



# Building policy, strategy and regulation to ensure the radiation safety of waste containing radionuclides of natural origin management

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## 1. Scope of State Nuclear Regulatory Inspectorate of Ukraine responsibility

Within the framework of the responsibilities defined by the law, SNRIU develops legislation in the area of nuclear energy use, carries out state supervision of compliance with legislative requirements, and issues licenses, in particular, for activity of radioactive waste management and mining/milling and processing uranium ores.

Regulation of radiation safety of other extractive (minerals, ores, oil, gas and other raw materials) and processing industry is not within the competence of the SNRIU, since these industries do not belong to activities in the field of nuclear energy use.

At today, measures are being taken to amend the legislation to extend the scope of SNRIU competence to NORM and NORM-waste and NORM residues (in addition to uranium ores).

The goal is to fulfill the EU, ICRP, and IAEA recommendations that represent an international consensus on radiation protection within the safe management of radioactive waste and provide the basis for regulatory control of radioactive materials in all countries of the world.

## 2. The regulation of the mining and processing activity of naturally occurring radioactive materials – uranium ores

In Ukraine, activity of mining and processing of uranium ores and activity of radioactive waste management to be licensed according to the Laws of Ukraine "On Permissive Activity in the Area of Nuclear Energy" and "On the use of nuclear energy and radiation safety".

The issue of ensuring radiation protection of personnel, radiation safety of facilities and handling with waste from uranium ore mining and processing and radioactive waste has been fully resolved. Waste and residues that contains only natural radionuclides is not radioactive waste for the purpose of the legislation on RADwaste management.

One state-owned enterprise provides activity on termination of exploitation of processing uranium ores facility. This area, where the technological buildings, structures, etc. uranium processing facility and tailings (tens of tons of low-level long-lived waste) where located in violation of radiation safety was a typical example of «legacy sites». But since 2003, the activity of this enterprise has been transferred to the legal field based on the principle of permissibility of conducting this activity.

## 3. Challenges regarding the safety of the other extraction activity of naturally occurring radioactive materials

The main task to Ukraine – to develop state policy and strategy, provide safety requirements and guidance to ensure the safe management of NORM and NORM waste and NORM residues generated from Ukrainian mineral and hydrocarbons industries.

In Ukraine on the sites of oil and gas production industry enterprises, significant volumes of radioactively contaminated waste have been collected (pumping and compressor pipes, slurries, bulk waste etc.). The levels of surface contamination or specific activity of this materials exceeds the levels of release of radioactive materials from regulatory control.

The development and implementation of policy and strategy for management of NORM and NORM-waste will allow to ensure protection of workers, public & environment during the generation, accumulation, decontamination of equipment contaminated by NORM and NORM-waste) and disposal of NORM-waste that generated.

In the framework of implementation of European legislation SNRIU takes an active position in developing approaches to the formation and implementation of state policy in the field of management and handling with NORM and NORM residues and NORM waste that generated in other extractive industries.

By the way, it can be noted that the requirements of COUNCIL DIRECTIVE 2013/59/EURATOM of 5 December 2013, in particular, Article 23, in the part "Identification of classes or types of practice involving naturally-occurring radioactive material and leading to exposure of workers or members of the public which cannot be disregarded from a radiation protection point of view" are implemented.

However, today the regulatory framework of Ukraine only partially regulates the issue of the procedure for management and handling with NORM and NORM residues and NORM waste, which are formed as a result of the above-mentioned types of economic activities, from «cradle to grave».

## 4. "Road map" of state policy, strategy and regulation building for NORM and NORM-waste and NORM residues

4.1. *The first stage in assessing the need to regulate other NORM and NORM residues and NORM waste* - identification of practices that generate NORM and NORM waste and NORM residues that are likely to require regulatory control

Industry that may generate NORM residues and NORM waste and are more likely to require regulatory control – onshore production of oil and gas.

### 4.2. *Graded approach to regulation*

The graded approach includes exemption and clearance, notification, permit, release from permit, and appropriate inspections, commensurate with the magnitude and likelihood of exposures resulting from the proposed activity and commensurate with the impact that the regulatory control may have in reducing such exposure or improving radiological safety.

### 4.3. *Exclusion, exemption and clearance levels*

#### 4.3.1. *Exclusion from scope*

Excluded exposure includes exposure to the natural level of radiation such as radionuclides contained in the human body, cosmic radiation prevailing at ground level and in-flight or space (here excluding the air or space crew), and from radionuclides present in the undisturbed earth's crust.

#### 4.3.2. *Exemption and clearance*

Management, storage, and disposal of NORM waste generated from onshore production of oil and gas do not require a license from SNRIU if the waste contains

radionuclides with an activity concentration at and below the clearance and exemption threshold values.

Generic exemption/clearance levels to any amount of material: 1 kBq kg<sup>-1</sup> for 238U series radionuclides\*\*; 1 kBq kg<sup>-1</sup> for 232Th series radionuclides\*\*; 10 kBq kg<sup>-1</sup> for 40K

\*\* A summation formula can be used to determine if a material containing a mixture of radionuclides is below the clearance and exemption level.

It shall be underlined that the considerations above focus on radiation protection and that health aspects other than radiation, like chemical toxicity, may be prominent.

Surface contamination clearance and exemption levels are only applicable to fixed surface contamination, in particular, for "metallic" waste:

dose rate (at 0,1 m) - less than 0.26 µGy/h - without restrictions; less than 0.43 - without restrictions on the territory of Ukraine; greater than/equal to 0.43 - withdrawn from circulation in the established order;

beta particles flux density - less than 30 particles/min\*cm<sup>2</sup> - without restrictions; less than 100 - without restrictions on the territory of Ukraine; greater than/equal to 100 - withdrawn from circulation;

alpha particles flux density - less than/equal to 1 particles/min\* cm<sup>2</sup> ;

The presence of unfixated contamination is prohibited.

Surface contamination must be removed entirely, or all accessible surfaces stripped to ensure complete removal. In most cases, decontamination efforts that meet beta surface contamination levels will concurrently provide for the control of mixed alpha/beta/gamma sources.

## 4.4. Occupational and members of the public exposure

It is planned that the enterprise should carry out a radiation risk assessment from the impact of ionizing radiation on representatives of the population and workers. The NORM and NORM waste management facility must complete an environmental impact assessment prior to operating the facility. In the event that an increased content of radionuclides of natural origin in hydrocarbons or an increased level of gamma radiation (in relation to the natural radiation background) is detected, which may lead to exceeding the effective dose of exposure of workers by more than 1 mSv but less 5 mSv per year, regulatory control of this activity is introduced.

For public exposure, the limit of the effective dose is one mSv above background in a year.

## 4.5. Current classification of NORM and NORM waste and NORM residues

Waste and residues that contain only NORM is not radioactive waste for the purpose of the Ukrainian legislation of RADwaste management.

Waste that may be generated in the future from the oil and gas industry contains only NORM. At present, the procedure for managing waste from the milling and mining of uranium ores is regulated similarly to the procedure for managing Very Low-Level Waste and Low-Level Waste.

That is, the NORM-waste must be placed in a facility designed for disposal – "in situ" or in a specially constructed near-surface landfill-type facility.

NORM residues from mining and milling of uranium ores (crushed stone, sand), as well as radioactively contaminated technological equipment, can be used as secondary resources in case of reaching the levels of release from regulatory control, in particular, due to the use of technological operations for decontamination, reprocessing, etc.

It is planned that the same procedure will be for NORM waste for oil and gas industry

Parameters to be considered for NORM waste – radiological, mechanical and physical chemical properties.

NORM-waste is considered only that waste that is subject to disposal – only scales removed from the pipe, vessels etc. and solidified sludges.

4.6. *Other important safety aspects are* - emergency preparedness, transportation, closure and long – term stewardship for disposal facility, site remediation, fund accumulation mechanism (until decommissioning), social/economic factors, system to prevent NORM-waste generation and unplanned releases, identify the regulatory body, or other authorities appropriate to these industries, to oversee enterprises involve to NORM activities (if there are multiple activities or industries, there might be more than one regulatory body or authority involved), responsibilities between the authorities of the executive regulatory control, supervision and overall management, effective system of permitting procedures, supervision and enforcement.

4.7. Specific normative document for safe management of generated "metallic" NORM and NORM-waste in Ukraine are currently under development.

## 5. Conclusion

The result of the implementation of the "road map" will be the development and approval of the Strategy for management materials, equipment and waste of the oil and gas production industry contaminated with radionuclides of natural origin.

Expected results and implementation of the Strategy:

- the generation of waste requiring disposal is minimized to the extent practicable through design measures, operational procedures and decommissioning practices;

- reuse, processing, collection, characterization, separation, management and disposal of all radioactive waste under safe conditions in storage facilities;

- management of NORM-waste and NORM residues in accordance with its radiological, chemical and biological danger to the health and safety of people and the environment;

- mitigation of the impact of treatment of NORM waste disposal facilities on the health and safety of people and the environment is ensured;

- the implementation of measures necessary to reduce risks for current and future generations and the environment from NORM waste is ensure.