

**Russian Experience in Regulatory Supervision of the Uranium Mine and Milling Legacy Sites – 14242**

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**ABSTRACT**

There are many uranium legacy sites in Russia and ex-Soviet republics in the Central Asia, which are decommissioned now. In Russia, there is a number of operating uranium mines and ore milling facilities to be decommissioned after termination of their life cycle. Today, the list of Russian subsoil areas of the federal significance includes 135 uranium deposits. The uranium legacy management is accompanied with the environmental impact. The intensity of such impact depends on the amount of generated waste, degree of its confining and dispersion in the environment. The whole question reduces itself to the following: to what extent this impact is harmful to the environment and human health. The proper regulation of this problem is a criterion for the safe work. Since the establishment of the uranium industry, the well done regulatory system operates in the FMBA of Russia. Such system covers inter alia, the uranium legacy. This system includes the extent laboratory network of independent control and supervision, scientific researches, regulative practices.

**INTRODUCTION**

The uranium legacy management results in the environmental impact. The intensity of such impact depends significantly on the volume of the generated wastes, extent of their localization and spreading in the environment. The question is: how hazardous is such impact on the environment and human health? An adequate regulation of this problem is a criterion for the safe operation.

The problem is that there are no comprehensive regulative and legislative provisions on uranium legacy management operations in the current legislation. These provisions should envisage implementation of the principles aimed at prevention of harmful impact of legacy sites on the human health and environment and at reduction of burden on future generations.

**MAIN HEADINGS**

**The current situation.**

There are many uranium legacy sites currently decommissioned in Russia. These are: Lermontov PA "Almaz"; Novotroitsk ore management involved in the thorium ore mining in Balej city of Chita region; Stepnoye ore management in Kalmykia; many places where the geological parties carry out their the pilot industrial operations, the largest of which is Aldan deposition in Sakha (Yakutia) Respublik. There are also many operational uranium mines and uranium milling facilities. After termination of the operational life of some mines, cyclic decommissioning of the spent facilities is to be carried out. The large operational enterprises are: Priargun Mountain Chemical Association, Krasnokamensk, Chita region, Malyshevskoye ore management, Malyshevo village, Sverdlovsk region, Machinery plant in Electrostal city, Chepetsk mechanical plant in Glazov city. Since 2013, development of the new Elkon deposition in Yakutia is in plans.

**The public exposure**

In case of the uranium legacy originates from the radon presence in common air mainly

because of allocation of the uranium mines at certainly radon hazardous uranium bearing areas. Unsatisfactory situation exists in Octyabrsky village and in Lermontov city. In Octyabrsky village located on the territory of the largest Russian Priargun uranium combine, the elevated radon values in comparison with the established one have been registered (200 Bq/m<sup>3</sup>) in 39 % of the residential area. The situation in Lermontov city is connected with the operation of the ore milling facility “Almaz”. The aggravator in this case is the fact that: the rock dumps and ore waste were used for the purpose of the city roads bedding and of the baseline and coverage construction. On the base of research findings and directions of the FMBA of Russia, the decision was made on re-settlement of the residents in Krasnokamensk city. In Lermontov, where about 1000 rooms are radon-unhealthy, this problem is still to be solved.

**The occupational exposure.**

The uranium mining and milling are the most dose resulting operations. So, at the Priargun Facility, of the annual dose limits for the underground workers are systematically exceeded, mainly due to the elevated concentration of radon and its progeny in the air of mines. According to our assessments (monography), the lung cancer of miners of the uranium mines is 4 times more frequent in comparison with the average population data. Thus, when solving the uranium legacy problem with radiation protection of the environment and population, the problem of protection of workers cannot be avoided.

Considerable radon inflow in dwellings was firstly detected in 1987. Radon concentrations registered in flats were comparable with its air concentration in underground openings of mining. In some rooms, radon air concentration acceptable for the personnel (miners involved into underground operations) was exceeded.

Gamma dose rates are specific for uranium-containing areas. Inside dwellings, within farmlands and outdoors they are 0.09–0.4, 0.2–0.8 and 0.1–2.5 μSv/h, respectively.

The maximum dose rate – up to 15 μSv/h – was recorded adjacent to the mine pumping station. On the most part of Octyabrsky area <sup>226</sup>Ra content in soil, is higher a bit than in the controlled area. In some streets, <sup>226</sup>Ra specific activity in soil is 200 – 400 Bq/kg.

The radioecological situation have been analyzed by force of examined:

- contents of main natural radionuclides in environmental media and foods
- gamma dose rate and radon equivalent equilibrium activity concentration in common air.
- common air.

TABLE I Contents of main natural radionuclides in foods

Food	<sup>226</sup> Ra	<sup>210</sup> Pb
<b>Octyabrsky</b>		
Milk	0.11	0.8
Potatoes	0.04	0.28
Vegetables	0.02	0.20
<b>Soktuy</b>		
Milk	0.01	0.08
Potatoes	0.01	0.08

Vegetables	0.02	0.09
Soctuy village was selected for comparison, situated beyond the mining impact area, at a distance of 40 km from Octyabrsky		

226Ra and 210Pb specific activity in local foods, sampled in Octyabrsky is higher, in comparison with the controlled village.

Radon EEAC in 40% dwellings exceeds 200 Bq/m<sup>3</sup> acceptable level. According to the sanitary norms, protective actions are to be implemented here to reduce radon content - cellar backfilling, floor weatherproofing, and overhaul of houses. However, these measures appeared to be inefficient: they did not cause reduction of radon inflow in dwellings.

### **The current regulation.**

Taking into account that medical support and regulation of the uranium mining facilities of the former USSR was the responsibility of the Third Chief Directorate of the Ministry of Health of the USSR (today FMBA of Russia), the accumulated potential and many results in radiation safety are already in use and will be used for the purpose of development of measures on the uranium legacy. In the ex-soviet republics in 1990 and following years and in Russia up to 2010, the regulatory rules were and are in use in the field of: design of the facilities; arrangement and operation of facilities for the uranium underground and heap leaching; operation of the uranium mines; closure, conservation and change of functions of the facilities for the radioactive ore mining and milling. Today, the next document is under development to substitute all above mentioned documents – The Rules/Requirements for design, operation and decommissioning of the uranium mining and milling facilities.

The FMBA of Russia recognizes the problems of radiation safety assurance related to the legacy of the former USSR in the uranium mining industry. Some part of the regulatory problems assumes to be solved within the EurAsEC inter-state target program «Reclamation of the territories of the EurAsEC member states affected by the uranium mining and milling facilities». Using the example of the uranium legacy sites in Kyrgyz and Tajikistan which could result in the tran-boundary disasters and require urgent reclamation, the experience will be gained to be used in other states as well. Harmonization of the national legislations and regulative documents on radiation safety assurance is envisaged.

### **Outlooks of the future regulation**

We think that the Outlooks of the future regulation are firstly in the necessity of introduction the existing exposure situation concept in the national regulation and harmonization of that concept with the international radiation protection system Secondly, the criteria for the site remediation are also to be considered there and the return of such lands to the economic activity, for example, similar to the nuclear legacy sites in the northwest Russia. Thirdly, optimization of the “question costs” of the criteria for the area to be recognized as remedied and of the remediation strategies developed. The recent ICRP recommendations provide the flexible approaches for solving of such tasks.

Important regulatory tasks during the environmental remediation of the uranium legacy sites are: full account of the requirements of the actual radiation safety regulation; development of the supervision and control functions; development of the insufficient documentation; review of the projects on the uranium legacy and discussion with the stakeholders.

The risen questions of the uranium legacy regulation in on-line dialogue must find their solutions

when implementing the working program within the IAEA International Forum on the regulatory supervision in the field of the nuclear legacy.

### **CONCLUSIONS**

1. In Russia (FMBA) since the beginning of the uranium industry up to now the system of uranium regulation operates successfully.
2. The most important tasks of the environmental remediation of the uranium legacy sites are: comprehensive account of the current radiation protection requirements; development of supervision and control functions; development regulative and methodical documentation; review of the design, working and organizational documentation; stakeholder involvement.
3. These issues must be the subject of active dialog within the IAEA member states.

### **COMPREHENSIVE LIST OF ACRONYMS**

1. **FMBA OF RUSSIA** Federal Medical Biological Agency (Russia)
2. **IAEA** International Atomic Energy Agency
3. **ICRP** International Commission on Radiological Protection
4. **EurAsEc** Eurasian Economic Community
5. **Former USSR** Former Soviet Republics

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