental control

- Atmosphere air
- Buffer area and controlled area, virgin and arable lands
- Drinking water, open water, bodies water, underground sources
- Environmental objects (vegetation, soil, snow cover)
- Locally produced articles of food (milk, meat, fish, vegetable crop)
- Solid and liquid radioactive wastes transportation to sites of permanent dumping

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Regulation of releases

- Release of liquid radioactive wastes into special reservoirs is regulated in compliance with “Restriction on radioactive substances release into “Mayak” PA special reservoirs”, approved by FMBA deputy director, annually reviewed release standards, standing instructions, and regulations coordinated with FMBA Regional Office №71

- Release of nonradioactive pollutants into the Techa river basin is performed on the basis of “Permit for discharge of chemical agents”, issued by Rostechnadzor of Chelyabinsk region

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## SOUTHERN URAL

Population effective dose rate

Population individual effective dose rate in “Mayak” PA affected area, mSv/year

<table>
<thead>
<tr>
<th>Check points</th>
<th>Years of observation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2002</td>
</tr>
<tr>
<td>Ozersk</td>
<td>0,10</td>
</tr>
<tr>
<td>Community № 2 (Ozersk)</td>
<td>0,13</td>
</tr>
<tr>
<td>Novogorny community</td>
<td>0,25</td>
</tr>
<tr>
<td>Metlino (ONIS) community</td>
<td>0,16</td>
</tr>
<tr>
<td>Khudaiberdinsk</td>
<td>0,15</td>
</tr>
<tr>
<td>Bashakul</td>
<td>0,17</td>
</tr>
<tr>
<td>Kyshtym</td>
<td>0,06</td>
</tr>
<tr>
<td>Dose limit by RSS-99</td>
<td>1,0</td>
</tr>
</tbody>
</table>

Dose limit by RSS-99: 1,0

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Basic issues of radiation safety:

In the course of implementation of Federal target program “Nuclear and radiation safety in 2008 and for the period through to 2015” the following problems are to be resolved:

• Conservation of reservoirs with medium active waste (lake Karachay - by 2015, «Old bog» by 2025)

• Bringing TCR to ecologically acceptable state

• Processing and storage of accumulated radioactive wastes

• Processing of spent fuel (including nuclear-powered submarines)

• Decommissioning of shut-down reactors

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### Registry of Mayak’s personnel

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of persons</td>
<td>12,692</td>
<td>6,154</td>
<td>18,846</td>
</tr>
<tr>
<td>Number of persons – Pu</td>
<td>9,423</td>
<td>4,997</td>
<td>14,420</td>
</tr>
<tr>
<td>With known vital status</td>
<td>92,1%</td>
<td>96,3%</td>
<td>93,5%</td>
</tr>
<tr>
<td>Archive dose, cGy</td>
<td>112,8</td>
<td>18,9</td>
<td>83,4</td>
</tr>
<tr>
<td>Pu body burden, kBq</td>
<td>2,5</td>
<td>0,4</td>
<td>1,7</td>
</tr>
</tbody>
</table>

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Total in the register:
✓ 83210 people
✓ over 2 mln. person-years of follow-up

Inside the columns % of the known is indicated

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Medical-dosimetric database of URCRM

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SOUTHERN URAL

Some conclusions

1. The distant effects as the increase of the malignant neoplasms and leukosis caused mortality rate were:
   - in the Techa river cohort which has got the biggest doses during the maximal burial period at 1948-1958
   - in the “Mayak” PA personnel, recruited in 1948-1958

2. In the cohort started the labor at the “Mayak” PA after the 1958, the oncological mortality rate is lower than the national in two times

3. There are no any changes in the health of many years inspected offsprings of Techa river cohort

4. The radiation conditions around the Techa river is under the control and there is no the irradiation of the personnel and the population except the population of the Muslyumovo village

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Residents of Muslyumovo village, Chelyabinsk region

- In 2006 GC «Rosatom» and Chelyabinsk region government made an agreement on joint financing of procedures to solve the Techa river ecological problems and Muslyumovo village social issues.

- 741 households of Muslyumovo village are subject to evacuation (about 2400 residents). By the mid 2009 all village residents will be able to move to a new place of residence.

- Evacuation is sponsored by GC «Rosatom» and Chelyabinsk region government.

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To develop the low draft “About status and special conditions of using affected territories in area of “Mayak” PA”
NUCLEAR LEGACY SITES

Andreeva Bay
6.0 \times 10^{14} \text{ Bq of RW}

Gremikha
3.3 \times 10^{13} \text{ Bq of RW}

Krasheninnikova Bay
1.5 \times 10^{13} \text{ Bq of RW}

Sysoeva Bay, Razboinik Bay
2.68 \times 10^{13} \text{ Bq of RW}

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Nature of the STS Contamination

Andreeva Bay

Sysoeva Bay

The main dose-forming radionuclides: \( ^{90}\text{Sr} \), \( ^{137}\text{Cs} \)

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Tasks of FMBA of Russia

- Independent analysis of the situation
- Assessment of radiological threats
- Development of the regulatory documents
- Supervision, control, monitoring
- Emergency response
- Expert review

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Regulatory Documents
developed by the FMBA for
SevRAO

Requirements to provide radiological protection of the personnel and the public

Criteria and norms on remediation of sites and facilities contaminated with man-made radionuclides

Arrangement of the environmental radiation monitoring in the operational area of the STSs

Requirements for industrial waste management

The Operational Radiological and Medical Criteria for the Initiation of Emergency Protective Actions

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## Norms of remediation

<table>
<thead>
<tr>
<th>Variant of remediation</th>
<th>Category of persons</th>
<th>Dose constraint, mSv·y⁻¹</th>
<th>Dose limit from (NRB-99)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Due to residual contamination</td>
<td>Due to new operation involved radiation sources</td>
</tr>
<tr>
<td>Conservation</td>
<td>Workers</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Public (SA territory)</td>
<td>0,1</td>
<td>-</td>
</tr>
<tr>
<td>Conversion (&quot;brown lawn&quot;)</td>
<td>Personnel group A</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Personnel group B</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Public (SA territory)</td>
<td>0,1</td>
<td>0,15</td>
</tr>
<tr>
<td>Liquidation (&quot;green field&quot;)</td>
<td>Public (former STS territory)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Public (the rest territory)</td>
<td>0,1</td>
<td>-</td>
</tr>
</tbody>
</table>
Requirements to support safe management of products containing nuclear materials (NM)

Radiation hygienic and organizational, including those concerning:

- Safety and protection of workers
- Technological processes and equipment
- Radiation monitoring
- Personal protection of workers

Radiation protection optimization

The procedure of ascription of the NM containing products to the RW category is specified

PBYa – 06-00-96

Workshops for SRW and LRW management do not assume to accept the NM containing RW in amounts

> 300 gram
Example of remediation

2005
0.15 – 450 μSv/h

2010
0.15 – 0.35 μSv/h
Next Steps in Regulation

1. To ensure and support performance of independent expert review of the design documentation; safety justification over the new-built facilities and radiation hazardous operations at the SevRAO

2. To analyze safety justification of the design decisions on arrangement of the container site for the SNF and RW storage.

3. To provide control of the SNF and RW transportation over the territory of Russia and to ensure preparedness of powers and resources of the FMBA of Russia for operation under conditions of potential radiation accident in respect to the cargo transported.

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Thank you for your attention!