Remediation of Former Uranium Open Pit Baita, Romania – a Challenge!

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Two state enterprises have legal responsibility with respect of remediation of uranium production legacy sites in Romania:

- **The Uranium National Company S.A.** was set up by the Government’s Decision No. 785/1997, modified by Government’s Decision No. 729/2004 and is responsible for administrating the uranium mineral resources existing in Romania.

- By the Government’s Decision No. 729/2004 all the former activities related to uranium mining exploitation, uranium ore processing and uranium concentrates conversion to $\text{UO}_2$ sintered powder are transferred to the National Uranium Company S.A.

- By the same Government’s Decision No. 729/2004 the geological research for uranium are transferred to a new company named “Radioactiv Mineral Magurele S.A.”

- Annex no. 3 at Government’s Decision No. 729/2004 contains the list of all sites where the Uranium National Company carried out geological research for uranium.
By the Government’s Decision No. 313/2002 and Government’s Decision No. 1158/2004 was set up a new trading company named “CONVERSMIN S.A.”, subordinated to the Ministry of Economy.

According to Art. 1, paragraph (3), Trading company “CONVERSMIN S.A.” has as main activity object:

a) the conservation of mines from shut-down until starting subscription of the closing contract;

b) closing of underground mines and ecological remediation;

c) operating, maintenance and remediation of the facilities resulted by the break-up of closing activity, in order to preserve the designed environmental parameters;

d) post-closure monitoring of closed mining facilities.
According to Art. 3, paragraph (1) of Government’s Decision No. 1158/2004:

“Financial funds of the trading company “CONVERSMIN S.A.” are constituted by:

1. The amounts allocated from state budget by the budget of Economy Ministry to carry out the works included in National Annual Program for conservation, closing, ecological reconstruction and post-closing surveillance of mining objectives (including uranium mines).

2. Own capital realized by contracting and executing works financed by the programs and financial projects based on the agreements between Romania and international institutions.

3. The conservation and definitive closing of each mine (or mining site), including uranium production sites, are approved by Government´s Decision.

4. Also, the mentioned Government´s Decisions contain the amounts approved for the elaboration of the technical closing documentation and, separately, for conservation, closing and remediation works, for each mine, including uranium production sites.
The official document for the definitive closing of each uranium site, environmental restoration and monitoring is Government’s Decisions.

- Government’s Decisions No. 17/1999 (Ciudanovita mine)
- Government’s Decisions No. 720/1999 (Mines: Ranusa, Lisava and Avram Iancu)
- Government’s Decisions No. 602/2001 (Hojda-Magura mine)
- Government’s Decisions No. 1846/2004 (Mines: Milova, Repedea-Poienile)
- Government’s Decisions No. 644/2007 (Mines: Baita Plai Partial, Dobrei Est and Rapsag; Tailing pound Cetatuia Feldioara – Compartment 1)
The radiological safety assessment

The technical decommissioning project

The analysis on the radiation safety of the occupational exposed workers and of the environment on the time of decommissioning activity

The radiation protection program

The quality assurance program in the decommissioning stage

The monitoring and surveillance programs of the radioactivity of the environment factors
The documents proving the technical capability and accreditation or authorization provided in the legislation in force for the legal bodies and for the physical persons involved in the decommissioning activity

The document stating the definitive cessation in view of decommissioning

The intervention plan in case of emergency

As applicable, physical protection plan and the procedures on the access in the facility to be decommissioned,

Environment authorization or agreement
Before starting the closing works in compliance with technical documentation approved by CNCAN, the holder of CNCAN decommissioning authorization must obtain the environmental agreement from local Environmental Protection Agency (EPA). The environmental agreement is issued by the EPA only if local community agrees with this decommissioning project, after a mandatory public discussion with community members takes place.

Founded in 1962

Part of the integrate survey system of environmental pollution in România, in the framework of MECC.
Locating the Main Uranium Sites in Romania and their state

Mines: Dobrei, Natra and Ciudanovita (decommissioning)

- Baita Plai - Open Pit and Mine (conservation)
- Avram Iancu mine (decommissioning)
- Repedea-Poenile de sub Munte mine - Remedied
- Tulghes Area – new uranium deposit
- Jolotca Site - Remedied

Feldioara Uranium Ore Processing Plant

- ROMAG Heavy Water Plant
- Pitesti Nuclear Fuel Plant
- NPP Cernavoda

HUNGARY

UKRAINE

SERBIA

BULGARIA
Currently, in Romania there is only one mine (Mine Botusana) in operation.

There are about 50 uranium sites in accordance with the definition given for "legacy sites" in the Work Programme, adopted on 24 October, 2011 at the RSLS Technical Meeting in Vienne.

Most of them come from geological exploration of uranium ore and are small (in area and volume).

Only three of them are large and come from the exploitation of uranium deposits, requiring extensive works closure and environmental rehabilitation, respectively:

- Uranium mines group in Banat area (Ciudanovita, Lisava, Natra mines);
- Former Open pit Baita and Avram Iancu mine (Bihor area);
- Crucea Mine (Suceava county)
Activity closure and environmental remediation was completed at uranium sites:

- Glogova, Gorj county
- Jolotca, Harghita county
- Barzava, Arad county
- Repedea-Poienile de sub Munte, Maramures county
The current state of uranium sites closing activities and environmental remediation (2)

Termination of closure and environmental remediation is certified by regulatory body that issued the document “Certificate of termination of nuclear activities and the release of licensing regime”
Technical Documentation for obtaining “Certificate of termination of nuclear activities and the release of licensing regime” must contain:

- the final decommissioning report
- the final radiological safety assessment
- the document by which the local Environmental Protection Agency (EPA) certifies that the affected environment is rehabilitated
Barzava uranium site, Arad county, before (2007) and after closure and remediation (2013)
Barzava uranium site, Arad county, after closure and remediation
Uranium site Barzava, Arad county - Gamma dose rate at a height of 1 m before and after closure and remediation

**Before remediation**

**After remediation**

After closure and remediation Gamma dose rate at a height of 1 m is less 0.40 μ Sv / h

The concentration of radon-220 at a height of 1 m is the natural background level (<20 Bq /m³)
The remedial works were:

(i) ensuring stability of slopes by adjustment of the angle of inclination;

(ii) coverage following:
- A layer of high density polyethylene;
- A layer of fine sand filter;
- A thick layer of clay 50 cm;
- Topsoil with a thickness of 20 cm
- Fertilizer and vegetation establishment.

(iii) building trenches to protect dump guard removed by runoff on slopes;

(iv) the river at the bottom of the heap was adjusted so that it is protected against erosion. Riverbanks and dump base was reinforced with walls.

(iv) installation of a protective fence.
Priorities in Romania today on the closure and remediation of uranium sites

- Completion of closure and remediation at uranium mines Ciudanovita, Lisava and Natra localized in Banat area
- Completion of closure and remediation at uranium mine Avram Iancu localized in Bihor area
- Completion of closure and remediation at uranium mine Crucea, Suceava county
- Finding the best technical options closure and remediation of former uranium open pit Baita Plai and Baita Plai mine from the point of view of the benefit / cost; Preparing project closure and rehabilitation as the best option.
- Baita uranium ore had an average concentration exceptional (over 5% U).
- It was mainly exploited career and partly by underground mining.
- The operation was made a Romanian-Soviet Union joint venture between 1950-1960.
- On operation there were no further remedial requirements.
- Uranium ore was sorted before being sent to the Soviet Union.
- Since the ore was shipped only with a content of 0.5% U, large quantities of ore with a lower content contaminated waste rock resulting from stripping.
Remediation of open pit Baita Plai site, Bihor county – An challenge (1)
Remediation of open pit Baita Plai, Bihor county – An challenge (3)

Open pit Baita Plai

Open pit Baita

160 000 m²
Contaminated land (Locations of former uranium ore deposits)

Network measurement: 20 x 20 m
Contaminated land between Station Reception-Expedition and Ore Crushing Building
Dose rate range of contaminated land between Station Reception-Expedition and Ore Crushing Building; Network measurement: 20 x 20 m
Remediation of open pit Baita Plai site, Bihor county – An challenge (7)

Dose rate range of Dump G15 (Network measurement: 10 x 10 m)
Dose rate range of Valea Plaiului Dump

(Network measurement: 20 x 20 m)
Why is a challenge the remediation of former open pit Baita?

- The total area covered by dumps and contaminated soil is very high (a few square kilometers);
- Total mass of rock dumps contaminated and contaminated soil is very high (millions of tons);
- The landscape is very rugged area;
- There are large areas of rock outcrops that generates significant flows of external exposure;
- Clay deposits that could be used to cover heaps are far away from the open pit;
- The needs of clay coating is enormous;
- Remediation costs seem immense, without being sure that there will be a significant reduction in effective doses for realistic scenarios.
Why is a challenge the remediation of former open pit Baita?

- There is a huge stockpile of crushed rocks, contaminated results from radiometric ore sorting. They can be easily trained outside the mining area of rainwater.

- The main access road was achieved by filling the bed of a creek with rocks was contaminated; In some cases, the filling material has a thickness of several meters.

- There is a small critical group (less than 100 people) who lives near the mining area. The main radiological risk for this group is radon. Radon activity at certain times of the day can be over 2000 Bq / m³. Source radon does not seem to be mine waste.
Why is a challenge the remediation of former open pit Baita?

Positive aspects

- Currently, access is controlled and restricted in mining area.

- The rocks of the dumps are geochemically stable. So we have not high content of uranium and radium in mine water.

- The next critical group living in more than 7 km from the mining area.
Why is a challenge the remediation of former open pit Baita?

Other options considered:

- Moving small group critic who lives near the mining area

- A new radiometric sorting rock dumps recovery of those with high uranium content.

- Only coverage and stabilize the dump with fine material in order to reduce the spread of contamination outside the mining area;

- Maintaining access control in mining area for long.
THANK YOU!