

Radiation and Nuclear Safety Authority Regulation on the Safety of Mining and Milling Operations Aimed at Producing Uranium or Thorium

Adopted in Helsinki on 22 December 2015

By virtue of Section 7 q of the Nuclear Energy Act (990/1987), as it is in Act 676/2015, the Radiation and Nuclear Safety Authority has issued the following:

Chapter 1 Scope of application and definitions

Section 1 Scope

1. This regulation shall apply to the safety of mining and milling activities aimed at producing uranium or thorium insofar as the activities fall within the scope of application of the Nuclear Energy Act (990/1987). The regulation shall also apply to the handling and disposal of the radioactive waste generated by these activities insofar as the waste falls within the scope of application of the Nuclear Energy Act.
2. Section 2 of the Radiation Act (592/1991) contains provisions regarding the general principles of activities causing radiation exposure and Chapter 9 contains provisions regarding the radiation protection of workers.

Section 2 Definitions

1. For the purposes of this regulation:
 - 1) *mining area* shall refer to a mining area referred to in Section 19 of the Mining Act;
 - 2) *contamination* shall refer to unwanted radioactive substances on surfaces, in solid matter, liquid or gas (including the inside of the human body);
 - 3) *disposal* shall refer to the isolation of radioactive waste covered by the scope of application of the Nuclear Energy Act from the environment in a permanent manner;
 - 4) *licensee* shall refer to the holder of a licence entitling to the use of nuclear energy. The use of nuclear energy shall refer to the operations referred to in Sections 2(1) and 2(2) of the Nuclear Energy Act, including mining and milling activities;

- 5) *mineral processing waste* shall refer to tailings and other waste generated during the process of separating uranium or thorium from ore;
- 6) *anticipated operational occurrence* shall refer to any such a deviation from normal operation influencing the safety of a mine or processing plant that can be expected to occur at least once during any period of a hundred operating years;
- 7) *internal contamination* shall refer to radioactive substances inside the body;
- 8) *waste rock* shall refer to rock that is excavated from a mine but not forwarded to a production plant;
- 9) *production* shall refer to mining or milling activities aimed at producing uranium or thorium, or both if they take place in the same mining area;
- 10) *production waste* shall refer to nuclear waste generated during the production of uranium or thorium where the average activity concentration of the isotope uranium-238, radium-226, lead-210, thorium-232 or radium-228 exceeds the value of one becquerel per gram (Bq/g);
- 11) *production unit* shall refer to a mine or processing plant intended for the production of uranium or thorium, or both, if they are located in the same mining area;
- 12) *nuclear waste* shall refer to a) radioactive waste in the form of spent nuclear fuel or in some other form, generated in connection with or as a result of the use of nuclear energy; and b) materials, objects and structures which, having become radioactive in connection with or as a result of the use of nuclear energy and having been removed from use, require special measures because of the danger arising from their radioactivity. (Nuclear Energy Act 990/1987, Section 3). The use of nuclear energy shall refer to the operations referred to in Sections 2(1) and 2(2) of the Nuclear Energy Act, including mining and milling activities.

Chapter 2 Limiting radiation doses

Section 3 Radiation safety of workers and population

1. Pursuant to Section 3 of the Radiation Act (592/1991), Section 2 and Chapter 9 of the Act apply to the radiation exposure of the workers and the population in the vicinity of a production unit. The maximum values for workers' radiation exposure are stipulated in Chapter 2 of the Radiation Decree (1512/1991).
2. Section 27 of the Radiation Decree contains provisions regarding worker exposure due to radon gas.
3. The limitation of radiation exposure to the population in the vicinity of the production unit caused by its operation and the disposal of production waste, and the limitation of releases of radioactive substances are enacted in the Nuclear Energy Decree (161/1988).

Section 4 Estimating the radiation doses of the members of the population

1. The licensee shall use computational analyses to estimate the radiation doses caused to the population in the vicinity of the production unit by the releases of radioactive substances as a result of normal operation, anticipated operational occurrences or accident situations.

2. Furthermore, the licensee shall use computational analyses to estimate the radiation doses caused to the population in the vicinity of the production unit due to the disposal of production waste as a result of expected developments and hazards impairing the isolation of the waste.

Chapter 3 Technical design requirements

Section 5 Planning of mining operations

1. The operation of the mine shall be designed in a manner that prevents the leakage of radioactive substances into the environment as effectively as possible.
2. The design of the mine shall consider the closing of the mine and the disposal of production waste.
3. The rooms, systems and ventilation of the mine shall be designed in a manner that limits workers' radiation exposure according to the provisions in Section 3.
4. Excavation, crushing and other processing of ore shall be planned and implemented in a manner that limits the dispersion of radioactive substances and dust containing them from the mine into the environment as effectively as possible.
5. Water treatment shall employ methods that effectively limit the leakage of radioactive substances from the mine into the ground, surface water and groundwater.
6. The amount of waste rock classified as production waste shall be minimised. Waste rock shall be stored in a manner that prevents the release of radioactive substances as effectively as possible.
7. Hazards caused by radioactive substances shall be considered when preparing for operational occurrences and mining accidents in accordance with the provisions in Chapter 11 of the Mining Act (621/2011).

Section 6 Planning of ore processing activities

1. The operation of the processing plant shall be designed in a manner that prevents the leakage of radioactive substances into the environment as effectively as possible.
2. The design of the processing plant shall consider the closing of the plant and the disposal of production waste.
3. The rooms, systems and ventilation of the production plant shall be designed in a manner that limits workers' radiation exposure according to the provisions in Section 3.
4. The crushing, grinding and other processing of ore shall be planned and implemented in a manner that limits the dispersion of radioactive substances and dust containing them into the workspaces inside the production plant and the environment as effectively as possible.
5. The water treatment process at the production plant shall employ methods that effectively limit the leakage of radioactive substances from the production plant into the ground, surface water and groundwater.

6. The migration of different radionuclides inside the process shall be analysed and the results of the analysis shall be taken into account when meeting the obligations set forth in chapters 2 and 3.

7. Mineral processing waste classified as production waste shall be processed and stored in a manner that effectively limits the release of radioactive substances into the air and their migration into the ground, surface water and groundwater. The design of the storage structures and systems for the products and waste materials of the production plant shall take into account erosion, flooding, abnormal weather phenomena, ground displacements and other natural phenomena threatening the stability of the structures and systems.

8. When designing the production plant, any risk factors attributable to internal or external hazards that could result in the release of radioactive substances in amounts that are significant in terms of radiation exposure shall be identified and, whenever possible, removed. Operational occurrences and accidents shall be prepared for by means of technical and administrative arrangements that mitigate their consequences and implement rescue activities, if necessary.

Chapter 4 Commissioning and operation

Section 7 Ensuring the safety functions

1. Prior to the commissioning of the production unit, the licensee shall ensure that the structures, systems and components important for radiation safety are operating as planned. During commissioning, the licensee shall experimentally demonstrate their performance under normal operating conditions and, whenever possible, also under conditions that are similar to operational occurrences and accident situations. Their continuous operability shall be ensured.

Section 8 Radiation protection arrangements

1. The use of personal protective equipment, working methods, working conditions and, if necessary, working hours at the production unit shall be planned in a manner that limits the radiation exposure of workers according to Section 3.

2. The production unit shall have written radiation protection procedures that correspond to the structure and state of the mine or plant at any given time.

3. The production unit shall have in place appropriate equipment for detecting contamination on the skin and clothes of the workers and for removing it, and arrangements for the regular measurement of internal contamination.

4. The production unit shall have appropriate equipment and arrangements in place for detecting contamination on the vehicles, machinery and other objects and materials leaving the area of the production unit and for removing it, if necessary.

5. The production unit shall have in place appropriate arrangements for monitoring the access of the members of the public into areas where radiation exposure is possible.

Section 9 Radiation monitoring

1. The licensee shall ensure compliance with the requirements concerning radiation safety set forth in Section 3 by means of regular measurements performed within the premises of the mine or production plant and along the possible release routes of radioactive substances.
2. The licensee shall carry out monitoring of worker radiation exposure within the area of the production unit pursuant to Chapter 9 of the Radiation Act in accordance with the nature and scope of the activities.

Section 10 Environmental radiation safety

1. The natural radiation situation (*basic state*) in the vicinity of the production unit shall be determined before the operation of the unit is started.
2. The possible releases of radioactive substances from the production unit shall be monitored and their concentrations in the environment shall be observed.
3. If radioactive substances are released into the environment to such an extent that environmental decontamination measures are required in order to avert consequent health or environmental hazards, then the licensee shall ensure that the said decontamination measures are taken.

Section 11 Exceptional situations and emergency arrangements

1. The production unit shall prepare for operational occurrences and accidents where substantial amounts of radioactive substances may be released into the plant area and its vicinity.
2. Written procedures shall be made available for the identification and control of operational occurrences and accidents.
3. The production unit's internal rescue plan shall also consider radioactive substances.
4. Emergency arrangements shall be compatible with the external rescue plan prepared by the authorities for the production unit.
5. STUK shall be notified of the following without delay:
 - a) a dispersion of radioactive substances within the area of the production unit or its vicinity which may jeopardise safety in the production unit or its surroundings;
 - b) any other abnormal observation and information which have or may have an effect on the safe operation of the production unit.

Section 12 Management, organisation and personnel

1. The licensee shall employ sufficient and competent personnel in order to ensure the radiation safety of the production unit pursuant to Section 7 i of the Nuclear Energy Act. The lines of management in the licensee's organisation, as well as the positions and related responsibilities of workers, shall be defined and documented. The licensee shall have a responsible manager and their deputy as defined in Section 7 k of the Nuclear Energy Act.

2. The radiation protection competence of the persons controlling and supervising functions related to radiation safety shall be ensured by means of basic and supplementary training programmes, and their adequate understanding of the necessary information shall be verified.
3. Pursuant to Section 36 of the Radiation Act, the personnel of the production unit and the workers of external companies operating at the unit shall be provided with the basic information concerning radiation safety that is related to their work.
4. The licensee shall have in place a management system that is used to ensure the management of radiation safety and quality. The objective of such a management system is to ensure that safety is prioritised without exception, and that quality management requirements correspond to the safety significance of the activity and function. The management system shall be systematically assessed and further developed.

Section 13 Nuclear safeguards and security arrangements

1. According to Section 118 b of the Nuclear Energy Decree, the licensee shall have in place an accounting and reporting system for nuclear materials and other nuclear use items.
2. Section 7 l(1) of the Nuclear Energy Act contains provisions regarding security in the use of nuclear energy. Furthermore, Sections 62 a and 112 a contain provisions regarding security in mining and milling activities.

Chapter 5

Nuclear waste management and rehabilitation of the area

Section 14 Principle of nuclear waste management

1. Nuclear waste generated from mining and milling activities shall be processed and disposed of in a manner that can be considered safe in terms of long-term isolation, while taking into account the amount of the waste, its activity concentration, the other factors affecting radiation exposure and the local conditions.

Section 15 Disposal of production waste

1. When planning the disposal of production waste, an adequate protection zone shall be reserved around the disposal area proper, when necessary, as a provision for the prohibitions on measures referred to in section 63(1)(6) of the Nuclear Energy Act.
2. Waste rock classified as production waste shall be covered in a manner where the strength of external radiation and radon concentration in air will not exceed the natural levels prevalent in the area. The protective layers shall withstand degradation caused by natural phenomena and effectively limit the release and dilution of radioactive substances.
3. Mineral processing waste classified as production waste shall be processed in a manner that will make the long-lived radioactive substances within the waste chemically stable within their disposal environment. A mineral processing waste area located near the ground shall be covered in a manner where the strength of external radiation and radon concentration in air will not exceed the natural levels prevalent in the area.
4. If necessary, the mineral processing waste shall be isolated by means of protective layers that act as release barriers. They prevent the filtration of rainwater and the flow of surface water and groundwater through the waste area, the resulting passage of radioactive substances from the waste area to the

environment and, on the other hand, limit the penetration of plant roots into the mineral processing waste. The protective layers shall withstand degradation due to natural phenomena.

Section 16 Materials contaminated by radioactive substances

1. Structures, items, components and materials contaminated by radioactive substances that cannot be decontaminated shall be disassembled and disposed of in a manner approved by the Radiation and Nuclear Safety Authority.

Section 17 Record-keeping and reporting

1. The licensee shall arrange the records concerning disposed production waste and other nuclear waste into a file that includes information concerning the location of the waste area, the characteristics of the waste and the amounts of radioactive substances within the waste. The information shall be continuously kept up to date for as long as the mining or milling activities continue. The information shall be regularly submitted to the Radiation and Nuclear Safety Authority.

Section 18 Rehabilitation in areas used for production

1. When decommissioning mining activities aimed at producing uranium or thorium, the activities laid down in the Mining Act concerning the restoration, cleaning and landscaping of the mining area shall be planned in a manner where the rehabilitation of the functions within the scope of the Nuclear Energy Act, including the treatment and disposal of nuclear waste, meets the safety requirements issued on the basis of the Nuclear Energy Act and Radiation Act.

2. When decommissioning milling activities aimed at producing uranium or thorium, the area used for production shall be cared for in a manner where the rehabilitation of the functions within the scope of the Nuclear Energy Act, including the treatment and disposal of nuclear waste, meets the safety requirements issued on the basis of the Nuclear Energy Act and Radiation Act.

Chapter 6

Entry into force and transitional provisions

Section 19 Entry into force

1. This regulation enters into force on 1 January 2016.
2. Upon the entry into force, this regulation shall be applied to any pending matters.

Helsinki, 22 December 2015

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Availability of the regulation, guidance and advise

This regulation has been published as part of the regulations issued by the Radiation and Nuclear Safety Authority (STUK) and it is available from the Radiation and Nuclear Safety Authority.

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