MONITORING AND REGULATION OF NORM IN THE SLOVAK REPUBLIC

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OUTLINE OF THE PRESENTATION

• Introduction
• Transposition of the EU Council Directive
• Graded Approach
• Legislative Framework
• Adoption of the Slovak White List
• Obligations of the Operators
• Utilization of Geothermal Energy
• Undergroundwater Handling
• Building Industry
• Doses of Workers
• Protective Measures
WHO WE ARE
PUBLIC HEALTH AUTHORITY OF THE SLOVAK REPUBLIC

- National Regulatory Authority competent for the control, regulation, and supervision in the field of radiation protection and physical protection of sources of ionizing radiation.

- Contact point for communication with the competent authorities of other MSs and international organizations in the field of radiation protection.

- The PHA SR is a budgetary organization of the State with competence on the territory of the Slovak Republic with a registered office in Bratislava. The PHA SR is managed by the Chief Public Health Officer of the Slovak Republic who is also the Director of the office.
WHAT WE DO

- Inspections
- Licencing
- Drafting Legislation
- Radiation Monitoring Network
- Provision of services
- EPR
- Training, Education and Public Information
- Central registry of doses
- Central registry of sources of ionizing radiation
- Research
Fundamental Safety Principles SF-1

Basic Safety Standards (BSS), eg GSR PART-3

Safety Guide „Occupational Radiation Protection“ GSG - 7

TRANSPOSITION OF THE EU COUNCIL DIRECTIVE 2013/59/EURATOM

Act No. 87/2018 Coll. On Radiation Protection valid from 1st April 2018

MH SR Decree No. 96/2018 Coll. Laying Down the Details on Operation of Radiation Monitoring Network

MH SR Decree No. 98/2018 Coll. On the Limitation of Exposure of Workers and Population from Natural Sources of Ionizing Radiation

MH SR Decree No. 99/2018 Coll. On Radiation Protection

MH SR Decree No. 100/2018 Coll. Laying Down the Details for Limiting Exposure from Drinking Water, Natural Mineral Water and Spring Water

MH SR Decree No. 101/2018 Coll. Laying Down the Details on Ensuring Radiation Protection During Medical Exposure
Practices
- excluded from the scope:
  a) exposure to the natural background radiation, such as radionuclides contained in the human body and cosmic radiation prevailing at ground level;
  b) exposure of members of the public or workers other than air or space crew to cosmic radiation in flight or space;
  c) exposure to radionuclides present in the undisturbed earth's crust.
- exempted from the regulatory control: exemption levels and clearance levels are in line with GSR Part 3

<table>
<thead>
<tr>
<th>Radionuclides</th>
<th>Exemption levels [Bq·g⁻¹]</th>
<th>Clearance levels [Bq·g⁻¹]</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-40</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Natural RNs from Th-232 series; Natural RNs from U-238 series</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

- need to be notified
- need to be registered
- need to be authorized
An activity leading to exposure is a human activity which can lead to increased exposure of a physical person and it is managed as planned exposure situation, such as:

➢ exposure to natural source of ionizing radiation, when natural radionuclides are processed for their radioactive properties or fissile properties.

An activity at workplaces with exposure to natural sources of ionizing radiation is a work activity that leads to the exposure of a worker or a natural person from the population to natural sources of ionizing radiation, which is not negligible from the point of view of radiation protection; includes the processing of material containing natural radionuclides, underground work, exposure of aircraft crews or spacecraft crews, and work at a workplace with exposure to radon.
**TERMINOLOGY IN THE LEGISLATIVE PROCESS**

<table>
<thead>
<tr>
<th>DEFINITION NORM</th>
<th>ACTIVITIES LEADING TO EXPOSURE IS A HUMAN ACTIVITY WHICH CAN LEAD TO INCREASED...</th>
<th>AN ACTIVITY AT WORKPLACES WITH EXPOSURE TO NATURAL SOURCES OF IONIZING RADIATION includes</th>
<th>DEFINITION Workplaces with exposure to natural sources of ionizing radiation</th>
<th>DEFINITION Workplaces with exposure to radon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naturally occurring radioactive material is material in which the technological process has increased the content of the naturally occurring radionuclides</td>
<td>Exposure to naturally occurring radioactive material in which the activity concentrations of the naturally occurring radionuclides have been changed by a technological process</td>
<td>Handling material in which the technological process has increased the content of the naturally occurring radionuclides</td>
<td>A workplace with exposure to natural sources ionizing radiation is considered to be an area where, as a result of the work activity, the worker's effective dose may exceed 1 mSv per calendar year</td>
<td>A workplace with exposure to radon is considered to be an area where reference levels could be exceeded (annual radon volume activity &gt; 300 Bq·m⁻³)</td>
</tr>
</tbody>
</table>
### ACTIVITIES LEADING TO EXPOSURE THAT NEED TO BE NOTIFIED

<table>
<thead>
<tr>
<th>Workplaces with exposure to natural sources of ionizing radiation</th>
<th>Workplaces with exposure to radon</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ operations of aircraft and spacecraft, concerning the exposure of crews during the flight with altitudes more than 8 km,</td>
<td>➢ underground workplaces,</td>
</tr>
<tr>
<td>➢ industrial sectors involving NORM.</td>
<td>➢ workplaces situated on radon prone areas,</td>
</tr>
<tr>
<td></td>
<td>➢ workplaces in a building that serves as a preschool or a school facility, a day-care home, a health care home, or for other commercial purposes for the long-term residence of persons,</td>
</tr>
<tr>
<td></td>
<td>➢ workplaces where underground water is handled in a way of pumping, cumulating, or in other ways.</td>
</tr>
</tbody>
</table>

If annual effective dose of workers ≥6 mSv → PLANNED EXPOSURE SITUATION
Slovak white list that has been set in the radiation protection law includes workplaces where the following activities could be performed:

- Mining and processing of ores (other than uranium ores);
- Manufacture of TiO$_2$ pigments;
- Production of oil and gas;
- Production of tin, copper, lead, and iron;
- Exploitation of coal;
- Exploitation of raw materials with the content of niobium, tantalum, and zircon;
- Metal mining and smelting;
- **Using of geothermal energy**;
- Handling sediments, filters, etc., from water treatment plants (groundwater is treated);
- **Handling underground water in a way of pumping, cumulating, or in other ways, and workplaces where the activities mentioned above are performed in closed spaces**;
- Building industry;
- Recycling.
OBLIGATIONS OF THE OPERATORS

➢ Perform measurements to calculate the worker's annual effective dose during the worker's stay in the workplace – if the duration of the worker's stay in the workplace is more than 100 hours per calendar year;
➢ Keep a record of the results of the calculation of the worker's annual effective dose;
➢ Ensure optimization of radiation protection;
➢ Inform the worker of the results of the effective dose calculations;
➢ Submit to the radiation protection regulatory body, every year, data on workplace monitoring and the results of the measurements and calculations of annual effective doses of the workers.
The total surface area: 6 ha
The main crops: tomatoes
The water for heating greenhouses ranges from 40 to 100 °C
The number of workers: 300

FIG. 1. Utilization of geothermal energy in the Slovak Republic.
USING OF GEOTHERMAL ENERGY FOR HEATING OF GREENHOUSES

Process Description
USING OF GEOTHERMAL ENERGY FOR HEATING OF GREENHOUSES
Workplace Monitoring
USING OF GEOTHERMAL ENERGY FOR HEATING OF GREENHOUSES

Radionuclides concentration

<table>
<thead>
<tr>
<th>radionuclide</th>
<th>Drinking water concentration</th>
<th>Geothermal water concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-238</td>
<td>2 ± 1 mBq/L</td>
<td>U-238</td>
</tr>
<tr>
<td>U-234</td>
<td>21 ± 4 mBq/L</td>
<td>U-234</td>
</tr>
<tr>
<td>Ra-226</td>
<td>&lt; 1 mBq/L</td>
<td>Ra-226</td>
</tr>
</tbody>
</table>
Groundwater resources are mainly used as the supply of drinking water in Slovakia (87.3% of inhabitants are supplied with drinking water from underground resources), of which approximately 22% of this amount has to be treated. Water treatment is mostly needed for the removal of iron and/or manganese.

**FIG. 2. Survey data (17 operators participated in the survey).**
- Types of monitored materials: concrete, brick, sand, aggregate, cement, shale, etc...
- Sample preparation: hermetisation = sample is filled into a gas-tight container and measured after 23 days at least (because of equilibrium of $^{226}$Ra and its progeny).

- Monitored radionuclides: $^{40}$K, $^{226}$Ra, $^{232}$Th.
PHA SR maintains the national registry of doses, records and keeps doses of up to 16,000 workers every year. Approximately 150 of monitored workers are classified as category A workers who are exposed to natural sources of ionizing radiation.

**FIG. 3.** Total number of monitored workers.

**FIG. 4.** Collective doses of monitored workers.

**FIG. 5.** Annual average effective doses of monitored workers.
TAKEN PROTECTIVE MEASURES

✓ Occupational health and safety measures are already in place
✓ Control of the occupancy period
✓ Discouraging and reducing access (maintenance workers)
✓ Control of the air quality
✓ Ventilation systems
✓ General housekeeping
✓ Personal hygiene
Thanks for your attention.

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