Experience of Ukraine in implementing rehabilitation programs for uranium legacy sites

Tetiana KORZYNA
Department on Radiation Safety

Uranium facilities of Ukraine

1. State Enterprise “Eastern Mining and Processing Plant”
Zhovti Vody city, Dnepropetrovsk region

2. The Production Association “Prydniprovsjsx Chemical Plant” (PA “PCP”)
Kamyanske city (formerly Dniprodzerzhynsk), Dnepropetrovsk region
State enterprise “Eastern Mining and Processing Plant” (SE “EMPP”)

- SE “EMPP” is located in the city of Zhovti Vody of the Dnipropetrovsk region
- It has carried out mining and processing of uranium ores since 1951
- supplies up to 40% of the uranium required for fueling the Ukrainian nuclear power plants
- three mines: Smolynska, Inhulska, Novokostyantynivska and a hydrometallurgical plant

According to current life of mine Smolyska calculations, uranium ore reserves will be exhausted by 2023 in the Vatutinske deposit. There is an issue about the closure of the mine, which is working out this deposit.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Units</th>
<th>Range</th>
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<tbody>
<tr>
<td>Dose rate of gamma radiation</td>
<td>µSv/hour</td>
<td>0.35 – 1.75</td>
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<tr>
<td>(dose equivalent power)</td>
<td></td>
<td>0.78 – 5.75</td>
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<tr>
<td>facilities</td>
<td></td>
<td>0.11–0.17</td>
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<tr>
<td>Mine Smolynska</td>
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<td>≈ 1 million m²</td>
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<tr>
<td>Natural background</td>
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<td></td>
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<tr>
<td>contaminated area</td>
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I stage: decommissioning of mine Smolynska by eliminating it. Bringing in a safe condition disturbed ground, mine water treatment, creation of conditions for development of the area

Preparatory activities for the cessation of the mine Smolynska should start in 2020. Mine production facilities involved in mining and processing of uranium ore are contaminated with a natural origin radionuclides. And they need to be put in a safe condition that guarantees the safety of people, property and the environment.

II stage: mine water treatment before discharge into water body, carrying out radiation monitoring. The measures on human protect radiation exposure and the economic development of the area.

Currently the Concept is under consideration and approval stage with competent authorities
Former uranium facilities of SE “Eastern Mining and Processing Plant”

- Located in Dnipropetrovsk region at a distance of 30 km to the South-east from the town of Zhovti Vody
- Operated from 1959 to 1983.
- Today, 100% of the territory is deactivated, the land is transferred to the land owner.
- The company carries out radioecological monitoring.

- Exhausted section of underground leaching “Devlagovo”

Tailing pond “Brown Iron Career”

- Located at a distance of 2 km to the North-west from the town of Zhovti Vody.
- Operated from 1964 to 1996.
- Since 1996 is in the conservation stage.
- Currently the whole territory of the tailing pond is covered by a reclamation layer.

PA “Prydniprovsy Chemical Plant”

Production Association “Pridneprovsky chemical plant” (PA “PCP”) is located in Kamianske city (former Dniprodzerzhynsk), Dnipropetrovsk region.

It was the most powerful mining and processing enterprise of the former USSR from 1949 – 1991.

Result:
- 9 tailings
- Approximately 42 million tons of radioactively contaminated uranium ore waste, uranium raw material residues and industrial waste
- Total activity \(3.14 \times 10^{15}\) Bq. Total area – 2.68 million m².

Restructuring and conversion of PA “PCP” since 1992.

Currently on the industrial site of PA ”PCP” more than 50 different companies are registered.
STATE PROGRAMMES
on bringing into environmentally safe condition former uranium facilities of PA “PCP” and protect the public:

Government decree on November 26, 2003 № 1846
Government decree on November 12, 2008 № 1425-p (Plan of priority measures until 2009 to improve the ecological situation of Dneprodzerzhinsk city) and
Government decree on September 30, 2009 № 1029 (terminated in 2014)

On August 21, 2019 The Government of Ukraine has approved
The State Targeted Environmental Programme of Priority Measures for Safeguarding the Objects and Site of the Former Uranium Production of the Production Association “The Prydniprovsky Chemical Plant” for 2019-2023”.

Rehabilitation work on uranium facilities is possible during the phased implementation of measures with a duration of 20-30 years with the financial support of the state, local communities and at the expense of other sources, including international organizations (IAEA, European Commission).
During the implementation of the State programs (2003-2009), research work was carried out in order to study the composition and condition of uranium production wastes, determine the ways of possible radionuclide migration, the possibility of using different methods of decontamination of buildings and equipment.

**Implementation of the State Programmes**

- Tailing "Sukhachevskoye - Section II"
- A protective covering on the tailing "Zahidne", 2005
- Dismantling of technological pipelines, 2007
- Creating a protective covering on the tailings "Yugo-Vostochnoe", 2009
- The site container for storage of technological pipelines

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**EC technical assistance project U4.02 / 16B1 “Implementation of emergency measures for the Dnieper Chemical Plant, Kamysnka (formerly neprodzerzhinsk), Ukraine”**

Since 2016 the European Commission finances rehabilitation activities of this location.

It is planned:
- development of relevant regulations
- Law on Management of Nuclear Inheritance Sites (draft)
- review and revise of Radiation Safety Standards of Ukraine
- establishment of controlled areas to prevent unauthorized access to contaminated areas:
  - Building of controlled areas on the industrial site of the former the PA “PCP” (building of controlled areas around the building #103, Zahidne, Central Yar, Pivdenno-Shidne);
  - building of a site for temporary storage of waste
- moving “freely located“ and “easily moved” objects of radiological risk from the territory of the PCP site to the site of temporary storage
It is planned to fulfill during 2019-2023:

- elimination of the most contaminated building (the building #103 used for thorium extraction)
- remediation, safe shelter, reconstruction for the purpose of further operation
- establishment of a site decontamination of waste
- identification and inventory of uranium ore processing waste, which will be identified within the process of bringing the site to safety
- support for European Commission project activities
- informing the human about the results of the activities
- environmental impact assessment